Establishing Vegetable Agroforestry System Research at The World Vegetable Center

AVRDC The World Vegetable Center

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INTRODUCTION

Fruits and vegetables provide food and increase incomes for small-scale farmers in the tropics. These high-value crops are also important components of home garden agroforestry systems; they contribute to biological stability, enhance crop diversity, conserve soil properties and increase total productivity. Although the benefits of integrating high-value crops into agroforestry systems have been recognized, few studies have been done to quantify and describe tree-crop interactions. A vegetable agroforestry system (VAF) research was initiated at the World Vegetable Center to study the relationships between fruit trees and vegetable crops in terms of competition and complimentation.

OBJECTIVES

- Study tree-crop interactions in alley cropping vegetable crops with tropical fruit trees.
- Investigate influence of tree crops on natural habitat and insect population in vegetable cropping systems.
- Evaluate total productivity and economic returns from high value horticultural crops in an agroforestry system

MATERIALS AND METHODS

Seedlings of 12 tropical fruit trees: *Anona reticulata, Artocarpus heterophyllus, Chrysophyllum caimito, Coffea arabica, Eugenia brasliensis, Eugenia uniflora, Pouteria caimito, Pouteria campechiana, Psydium littorale, Rollinia mucosa, Syzygium samarangense* and *Tamarindus indica* were planted in hedgerows December 2005 in World Vegetable Center organic vegetable research plots. Vegetable crops were sequentially grown in 8 m alleys between tree hedgerows 10 months after establishment. Monoculture cropping of similar vegetable species was established for comparison. Three sources of organic fertilizer (compost) were applied and evaluated in terms of their effects on growth and yield of vegetables crops. The trial was laid in RCBD with 4 replications.

RESULTS

Establishment and initial growth of tropical fruit trees varied according to species. Outstanding species were *A. heterphyllus, C. caimito, T. indicus and A. reticulata*. Marketable yield of vegetables varied with species over a period of 3 years and 4 cropping seasons. Effect of tree-crop competition was not apparent in reducing yields during the first 2 seasons (Table 1). Significant yield reduction was observed when trees developed full canopy starting the third cropping (Table 2). Yield reduction in sweet pepper was 63%; tomato, 27%; and Chinese cabbage, 20%. Cucumber yield in VAF was similar with monoculture while eggplant was less affected by tree hedgerows with yield reduction of 11%. In the long term, yield loss from vegetables will be compensated by yield gains in fruit trees as some species were already at reproductive stage. Although net returns from vegetables were lower in VAF than in monoculture system, some vegetables (Chinese cabbage and tomato) were more profitable than others when grown under VAF system. Natural enemies including spiders, parasitic wasps, ants, and predatory ladybird beetles were found in VAF system. Results suggest that integration of high-value vegetables during early tree establishment can provide quick economic return.

Vegetable Agroforestry System at AVRDC – The World Vegetable Center

Table 1. Marketable yield of vegetable crops grown in monoculture and VAF systems, AVRDC-The World Vegetable Center, hot-dry season, 2008.

Vegetable Crop	Mono (t/ha)	VAF (t/ha)	Variation (%)
Chinese cabbage	30	60	+100
Common cabbage	43	47	+9
Cucumber	30	42	+41
Eggplant	151	71	-53
Tomato	168	89	-47

Table 2. Marketable yield of vegetable crops grown in monoculture and VAF systems, AVRDC-The World Vegetable Center, hot-dry season, 2008-2009.

Vegetable Crop	Mono (t/ha)	VAF (t/ha)	Variation (%)
Chinese cabbage	61	49	-20
Cucumber	9	9	0
Eggplant	51	46	-10
Sweet pepper	19	7	-63
Tomato	77	56	-27

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