

A PROPOSAL FOR THE DEVELOPMENT OF A REGIONAL PROGRAM ON CROPPING SYSTEMS FOR THE CONTROL OF ROOT-KNOT NEMATODES

C.P. MADAMBA

Regional Investigator for Asia, IMP, and Professor and Chairman, Department of Zoology, University of the Philippines at Los Banos, Laguna, Philippines.

Crop rotation is an old age farming system that is effective in controlling plant-parasitic nematodes. By manipulating the cropping pattern which is basically a 2-crop system which includes crops that are non-hosts, farmers have effectively used this approach to reduce nematode population increases there by shifting the focus to more intensive land utilization and the use of advanced technology. Among the approaches, multiple cropping as a means of effectively utilizing farm resources and technology has caught the fancy of both the farmer in the tropics and the agricultural scientists.

Strictly speaking, multiple cropping means the growing of two or more crops in succession in the same field in one year. As a revolutionary concept, this intensive cropping approach has made a tremendous impact on traditional tropical agriculture.

Much of the current cropping patterns evolved have integrated traditional approach with new cropping systems that incorporate available technology. Unfortunately, this integration included elements which have until now received little attention. Information presently available indicates a need for research emphasis in areas not normally considered in traditional lines of research. Foremost among these is pest management.

Intensified practices usually favor the build-up of pathogens, notably soil-borne organisms such as nematode. The sequence of cropping and the frequent use of crops that are especially susceptible contribute to this population build-up. Consequently, the necessity of obtaining benchmark information on the host-parasite relationship of the more important plant-parasitic nematodes and the crops associated in this type of farming system has become increasingly important. By integrating our knowledge on nematode technology alternative optimum cropping systems can be made available to the Asian farmer.

The principal objectives of this program are:

- 1) To identify the more economically impor-

tant nematode species associated with traditional cropping patterns in the region.

- 2) To study their population dynamics under different cropping sequences in view of identifying the cropping sequence and/or for developing crop rotation schemes that will least encourage nematode build-up.

- 3) To develop cropping patterns and determine their feasibility and long term effect.

Procedure/Methodology

A. Evaluation of traditional/current cropping patterns.

Typical cropping patterns that are representative of the region, climate and major crops grown will be assessed on the basis of response to nematode infection among other things. The population dynamics, eg. build-up or infestation and decline of the more economically important nematode species will be monitored periodically and the final yields of each crop in the sequence will be determined.

For the Philippines, cropping patterns to be evaluated will be the rice and coconut based systems. This is because one half of the total 9.0 million hectares of arable land is devoted to rice and 2.2 million hectares or 21 percent is devoted to coconuts. The following scheme is suggested for evaluation.

Type I Climate

Pangasinan

Lowland, rainfed:

rice-watermelon-cabbage
rice-mungo-cabbage
rice-cabbage-cabbage
rice-radish-watermelon

Lowland, irrigated:

rice-rice-cabbage

Nueva Ecija

Lowland, rainfed:

rice-cabbage-sorghum
rice-cabbage-onion
rice-green corn-cabbage

Lowland, irrigated:

rice-cabbage-rice
 rice-melon-rice
 rice-tomato-rice

Type II Climate**Bicol (Sorsogon and Albay provinces)****Lowland, rainfed:**

rice-tomato-pechay
 rice-cabbage-cabbage
 rice-pechay/cabbage/tomato-cabbage

Lowland, irrigated:

rice-rice-pechay-cabbage-tomato & K.
 beans
 rice-rice-Baguio beans/string beans
 rice-rice-pechay-tomato
 rice-rice-string beans-pepper/cabbage

Type III Climate**Northern Luzon (Cagayan, Isabela and Nueva Viscaya provinces)****Lowland, rainfed:**

rice-cabbage-mungo
 rice-watermelon
 rice-upo-compre
 rice-upo-bush sitao

Type IV Climate**South Mindanao (Cotobato and Davao provinces)**

B. Development of cropping systems and identifying best crop combination in terms of economic returns, nematode population, weed population, nutrient uptake of crops, water consumption, long term effects and other elements to maximize production. Initially cropping sequences will be devised and evaluated according to the following scheme:

grains—root crops—legumes
 grains—vegetables—legumes
 grains—legumes—root crops
 grains—legumes—vegetables
 grains—root crops—root crops
 grains—vegetables—vegetables
 grains—legumes—legumes
 root crops—root crops—root crops
 (control)
 vegetables—vegetables—vegetables
 (control)
 legumes—legumes—legumes (control)
 grains—grains—grains (control)

Grains: rice, sorghum or corn

Legumes: peanut, soybean, cowpea, bush beans, pole beans or mung beans

Vegetables: cabbage, eggplant, cauliflower, tomato, okra, pechay, mustard or cucurbits

Root crops: sweet potato, yam or gabi

The specific crop will generally depend upon those recommended for the region in which the system will be evaluated. Specific guidelines like recommended crop on the basis of productivity and market potential, climate type, moisture availability and soil texture and others in the selection of crops will be determined.

Duration and Schedule of Activities:

First and Second Year—evaluation of traditional/current cropping patterns: survey, sampling nematode identification and counting, collection of other data includes yields, data analysis and preparation of report.

Third Year—development and evaluation of cropping patterns to determine best cropping combination.

Definitions

Multiple cropping terminology has become extremely garbled. We have adopted the following word usage at IRRI and will adhere to these meanings throughout the paper.

Multiple cropping: the growing of more than one crop on the same land in one year.

Maximum cropping: the attainment of the highest possible production per unit area per unit time without regard to cost or net return.

Mixed cropping: two or more crops grown simultaneously and intermingled; no row arrangement (Ruthenberg, 1971).

Intercropping: two or more crops grown simultaneously in alternate rows in the same area (Ruthenberg, 1971).

Relay planting: the maturing annual crop interplanted with seedlings or seeds of the following crop (Ruthenberg, 1971).

Cropping pattern: the yearly sequence and spatial arrangement of crops or of crops and fallow on a given area.

Cropping system: the cropping patterns utilized on a given farm and their interaction with farm resources and the available technology which determine their makeup.

Bibliography

1. HARWOOD, R.R. and G.R. BANTA. 1973. The direction and scope of IRRI's multiple cropping program. National

- Multiple Cropping Conference, UPCA, College, Laguna, April, 1973.
2. CARANDANG, D.A. *et al.* 1976. Integrated research on multiple cropping (coconut and upland areas). Technical Report, UPLB/NSDB Integrated Research Program, Research Project No. 7313 Ag. 31 p.
 3. THE PHILIPPINES Recommends for Integrated Farming Systems. 1976. PCARR Philippines Recommends Series. Farming System Committee.