To help increase maize production in the state of Oaxaca, Mexico, where average grain yields are low at around 2 tons/ha, a collaborative project of participatory plant breeding (PPB) of maize is conducted by CIMMYT maize germplasm bank and Research Extension Services of Autonomous University of Chapingo (UACH), Oaxaca, Mexico. CIMMYT maize germplasm bank has developed tropical maize gene pools and pool hybrids between heterotic pools. UACH has developed a movable seed conditioning and processing equipment to clean, sieve, classify, and treat seeds for production of "declared seeds". From six on farm variety trials conducted in 2009-2010 in the tropical wet region of Papaloapan, Oaxaca, CIMMYT late gene pools (variety) and pool hybrids (inter-variety hybrid) yielded 5.15 tons per hector on the average which was 1.9 ton (58%) more than the average yield of farmers' landraces which was 3.25 tons. On the other hand, the same trial conducted at four environments in CIMMYT stations during the same period showed late maturity gene pools and pool hybrids yielded 6.85 tons and the landraces yielded 3.1 tons per hector. Early and intermediate maturity CIMMYT gene pools and pool hybrids were not well adapted at high rain fall tropical regions of Papaloapan. CIMMYT late gene pools of yellow grain types yielding as much as white are new to most of the farmers for production of forage maize. The production of declared seeds in parallel with on farm variety trials and demonstrations has enabled farmers to plant selected varieties and hybrids in the following cycle. Based on the results of PPB activities conducted in 10 maize regions of Oaxaca, short statute, relatively early maturity and high yielding white and yellow CIMMYT pools and pool hybrids are expected to contribute to the on-farm maize diversity and productivity in the state of Oaxaca, Mexico.

*Key words: Participatory plant breeding, on farm maize diversity, Tropical maize gene pools*

## 10. OMEGA3: AN ECOLOGICALLY INTENSIVE APPROACH FOR THE DESIGN OF SUSTAINABLE CROPPING SYSTEMS IN THE TROPICS

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Farmers in the tropics are faced with plant protection issues resulting in: (i) food insecurity and low-income in low-input traditional agrosystems; (ii) pesticide-induced adverse impacts on human health and the environment in intensive systems; (iii) export restrictions due to strict regulations imposed by importing countries. To sustainably provide more and better food to populations of both southern and northern hemispheres, one should therefore

shift from Agrochemistry to “Ecological intensification”, a paradigm based on the optimization of biological interactions and regulations in agroecosystems, particularly via the planned introduction and management of plant species diversity (PSD), resulting, alongside other positive impacts, in pest and pathogen regulation, through various pathways. The CIRAD Omega3 project addresses such issues, building on a broad range of tropical case studies representing various PSD deployment scales (soil, field, landscape), according to a typology of pests and diseases based on their life-history traits (specificity, dispersal ability): (1) sanitizing effects of rotation with service plants versus bacterial wilt on tomato in Martinique; (2) allelopathic effects of cover crops versus white grubs and Striga on upland rice in direct seeding mulch-based cropping systems in Madagascar; (3) diversionary effects of trap plants, combined with conservation biological control versus tomato fruit worms on tomato and okra in Martinique and Niger; (4) same effects "assisted" by application of a food attractant/biological insecticide combination versus fruit flies on cucurbits in Réunion; (5) effects of combining trees and shrubs on plant bug dynamics and black pod rot epidemics on cocoa in agroforestry systems in Cameroon; (6) landscape fragmentation effects on coffee leaf rust epidemics and coffee berry borer dynamics in agroforestry systems in Costa Rica. Beyond obtained immediate impact-oriented results, main expected outputs are tools for evaluating, developing and monitoring agroecosystems based on enhanced ecological processes of pest and disease control by optimized vegetational diversification.

## 11. USE OF RESIDUAL BODY CONDITION TO DETERMINE HABITAT SUITABILITY AND USE OF CLOUD FOREST AND SHADE COFFEE BY RESIDENT AND MIGRATORY BIRDS IN NICARAGUA

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Birds are prime bioindicators of habitat quality and ecosystem health. Avian body condition is a convenient measure of habitat quality. To evaluate the suitability of cloud forest and shade coffee as prime habitat for migratory and resident birds, I used principal components analysis to generate one optimal size variable (PC1) from eight longitudinal measurements (standardized structural differences). I used residuals from linear regression between the linear size variable (PC1) and body mass to obtain a body condition index. Birds relatively heavy for their size (positive residuals) were considered to be in good condition and vice versa. The data set constitutes 1,403 captures (3 migratory and 7 resident species) inhabiting cloud forest (n = 595) and coffee (808). Nine age class (adult, juvenile) and gender comparisons resulted in differential capture rates ($\alpha = 0.05$) within and between habitats. Whereas adult females were captured about equally in box habitats, 66% adult