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The Sustainable Vegetable Production Project in Guimaras - empowering local farmers to increase farm income through environmental-friendly vegetable production

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Abstract

The productivity of the agricultural enterprises in the Province of Guimaras, a small island in the Philippines, is observed to be low. Small farmers generally find that their farm income is insufficient to meet their cost of living. Despite a potential for vegetable production, which can be more profitable than most other agricultural enterprises, only few local farmers engage in the activity. Most locally sold vegetables come from other provinces. Facing this fact, and the heavy and indiscriminate application of synthetic agro-chemicals in Philippine vegetable production with all its resulting problems, it was decided by the Provincial Government to especially promote organic vegetable farming in the province.

The project that was conceptualized uses a two-pronged strategy, offering to its cooperators information on both organic and integrated production methods. Cooperators producing organically reduce pest and disease infestation by employing cultural and mechanical methods and control them, if necessary, by biological methods. The project stresses that botanicals are no panacea and may be as hazardous as synthetic agrochemicals if used indiscriminately. The results obtained show a clear potential for organic vegetable production. Gross production output and marketable yields from organic production are so far not significantly different to those produced under Integrated Crop Management (ICM). Both production systems produce higher yields than the conventional production method (farmer's practice). This fact is due to the very low productivity of the latter.

Notwithstanding, as organic farming is more labor-intensive and carries a perceived increased risk of crop failure, farmers expect to realize higher market prices, while in the local markets organic products have to compete with non-organic products on the same price levels. To realize higher prices, cooperators must engage in direct marketing. It can be concluded that organic production makes most sense in areas situated

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close to cities or population centers, where markets and individual consumers are easily accessible and willing to pay higher prices for healthier products. Notwithstanding, the Guimaras experience shows that organic vegetable production, while more labor- and knowledge-intensive than the "conventional" way of farming, can be economically viable even in an unfavorable market environment. While further research is needed, this experience can indisputably serve as a model to other small farmers.

1 Background

Located in the Western Visayas, Guimaras is the youngest province of Region VI in the Philippines. It covers a total land area of 60,465 hectares, dominated by a moderately sloping to moderately steep topography. As its highest peak extends to only 290 m above sea level, the province' agro-ecosystem is characterized by lowland conditions. Its climate is defined by a pronounced wet season and a four-month long dry season. Population figures for 1995, based on estimates, are given at 130,000 inhabitants (OPA, 1994).

As one of the smallest and poorest provinces in the country, it has been declared a 'priority province' by the administration of President F. Ramos. The median annual income of Guimaras households for 1991 was determined to be P10,000, well below the

Table 1: Costs and returns from selected, organically grown vegetable crops as compared to rice and mango production in Guimaras

Crop	Yield (kg/ha fresh weight)	Production costs/ha (Peso)	Lowest recorded Farm Gate Price (Peso/kg)	Gross margin (Peso)
Bitter Gourd	20,000	64,000.00	12.00	176,000.00
Bush beans	8,000	16,780.00	7.00	39,220.00
Cucumber	20,000	50,000.00	7.00	90,000.00
Eggplant	15,000	31,800.00	8.00	88,200.00
Garlic (native)	4,000	45,316.00	40.00	114,684.00
Hot Pepper	2,000	10,000.00	15.00	20,000.00
Pigeon Pea	1,200	2,500.00	30.00	33,500.00
Mungbean	1,000	6,000.00	35.00	29,000.00
Okra	12,000	20,880.00	10.00	99,120.00
Pechay	18,000	28,080.00	5.00	61,920.00
Pole beans	12,000	24,540.00	7.00	59,460.00
Squash	20,000	32,940.00	4.00	47,060.00
Radish	25,000	25,569.00	8.00	174,431.00
Rice (*palay*)	2,520	11,284.00	7.14	6,708.80
Mango (10th year)	1,800	21,023.00	10.00	-3,023.00

Source: Sustainable Vegetable Production Project, Office of the Provincial, Agriculturist, Guimaras, own data, 1997

official poverty line of P39,270 per annum for a family of six (PPDO, 1991). The prevalence of malnutrition among pre-school children was recorded at around 20 percent in 1990 (OPA, 1993).

The major crop produced on Guimaras is rice (mostly rain-fed), followed by coconut, mango, cashew, and calamondin. However, productivity per ha is generally low and more and more farmers find that their farm income is insufficient to meet their costs of living.

Vegetables, as compared to rice, may produce significantly higher yields and, due to their greater market value, higher financial returns (Table 1) per area unit. Their vegetation period is often equivalent or even shorter than that of rice, while their water requirements are easier to meet. Consequently, intensive market-oriented vegetable production enables farmers to realize relatively high returns within a short time span from even a small area.

The environmental adaptability of vegetables allows for their easy incorporation into existing farming systems. However, as most vegetables are highly perishable in nature and therefore require rapid marketing, farmers producing far from major population centers or in locations with poor roads or limited access to transportation facilities are disadvantaged. Furthermore, production costs and labor requirements for intensive vegetable production are, on a per hectare basis, in most cases significantly higher than for rice production (Table 1). Still, capital-poor small farmers may start their vegetable-growing venture small and expand their operations with the income generated.

Despite a large potential for vegetable production in Guimaras as far as environmental factors are concerned, problems like lack of awareness on the potential returns, lack of technical expertise, and a lack of credit prevent local farm households from engaging in the activity. A marketing study found that local production cannot satisfy the local demand and that most vegetables sold in local markets originate from other provinces.

Given prevailing production techniques in the vegetable producing areas of Region VI as well as other regions, these vegetables could have been subject to improper use of pesticides.

2 Widespread unsustainable crop protection practices in Philippine commercial vegetable production

As is the case worldwide, the advent of relatively cheap and readily available agricultural chemicals has led to the wide adoption and intensive use of these chemicals in local vegetable production. While agro-chemicals may hold certain merits for commercial agricultural production, their unrestricted and indiscriminate use causes harmful effects to farmers and consumers alike. It has led to the contamination of soil and water

resources and poses a threat to the natural environment as it has led to serious disturbances in biological balances, killing off beneficial organisms while causing development of resistance in pests. Many examples can be named where indiscriminate use of chemicals has worked counter-productively. The example of the development of resistance against pesticides by DBM *(Plutella xylostella)* in the Cordillera region of the Philippines is but one (AMEND et al., 1994). Personal observations and interviews by this author over a number of years in vegetable growing areas in the Cagayan Valley region and in the provinces of Benguet, Davao del Sur, Negros Oriental, Cebu, Iloilo, and Guimaras show that local vegetable farmers are mostly heavy pesticide users. Improper spraying techniques expose these farmers to dangerously high levels of toxins, aggravated by the fact that most do not use protective clothing when handling pesticides. Often, pesticides are applied at very short intervals, and farmers do not observe prescribed pre-harvest intervals, use banned chemicals, apply higher than recommended doses, and mix chemical "cocktails", causing considerable health hazards for themselves and for consumers. A study by Bernado and Adalla (1992) describing pest control practices in vegetable production in two Luzon provinces corroborates these personal observations. Random samples collected by the Bureau of Plant Industry of vegetables sold in Metro Manila markets in 1991 showed considerable pesticide residues (BPI 1991), posing health risks to consumers. Integrated Pest Management – Farmer Field School (IPM-FFS) facilitators in Canlaon City, Negros Oriental, found that farmers are not necessarily unaware of this and sometimes do themselves not eat the vegetables they produce (Personal communication, 1996).

In the late 1980's, more and more voices demanded a change in national agricultural policy which equated the heavy use of synthetic agro-chemicals with "modern" (highly productive) production systems as opposed to "traditional" (unproductive) farming practices. Until then, Southeast Asian national governments held that the use of synthetic agro-chemicals was a prerequisite to attaining national food security and self-sufficiency (REPETTO, 1985) in rice production. This certainly caused a spillover effect as far as the production of other crops was concerned. However, economic analyses like the one by Rola and Pingali (1993) at the International Rice Research Institute (IRRI) showed that there was no significant difference in the performance of rice crops produced using synthetic agro-chemicals (then the farmer's practice) compared to those produced using economic threshold levels as a basis for decision making, and those produced completely without the application of insecticides.

When it became obvious that the presumption: agro-chemicals equal high productivity, and this in turn equals high economic returns, could no longer be upheld, the shift to a promotion of sustainable crop production systems was complete. This is reflected in the Philippine government's current *Gintong Ani* Program (PHILRICE and DA, undated). The success of IPM in rice production in Southeast Asian countries (Kenmore 1991, Kenmore et al., 1995) surely contributed to this shift and encouraged decision-makers to apply the sustainable crop production concepts to other crops, where it has since shown potential (KENMORE et al., 1995).

3 Searching for an alternative, more sustainable approach

When Guimaras was declared a province after the 1992 presidential elections, its people and provincial government began looking for ways on how to develop their province without further sacrificing their strained ecological resources.

With this goal in mind, the Office of the Provincial Agriculturist (OPA), in cooperation with the local Offices of the Municipal Agriculturists and interested farmers conceptualized the Sustainable Vegetable Production Project (SVPP) in 1993. The project is designed to address the low income of Guimaras farmers, the high prevalence of malnutrition among its children, the lack of expertise on vegetable production, and the fact that most locally sold vegetables originated from other provinces. Facing the heavy and indiscriminate application of pesticides in local vegetable production, and the loss of soil fertility due to the overuse of synthetic fertilizers resulting in an average soil-pH value of 5.4 and organic matter contents of below 0.5 %, it was decided to promote organic vegetable farming in the province. Requiring low external input levels, organic agriculture seemed an ideal endeavor for capital-strapped small farmers.

The project pursues its objectives through a people-centered, community-based approach using non-formal education tools. The project components include:

- Promotion of pesticide residue-free vegetable production by employing either completely organic production methods, or the Integrated Crop Management (ICM) approach;
- Conduct of locally relevant, farmer-led on-farm research trials and dissemination of the generated data to local farmers;
- Provision of customized technical assistance to cooperating farmers;
- Organization of local vegetable producers; and
- Provision of marketing assistance.

Linkages were forged with relevant government line agencies, Local Government Units (LGU's), and NGO's like the German Development Service (DED), which provides technical assistance and limited, supplementary funding to the Project since 1995.

4 Project Implementation

As of March 1998, the project has been working in 26 *barangays* (villages) with a total of 363 farmer-cooperators organized into 27 separate groups (Figure 1).

As the initial activity when approaching prospective sites, the project conducts an introductory meeting in order to evaluate the interest of the local farmers and to ascertain whether they meet the project's criteria - availability of land, irrigation water, time and

labor, willingness to learn and try new technologies and willingness to repay the project inputs.

After this initial session, a motivation/information exchange session is held. This activity facilitates the exchange of ideas among participants regarding vegetable production. Seasoned local vegetable farmers are invited to share their experiences. During this session, the farm planning tools conceptualized by the project are introduced.

Next, farm planning work starts with individual co-operators on their respective farms. A farm layout is drawn and each individual plot is named or numbered. Then, for each farm plot a planting calendar covering one year is developed and drawn, incorporating necessary cultural requirements. After this, a gross margin estimation is done for each of the planned activities in order to estimate the cost of needed inputs, labor requirements, peaks and possible shortages, and expected returns. A cash flow chart for the period covered by the plan can then be visualized, showing the farmer when he needs cash, when he can expect income, and whether his activities will realize sufficient income to cover household expenses and build up savings.

The project then releases requested inputs to the farmer in a roll-over scheme, in which farmers have to repay the received inputs in cash or kind within one year, interest-free. Every participant enters into a Memorandum of Agreement with the project upon the release of inputs.

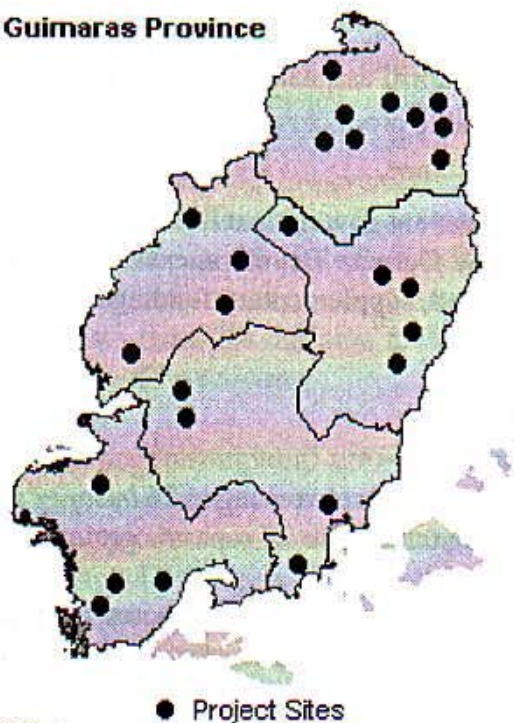

Figure 1: Province of Guimaras

A field technician visits each farm on a regular basis. Monitoring forms are filled out during these visits. In addition, cooperators fill out gross margin calculation forms while growing and harvesting their crops. These are then compared to the gross margin estimation that was done before the actual planting. Differences between the plan and the actual outcome are discussed with the farmers, an activity designed to hone their planning and analytical skills. A large part of training is customized to the specific needs of the individual cooperator and is conducted on his/her farm.

In addition, group activities like farmers' classes are held. Such training and information dissemination sessions cover a wide variety of topics important to successful vegetable production, like soil and seed treatment, and farming practices such as nutrient management, disease and pest identification and control (cultural, biological, chemical), cultural management practices, compost preparation, and entrepreneurial planning and marketing skills.

A number of cooperators conduct crop variety and plant protection trials, testing the performance of different varieties of the same crop or of botanical pesticides under local conditions. The project cooperators also join agricultural fairs to display their vegetables and disseminate information on their activities.

Based on the experiences of three years of implementation, the project has drafted its own curriculum for an ICM Farmer Field School, which is being piloted in the province in 1998.

5 Lessons from the project implementation and perspectives for organic vegetable production

As mentioned above, the provincial leadership early on favored an organic approach to vegetable production. This sentiment has since been mirrored by government and non-government organizations throughout the country.

Organic farming is a way of agricultural production by which crops are produced entirely without synthetic chemicals. Instead, organic farmers manufacture and utilize natural components such as fertilizers of mineral, animal and vegetative origin (e.g. ground rock, manure and compost), and natural pesticidal compounds such as extracts from various locally available plants.

However, there is more to organic farming than the simple replacement of synthetic with natural compounds. Organic farmers embrace the idea of nurturing natural resources and of production in a balanced ecosystem. Thus, maximization of production is not the primary goal, but rather optimizing production within the framework of a sound ecosystem. Organic farming focuses on long-term issues, and by definition is not just a way of production, but more a way of life.

Consequently, it is important to realize that one cannot simply approach a farmer who has been told for the better part of his life by agricultural authorities and chemical companies alike to all of a sudden "turn organic". Organic farming cannot be prescribed from above. Naturally, any farmer will react with distrust and even outright rejection as the very people who until quite recently encouraged him to use chemicals now ask him to forego the former and use organic inputs instead. Vegetable farmers have come to depend on synthetic agro-chemicals, and they strongly believe that without them there can be no success. It should, therefore, not surprise anyone when farmers embrace the new recommendations rather cautiously.

In the case of the Sustainable Vegetable Production Project, this had to be explained to the provincial officials. It also means that the project uses a two-pronged strategy. Cooperating farmers are offered information on both purely organic and integrated (as in Integrated Pest Management, or Integrated Crop Management) production methods. They are thus enabled to reach their own informed decisions on whether to produce organically or to employ ICM.

The results attained by several of the project's cooperators who produce organically show a clear potential for organic vegetable production despite serious pest and disease pressure. The project found that improved crop varieties and hybrids performed under organic farming conditions just as well or better than traditional farmers' selections. Gross production output and marketable yields from organic production where no different to those produced under ICM. It was observed that a number of farmers cooperating with the project, regardless of whether they produced organically or not, enjoyed higher yields than their neighbors following the conventional production methods (Table 2).

This development has considerably contributed to the credibility of the project's recommendations. The success is grounded in several reasons: SVPP cooperators use tested seeds, they supply organic fertilizer in significant quantities to their plots, and they have substantially changed their plant protection practices, incorporating, among others, a number of previously not practiced non-chemical control measures. In other words, project cooperators employ production methods based on scientific findings, thus providing a better production environment to crops than the traditional farmer's practice does.

SVPP cooperators reduce the pest and disease infestation of their vegetables through cultural and mechanical methods and control them, if necessary, by biological means. Cultural methods used are the timing of planting, crop rotation, mixed cropping and intercropping, deep plowing or spading, flooding, mulching, and observation of strict field sanitation. In addition, resistant crop varieties are planted whenever available. Crop diversification is a must. Biological control methods are used if the infestation becomes acute. Aside from the use of botanical and bacterial (*B.t.*) preparations, manual collection of pests and trapping with yellow glue paper, light or pheromone traps are

practiced. Fungal diseases are controlled by the use of lime, copper, or sulfur preparations.

While the biological efficiency of various botanical extracts has been proven against a wide range of agricultural pests, their practical use is only gaining limited acceptance. Several factors contribute to this situation, the major one being the comparatively high labor opportunity costs involved in the gathering of the plant materials and the preparation of the extracts. Extracts are generally not stable and mostly less effective than synthetic preparations. It is often more convenient and may be cheaper for farmers to visit the local agri-supply store and buy a bottle or box of synthetic chemicals. However, given the current economic crisis combined with the impact of the El Niño and the resulting shortage of cash, farmers turn more and more to botanicals.

While the project promotes the use of botanicals, it should be observed at this point that botanical pesticide preparations are no panacea. Nature has offered us a profusion of plants the world over for use in crop protection. They can certainly contribute to an appropriate, „integrated" pest management as they can minimize the hazards for farmers, consumers, and the environment inherent in the use of synthetic agro-chemicals. However, aside from their use being more labor-intensive for the farmer, most have the distinguished disadvantage that we do not fully know why or how they are effective. As Stoll (1992, p.12) notes, the most important research into insecticidal plants stems from the period between the two world wars. While, as Stoll (1992) further observes, re-

Table 2: Yield of selected vegetable crops grown organically by SVPP cooperators as compared to yields of vegetable crops grown by non-cooperators in Guimaras

Crop	Yields obtained (kg/ha fresh weight) by SVPP cooperators [1]	Yields obtained (kg/ha fresh weight) by non-cooperators [2]	Average Yield (kg/ha fresh weight) in the Philippines [3]
Bitter Gourd	20,000	10,000	10,000
Eggplant	15,000	7000	11,000
Hot Pepper	2,000	650	no data
Pigeon Pea	1,200	873	no data
Mungbean	1,000	687	no data
Okra	12,000	7,460	11,000
Pechay	18,000	6,500	15,000
Pole beans	12,000	12,000	12,000
Squash	20,000	12,000	10,000
Radish	25,000	28,000	no data

[1] Source: Sustainable Vegetable Production Project, OPA Guimaras, 1996, rounded data based on farm records

[2] Source: Sustainable Vegetable Production Project, OPA Guimaras, 1996, rounded data based on farm records and interviews

[3] Source: Bureau of Plant Industry, undated

search into this field has begun to expand since the early 1980, most of this research is concerned with a limited number of known insecticidal plants, e.g. neem, and little remains known on the active ingredients in many others.

It is therefore important to be aware that we might well be exorcising one demon with another. Botanicals are, to use the phrase of Stoll (1992, p.8) "nature's own instruments". That, however, does not in itself mean that they are always safe and harmless. Rotenone, the main active compound in Tubli (*Derris elliptica*), is a known fish poison and severely irritated the skin on contact. SVPP cooperators claimed that vegetables treated with aqueous tubli extract tasted bitter. There may be several explanations for this phenomenon, one being improper irrigation of the concerned crop. The possibility that the bitterness was caused by tubli cannot be discounted without further research, though, especially as it seems that the farmers did not observe the pre-harvest interval recommended by the project as they thought the preparations "natural" and therefore "safe".

There are a number of other botanical pesticide preparations which are or could be harmful. Tobacco extracts are among them, nicotine being one of the most toxic organic poisons to warm-blooded mammals. It is crucial to avoid any contact with the spray during preparation and application. After treatment, a pre-harvest interval of at least 3-4 days must be observed (Conacher, 1980, as cited in: Stoll, 1992).

It is therefore important to realize and emphasize that while botanicals are in fact naturally occurring compounds, they may still be hazardous, if not to warm-blooded mammals, then to other animals. Their incompetent and indiscriminate use can cause similar problems as does the use of synthetic chemicals. After all, if they weren't somehow toxic, man could not utilize them as pesticides. The main advantage of botanicals over synthetic agro-chemicals lies in the fact that as they are nature's own, they can be broken down and disarmed by natural processes much faster than man-made, synthetic concoctions.

As organic vegetable farming carries a perceived increased risk of crop failure due to pest and disease pressure and is labor-intensive, it is a comparatively expensive way of production. Thus, farmers' common perception holds that organically grown vegetables should realize higher market prices than non-organic products. But as well to do, health-conscious consumers in Metro Manila are willing to pay these higher prices, the vast majority of consumers in the rest of the country are so far unwilling and unable to pay a premium for organic products. In other words, outside Metro Manila organically produced vegetables have to compete with non-organic produce on the same price level. While this is for now possible under Guimaras conditions currently characterized by relatively high vegetable prices compared to some other areas of the country, local farmers nevertheless find this situation discouraging. They expect to be properly compensated for their increased efforts and risk if they produce organically. While higher prices could be achieved in Metro Manila and a potential but as yet undeveloped market exists in

Cebu City, local producers find it difficult to ship their produce to these markets. Recalling that organic agriculture is more than a mode of production, it would also be somewhat difficult to reconcile the underlying philosophy with the fact that non-renewable energy is burnt to ship the product to a faraway market.

Some Guimaras producers are able to circumvent these difficulties by marketing directly to end consumers both in the province and in Iloilo City. By doing so, they build up a personal relationship of trust with the customer. The customer, in return, responds with "brand"-loyalty. This marketing approach requires, however, an active and positive attitude of the producer, and is time- and labor-intensive, adding additional costs to the venture. This situation contributes for the time being to the reality that only few local farmers choose to produce purely organically.

As most vegetables are highly perishable, marketing to the end consumers has to be done rapidly in order to minimize losses. This means producers, regardless of whether they produce organically or not, need access to a good road network and readily available transportation facilities. On Guimaras, this is so far still a problem. Roads and transportation facilities are usually best in the close vicinity of cities, where also most potential buyers of organic vegetables are found. Accordingly, organic vegetable production can be expected to be most profitable in such areas. Most Guimaras producers circumvent these difficulties by concentrating on the production of crops with a longer shelf life.

6 Conclusions

Summarizing the Guimaras experience, it was found that organic vegetable production does generally not produce the harmful effects for growers and consumers that come with the use of synthetic pesticides. It improves soil fertility and decreases erodibility through the build-up of organic matter. If farmers even produce their own seeds, such a system can be maintained with relatively little external input. As the production system is very labor-intensive and produces high returns on comparatively small farmlots, the system is basically ideal for a situation in which capital is scarce, land holdings are small and labor is sufficiently available. The main problem becomes the production or purchase of sufficient organic fertilizer once a farmer decides to produce on a larger scale.

As the results show so far, yields of organically produced vegetable crops do not necessarily have to be significantly lower than those produced with the application of synthetic agro-chemicals if cultural management practices are sound. This observation, however, is based on the currently available data that is short-term in nature. The fact that the „conventionally" produced crops that served as comparison were not grown under the best possible cultural management regimen has to be taken into account. It remains to be seen whether the results obtained so far can be sustained. Based on expe-

riences in temperate climates and on trials done at the Bohol Agricultural Promotion Center (Lewke et. al., unpublished), yields would be expected to be somewhat, though not necessarily dramatically, lower. The shortfall in production would then have to be compensated for by the higher prices organically produced products should realize in the market. As Waibel and Fleischer (1995) observe and the results of Lewke et. al. (unpublished) suggest, the expected yield reduction might not be as great as is often assumed, as most field trials base their analysis solely on a comparison of trial replications treated with synthetic pesticides and a zero-treatment control. This approach does not take into account cultural and other non-chemical pest and disease control measures and may thus invite misleading conclusions.

Despite the initial success, agricultural authorities, policy-makers, and farmers should proceed with caution. To demand a complete renunciation of the use of modern synthetic agro-chemicals without further study on a larger scale and without training farmers extensively may in the current Philippine context - growing populations, decreasing agricultural lands - not lead to the desired results. It may be safest for the vast majority of producers to tread the middle ground, which in this case, means basically to gain a thorough understanding of the agro-ecosystem surrounding one's farm operation and to base decisions as to the most appropriate course of action in a given plant protection situation on this knowledge. This is what is currently referred to as Integrated Pest Management (IPM), or sometimes, as Integrated Crop Management (ICM). Using this knowledge, combined with additional practical experience as the point of departure, more and more farmers may decide to produce purely organic agricultural products, if their local markets compensate them for the additional labor requirements and higher risk of crop failure that they have to face.

The current trend towards agricultural production systems based on environment-compatible, sustainable farming technologies requiring only low levels of external inputs is definitely aiming in the right direction. In order for the farmers to be able to make informed decisions on the basis of an understanding of the agro-ecosystem surrounding them, more participatory extension inputs patterned after the farmer field school model are required, and future farmers should already learn about these concepts in their environmental education classes while in school.

The Guimaras experience has shown that such an approach, while certainly more labor- and knowledge-intensive than both the "conventional" modern way of farming and existing farmer's practices, can be economically viable even in an unfavorable market environment. While more research is needed, this experience can indisputably serve as a model to other small farmers and to underscore the validity of such a production approach.

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