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THE REHABILITATION AND EXPANSION OF THE COCOA INDUSTRY IN SAINT LUCIA

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ABSTRACT: Cocoa (*Theobroma cacao*) production in Saint Lucia is characterized by low maintenance and low productivity, as well as dependence on very few niche markets. However, the "Fine Flavour" status and quality-conscious growers represent a significant potential for expanding the production of high-value cocoa in a sustainable manner. A project in 2010 had the aim to rehabilitate 200 acres of abandoned and neglected cocoa and establish 100 acres of new cocoa plantings. Assessment of 84 farms revealed that all farms required pest control and fertilization. Pruning was required on 99% of farms, disease control (for black pod and witches' broom) on 98%, shade reduction on 94% of farms. Erosion (82%) and weed control (79%) as well as drainage (61%) were also frequently lacking, but soil health was found to be moderate to very good on all farms, with over 50% scoring "good" and over 5% "very good". Rehabilitation consisted of formation pruning, shade regulation (essentially reduction), pest and disease management, fertilization and capacity-building. The focus was on small-holdings (0.5-10 acres), where the grower was prepared to contribute part of the labour. Expansion focussed on Saint Lucia's East coast. Prioritized cultivars were ICS1, ICS39, ICS95 and ICS98. Permanent shade species were chosen in a participatory manner, resulting in the joint selection of some species recommended as cocoa shade (mango, avocado, wax apple) and others with a less suitable canopy, but other characteristics valuable to the growers, e.g. citrus and West Indian cherry. Challenges encountered were the timely availability of planting material and agrochemicals, farmers' contribution of labour and Hurricane Tomas, which hit on 30 October 2010, and devastated much of the country. Farmers were more inclined to invest time in expansion than in rehabilitation. To ensure the project had a beneficial impact beyond its duration, resources had to be focused on the more motivated farmers, while other producers and extensionists needed to be empowered to make well-informed decisions. In this context, participatory technology transfer as well as strategic planning, with wide stakeholder involvement, was an integral part of all interventions. A road map for follow-up is presented.

INTRODUCTION

Throughout the Caribbean, cocoa (*Theobroma cacao*) is typically produced by smallholders. It is uniquely suited for cultivation in remote areas due to its relatively high value per weight and low perishability. Compared to other cash crops, cocoa is produced in an environmentally friendly fashion: it is commonly grown in diverse agroforestry systems, i.e., under shade, preventing soil erosion and maintaining watershed functions. Cocoa-based agroforestry systems also play an important role as buffer zones in the vicinity of protected areas, by decreasing *de facto* fragmentation. The tree component provides fruits and timber that contribute to farmers' income and thereby decreases dependency on commodity markets. The rehabilitation and expansion of Saint Lucia's cocoa industry thus offers a valuable opportunity to improve livelihoods in a sustainable manner. However, a number of challenges face the cocoa sector in Saint Lucia; strengths, weaknesses, opportunities and threats (SWOT) are summarized in Table 1.

Table 1: SWOT analysis of the Saint Lucian cocoa industry

Strengths	Weaknesses
➢ Producers have culture of quality assurance and record-keeping ➢ Good infrastructure and logistics for commodity export in place ➢ Two propagation centres can supply suitable cocoa germplasm in adequate quantity ➢ Land is available in form of private smallholdings, usually close to grower's home, minimizing the risk of praedial larceny, while allowing close supervision of operations ➢ A significant proportion of land is actively cultivated with temporary or perennial shade already in place	➢ Low and seasonal volume of production regularly drops below critical threshold ➢ Cocoa trees past their economical lifespan are in poor conditions ➢ Poor agronomic practices ➢ Poor post-harvest practices ➢ Low up-take of recommendations as a result of non-participatory (top-down) technology transfer approaches ➢ The upper canopy is frequently made up of trees selected for other products (e.g. citrus) or forest remnants that provide sub-optimal shade for cocoa ➢ Steep slopes and incomplete canopy closure of some fields
Threats	**Opportunities**
➢ Declining soil fertility ➢ Unavailability of high-PK fertilizer ➢ Price fluctuations on international commodity markets are a deterrent to investment into a perennial crop such as cocoa ➢ Risky and far from optimal post-harvest operations lead to heterogeneous and inconsistent quality, potentially affecting the product's reputation ➢ Unsecure land tenure arrangements will limit potential investment by farmers and future expansion	➢ Absence of Frosty Pod Rot of cocoa ➢ World's finest status on US markets ➢ Optimized post-harvest operations could further increase Saint Lucia's cocoa quality and its consistency ➢ European export market potential not yet accessed to any significant extent ➢ Niche markets (especially organic) not yet accessed ➢ Decline of export banana industry encourages diversification into alternative commodity. Shaded cocoa is far better suited for steep slopes ➢ Successful composting and integrated crop management could serve as motivating example for farmers to venture further towards organic production

OBJECTIVES

The principal objective of this one-year project (March 2010 to February 2011) was increasing the profitability of Saint Lucian cocoa-based agroforestry systems in a sustainable manner, with the goal to improve livelihoods. The specific objectives were:

- Increase national cocoa production by expansion of the acreage under cocoa by 100 acres and by rehabilitating 200 acres of semi-abandoned and poorly-managed cocoa with suitable germplasm, accompanied by adequate shade and windbreaks
- Increase farm yield and profitability by introducing, and where applicable optimizing, integrated crop management approaches, including soil fertility management and integrated disease control
- Design and promote diversified - and thus risk-reducing - agroforestry systems with the

opportunity to become less dependent on export bananas

- Prepare a roadmap with prioritized strategic interventions for Saint Lucia's cocoa sector

The project was funded by the European Commission (EC) under the Special Framework for Assistance (SFA2005), managed by the Saint Lucia Banana Industry Trust (BIT) and implemented in coordination with the Ministry of Agriculture, Lands, Fisheries and Forestry (MALFF). Quality Assurance was provided by the Inter-American Institute for Cooperation on Agriculture (IICA).

MATERIALS AND METHODS

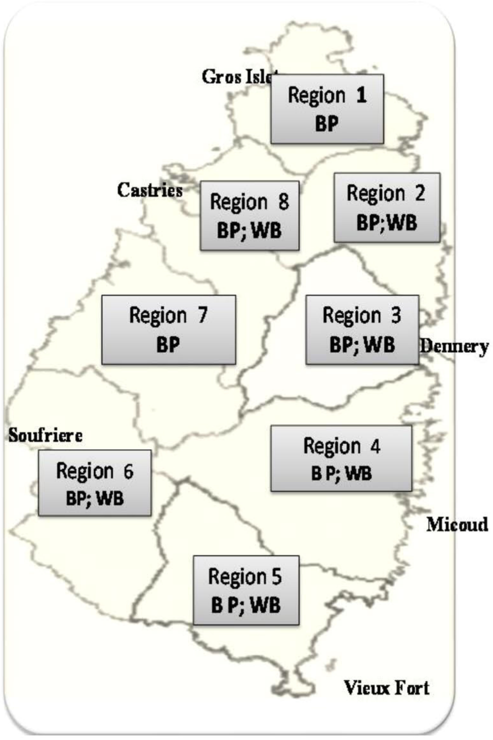

Figure 1: Map of agricultural extension regions in Saint Lucia, with distribution of black pod (BP) and witches' broom (WB).

Selection of farms and training content was conducted with MALFF. For rehabilitation, cocoa fields of 0.5-10 acres were prioritized, focussing on actively managed farms, on which some of the required labour was being made available by the farmer. Eligibility checks soon eliminated nearly half of the original candidates; the up-dated list of 84 farms covered only 124 acres, instead of the 200 acre target. Areas for planting new cocoa (ICS1, ICS39, ICS95) were selected in Regions 2, 3 and 4 (Babonneau, Dennery and Micoud; Fig. 1) and was led by the extension officers for each region. The consultants see substantial merit in converting unprofitable, neglected or abandoned banana fields to cocoa, where this coincides with the farmers' long-term plans, and this influenced the decision-making. The already established banana canopy could provide instant temporary shade and even sub-optimal drainage for banana is generally adequate for cocoa. A total of 106 farms were selected for expansion, covering just over 100 acres, i.e. the project target.During initial farm assessment, the entire field was considered holistically. Input needs (labour, agrochemicals and planting materials) were quantified. Data were analyzed by ANOVA (followed by Tukey test), χ^2 or Kruskal Wallis as appropriate on InfoStat (2004).

Neighbour tree counts per acre were square-root transformed [$x' = (x+3/8)^{0.5}$] to normalize the error distribution (Zar, 1996).

Participatory technology transfer was an integral part of interventions. It aims to build farmers' capacities to make their own crop management decisions, based on a better understanding of the agroecology of their fields, and according to their own unique set of circumstances and priorities (Vos & Krauss, 2004). Because success depended on the support by farmers, institutional partners and other beneficiaries, all detailed planning was carried out with full stakeholder participation. For perennial crops, such as cocoa, the curriculum is based on crop stages.

RESULTS

Cocoa plot sizes ranged from 8.3 acres in Region 6 to 0.93 acres in Region 2 (ANOVA: $P = 0.005$); the national average cocoa plot size was 3.0 acres. The cocoa density in Region 3 (99 trees acre^{-1}), was significantly ($P < 0.001$) lower than in Regions 4 to 6 (252 trees acre^{-1}). Region 2 was intermediate (192 trees acre^{-1}). Cocoa is not a priority crop in Region 3, with traditionally more interest in banana production. The target density for cocoa on flat land is 300 trees acre^{-1} (12'×12' arrangement), but tends to be lower because of slopes and to accommodate neighbour trees. Steep slopes necessitate erosion control on 82% of farms; 61% lacked drainage (Fig. 2), mostly in Region 4 (89%), followed by Region 2 (78%; $P < 0.001$). Composting was practiced on a single, large estate only. All farms required fertilization, particularly potassium, but soil health was found to be moderate to very good on all farms, with over 50% scoring "good" and over 5% "very good".

We observed severe IPM shortcomings: all 84 farms required pest control, 98% disease control (Fig. 2), with no regional differences (χ^2: $P \geq 0.093$). Phytosanitary problems were within the manageable range. The most common pest problems were rats (100% of farms) and termites (35%). Witches' broom (WB) was predominant in Region 3 (Errad), but also present in Regions 2, 4 and 8 (Fig. 1). Black pod (BP) incidence was similar in all areas ($P = 0.634$), but more severe on farms with excessive shade. Other diseases were negligible.

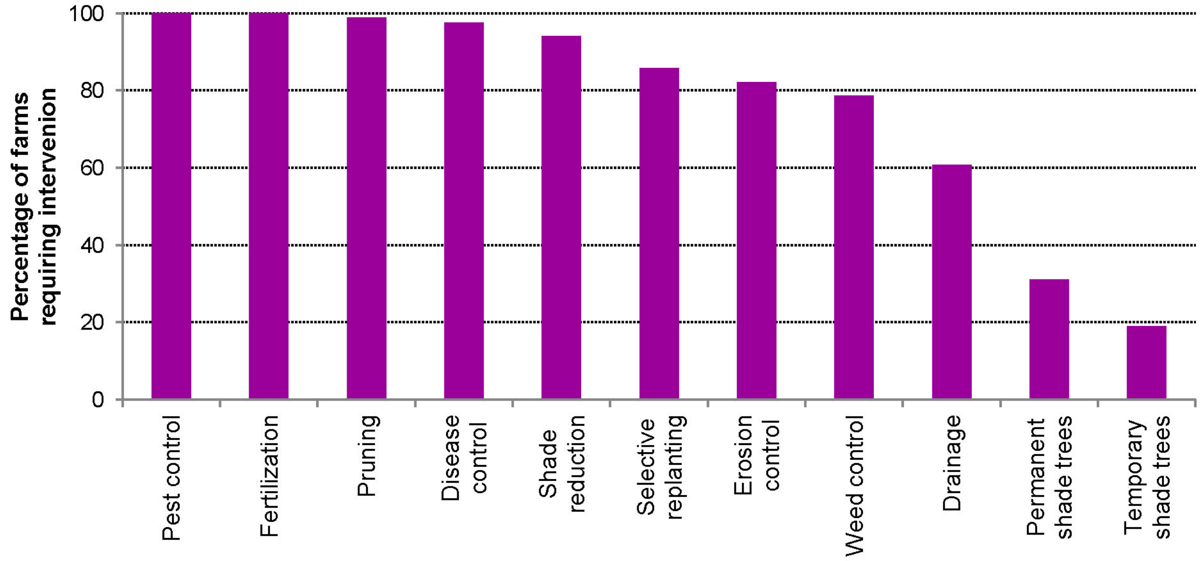

Figure 2: Management needs on farms earmarked for rehabilitation

Most farms had existing temporary (bananas, plantain, tannia) and permanent shade (avocado, mango, breadfruit, immortelle and timber). Canopy management was poor: 99% required cocoa pruning, 86% selective replanting of cocoa. Shade reduction was needed on 94% of farms across regions ($P \geq 0.066$). The fact that 79% of farms required weed control indicated patchy shade or poor canopy formation: 31% required permanent shade and 19% temporary shade (Fig. 2). While estimates for cocoa planting materials were based on agronomic criteria, i.e. target density, the selection of associated trees was done in a participatory fashion. Farmers' choices were driven by criteria other than optimizing cocoa conditions and related to existing stock: farmers tried to diversify more, particularly with fruit trees (Fig. 3). This parallels the findings of Boa *et al.* (2000) in Ecuador. Citrus species showed most pronounced trends: Key lime was most popular in Region 4 and least in Region 3; Region 2 was intermediate ($P = 0.015$). Valencia oranges grew steeply in popularity from Region2 to Region 4 ($P < 0.001$). Wax apple was more popular in Region 3 than the other regions ($P = 0.010$). Julie mango was most popular in Region 4 and least in Region 3 ($P = 0.013$), while Cabiche mango, avocado, cinnamon, golden apple, guava and West Indian cherry did not differ among regions ($0.077 \geq P \geq 0.085$). These analyses can advise the wider diversification efforts in Saint Lucia.

Cocoa rehabilitation efforts consisted principally of pruning of cocoa trees and shade regulation (essentially reduction). Table 2 shows that a total of 124 acres have been pruned on 84 farms. This area represents 62% of the original target for the project. Several factors beyond the consultant's control limited the rehabilitation efforts:

- Due to the unavailability of most essential inputs (fungicide, herbicide, rat bait, fertilizer, cocoa seedlings) at critical times, only cocoa pruning and shade control could be practiced during the main implementation period. Application of fungicide in early 2011 required re-visiting already pruned farms.
- Over 75% of farmers did not comply with the stipulation that they provide part of the labour and attend rehabilitation session with the trained crew for capacity building purpose. As a result, farm labour accounted for only 5%, which is both unsustainable and undidactic.
- Some farmers failed to show up on the scheduled pruning day or withdrew from the programme, following conflicting advice on pruning needs by advisor external to this programme.

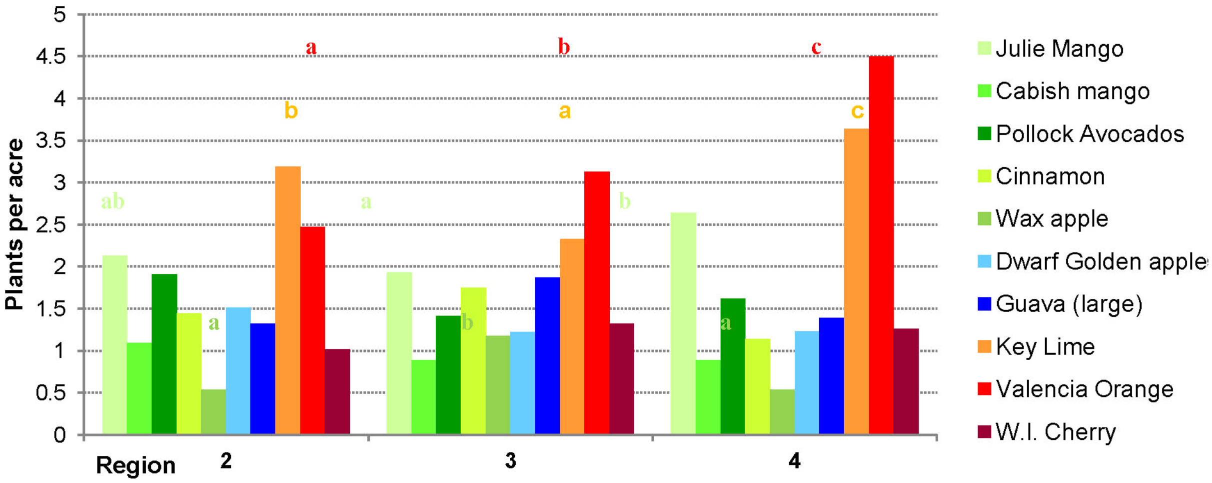

Figure 2: Farmers' preference for permanent neighbour trees of cocoa by region on a per-acre basis. Bars with the same letter do not differ at P = 0.05 (comparison within species only).

Pruning and shade reduction led to a drastic improvement of both mature and young cocoa. On pruned farms, minimal blow-over occurred during Hurricane Tomas, whereas damage was more severe on the neglected farms. However, some farms started to revert towards the previous, abandoned state; these growers took advantage of project-paid assistance without pulling his/her own weight. Thus, MALFF extension personnel should provide follow-up, to establish a record of conscientious growers who continue actively managing their cocoa.

Table 2: Summary of farms rehabilitated during this project.

Region	Number of Farms	Existing Acreage	Acreage Rehabilitated	Farm labour contribution (%)	Farms (%) contributing labour
Region 2	9	8.3	4.9	5.2	67 [b]
Region 3	14	21.5	16.5	7.1	21 [ab]
Region 4	28	55.5	28.0	7.1	21 [ab]
Region 5	15	24.3	24.3	5.7	20 [ab]
Region 6	16	136.5	47.0	0.0	0 [a]
Region 8	2	3.0	3.0	5.0	100 [b]
Total	**84**	**247.6**	**123.7**	**5.0**	**21.4**

[a, b] Mean followed by the same letter do not differ at $P = 0.05$ (Kruskal-Wallis test).

Cocoa planting was delayed by a severe drought from March to June. Barth nursery was unable to produce sufficient grafted cocoa plants in the remaining time. Thus, availability of cocoa plants presented a challenge to expansion. Many delivered plants were subsequently destroyed by Hurricane Tomas; nursery infrastructure was damaged too. Despite these adversities and delays, a total of 16,400 cocoa plants were delivered and transplanted. This number of plants translates into *ca* 54.7 acres.

Practical farmer field days focussed on pruning. Additionally, the group discussed

- shade reduction, optimizing shade for disease control: WB versus BP; termite control;
- BP and WB control, particularly the use of resistant germplasm for the latter to save labour;
- nutrient deficiencies: recognition, plant biomass distribution: photosynthesis versus soil nutrient cycling; and
- establishment of new cocoa plantings.

A training module for extensionists was also developed and covered:

- "Rehabilitation of and Care for Mature Cocoa Plantings"
- "Establishment of and Care for New Cocoa Plantings"
- "Integrated Pest and Disease Management for Saint Lucian Cocoa". This module also covers rational pesticide use and touches on abiotic disorders, as these frequently go hand in hand with pathogen infections;
- "Frosty Pod Rot (FPR) Threatens Caribbean Cocoa" - this topic is separate from the IPM module, as it is strategic in nature and refers to a pathogen still absent from the insular Caribbean; and
- "Harvest and Post-harvest Management of Saint Lucian Cocoa", focussing on techniques used by organic smallholders in the Dominican Republic (Krauss, 2005), as these methods are particularly suitable to Saint Lucian conditions, but also present the same risks and challenges.

Strategic interventions focussed on stakeholder mapping, FPR prevention, and fine cocoa quality.

CONCLUSIONS AND RECOMMENDATIONS

The majority of planned outputs were fully achieved. Shortfalls were the result of log-frame assumptions, particularly timely availability of farm labour and inputs, not being met. Pledged inputs should be made available until the project targets have been met. The well-received participatory field demonstration should be replicated in other areas by facilitators trained in participatory techniques. For a sustainable impact, farmers need to continue regular pruning. MALFF should up-date its farmer database to rate professionalism and show acreage of crops. In the long term, this information will allow to better target future support on a smaller but more dedicated group of active growers. Farmers' decision-making criteria regarding perennial crops should be considered in diversification efforts. Strategically, MALFF also needs to prevent the introduction on the FPR pathogen, *Moniliophthora roreri,* aim for continuous improvement of fine flavour quality, strengthening of stakeholder linkages, and expansion of high-value niche markets.

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