Sustainable Development in Central America's Non-Traditional Export Crops Sector Through Adoption of Integrated Pest Management Practices: Guatemalan Case Study

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Abstract

Non-traditional crops for export (NTAE's) have played an increasingly important role in Central America's economic development since 1983. This relatively new market-driven development opportunity has represented the fastest expanding sector of the agricultural industries in Central America, with an average annual growth rate of 16% between 1983 and 1997. However, future development of economically sustainable expansion in NTAE crops in Central America will be substantially influenced by the region's capacity to meet more demanding food safety standards in the United States and Europe. Market access in these countries is increasingly being determined by sanitary and phytosanitary standards, and not solely by economic competitiveness at the production level. Case studies in Guatemala found that chemical overuse was the primary factor contributing to high detentions and rejection rates for NTAE shipments at ports-of-entry in the United States. It was found that producers who adopted performance-proven integrated pest management practices had significantly fewer sanitary and phytosanitary compliance problems. Further, these producers achieved higher marketable yields at lower production costs, resulting in greater economic and socioeconomic sustainability.

BACKGROUND

Since the inception of commercially important NTAE production in 1983, US horticultural imports from Central America, excluding bananas and coffee, have increased from 43 million USD to 407 million USD in 1997 (Figure 1). Fruit and vegetable exports comprised 303 million USD of this total. This expansion has subsequently played an increasingly important role in the region's economic development, providing increased employment and per capita GDP throughout the rural and small farm sectors. Guatemala, for example, derives about 66% of all its export earnings from the agricultural sector, and 60% of all employment. Similarly, Costa Rica derives about 52% of all its export earnings from the agricultural sector, and 21% of all employment. These two Central American countries, along with Honduras, have been the main regional participants in the commercial expansion of NTAE production since 1983, accounting for over 90% of all horticultural exports from the region, excluding bananas and coffee. Costa Rica has become the dominant market force in the NTAE sector, achieving 55% of the region's horticultural exports in 1997; Guatemala follows with 23% (Figure 2). Costa Rica's NTAE expansion, however, has been achieved largely through increased pineapple production for export, while Guatemala has established a much more diversified NTAE programme that has broader appeal among buyers in the export marketplace and generates economic opportunity for large numbers of small farm families. Guatemala, for example, has over 18 500 producers engaged in snow pea production for the export markets, mostly small farm family units.

The US marketplace is clearly important to Central American agricultural trade. The United States is the destination for over 2.2 billion USD of Central American agricultural exports annually, about 40% of the regional total. Our research in the USAID sponsored Integrated Pest Management Collaborative Research Support Program (IPM CRSP) found that the NTAE sector in Guatemala continues to enjoy a regional advantage in the production of horticultural crops that are targeted

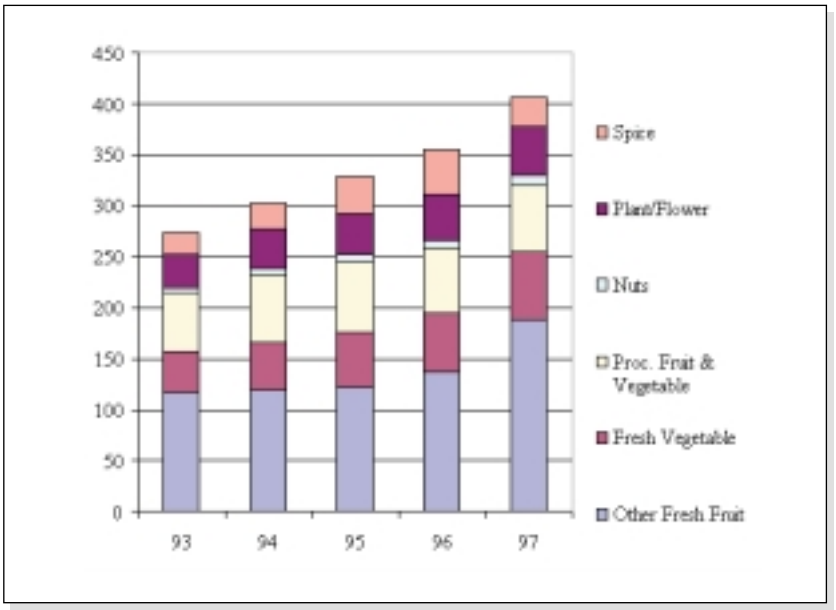

Figure 1
The value of non-traditional agricultural exports to the United States from Central America by commodity from 1993 to 1997 in millions of US dollars

Source: USDA/FAS and US Census Bureau, Foreign Trade Division

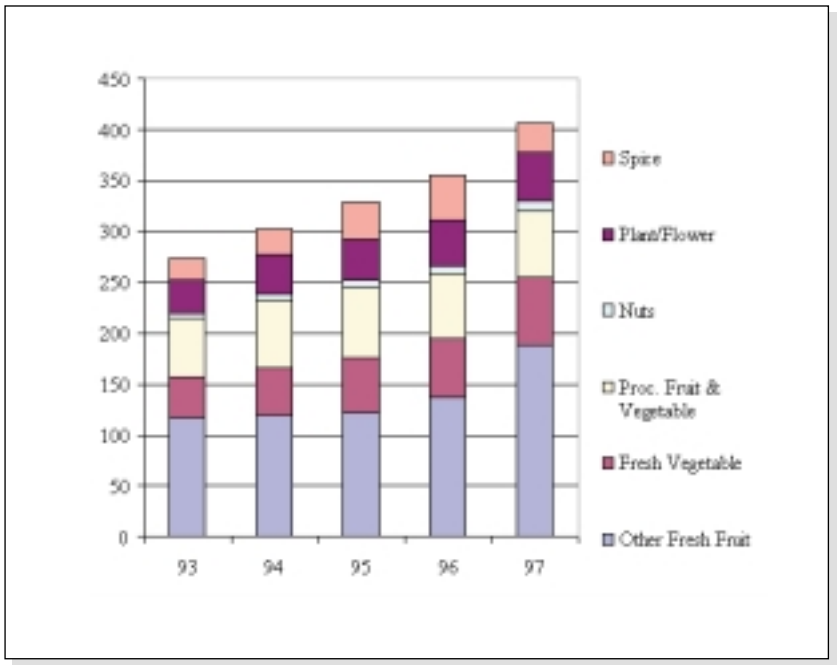

Figure 2
The value of non-traditional agricultural exports to the United States for selected Central American countries from 1993 to 1997 in millions of US dollars

Source: USDA/FAS and US Census Bureau, Foreign Trade Division

for sale in North America and Europe. Guatemala derives its economic advantage in selected NTAE crops from an abundance of small-farm family labor, diversified microclimates for producing high quality counter-seasonal NTAE crops, and access to cost-effective transportation and shipping infrastructure. Within the Central American Region, only Costa Rica parallels Guatemala's current interregional competitiveness and potential for expansion in selected NTAE crops.

However, our research also suggests that future expansion of economically sustainable NTAE production in Guatemala will depend significantly upon the industry's capacity to address increasingly important non-economic constraints to interregional trade, particularly more demanding food safety standards in the United States. The main non-economic constraints to Central American trade expansion in the NTAE crops relate to phytosanitary compliance and contamination from unapproved chemicals. For example, during the period 1984-94 over 3000 Guatemalan NTAE shipments valued at almost 18 million USD were detained and/or rejected at US ports-of-entry for chemical residue violations. These constraints subsequently impacted economic and socio-economic sustainability at the producer level. Our research suggests that in order to continue the trend of NTAE expansion, producers and exporters must become increasingly more market focused in addressing the aforementioned constraints to future trade and economic development.

SNOW PEA CASE STUDY

Snow peas (Pisum sativum) have become one of the main NTAE crops produced in Guatemala. Snow pea is a temperate climate crop, cultivated in the central highland districts of Chimaltenango and Sacatepequez. In recent years, however, Guatemalan snow pea production has been negatively impacted by insect and disease infestations that have led to excessive reliance on chemical control measures. The 1995 leaf miner (Liriomyza huidobrensis) crisis represents a recent example of this problem, resulting in a USDA Plant Protection Quarantine (PPQ) at US ports-of-entry on all Guatemalan snow pea shipments.

The Government of Guatemala (GOG), in collaboration with the IPM CRSP and the United States Department of Agriculture Foreign Agricultural Service (USDA/FAS) Guatemala, initiated technical assistance programmes to help resolve the immediate quarantine problem and develop long-term solutions that can lead to increased sustainability in the NTAE sector. Research protocols were established to address the USDA PPQ snow pea leaf miner quarantine problem in March, 1996. The IPM CRSP research scientifically documented that the Guatemalan leaf miner problem was not the result of a species exotic to the United States, and consequently not a threat to US producers. Parallel with these findings, the IPM CRSP recommended several testable strategies to reduce chemical residues on snow peas and enhance product quality. In April 1997, the USDA PPQ quarantine on Guatemalan snow peas at US ports-of-entry was removed, thus helping re-establish nearly 35 million USD in snow pea shipments annually.

This led IPM CRSP researchers, in collaboration with the Guatemalan Ministries of Agriculture and Finance and USDA/FAS Guatemala, to the second objective of developing long-term solutions to insect control problems by testing production strategies that rely less on chemical control methods and subsequently result in greater sustainability at all levels within the NTAE sector.

RESEARCH APPROACH

Nine field test sites were established in the Departments of Chimaltenango and Sacatepequez in the Guatemalan Highlands. These two areas account for nearly 80% of all snow pea production in Guatemala. Snow pea production sites and participating producers were selected to represent typical production in the region. In all cases, the main pest control strategy relied on the application of chemical pesticides using a 7-10 day calendar programmed schedule. Most participating producers were small family farming operations with less than 0.5 ha. of snow pea production. One participating producer was a larger commercial operation with nearly 4 ha.of snow pea production. Few were acquainted with integrated pest management (IPM) strategies, and most relied heavily on agrochemical distributors for their pest management information.

Primary data acquisition included assessment of participating growers' current production and pest management practices as well as an assessment of existing pest problems. Leaf miner insects were found to be the major pest problem in snow peas. Data regarding post-harvest practices and problems were also collected. The control plots, using current traditional production management methods, were entirely managed by the individual producers according to their normal cultural and pest control practices. The IPM test plots were managed by IPM CRSP trained agronomists and field technicians.

The IPM test plots were established in plantings parallel to the control plots, with all case study plots representative of s7mall farm commercial fields at 1100 m^2 each. Tested IPM tactics included pest scouting for insects, pathogens and weeds on a bi-weekly basis. The main insect pests monitored were leaf miners (Liriomyza huidobrensis) and thrips (Frankliniella spp.). Disease monitoring included Ascochyta (Ascochyta pisi), Fusarium wilt (Fusarium oxysporum f.sp. pisi) and powdery mildew (Oidium spp.) Leaf miner samplings were conducted once a week to determine adult insect pressure and threshold based pesticide applications. Insecticide applications in the IPM test plots

Table 1. Yields and Total Insecticide Applications in Snow Pea Field Evaluations of the Integrated Pest Management Programme

Locality	Planting date	Yields (kg/ha)		Total insecticide sprays	
		IPM plot	Test plot	IPM plot	Test plot
Xenimajuyu 1	August, 1996	9551	9473	6	10
Patzic'a	August, 1996	10808	10600	5	14
Magdalena M.A.	March, 1996	3257	4712	1	12
Xenimajuyu 1a	August, 1997	3540	1812	2	>15
Chuchuca	August, 1997	11958	9362	2	7
El Sitio 1	August, 1997	9254	9091	4	9
El Sitio 2	August, 1997	7075	5080	6	11
Tres cruces	August, 1997	3652	5564	2	6
Xeabaj	August, 1997	5059	4725	5	10

were based on prior IPM CRSP research that established threshold-based application strategies. Sticky traps were incorporated to reduce adult insect leaf miner pressures and help determine adult insect thresholds. Row hilling also was incorporated into the IPM test plots to reduce adult leaf miner reproductive capacities. Environmental Protection Agency (EPA) approved pesticides were applied to the IPM plots only at critical threshold points where insect pressure and stage of life cycle dictated. EPA approved fungicides were applied sparingly depending on environmental conditions favorable to disease development. The grower-managed control plots followed traditional calendar pesticide application schedules at 7-10 day intervals regardless of insect pressure or growing conditions.

RESULTS

Insect and disease incidences were similar in both the IPM and control case study test plots. The most prevalent insect pressure was from leaf miners (L. huidobrensis), with some presence of thrips (Frankliniella spp.). Ascochyta (Ascochyta pisi) leaf and pod blight were the most common fungal diseases. Pesticide applications in the IPM plots were significantly reduced, averaging about one-third of the number of applications in the control plots (Table 1). The IPM plots required an average of only 3.7 pesticide applications to fully achieve our pest management objectives, while the traditional chemical control plots required an average 10.4 pesticide applications to achieve the same objectives. Application reduction resulted in lower production costs and increased returns to household labour for the producers. In addition, snow pea yields were 23.4% higher in the IPM plots on average compared to the control plots. Production in seven of the nine IPM plots recorded higher yields (Table 1). Moreover, the product quality was found to be higher in the IPM plots as measured by marketable yields at the shipping point grading facilities. Product rejections at the shipping point averaged 6% less from the IPM plots.

CONCLUSIONS

Results from these commercial field tests clearly confirm the underlying premise of IPM, which centres on the scientifically proven fact that when current production technologies are properly integrated and precisely managed, the production goals of immediate economic gain and long-term sustainability are mutually reinforcing. IPM strategies, when properly implemented and precisely managed, significantly reduce the use of pesticides to control crop pest problems, and result in a more economically sustainable and ecologically balanced NTAE production system. The adoption of proven IPM strategies by NTAE growers and shippers in Central America will significantly increase the region's capacity to meet product quality standards and compete successfully in the increasingly more demanding international markets.

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