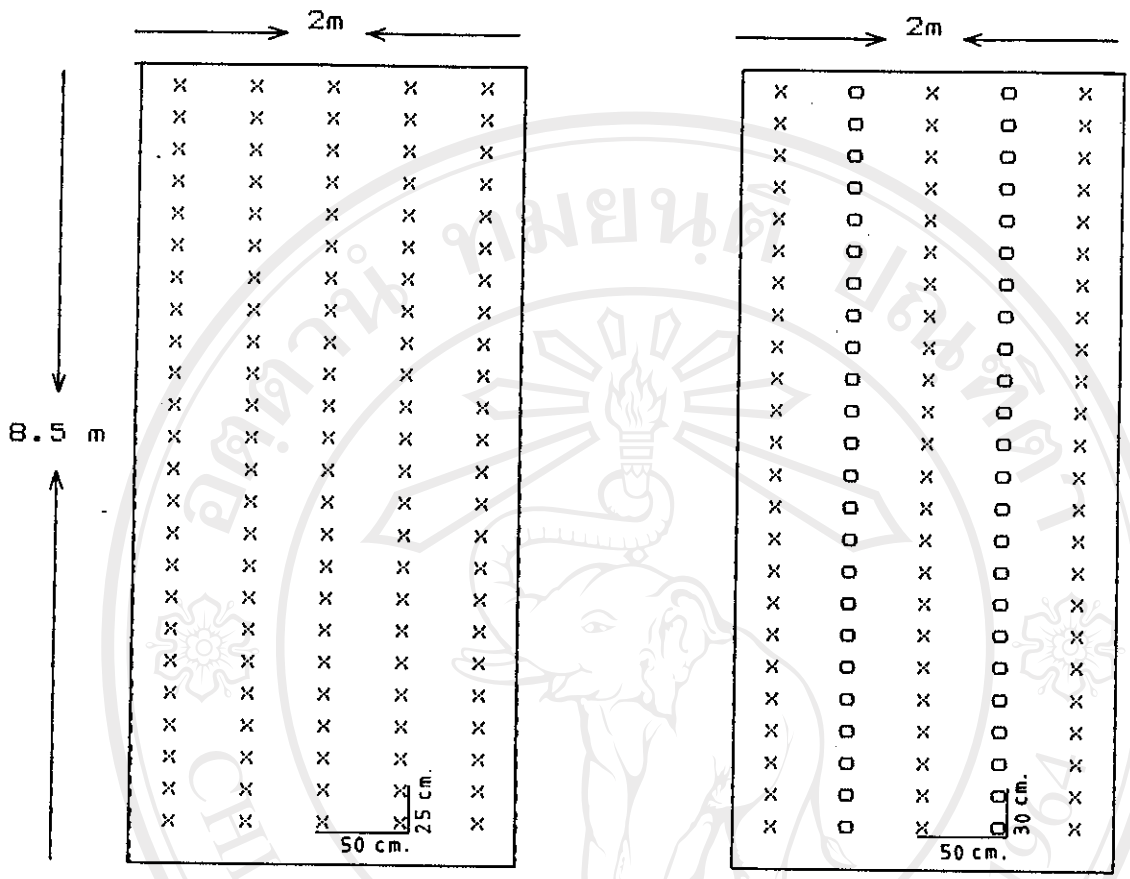
MATERIALS AND METHODS

During the wet season 1989, thirty two experimental plots arranged in a randomized complete block design were established at the Multiple Cropping Center Experimental Farm of Chiangmai University where fluctuations of temperatures were between 26.24 ^{0}C to 27.82 ^{0}C and relative humidity 68% to 80.3% (Table 1). Each plot was 17m^{2} (8.5 m x 2 m) and separated from neighboring plots by a 3 m fallow ground as shown in Figure 1. All plots were four replicates each of eight treatments: (1) soybean monocultures weedy throughout the season, (2) soybean monocultures kept weed-free for only two weeks after planting, (3) soybean monocultures kept weed-free for only four weeks after planting, (4) soybean monocultures kept weed-free throughout the season, (5) soybean polycultures (intercropped with corn) kept weed-free throughout the season, (6) soybean polycultures kept weed-free for only two weeks after planting, (7) soybean polycultures kept weed-free for only four weeks after planting, and (8) soybean polycultures weedy throughout the season.

Monoculture plots were composed only of soybean

Table 1. Mean monthly temperature, rainfall, and relative humidity during the experimental period.

Year 1989	May	June	July	Aug.	Sept.
Temperature (^{0}C)	27.82	26.76	26.79	26.63	26.24
Rainfall (mm)	702.72	662.74	859.17	752.18	331.36
Relative Humidity (%)	68.00	74.70	77.90	78.90	80.30



Soybean monocultures

Soybean/sweet corn polycultures in 1:1 arrangement.

Figure 1. Layout of randomized complete block design for each of eight treatments: Soybean monocultures; weedy all season, weed-free for only two weeks after planting, weed-free for only four weeks after planting, and weed-free throughout the season. Soybean/sweet corn polycultures: weed-free throughout the season, weed-free for only two weeks after planting, weed-free for only four weeks after planting, and weedy throughout the season. Each replicated four times at the Multiple Cropping Center Experimental Farm, Chiangmai (1989). x = soybean, o = corn.

(variety SJ5) whereas polyculture plots contained alternating rows of soybean and corn (variety Supersweet). Sweet corn was used in the polycultures because of its economic importance to the farmers in the Chiangmai valley both as a feed crop or as corn in the cob. The plots were planted on May 9, 1989, after the land had been plowed and disked twice. All plots were fertilized with complete fertilizer (15-15-15) at a rate of 30 kgs/rai. Crop spacing was 25 x 50 cm. for soybean and 30 x 50 cm. for sweet corn as suggested by Puttachareon (1988). In soybean/sweet corn polycultures, corn seeds were planted simultaneously between soybeans in a 1:1 arrangement. Corn was side dressed with 30 kg/rai of complete fertilizer (15-15-15) in soybean/sweet corn polyculture treatments. No insecticide treatments were applied. Irrigation was applied to the plots when necessary. The areas between the plots were kept free of vegetation by frequent harrowing.

Sampling Stem Fly, *Melanagromyza sojae* (Zehntner) on Soybean

Sampling adult populations

The abundances of adult flies on soybeans were determined by directly counting the number of adult flies found on 25 randomly selected soybean plants in each plot. This was done at weekly intervals from the third to the twelfth week after planting with a total of ten sampling periods.

Sampling was done between 7 to 9 a. m. when the stem flies were most active in the field. Visual searches for adult flies were conducted by walking along a length of row and selecting 100 non-adjacent plants (a random sample of 25 sampling units per replication). After the initial scanning, each of the plant canopy was carefully examined and searched for adult flies. In order to reduce the chance of counting the same individual more than once, the direction of movement was against the wind so that the flies do not fly ahead to plants which were not yet sampled.

The number of adult flies per 25 plants was recorded during each sampling period. Statistical analysis of the data from this experiment was by analysis of variance and the F-test. It was followed by the Duncan's Multiple Range Test to compare differences between means.

Sampling larvae and pupae populations

Five time periods for sampling of stem fly larvae as suggested by Titayavan (1987) used to evaluate the distribution and relationship between stem fly density and parasitization by naturally occurring parasitoid, Eurytoma sp. were 3, 4, 5, 6 and 7 weeks after planting. A random sample of ten soybean plants were unrooted on each test period. Four replicates were run for a total of 40 plants sampled for each treatment. The plants were brought to the laboratory and carefully dissected under a dissecting microscope then the total number of live larvae, pupae, and parasitized larvae were recorded. The larvae were immediately transferred into a series of alcohol then xylene and preserved in lactophenol for further examination. The mean number of immature stages in a cropping system, the rate of parasitization, and the percent infestation were calculated. Statistical analysis was calculated as described previously for sampling adult populations.

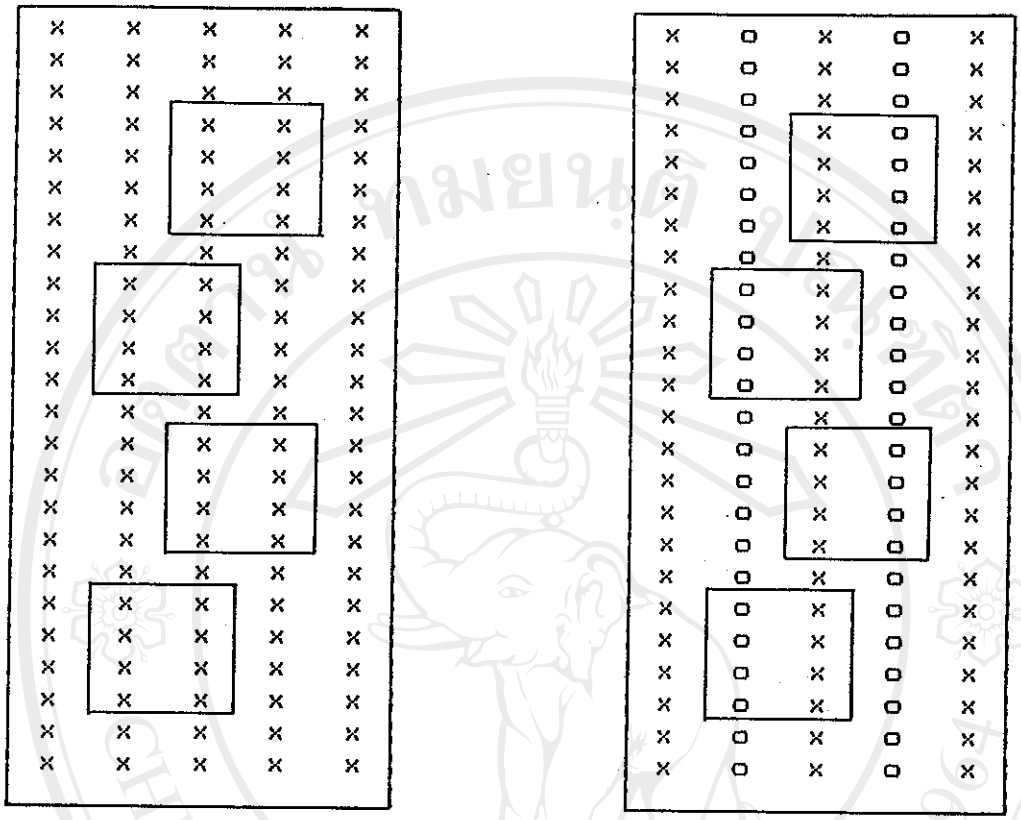
Predator Population
Densities Assessment

Sampling of predators was conducted between 7 to 9 a.m. on six time periods: 7, 8, 9, 10, 11, 12 weeks after planting. Population densities and abundance were assessed for all potential predators of soybean stem fly found in the experimental plots. The abundance of predators: (1) spiders, (2) coccinellid beetles, (3) Geocoris sp. (4) Podisus sp., (5) Stiretrus sp., and (6) syrphid fly were estimated by carefully walking along a length of row and examining plants thoroughly. The number of predators on 25 randomly selected soybean plants in each plot were counted. Analysis of variance to determine significant differences in the number of predators was conducted. Insect species diversity was estimated using Simpson-Yule's measure of diversity (D) (Southwood 1987) and the Shannon-Wiener index (H') (Pielou 1969). The evenness (J') and species richness (rMA) component of species diversity were quantified using the formula of Allan et al. (1975) and Pielou (1969), respectively.

Vegetation Diversity
in Cropping Systems

Uncultivated vegetations were allowed to grow undisturbed throughout the season in both monoculture and polyculture plots which were kept weedy throughout the season. The weeds in soybean monoculture and soybean/sweet corn polyculture plots; weed-free for only two and four weeks after planting and weed-free throughout the season were regulated with handweeding. Two weeks before the harvest of soybean, weed population densities per one square meter quadrat were estimated in each treatment as shown in Figure 2. The identification of weed species was done by collecting fresh weed specimens from the field which were immediately transferred into 30 x 60 cm. plastic bags and brought to the laboratory for further identification. The percentage of species composition per square meter was calculated.

Two weeks before harvest time the weeds, soybeans, and corn plants which were contained in the one square meter quadrat were cut off at ground level. These were placed separately into 30 x 60 cm. plastic bags and brought to the laboratory for oven drying. The dry



Soybean monocultures

Soybean/sweet corn polycultures in 1:1 arrangement.

Figure 2. The locations of four one square meter quadrats selected for sampling vegetation diversity and biomass in various soybean cropping systems at the Multiple Cropping Center Experimental Farm, Chiangmai (1989). x = soybean, o = corn.

matter were weighed separately for the three components: soybean, corn, and weeds. The total dry matter yield per unit area was calculated.

Soybean and corn yield was determined by randomly selecting 25 soybean and corn plants per replication. The grains obtained from soybean samples and cobs from corn were then oven dried (at approximately 10% moisture content) and weighed for yield per 25 plants.

The mean monthly temperature and rainfall for the experimental period were obtained from the records kept by the meteorological station at the Multiple Cropping Center Experimental Station of Chiang Mai University.