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***ENVIRONMENTAL FRIENDLINESS AND POVERTY:  
THE PRICE OF HILLSIDE FARMING IN JAMAICA***

**APRIL 15, 1995**

IICA OFFICE IN JAMAICA

98

## WHAT IS IICA?

**T**he Inter-American Institute for Cooperation on Agriculture (IICA) is the specialized agency for agriculture for the inter-American system. The Institute was founded on October 7, 1942 when the Council of Directors of the Pan American Union Approved the creation of the Inter-American Institute of Agricultural Sciences.

IICA was established as an institution for agricultural research and graduate training in tropical agriculture. In response to changing needs in the hemisphere, the Institute gradually evolved into an agency for technical cooperation and institutional strengthening in the field of agriculture. These changes were officially recognized through the ratification of a new Convention on December 8, 1980. The Institute's purposes under the new Convention are to encourage, facilitate and support cooperation among the 33 Member States, so as to better promote agricultural development and rural well-being.

With its broader and more flexible mandate and a new structure to facilitate direct participation by the Member States in activities of the Inter-American Board of Agriculture and the Executive Committee, the Institute now has a geographic reach that allows it to respond to needs for technical cooperation in all of its Member States.

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In order to attain these goals, the Institute is concentrating its actions on the following five programs:

- Agricultural Policy Analysis and Planning
- Technology Generation and Transfer
- Organization and Management for Rural Development
- Marketing and Agro-industry
- Animal Health and Plant Protection

These fields of action reflect the needs and priorities established by the Member States and delimit the areas in which IICA concentrates its efforts and technical capacity. They are the focus of IICA's human and financial resource allocations and shape its relationship with other international organizations.

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The contributions provided by the Member States and the ties IICA maintains with its seventeen Permanent Observer Countries and numerous international organizations provide the Institute with channels to direct its human and financial resources in support of agricultural development throughout the Americas.

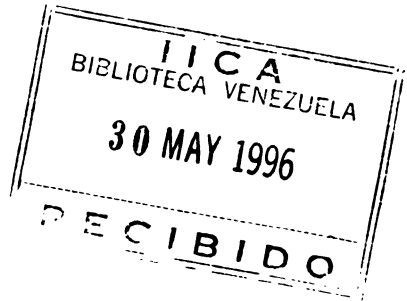
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***ENVIRONMENTAL FRIENDLINESS AND POVERTY:  
THE PRICE OF HILLSIDE FARMING IN JAMAICA***

**By: Armando Reyes-Pacheco**

**APRIL 15, 1995**

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## CONTENTS

	<i>Page</i>
<i>List of Figures</i>	
<b>INTRODUCTION</b>	<b>1</b>
<b>HILLSIDE FARMING IN JAMAICA</b>	<b>3</b>
<b>THE PARADOX</b>	<b>9</b>
<b>UNRAVELING THE PARADOX</b>	<b>15</b>
<b>FINAL COMMENTS</b>	<b>19</b>
<b>BIBLIOGRAPHY</b>	<b>21</b>



## **LIST OF FIGURES**

	<i>Page</i>
<b>Figure # 1: Land Under-utilized</b>	<b>7</b>
<b>Figure # 2: Land Over-utilized</b>	<b>7</b>
<b>Figure # 3: Result of Low Environmental Degradation</b>	<b>10</b>
<b>Figure # 4: Result of High Environmental Degradation</b>	<b>11</b>
<b>Figure # 5: Changes in The Environmental Index Trend</b>	<b>13</b>





## **INTRODUCTION**

The engagement for agricultural development in tropical countries has intensified to supply food and fiber for a rapidly increasing population, and it must be attained with a sensible natural resource balance; if not with minimal disturbance. Natural resources are being progressively recognized as a capital endowment that must be appropriately managed to nurture, not to lavish.

As under-developed countries strive to achieve a more productive agriculture, land degradation, deforestation and bio-diversity losses are imputed to unsound agronomic practices specially in frail resource base environments. The issue of natural resource degradation, on account of agriculture, appears more intense and pertinent on the hillsides. This in itself merits to be dealt with a sense of urgency, over and above when poverty level, food demand and population growth pressures are additional strains.

This paper stems from conceding Jamaica's hillside agriculture as an environmental endowment, for the prevailing traditional small hillside farming system comprises amiable environmental fundamentals of sustainability. Inasmuch hillside agriculture in Jamaica encompasses a farming system that abates natural resources and bio-diversity losses, it also denotes economic poverty for its practitioners vis-a-vis bounteous non-market environmental benefits for the society. Undoubtedly this is not sustainable (Reyes-Pacheco, 1994). The paradox of hillside agriculture in Jamaica as a sustainable farming system that will also improve the living conditions of poor hillside farmers --poverty alleviation, is discussed.

The conceptual argument presented portrays the relative amicable environmental traditional hillside farming system and the farmers' poverty level, as it evokes the risk of a forcibly land use intensification, while farmers contest to reduce their poverty levels. This might lead to inappropriate alternative farming systems conducive to a hastened watershed degradation, unless appropriate improved farming systems are devised and maintained, or the society at large constitutes poverty compensatory mechanisms to resolve the paradox --"poverty with

environmental soundness."

## **HILLSIDE FARMING IN JAMAICA**

In Jamaica only 3.2% of the land is suited for cultivation with little or no limitations. Only an additional 11.3% of the land is apt for agriculture, but with moderate restrictions. Of the rest, 24.1% is suitable for farming with strong limitations, 10.6% for tree crops and pasture with extreme shortcomings for cultivation, while the remaining 56.4% is not suitable for agriculture, tolerating only forestry<sup>1</sup>. More than 75% of the country's topography has slopes of 10 or more degrees.

Likewise, land is concentrated in relatively few large farms as attested by the skewed distribution of the land structure. Most small farms occupy 13% of land with a high level of fragmentation (2.2 parcels per small farm). " . . . large farmers have occupied the best land of the plains, while small farmers are concentrated in the watershed areas, cultivating steep slopes and other marginal lands" <sup>2</sup>.

These broad statistics highlights the extreme land restrictions for agriculture. The pursuit of agricultural activities in these hilly lands without accelerating the rates of natural resources depletion is a perplexing task, which requires suitable plans for protection and development of this sparse resource base.

The Domestic Agriculture Sub-sector accounts for more than 50% of the Agricultural Gross Domestic Product. Its production is largely generated by small farmers located on the hillsides, having small and fragmented holdings spread across thirty-four (34) watersheds in the country. Indeed, "small hillside farmers who are the majority produce most of the perennial tree crops and almost all of the annual food crops. A majority of all farmers operate 15 percent of Jamaica's

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<sup>1</sup>*IFAD/IICA 1994. Jamaica: A Strategic Proposal For Rural Development. Page 18.*

<sup>2</sup>*Ibid. Page 19.*

farm land on plots with less than 5 acres, typically on the hillsides."<sup>3</sup>

The significant role played by the small hillside farmers in the performance and development of the agricultural sector in particular and the country in general is self-evident. "Today, small farms are the principal production units in the sector. A substantial segment of the population depends on them for employment, income and source of food. According to the 1978/79 Agricultural census, small farms (< 2.1 ha.) comprised the largest group in the sector, accounting for more than 80 % percent of all small farm enterprises. Furthermore, there were more than 150,000 small farmers in Jamaica. Given an average of 4.4 persons per household, more than 660,000 people were linked to small farming" <sup>4</sup>. These facts underline the critical role played by Jamaica's Domestic Agriculture Sub-sector and endorse the conclusion that it is analogous to hillside agriculture.

Beside the economic prominence of hillside agriculture, there are externalities interlaced to its sustainable development. Among many they comprise: water supply for human consumption and irrigation, flora and fauna in upper and lower river basins, quality of air, sedimentation of river basins and reservoirs, soil losses, cultural and national heritage, natural beauty and social-psyche.

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<sup>3</sup>*World Bank 1994. Jamaica: A Strategy For Growth And Poverty Reduction Country Economic Memorandum. Page 20.*

<sup>4</sup>*To appraise the role of the small farmers and in agriculture see: Op. Cit. Page 31 to 34.*

Generally, agricultural activities on the hillsides are successively juxtaposed with soil depletion, land erosion, bio-diversity losses, high levels of sedimentation -- impacting river basins, and general environmental degradation. It is accustomed to adjudicate claims upholding the aforesaid --"The farming practices of small hillside farmers in general, have negative impacts on the environment. Because of the fragility of the soil and the technology used, hillside farming contributes to soil loss and environmental degradation of watersheds, with adverse consequences on downstream farming, water pollution and destruction of wildlife and habitat" <sup>5</sup>.

On the contrary, the existing traditional farming system as practiced by small farmers on the hillsides in Jamaica has evolved adjacent to an agro-ecological system that incorporates amiable environmental elements (Hills, 1988). Indeed, hillside farming in Jamaica seems to incorporate sound ecological practices as it resembles a "Home Gardens" agro-forestry system (Soemarwoto, 1988). Traditional agricultural methods such as minimum tillage (use of stakes and mulch), appropriate crop rotations, diversification of crop combinations, use of organic materials for soil fertility, appropriate soil cover management (mulch for soil protection, relay cropping and inter-cropping and live tree barriers) are many of the methods that hillside farmers in Jamaica apply which insure sound land use sustainability.

Adjunctly, if land under-utilization of Jamaica's hillsides is confirmed the small farmers' environmental impact on the watersheds is restrained. The farming system portrays a traditional low-input, highly extensive diversified mix-cropping (annual crops inter-cropped with perennials) and mixed-patterns of cultivation. These are some salient features that plea in its favor; vis-a-vis intensive tillage, high-input modern agricultural systems. "Jamaica's hillside agriculture far from being modern, has unfolded into a highly diverse multi-crop mix system that reduces the effects of adverse climatic conditions, pest and diseases, prices, and market variability. Minimizing risk is the prevailing economic denominator to

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<sup>5</sup>*Ibid. Page 34.*

ensure a continuous flow of subsistence foodstuffs and income, rather than a profit maximizing function. One could suggest that its under-utilization could reflect a reasonable sustainability, given its relative environmental amicability"<sup>6</sup>.

The rationale behind this farming system confirms that small hillside farmer's economic function is not unavoidably profit maximization but preferably cash-flow stabilization. "the great diversity of the food forest also results in the reduction of risk; a most important economic objective for any small farmer. The chances of all staple subsistence crops and major crops being destroyed or seriously damaged by hurricanes, drought, disease and insect infestation are greatly reduced by intensive mixing. Diversity, reduction of risk and loss of production have the combined potential to provide a more balance diet as well as a regular adequate food supply"<sup>7</sup>. Indeed, far superior options do not seem viable alternatives to subsistence agriculture on fragile lands. Hence while it is difficult to change the relatively appropriate traditional land use, there are many methods--indigenous and non-indigenous, that are available for managing lands (SWSC, 1990).

Granted, land under-utilization on the hillside does not unquestionably denote sound environmental agricultural practices. Notwithstanding, it is conceptually preferred to an over-utilization of the natural resource base, especially if performed on frail environments such as the hillsides. See the following Figures # 1 and 2 for an illustration.

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<sup>6</sup>*Reyes-Pacheco, A., 1994. Jamaica's Hillside Agriculture: An Environmental Endowment. Page 14.*

<sup>7</sup>*Hills, T.L., 1988 The Caribbean Food Forest Ecological Artistry Or Random Chaos. Page 7*

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Figure # 1

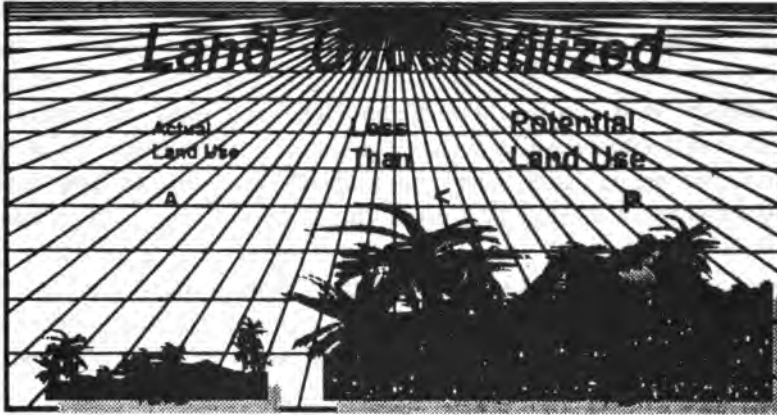
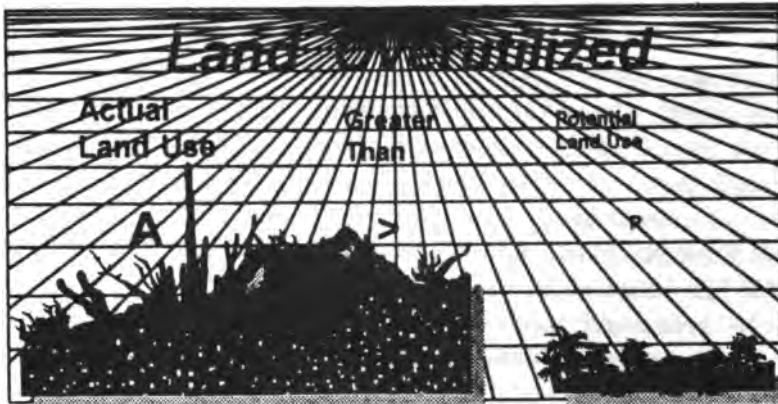


Figure # 2



There is a sparsity of knowledge required to appraise the intricate web of man and the natural resources, for developing reliable information to detect the sustainability of different agricultural farming systems with regards to the production practices and the environment. "Part of the negotiation process to achieve the balance that yields a sustainable agriculture is to agree on indicators of sustainability. How can we measure the degree to which one practice is more sustainable than another? And how can we make sure that the multiple measures of sustainability are included when we evaluate the utility of new technology, especially when some impacts take more time to be discerned than others? . . ."<sup>8</sup>.

If farming systems can be identified, characterized, valued, and evaluated -- productively and financially, and their relationships with the environment established, then distinct farming systems could be analytically assessed for their effects and impacts. Thus, policy design and implementation will be facilitated if not improved. While a general agreement is not forthcoming about defining what constitutes sustainable agriculture, it will assuredly comprise a relaxed crop management system, less intensive and with fewer synthetic inputs.

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<sup>8</sup>*Flore, C.B., 1992. Building Sustainable Agriculture: A New Application of Farming Systems Research and Extension. Page 40.*

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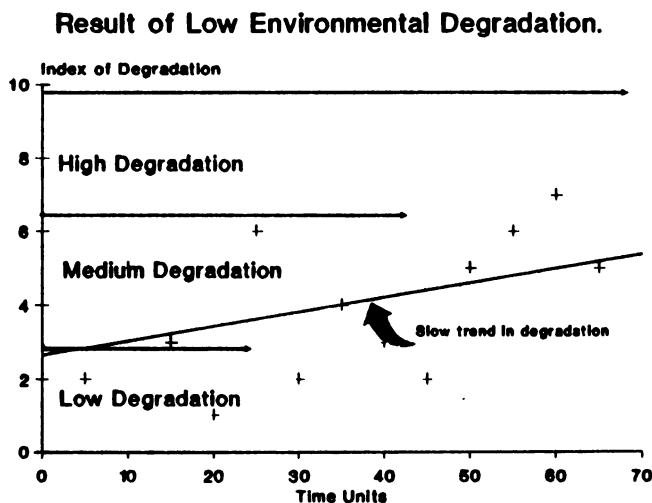
## **THE PARADOX**

How to value the environment? A short path could be to ask people. There is no reliance on the value's exactness through this procedure, but it could be a close approximation in the absence of environmental figures and indexes. The difficulty is that environmental statistics are error-prone when estimating non-market goods, such as air quality, bio-diversity, national parks, etc. Some resources are not bought or sold, thus it is very difficult to assign a market value in the absence of actual market transactions. Economists try to price them indirectly by employing different techniques and proxies. These processes and techniques can be complemented and enhanced by public-opinion surveys or contingent evaluation.

Reliable and ready information concerning the economic and environmental consequences of alternative farming systems is unperformed. How to value -- market price, the hillside farming system's effects on natural resources? How to earmark prices for non-market environmental resources such as bio-diversity, ecosystems, air and water quality, as well as other externalities such as cultural and natural heritage? Environmental and agricultural natural resource accounting awaits progression.

Nevertheless, if the land use of Jamaica's hillsides echo a similar pattern of land under-utilization as that of the Rio Cobre watershed (Mulleady, 1994); in a land use and cultivation pattern study of watersheds on an individual basis, the actual hillside farming system would not seem to contribute to watershed degradation to the extent usually attributed to it. But most importantly, the rate of environmental degradation would not be hastened. This would outstretch the time frame for which watershed management policy can be designed and action -- interventions, phased in. See Figure # 3 for a visual illustration of a low environmental degradation index advanced for Jamaica's hillsides.

Figure # 3



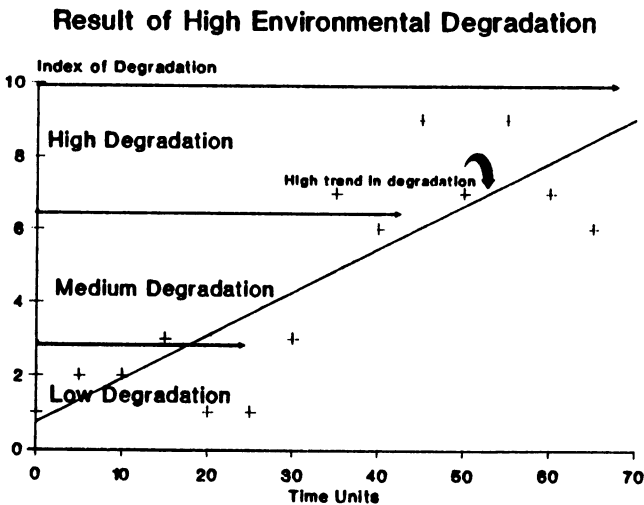
If a measure of watershed degradation --an environmental index, could be recorded, Jamaica's hillsides would reflect a low trend. For their farming system provides essential elements of agricultural practices and organization of relatively effective watershed management, that conceptually supports the low elasticity of an environmental curve as envisioned in Figure # 3 above.

While Jamaica's hillside agriculture seemingly portrays a simple farming system, simultaneously it comprises a sophisticated and complex array of social, technological and economic variables. The small hillside farmers allude to evidence of how their farming systems have evolved in the country, and indicates a trend that have been relatively sustainable. They have been successful in exploiting more rationally their natural resources, land use, crop diversification, intensive inter-cropping, plant heterogeneity, agricultural practices, etc. However, this sustainability is now being threatened. Any attempt to intensify or modify

their farming system seems risk-prone to environmental degradation without proper agronomic and economic research and modeling an optimal farming system. It is important to improve the knowledge of how the small hillside farmers have managed their natural resources and of other social and economic conditionalities and factors that have contributed to the evolution of their farming system. Traditional farmers' knowledge and practices merit thoughtful scrutiny.

In contrast, an over-utilization of natural resources, due to a specific farming system, an inadequate technological package, and/or land use intensification, could accelerate the rate of watershed degradation thereby resulting in an irreversible environmental stage. This narrows the time frame for possible interventions and/or corrective measures. Figure # 4 illustrates a high environmental degradation trend.

Figure # 4



Similarly, an assessment is made of the hillside farmers poverty status. (See IFAD/IICA/1994). The main challenge confronting them is how to overcome poverty. And to do so they must produce more --increase agricultural production. Thus, to intensify their farming system to become more productive and profitable is a reasonable aftermath, as they strive to solve the poverty situation.

Present allegations of heightening hillside degradation seem to highlight a conviction that farmers are trying to be more productive, but not necessarily in a manner which is concordant with the natural resource base. Their farming system in itself is not an important factor for explaining soil erosion and degradation of the watersheds, but rather the poverty alleviation measures that they have been taking predominantly in the last four years. This has meant intensive land utilization, thus departing from their traditional farming system.

Local knowledge --indigenous technological know-how, is sighted as critical and useful for designing and implementing technological break-throughs, specifically for adoption by poor farmers who have scarce resources and operate under fragile eco-systems. Lessons can be learned from the farming systems practiced by small farmers in making fragile eco-systems sustainable (Sharma, 1992).

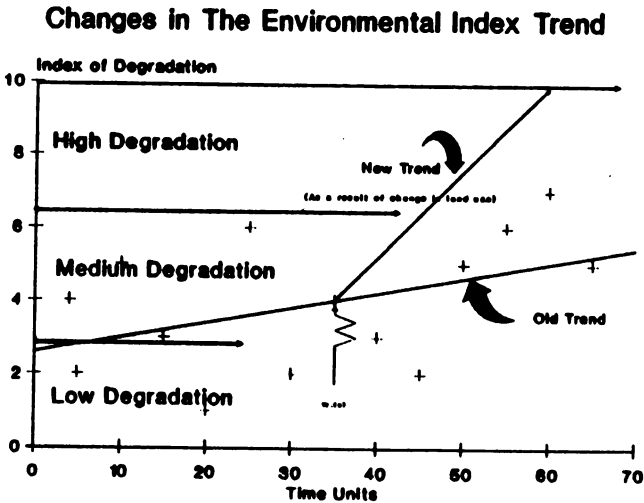
Perhaps the local agronomic, agro-forestry and socio-economic practices pursued by the small hillside farmers in Jamaica have a better chance for being sustainable, than costly and improved modern technological innovations. "Among small farmers not only in the Caribbean but elsewhere in the tropics exists a considerable body of agronomic knowledge. The knowledge is regularly used for solving problems resulting from specific production conditions. Working on inventory of this knowledge and of all the plants and their various uses is not only essential to the general benefit of the agricultural sciences, but also in an attempt to wed new and traditional technologies to the end that environmental sustainability will be achieved ....<sup>9</sup>. While modern agricultural technology might be more efficient, it may be relatively inferior in its effectiveness. The issue of its

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<sup>9</sup>Op. Cit. Page 23

wide applicability specially on the hillsides and considering the limitations of scarce resource farmers seems questionable. Farmers' traditional practices are often more realistic and applicable than modern technological innovations, but there is a risk in believing that every problem can be solved through the application of farmers' indigenous knowledge. The shift to a more intensive agriculture in a delicate natural resource base as the hillsides, evidently incorporates an environmental risk of mis-management and a hastened degradation.

Figure # 5



The above Figure # 5 illustrates how the relative environmental friendly small hillside farming system in Jamaica could become inelastic. Indeed, it is reported that the degradation of Jamaica's highlands has accelerated at an alarming rate in the last three years, negatively impacting the environment, the economy and the society in general, thereby drawing widespread attention.

Since development should incorporate all sectors of the society, consideration must be given to the heightened risk of watershed mis-management and degradation by small hillside farmers if they were to intensify their farming practices, while thriving to increase income and reduce poverty. While a change in their farming system practices might turn out to be more profitable in the short-run, this is not sustainable in the long-run. A step up of agricultural practices in the hillsides is environmentally perilous and perhaps non-viable.

In conclusion, to commence modifying Jamaica's hillside farming system it obliges to understand their past and current dynamics, if environmental disasters are to be avoided, especially when the existing farming system has demonstrated up to now, to be more stable and sustainable but now at a price --poverty for the farmers. This suggests that sustainable agricultural development is not compatible with poverty levels.

## **UNRAVELING THE PARADOX**

Rural poverty and environmental degradation have been recognized as a vicious cause and effect for a long time. Inappropriate land-use practices due to poverty pressures are recognized as a major cause of eco-system degradation and unsustainable farming systems. What is conferred for Jamaica's hillsides is an appropriate farming system with environmental friendliness characteristics, but with rural poverty.

The economic and environmental trade-offs from Jamaica's actual hillside farming system to other farming system; must be made explicit. Principally, it dodges visible problems associated with annual crops, when it is predominantly engaged in the production of perennial crops. Most tree crops in the tropics have a permanent leaf canopy, thus, better soil protection against erosion, require less frequent soil tillage, need less agro-chemicals, provide a natural sink and recycling of nutrients, ability to absorb large quantities of carbon dioxide and recycle water through efficient evapo-transpiration, with subsequent beneficial effects on climate, flora and fauna.

The low sustainability of intensive agricultural production in the hillsides is understandable when related to annual crops; which demand annual cyclical practices of soil tillage, sowing, weeding and harvesting, unbarring the land free of vegetation cover for long periods. A drastic departure from the actual farming system --high and diverse crop mixes, non-pattern sowing, low input, low-intensive activities and tree-crop domination, to a more predominant annual crops system is notoriously difficult to cultivate on the hillsides, without major risks of soil erosion and watershed degradation in general.

The price for eluding an environmental risk, as small hillside farmers undertake agricultural farming practices radically different from those currently practiced in their poverty alleviation pursuit, should be incurred by the society in general. Furthermore, when the society at large already enjoys environmental benefits -- externalities at no cost, but that of the poverty level endured by small hillside farmers, though it is not formally economically accounted for and therefore

recognized.

The poverty level associated with the present farming system in the hillsides is not a question of social justice, but rather draws attention to the prolonged non-payment to farmers for the provision of environmental externalities.

In the absence of watersheds' assessments to determine economic cost and benefits to the farmers and society in general, Jamaica's hillside agriculture might be conducive to rural sustainable economic development, granted this paradox is recognized and resolved. Rural Sustainable agriculture in the hillsides must incorporate and recognize legitimate objectives and concerns by the society and farmers <sup>10</sup>. Rural development in Jamaica is to be appraised as the basis for agriculture, forestry, and other natural resources conservation actions. And it ought to harmonize with the farmer's traditional production and farming systems, and the socio-economic and political context of their communities.

The public in general and policy-makers in particular have been biased in costing environmental damages caused by mis-management of natural resources, rather than in pricing benefits. Predominantly the literature highlights the most common environmental impacts due to agricultural practices pursued in the watershed's -- soil erosion and disorderly land use, deforestation, soil, water and air contamination, increasing levels of sedimentation, droughts, greater risks of emergencies and disasters, and accrued non-market values or proxies for biodiversity losses. A balanced approach for accounting environmental costs and benefits must be arrived by the different social players involved, if sustainable hillside agriculture is to endure.

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*"Op. Cit., Page 38. " . . .Sustainable agriculture seeks a balance of environmental conservation, agricultural production, farm profit, and community well being."*



Jamaica's hillsides are threatened not by the farmers' farming system, but by the poverty level they undergo. And it is the farmers' thrust to overcome poverty, that the present farming system is being challenged and changed with increasing natural resource utilization levels. The quest is to search for modified --not necessarily new, production and consumption forms, incorporating new distribution systems with restrained natural resource degradation. And/or the existing farming system could remain as is, while designing and incorporating payment systems --monetary compensation, for non-recognized environmental externalities that small hillside farmers generate. Beside the income derived from their farming, there are unrecognized economic external environmental benefits - public goods generated by hillside farmers in Jamaica. It is reasonable on economic grounds that the value of those goods and services, be priced and paid to producers by the beneficiaries or their users.

To account for those public goods and services a user value can be assigned, and it might be an acceptable and effective way not only to maintain the actual environmental amicability of the hillside farming system, and perhaps improve it, but also to alleviate poverty of its practitioners. How to calculate those fees? How to accrue them and how payment ought to be made? These are pending and urgent questions that ought to be addressed, if the two objectives of environmental friendliness and alleviation of poverty are to be met.

In light of predominant free-market economic thinking, the issue of economic transfers to account for environmental externalities from one sector to another by way of price-support systems, subsidies, etc. while justified, appears to be an unpopular measure which lacks advocates. Thus, some of the market mechanisms by which payments for watershed management and protection can be envisioned and explored to maintain the actual if not diminish agricultural activities and incorporate poverty alleviation measures to hillside farmers include:

- i. Debt-for-nature swaps;
- ii. Royalty fees for pharmaceutical rights to extract plants with medicinal qualities;

- iii. **Eco-tourism;**
- iv. **Assessment of research fees;**
- v. **Assessment of site-protection fees;**
- vi. **Compensation of foregone benefits; and**
- vii. **Royalties for alternative activities.**

The implementation of compensatory systems that consent to externalities ought to be explicit and direct. Additionally, there are certain elements that might suggest and enhance possibilities of success of any strategy designed for enhancing the sustainability of hillside agriculture. These include:

- i. **Recognition of the problems faced by the players involved and the desire to confront and change them;**
- ii. **Political support and commitment, with a high degree of community participation;**
- iii. **Adequate human and financial resources that support a well-defined strategy for dealing with the problems;**
- iv. **Integration of the different players involved not only to define, but also to implement problem-solving measures as well.**

No specific methodology has been designed for solving the paradox identified. Its solution must be envisioned within the country's particular social, political and economic realities. It is assumed that the society will demonstrate a willingness to compensate small farmers for environmental benefits and services generated by them through their hillside agricultural activities.

## **FINAL COMMENTS**

There is general agreement that sustainable agriculture must encompass besides the continued ability to provide food and fiber in a manner which protects the environment, strategies that incorporate the economic viability of the farming systems. In short, agricultural sustainability must comprise not only environmentally sound production practices but also economic viability, for them to be sustainable.

Questions arise as to the extent to which Jamaica's hillside agricultural farming system addresses this proposition. It satisfies the first criterion, but fails in relation to economic variables, as it translates into poverty for the farmers. In lieu of poverty alleviation, the environmental sustainability of the small hillside farming system in Jamaica is at risk. Its fewer rigid crop rotations and patterns, considerably less use of chemical inputs --pesticides, herbicides, fertilizers and also better animal and crop residue management, could be emphasized. Its long term viability depends on the poverty alleviation of its farmers. The options available seem to support either alternative profitable technological agricultural packages for exploiting this delicate natural resource base at a sustainable rate, or the requirement that the society accept its indebtedness and a contingent willingness to pay for the environmental benefits and services accrued to the actual small hillside farming system, or a combination of both.

Unquantified benefits of watershed protection provide tangible benefits, among them: ecological resources, recreation, bio-diversity preservation, educational and research opportunities, and resource exploitation. Despite their critical importance, the declaration and management of watershed areas depend on economic, social and political factors. The difficulties originate not only from the absence of quantified benefits and costs, but also of determining the social needs and interests, and evoking the political will. The quest is how to maintain said environmental amicable farming system, that will continue to shield and ensure natural (ecological) wealth, but also, simultaneously create material (economic) wealth?

It is difficult to account for and evaluate natural resources and environmental assets, and thus, environmental degradation and damages are usually overlooked. The environmental domestic product (EDP) has been introduced to deal with over-estimated assessment of gross domestic product (GDP) (Sterr and Lutz, 1993). An argument can be made and validated that the hillsides should be declared protected areas. Preserving natural habitats or farming system which are relatively benevolent to the environment as those in the hillsides of Jamaica helps to guard essential ecological systems.

The fact that there is an economically active population on Jamaica's hillsides, the preservation of the physical natural resources would plausibly incorporate its exploitation. Thus, the issue then is one of creation and maintenance of agricultural development in brittle natural resources. For "poverty with environmental soundness" among hillside farmers is not a sustainable trade-off in the medium run.

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