

Recollections and Reflections on the Integrated Pest Management Program in Zamorano from 1980 to 1993

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Abstract. The Integrated Pest Management program carried out by an interdisciplinary team in Zamorano from 1980 to 1993 made important contributions to regional scientific and technical progress as well as to Zamorano's evolution and educational programs. The IPM program left a legacy in regional pest management practices, teaching materials, and rural development practices. The program had major impacts because it was based on open-ended risk-taking, operated with minimal interference from both the donor and the host institution, and focused on human creativity rather than predictable, measurable outcomes.

Key words: Agricultural development, Central America, entomology, extension, Honduras, plant protection, research.

Remembranzas y Reflexiones del Programa de Manejo Integrado de Plagas en Zamorano de 1980 a 1993

Resumen. El programa de Manejo Integrado de Plagas (MIP), llevado a cabo por un equipo interdisciplinario en Zamorano desde 1980 hasta 1993, hizo importantes contribuciones al progreso científico y técnico regional, así como a la evolución institucional y programas educativos de Zamorano. El programa de MIP dejó un legado en las prácticas de manejo de plagas, en materiales didácticos y en prácticas de desarrollo rural. El programa tuvo su gran impacto porque se basó en la búsqueda abierta, la asunción de riesgos, se operó con un mínimo de interferencia del donante y la institución anfitriona, y se centró en la creatividad humana en lugar de resultados predecibles y medibles.

Palabras clave: América Central, desarrollo agrícola, entomología, extensión, fitoprotección, Honduras, investigación..

Introduction

This review of the Integrated Pest Management (IPM) Program in Zamorano from 1980 through 1993 is intended to be much more than a chronology of facts, events and outputs. This is not a public relations piece, nor is it an academic document. It is intended more as a reflection on what a group of pioneering IPMers set out to do, how we did it and what resulted. Having had the honor of working as Director of the IPM activities during those 14 years, I hope it gives readers a feel for the human element of a program that was driven by youthful energy, a crusading iconoclasm and naive enthusiasm. Second, I want it to allow those of us who were given the opportunity to participate in these activities the chance to reflect on and celebrate a key part of our lives. Third, it is a reflection on the legacies of the program a generation

later. Finally, I attempt to identify a few lessons - beyond pest management - that come from the Zamorano IPM experience that could be useful for others who are initiating or reorienting their rural development or agricultural careers.

These subjects will be addressed within two broad subthemes: 1. the scientific/ technological impacts the program had on the broader society, and 2. the impacts of the program on Zamorano University's institutional evolution and educational program.

A Brief Factual and Anecdotal Chronology

Late 1970s. In the late 1970s, IPM was a dynamic, highly visible, multidisciplinary approach that was dominant in rich nations. IPM had established a well-financed and well-developed presence in a few Latin American countries such as Peru and Nicaragua, most

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notably in cotton and fruit crops. Additionally, a FAO team had carried out exemplary work in Nicaragua in maize and dry beans IPM. Wherever it was practiced, IPM was perceived to facilitate the harmonic confluence of economic, ecological, agronomic and people-centered development practices. However, most Central American nations including Honduras lagged far behind, and continued to employ simplistic squirt-and-kill-'em pest control philosophies.

IPM at Zamorano appears to have begun during the last years of the 1970s when the Texan Harry Howell taught entomology; but by 1980, a year after his departure his influence had been reduced to a single cabinet of 2000 fungus-covered entomological pins and a few dozen stencils of translated taxonomic keys. IPM was nowhere to be found in either the classroom curriculum or field practice.

1980-early 1983. The author of this paper was recruited as Zamorano's entomologist and IPM specialist by Hugh Popenoe, President of the Escuela Agrícola Panamericana (EAP) Board of Trustees, and Simón E. Malo, the new Director of Zamorano, and began work in mid-May 1980. At that time, the Escuela Agrícola Panamericana which had rested on its laurels for more than a decade and was in precarious financial health was about to be transformed under the leadership of Dr. Malo who intended to not simply correct the problems, but to thoroughly modernize the institution.

From the outset it was clear that many students were very interested in the subject of IPM and that international funding could be obtained to support research and development work as well as to improve educational programs. The Cold War was being fought in Central America, and a tsunami of development money was approaching as a complement to the massive military and political investments.

I arrived in Zamorano as a refugee from the Salvadoran civil war. Initially, my only desire was to complete the interrupted scientific studies on pests of maize and beans that I had begun two and a half years earlier, finish my publications and move on as quickly as possible. When I arrived in the "School" I was shocked to see uniformed young men doing hour after hour of repetitive physical chores; I was used to a coeducational setting in which students set their own

schedules and engaged in strictly intellectual efforts. I was taken aback by an institutional culture based on military-like discipline that I perceived to be strictly empirical, even unscientific. Why, I thought, was there so much emphasis on authority, routine, regimentation and physical work when I had been taught that freedom, flexibility, individuality, and independent and scientific thinking were the keys? However, it was on the first day that I had contact with the students in the entomology module that I was forced to reconsider my first impressions. I still remember what it was like to work in the field with these young men with last names beginning with G and H; never at the University of California, Riverside, had I been given the opportunity to be involved in such authentic hands-on learning in a real life production setting. We worked together on pest scouting, we took turns applying with back pack sprayers (of course, no protective equipment of any kind was available), we snooped around in the fields, and we all learned so many new things every day. I found in the young people allies who were incredibly enthusiastic, energetic, open, intelligent (well, most of them) and committed. Together we began a process of formal experimentation and common-sense innovation to improve the EAP's pest management practices.

Initially salary and minimal operational support were provided by the Inter-American Institute for Cooperation on Agriculture to research IPM in vegetable crops. Work concentrated on the pepper weevil, *Anthonomus eugeni*; cabbage pests, especially the diamondback moth, *Plutella xylostella*; curcubit pests such as *Diaphania* spp.; and polyphagous pests like *Spodoptera* spp. Work on pests of maize and beans was bootlegged. Most work focused on bioecological studies, establishment of action thresholds and the comparison of conventional chemical control practices with alternative methods.

During this time, I taught the entomology work module, and the plant pathology module was taught by Mario Contreras, a Zamorano graduate who had recently taken a Ph.D. at Cornell University. While other modules emphasized repetitive physical work as quintessential EAP training, we attempted to emphasize the learning part of learning-by-doing through careful observation, dialogue, debate and consultation of scientific references, scarce as these

were. Both of us attempted to combine routine manual labor with question-and-answer sessions, explorations and genuine active learning. Some colleagues felt that we were coddling the students and that it would be better to restrict activities to hard physical labor. Mario (whose second name should have been Socrates) demonstrated a style of teaching that was student-centered, analytical and disciplined; he emphasized careful examination, analysis and debate before taking a decision. We both insisted on trophic level analysis and attention to bioecological processes as prerequisites and adjuncts to the use of technology.

As an obligatory part of each entomology module, students accompanied me at least one time for two hours on a nighttime walkabout (*gira nocturna*) during the study hours in order to accomplish two goals. First, students were able to experience the life of a biologist/ naturalist; by simply snooping around, we found examples of insects doing their things – predated, singing, copulating or ovipositing. Second, without ever saying so aloud, we all got a slightly perverse pleasure out of breaking Zamorano’s sacred, lock-step routine in which all students were expected to study silently in their rooms every night. It had not been easy to obtain permission to initiate this practice from the Inspector, Juan Fernández, and I suspect that oftentimes, even as we were excitedly observing the bugs, he was there in the shadows keeping his eye on us and wondering whether this aberration presaged utter chaos and ruin in the school’s discipline system. We always used our time wisely and learned important lessons, and these sanctioned acts of mild rebellion-with-a-purpose served as the first stage in the creation of the spirited and committed Zamorano IPM teams.

In addition, many student volunteers and young instructors worked enthusiastically in their free time, on weekends, at night and in the afternoons with me, and we conducted formal experiments that produced a number of referred publications, some of which proved to be of importance to scientists and producers in Florida and other tropical and subtropical areas.

In these early years, the team of Margoth and Keith Andrews prepared yearly improvements to what would become the Guide to the Orders and Families of Insects of Agricultural Importance in Central America. Margoth never complained about my tendency to do things at the last minute and under too much pressure;

she simply would get up every Friday at 2 AM to finish the translations.

In 1981, an attempt to create EAP’s first Fourth Year Program, in IPM, with ten fantastic recent graduates from half a dozen countries was suspended in late December, just a few weeks before it was to initiate, when expected USAID funding did not materialize in time.

Mid 83-87. In mid 1982, USAID/Honduras disbursed funds to support the “Proyecto Manejo Integrado de Plagas en Honduras: un programa en dos partes”. This Project set out to do a couple of novel things. First, it provided resources to hire full time scientists, including Jairo Castaño (plant pathologist), and a group of recent graduates to assist in research on pests of maize, sorghum and dry beans both on campus and on small holders’ fields in Olancho, El Paraiso (Francisco Morazán) and Comayagua; this was accompanied by extension activities to improve smallholder practices. Resources were also provided to develop IPM teaching materials – textbooks, guides, and audiovisuals - for use in Zamorano and eventually in other schools and universities.

After the initial project finished, USAID/Honduras renewed its support several times for varying periods (for up to one year and sometimes for just a few months). Work was expanded to other parts of Honduras and to horticultural pests. Presumably, USAID was pleased by the impacts of the project; they frequently brought VIP visitors to campus to see it. But in addition, it may have been that the aggressive cajoling of Simón E. Malo and me kept them on the defensive.

Huge quantities of chop suey and local fruits were consumed by famished, overworked data collectors in the middle of corn fields in El Paraiso and Olancho as the IPM teams manically conducted Zamorano’s first on farm experiments. Learning was a two-way street between proto-plant protectionists and farmers. The research always involved farmer collaborators, and as a rule was connected to training sessions. It was during this time that the plant protection team grew to include socioeconomists and communications specialists, among them Darlan Matute and Hector Barletta. Extension materials and practices were developed and then validated using

formal experimental designs and statistical analysis.

The following innovations will be treated in greater level later in the text. Grace Goodell of Johns Hopkins University brought her experience as the first anthropologist on staff at IRRI to our program, and we were never the same. Entomologists from the University of Florida, Gainesville, working with the program made invaluable contributions. Zamorano's first large-scale international internship program was initiated allowing many of the best and brightest graduate-employees to gain experience in US Universities, learn English and make the contacts that later led to offers of assistantships to carry out further studies. Every year, the program organized national and international congresses, symposia and workshops. At the program's urging, the Honduran Secretary of Natural Resources issued a decree making IPM the official national policy.

1987-1992. By 1986, it was obvious that Zamorano had developed the capability to contribute to IPM throughout Central America. USAID's Regional Office for Central America and Panama invited Zamorano to share regional responsibilities with CATIE in the new RENARM Project. Responsibilities would extend to all of Central America, including Panama, Belize and the Dominican Republic. The breadth and sophistication of the program's activities were further expanded. The team was enlarged to include a full time anthropologist, Jeffery Bentley; a biological control specialist and insect taxonomist, Ronald D. Cave; and a weed scientist, Abelino Pitty. The new Pesticide Use and Efficacy program was overseen by Mario Bustamante; it is important that the focus evolved quickly from simple safe use to efficacious use. Permanent teams of young researchers and transfer specialists were established in Nicaragua and El Salvador. More crops, including some for export markets, were included.

The production of a large variety of training materials was intensified, and a formal marketing program was created. This was the beginning of the Zamorano Academic Press (ZAP), an editorial created to assist Zamorano faculty in the production of textbooks, field guides and reference materials for general public, students, and professionals working in agriculture.

On campus, the Department of Plant Protection (DPV) was established in 1987, and the physical facilities were constructed beginning that year using project financing. At this same time, Zamorano initiated the fourth year program that allowed graduates of the three year Agrónomo program to complete their university studies (Ingeniero Agrónomo degree) in one additional year. Plant Protection was the major that many of the top notch students opted for. Student theses were never *ad hoc* studies; rather they were integral parts of the program's research efforts and often resulted in formal publications. The internship program was further expanded and came to involve half a dozen US Land Grant Universities and some private sector collaborators. A work-study option pioneered by the DPV supported students while they completed their degree in two years and gained extensive work experience.

Certain of the intangible characteristics of the IPM program during this 13 years merit mention. A special energy was ever present, as was a sense of discovery, of purpose and a conscious iconoclasm. The team's culture always reflected open-endedness. The people who worked in the IPM program wanted to be part of positive change in a convulsed and inequitable part of the world. While we certainly wanted to achieve scientific and technological results, we were also simply thrilled by the process of figuring stuff out, of exploring and of trying to shake things up and do them better. Most of the people who were involved in the program were creative thinkers who felt that by working in IPM they could deal with several of the region's agricultural, environmental and social development needs, especially of small scale poor farmers and their families. We hoped that through IPM we could correct some of the excesses of the technologically-oriented, chemically-based development model which had been the only component of the Zamorano program for decades and was the dominant paradigm of most national development programs.

For many of us this was a secular, science-based crusade to improve the conditions not only of Honduras and Central America, but to make contributions to the broader developing world. We were motivated by hubris and liberated by naiveté - in retrospect, a good combination.

Contributions of Zamorano's IPM Activities to Regional Scientific and Technical Progress

The IPM program set out to improve on farm pest management practices through scientific and technological innovation with a human focus. The program developed a large number of innovations as documented in the vast number of publications, congresses and symposia. In addition to the development and implementation of technologies, the program carried out important taxonomic work, and allowed social scientists to make important contributions to agricultural development. The program was recognized for the contributions it made to development thinking and practice in Central America because of its interdisciplinary practices, self-critical culture and agroecological thinking. The large numbers of refereed, scientific publications were widely consulted in Central America and beyond, and provided significant visibility and credibility to the Institution.

Not only did the program produce a noteworthy amount of documentation of value to scientists. It also placed considerable emphasis on communications with farmers, extensionists and the general public. The projects produced dozens of extension publications, including a series of illustrated comic book style references for farmers as well as technical references for extensionists and paratechnical farmer leaders. For many years the program published a weekly supplement in a national newspaper that informed students and the general public of pest management.

The scientific approach was not restricted to conventional bioecological studies. Randomized, controlled-variable trials were carried out to validate the efficacy of different extension techniques, approaches and materials. Some of the studies undermined the prevailing notions that audiovisual aids were effective adjuncts to extensionists' talks. The studies of farmers' perceptions and acceptance of printed messages and of illustrations helped refine the work of agricultural communicators.

Project financing permitted the rapid development of Central America's second largest entomological collection with over 200,000 specimens. This biological inventory work complemented the botanical systematics carried out

since the 1940s in the EAP herbarium. The work of Ronald Cave and Steven Passoa, among many others, made significant contributions to the understanding of Central American biodiversity and provided background information for the applied pest management activities. Special mention should be made of the taxonomic work with beetles, whiteflies, veronicellid slugs, parasitoids of agricultural pests and plant-feeding mites.

The Program was focused primarily on IPM in maize and beans. Believe it or not, a dozen of us dedicated the better part of a decade and a half to an intimate relation with bean slugs, *Sarasinula* spp., then causing tens of millions of dollars damage every year in Central America, and destroying the major source of protein for millions of families. We transformed Central American management of this introduced pest by a careful documentation of its feeding habits, geographical distribution and seasonal population dynamics, coupled with the development of monitoring procedures and the study under diverse agroecological settings of the efficacy and integration of assorted mechanical, chemical and cultural control procedures. Many other bean pests were also studied and management practices disseminated.

While the economic impact of the team's work was not as great in maize pest management as in the case of the slugs, the program advanced understanding and rationalized management practices. Considerable bioecological knowledge was generated and Honduran pest management technicians were provided for the first time with complete, locally validated information.

Reduced tillage systems in maize and beans were studied for a decade. During this extended time, zero till was shown to be a viable option and the studies provided information regarding changes in general biodiversity and the incidence of particular pests.

IPM of several vegetable pests, especially cantaloupes, was carried out by team members, most notably Lorena Lastres. This work, co-financed by RENARM, FPX and the growers themselves, saved the melon industry in southern Honduras and provided information to neighboring countries. The work in cabbage and cucurbits grown by small farmers did not result in the breakthroughs seen in melons, but did produce a better understanding of the bioecology of pests and resulted in a reduction of hard pesticide use.

The program carried out classical biological control efforts through the introduction into Honduras of enemies of water hyacinth, diamondback moth, maize stem borers, and maize whorlworm. The quarantine facilities in Zamorano have provided support to international scientists' searches for biological control agents of the Colorado potato beetle, bromeliad weevil and several Mesoamerican weeds that have invaded other parts of the world.

The experience in the RENARM and MIPH programs with the "Especialistas Socioeconómicos para Investigaciones Agrícolas" (ESPÍAs) was an extremely interesting experiment in which a research development and technology transfer program created a mechanism for real time monitoring of the acceptability and applicability of agronomic research and transfer activities. This activity employed agrónomos and ingenieros agrónomos who were trained in rudimentary social science techniques. They worked directly with farmers who were the intended beneficiaries of the on farm research and extension programs in ways that provided valuable information to program leaders allowing them to detect problems, adjust activities and reorient procedures that were unacceptable to clients or that did not seem to be headed in a productive direction.

Contributions to Zamorano's Institutional Evolution and Educational Program

The substantial impact of the IPM activities on Zamorano's culture, structure and practices was both unintentional and intentional. Some of the innovations pioneered were institutionalized, while some of the elements have always caused discomfort for conservative elements on the campus and even today continue to be controversial and suffer from push-back.

The IPM activities in Zamorano from 1983-1992 represent the largest applied and strategic research and outreach program ever to have been undertaken at the University. The IPM in Honduras Project was the first instance in which Zamorano, then the Escuela Agrícola Panamericana, engaged in a large scale, deliberate, continuous outreach program. It represented a distinct break with the pre-1980 period when faculty and students had been explicitly

prohibited from involvement in off campus activities.

The RENARM project represented Zamorano's first large scale involvement in a regional outreach project. The RENARM project allowed Zamorano to carry out scientific and technological research and development activities for the first time beyond Honduras' borders. This was the beginning of the ongoing outreach efforts that make Zamorano today an effective complement to organizations like CATIE and IICA.

These early discipline-restricted outreach activities were the direct precursors for the development of Zamorano's rural development program and eventually the Socioeconomic and Environmental Development career, as well as PROMIPAC and on-going projects in El Salvador and Nicaragua.

All of the IPM projects focused principally on the small scale producers who had never been the focus of Zamorano's research and development or teaching. The IPM activities provided Zamorano with direct contact with smallholders and significant experience with extension activities. This had never been the case prior to the programs. In fact, smallholders had often times been treated as little more than an embarrassing impediment to the development of Latin America.

Prior to the MIPH program, the focus in Zamorano was almost entirely upon conventional, synthetic input-based agronomic technologies. As a result of the IPM focus, new approaches were introduced, especially agroecological concepts. These included analysis of interactions among trophic levels and among taxonomic groups, as well as the efficacy of non-chemical alternatives. It should be noted that the latter changes "were in the air" and certain other professionals in Zamorano simultaneously began to develop similar concepts in their respective areas.

The external funding not only paid for the on-campus and on-farm research and development program, but also facilitated the realization of research symposia, congresses, international scientific exchanges, and the building and equipping of physical facilities on campus.

Project funding permitted the development of capabilities and activities that led to the establishment in 1987 of the Department of Plant Protection. The MIPH and RENARM projects provided the resources

to construct and equip valuable permanent physical infrastructure. The offices, laboratories, diagnostic center, museum, library and teaching facilities of the Plant Protection Department were all developed using external funds. This and the W.K. Kellogg Center are the only examples in Zamorano in which major physical infrastructure has been developed without the use of institutional core funding or American Schools and Hospitals Abroad (ASHA) financing. The presence of these large research development and outreach programs allowed the IPM program to support with external funds year after year from three to a dozen full-time M.Sc. and Ph.D. specialists. In addition to carrying out the project activities, these professionals taught classes, supervised theses, oversaw field work and otherwise supported Zamorano's educational mission. Salary substitution, always the model for the IPM program, was emulated in the rural development program and in a much more limited fashion in other disciplinary areas. Unfortunately, it never became the norm in the expansion and operation of resource-scarce Zamorano.

The development of the Center for Bio-control in Central America, the Center for Pest Diagnostics and the Center for Pesticide Management all represented a commitment on the part of Zamorano to the long-term development of regionally important outreach capabilities. The former appears to have had more long term impact than have the other two.

Both the MIPH and the RENARM programs facilitated and paid for the production of a large number of diverse teaching materials including text books, laboratory guides, field guides and audiovisual programs. This was a successful early example of the use of external funding to support the development of teaching materials for use in Zamorano and in other teaching institutions.

The IPM program brought the first desktop computer to Zamorano - an IBM 186. This was no simple process as it required both US State Department approval and an OK from a skeptical Simón E. Malo who worried - justifiably - that computers would undermine Zamorano's unilateral field orientation. The IPM program participants were the first on-campus users of email and the first to be interconnected by a virtual network.

The MIPH and RENARM activities represented

the first instance in which "soft social sciences" played a role in the thinking and actions of agricultural specialists in Zamorano. Grace Goodell was the primary ally in the early years. As a paid consultant, who always donated her honoraria to Honduran charities, she incessantly mentored and advised, as well as scolded and embarrassed us into examining our prejudices and processes and insisted that we broaden our thinking and practice. After 1998, Jeffery Bentley became an integral member of the IPM in Central America team. Both agricultural anthropologists brought significantly new ways of seeing agricultural development challenges to Zamorano.

The public recognition and credibility with international cooperators that Zamorano obtained as a result of the IPM work is not insignificant. In addition to USAID, the Kellogg Foundation and the Swiss Development Cooperation both considered the outreach model to be an important reason for their involvement in support of Zamorano.

One of the most important of all of the IPM program's contribution to the university was the way in which it helped leaders to break out of the educational straight jacket which was limiting the institution. The incorporation of outreach and the use of experimentation as a learning tool for students were revolutionary in Zamorano.

The outreach activities served as an important, even indispensable, component of an expanded educational model that led to a much broader concept of what education, especially learning by doing, can and should be. The projects created the opportunities for students to engage in what could be termed active, collaborative or authentic learning. Students worked in interdisciplinary groups, in off campus production settings and were charged with producing information needed to resolve real world problems.

In the earliest years (from 1980 through 1985) the IPM program, even when it had such limited external financing, was key in making the rules more flexible at Zamorano. The nighttime tours, and then the frequent off-campus work, and the around the clock experiments probably gave ulcers to the most traditional leaders of Zamorano. I have to assume that the Director and Dean Jorge Román knew that the beer we were buying with project funds was being used

only in traps for slugs, and I do know that only once did I have to explain how condom use was restricted to laboratory studies of insect vectors of plant viruses. In any case, all of these activities helped Zamorano to move away from the straight jacket that it put itself in during the 1970s.

Both the MIPH and the RENARM Programs strengthened Zamorano's relationships with US land-grant universities. The connection with the University of Florida at Gainesville was especially strong. Among the researchers and teaching specialists who worked very closely with Zamorano were Carl Barfield, Fred Bennett, Jerry Stimac and Dale Habeck. In addition, Henry Pitri's Sorghum program at Mississippi State University worked for years with Zamorano. Robert J. (Bob) O'Neil from Purdue University provided support in biostatistics and field plot design and was an unrelenting promoter of exchange programs and internships. Tony Shelton from Cornell University collaborated in horticultural IPM. It is important, to point out that the presence of these specialists the scientific input and the in-service training activities were all developed with external financial support. Many of these activities evolved into integral, permanent parts of Zamorano's activities.

The IPM projects developed and tested the first example of the work-study program for fourth year students. The RENARM project provided full financial support to Agrónomo students who dedicated two years to complete their final year of studies to obtain the Ingeniero Agrónomo degree. They gained real world work experience before graduation. This proved to be an extremely valuable combination for many young people.

IPM specialists in these projects worked with their counterparts in horticulture and agronomy on the development of pest and disease monitoring protocols, critical thresholds for pest management, and non-chemical controls. These interactions were never without friction and debate. It represented a different approach to the programmed treatments which had been commonplace in the teaching program until the mid 80's. This kind of tension was useful in that it showed students that there are multiple production paradigms and approaches to agronomic practice and that their professors – each one undisputedly capable – can disagree regarding best practices.

Final Reflections

The processes. Exploration and open-endedness. The Zamorano IPM projects were successful thanks partly to the flexibility that USAID allowed in the 1980s, a level of openness that is inconceivable in the 2010s. Our work in the 80s was relatively unstructured and exploratory; we enthusiastically opened ourselves to failure. We were given a degree of liberty to look for the best way and to experiment methodologically. Such an approach is not common, even impossible today. The current obsession with implementers' "accountability" for the achievement of predetermined, quantifiable results (as if development were some sort of an assembly line for profit business) makes that impossible. However, a review of the transforming results of the open-ended IPM activities should make us wary of current development "best practices" that are predicated on detailed planning, quantitative output indicators and inflexible methodologies. Could it be that we now operate under the quadruple illusions that we really know what development is, that we know how it is accomplished, that only those factors which are quantifiable are really important, and that the unpredictable human element is to be avoided?

Interdisciplinarity. A cornerstone of IPM thinking is the essential role of interdisciplinarity. In the Zamorano projects, the integration of professional disciplines was achieved in exemplary fashion between the social sciences and entomological practice. In addition, communication specialists and entomologists really did collaborate without barriers. To a large extent, entomological and agronomic practices were integrated. But if we are honest, it becomes clear that true integration among the plant protection disciplines was the infrequent exception rather than the rule; despite good intentions, only occasionally did the plant pathologists, entomologists and weed scientists produce anything of value by working together.

Transformative legacy. While it is clear that the projects had significant positive impacts on farmers' practices and opened the door to various new, more sophisticated programs and projects in Zamorano and

elsewhere, the legacy must not be overstated. IPM helped Zamorano to diversify and update its activities and approaches, but institution-wide transformation was not achieved; 1970s-style business as usual continues in many disciplines. As a legacy of the structural reforms of the 1990s and the rethinking of development priorities, few rural development programs in Central America are truly self-critical or innovative. IPM as a formal discipline has almost disappeared.

The people. It would be impossible to understand the IPM program in Zamorano without focusing on several groups of people.

First, there were the many farmers who put up with, encouraged and mentored us. One of my most enduring memories is the hand written note given to us in Linaca, El Paraiso, stating simply “Adelante, tecnicos gringos. Gracias.” In reality, I am sure that all of the US, Nicaraguan, Colombian and other foreigners were included in the category “gringo”.

We worked closely with collaborators in Honduras and throughout Central America. José Rutilio Quezada, Joe Saunders, Andrew B.S. King, Ramiro de la Cruz, Mario Pareja and Daniel Coto and others in the CATIE IPM program were valuable collaborators. The folks in USAID like Gordy Straub, Ron Curtis and Ray Waldron, among others, supported and tolerated us. An essential group that is oftentimes overlooked are the local support staff, people like Sergia de Revilla, Aleida Cruz, Nolvía Ramos and Rosa Ortega, all of whom made significant contributions to the operations of the projects.

Then there were the mentors from US Universities, many of whom were mentioned previously. Who can forget wise, practical, good natured Will Whitcomb and his reaction to my frustrations about the unexpected behaviors we frequently found in Honduran insects: “Of course, the bugs don’t do what the textbooks say they should... they can’t read textbooks that are written only in English.” (In other words, MIPH team, stop depending on academic dogma, stop relying on temperate zone information, open your eyes and minds, and get to work producing local information). Carl Barfield worked for years with us to develop new generations of teaching materials.

The success of the IPM program would have been inconceivable if we had had a boss other than Simón E. Malo. Dr. Malo always knew when to encourage, when to intervene, and when to simply look the other way. He was decisive as he led Zamorano’s evolution into something qualitatively different from what it had become by the late 1970s; this dramatic evolution and spectacular growth never betrayed the institution’s basic principles. He was usually right when it came time to try something new versus supporting what was tried-and-true. He didn’t get in the way of well-intentioned people who, as he said, were full of piss and vinegar. It is especially important to thank Dr. Malo for allowing us (he did not actively encourage us) to break down the barriers between “the school” and its neighbors. He permitted us to engage in what others considered to be unconventional and even dangerous, off campus, complex learning, research and development.

The final group, perhaps the most important, to be recognized includes those students and recent graduates of Zamorano who served as the soldiers and the non-commissioned officers in the Zamorano IPM army and who so enthusiastically contributed to the program. In the 1980s and early 90s, IPM attracted some of the best and the brightest, those who really wanted to shake things up and see progress in the region. It was great to work with them. It is impossible to name all of them, but a few examples not mentioned earlier are appropriate. Fidel Lema was always willing to work harder and more enthusiastically than anyone else and was one of the few people who had the ability to hold a nest of *Polybia* wasps still while they were stinging his face. There was a horde of Nicaraguans for the classes of 83 and 84 – Ali Valdivia, Julio López among them - who had IPM in their consciousness even before they arrived in Zamorano; all they had to do was forget about cotton, and begin to think of maize, beans, cabbage and other smallholder crops. Thanks so much to people like Rafael Caballero who could work 20 hours a day, seven days a week without ever getting a report in on time but always producing more results than others. Kimberly Allen Taylor knew that there is an opportunity cost to extension activities, so he conducted his interviews with farmers only after he had helped them to weed their fields. The Hondurans,

like Orlando Cáceres, Héctor Portillo and many others, contributed so much. And there is Alfredo Rueda, who as a student answered in one of his exams about “inceptos” (the word in English is insects and in Spanish insectos), then moved on to be the most consistent and productive lieutenant. In the mid 1990s, he picked up the flag and carried on as the extremely competent leader of Zamorano’s IPM Program. See his paper in this same publication (Rueda et al. 2011).

Then there are all those students who went out at night to follow slugs around in the drizzle (the world does have to know about the dispersal capacity of *Sarasinula*, doesn’t it?) or visit *Spodoptera* egg masses every 15 minutes all day and night to detect natural enemies; then the following day they lived up to their obligations in the class and field. As I said, it is impossible to list more than a representative sampling of all that special pool of people called Zamoranos to whom I am indebted and who made those years 1980 to 1993 so wonderful and productive.

What can I say to finish? The lesson for Zamorano (and more broadly for the Development

Community) is really quite simple: while discipline, structure and technical competence are indispensable, equally important are creativity, inspiration and the unleashing of talents in an environment that permits and rewards cooperation, creativity, experimentation and risk.

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