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A STUDY OF POSSIBLE CROP COMBINATIONS IN VEGETABLE INTERCROPPING SYSTEM WITH CABBAGE (BRASSICA OLERACEA VAR. CAPITATA) AS THE BASE CROP

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A STUDY OF POSSIBLE CROP COMBINATIONS IN VEGETABLE INTERCROPPING SYSTEM WITH CABBAGE (*Brassica oleracea* var. *capitata*) AS THE BASE CROP

by

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It is hereby certified that we have read this thesis entitled 'A Study of Possible Crop Combinations in Vegetable Intercropping System With Cabbage (*Brassica oleracea* var. *capitata*) As The Base Crop' by Nik Aziz bin Nik Mat, and in our opinion it is satisfactory in terms of scope, quality and presentation as partial fulfilment of the requirements for the degree of Master of Agricultural Science

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DEDICATION

To:

Bapa, Emak,

Dah, Yani, Yuni,

and Dalila.

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A STUDY OF POSSIBLE CROP COMBINATIONS IN VEGETABLE INTERCROPPING SYSTEM WITH CABBAGE (*Brassica oleracea* var. *capitata*) AS THE BASE CROP

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The biological and economic advantages of intercropping chilli (*Capsicum annum*), okra (*Abelmoschus esculentus*) and long bean (*Vigna sesquipedalis* fruw) with cabbage (*Brassica oleracea* var. *capitata*) at three different planting intervals were assessed by Land Equivalent Ratio (LER), Area Time Equivalent Ratio (ATER), Relative Value Total (RVT) and gross margin. The effect of intercropping on yield and other horticultural characteristics of both cabbage and the component crops were also assessed.

Results obtained showed that chilli + cabbage, okra + cabbage and long bean + cabbage intercrop combinations overyielded biologically and economically as both the LER and RVT of each of these intercrop combinations was greater than one. However, only chilli + cabbage intercrop combination was economically viable if assessment was based on gross margin. Among the different intercrop combinations, chilli + cabbage was

the most efficient combination with the LER (1.42) and RVT (1.22) values significantly higher than the rest. Significant intervals x cropping systems was recorded for LER. Nevertheless, there was no true biological advantage if the intercrop productivity was assessed by ATER.

Planting intervals interacted with cropping systems for yield, average weight per head, head diameter, ascorbic acid content and 50% head formation of cabbage. Intercropping had no significant effect on percentage dry weight, soluble solids, chlorophyll content and 50% head formation of cabbage. Intercropping significantly increased the P, K, Mg, Mn and B contents of cabbage. However, intercropping also had no significant effect on the N, Ca, Zn and Cu contents of cabbage. Similarly, the different planting intervals had no significant effect on the P, Ca, K, Mg, Mn, Zn, B and Cu contents of cabbage.

Intercropping had no significant effect on yield, number of fruits per plant, average weight per fruit and days to 50% flowering of chilli and yield, average weight per fruit and days to 50% flowering of both okra and long bean. On the other hand, intercropping significantly increased the number of fruits per plant and number of pods per plant of okra and long bean respectively.

Increase in planting intervals had no significant effect on yield and number of fruits per plant of chilli, okra or long bean. However, increase in planting intervals significantly

decreased the average weight per fruit (pod) of both okra and long bean and caused delay in flowering of chilli and long bean.

Abstrak tesis yang diserahkan kepada Senat Universiti Pertanian Malaysia sebagai memenuhi sebahagian dari keperluan-keperluan untuk Ijazah Sarjana Sains Pertanian.

SATU KAJIAN MENGENAI KEMUNGKINAN KOMBINASI TANAMAN SELANGAN DI DALAM SISTEM PENANAMAN SELANGAN SAYUR-SAYURAN DENGAN KOBIS (*Brassica oleracea* var. *capitata*) SEBAGAI TANAMAN ASAS

Oleh

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Prestasi dari segi biologi dan ekonomi sistem-sistem penanaman selangan cili, kacang bendi dan kacang panjang dengan kobis pada tiga selangan penanaman (planting intervals) telah di nilai dengan kaedah-kaedah Nisbah Persamaan Tanah (LER), Nisbah Persamaan Keluasan-Masa (ATER), Jumlah Nilai Relatif (RVT) dan pulangan kasar (gross margin). Kesan sistem penanaman selangan ke atas hasil dan sifat-sifat hortikultur lain bagi tanaman kobis dan tanaman-tanaman komponen juga di nilai.

Keputusan kajian menunjukkan sistem-sistem selangan cili + kobis, kacang bendi + kobis dan kacang panjang + kobis mempunyai nilai-nilai LER dan RVT melebihi satu. Ini bermakna semua sistem

selangan ini berdaya maju dari segi biologi dan ekonomi. Walau bagaimanapun hanya sistem selangan cili + kobis sahaja yang dapat memberi pulangan yang berdaya maju jika di nilai prestasi dengan kaedah pulangan kasar. Sistem selangan cili+ kobis adalah sistem yang paling efisien di antara ketiga-tiga sistem selangan yang diuji. Nilai-nilai LER dan RVT bagi sistem ini masing-masing ialah 1.42 dan 1.22. Interaksi antara jarak selangan dan sistem penanaman bagi LER adalah ketara.

Selangan penanaman berinteraksi dengan sistem-sistem penanaman bagi sifat-sifat hasil, purata berat/biji, garus pusat, kandungan asid askorbik dan tarikh 50% pembentukan kepala kobis. Sistem penanaman selangan memberi kesan yang tidak ketara ke atas % berat kering, bahan pepejal terlarut, kandungan klorofil dan 50% tarikh pembentukan kepala kobis. Kandungan P, K, Mg, Mn, dan B di dalam tisu kobis bertambah dengan ketara bagi sistem-sistem penanaman selangan. Walau bagaimanapun sistem penanaman selangan tidak memberi kesan yang ketara bagi kandungan N, Ca, Zn dan Cu di dalam kobis. Begitu juga selangan penanaman tidak memberi kesan yang ketara ke atas kandungan P, Ca, K, Mg, Mn, Zn, B dan Cu di dalam tisu kobis.

Sistem penanaman selangan tidak memberi kesan yang ketara ke atas hasil, bilangan biji/pokok, purata berat/biji dan tarikh 50% berbunga bagi tanaman cili. Begitu juga sistem penanaman selangan tidak memberi kesan yang ketara terhadap hasil, purata berat/biji dan tarikh 50% berbunga bagi tanaman-tanaman kacang bendi dan

kacang panjang. Walau bagaimanapun, bilangan biji/pokok dan bilangan lenggai/pokok bagi tanaman-tanaman kacang bendi dan kacang panjang dipengaruhi dan bertambah dengan ketara oleh sistem penanaman selangan.

Peningkatan tempoh selangan penanaman tidak memberi kesan yang ketara ke atas hasil dan bilangan biji/pokok bagi tanaman-tanaman cili, kacang bendi dan kacang panjang. Walau bagaimanapun, purata berat/biji tanaman kacang bendi dan purata berat/lenggai tanaman kacang panjang bertambah dengan ketara dengan meningkatkan tempoh selangan penanaman. Sebaliknya, tarikh 50% berbunga bagi tanaman-tanaman cili dan kacang panjang bertambah dengan peningkatan tempoh selangan penanaman.

CHAPTER 1

INTRODUCTION

With the present world food shortages, increasing food production can no longer depend only on the increase of arable land and of yield of monoculture crops, but also on increasing the efficiency of land utilization for farming (Nasr et al., 1978). Multiple cropping, the growing of more than one crop per year on the same piece of land, is one of the more feasible ways that allows for more efficient use of agricultural land. Though the potential of this system is not yet very well explored in the world, economic surveys (e.g. Norman, 1972; 1974 a, b) and experimental studies (Agbola and Fayemi, 1971; Palmer, 1971; Bradfield, 1972) have amply demonstrated that where agriculture is capital scarce and labour intensive, and pest and disease incidence usually high, multiple cropping gives higher and more dependable returns than monocropping (Ogunfoworo and Norman, 1974).

One of the multiple cropping systems that involves the growing of two or more crops species on the same piece of land at the same time is called intercropping. Crops grown under intercropping system can be in alternating rows or even mixed together within rows (Crookstan, 1976). Many successful intercropping combinations have been cited. These include corn (Zea mays L) and dry bean (Phaseolus sp.) mixtures in Latin America, dryland rice