A History of Landscape-level Land Management Efforts in Haiti

Lessons Learned from Case Studies Spanning Eight Decades

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Andrew Tarter, Katie Kennedy Freeman, Klas Sander

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Overall there is immense ecological diversity in Haiti,

which results from the peculiarities of a landscape where most of the land area is in mountain. Agriculture is affected by the extreme variations in rainfall, variable soil types, differences in temperature according to altitude, and a mix of rugged highlands, fertile river bottom-lands and coastal pains. When the effects of these ecological variations are mediated through the prevailing social structure, they have a bearing on development potential and an understanding of production relations in Haitian economy.

-Anthropologist Glenn Smucker, 1982.

A watershed is formed by all those lands that shed water into a stream; *it can be a few acres that shed water into a ravine or creek; or it can be millions of acres that drain into rivers, such as the Nile and Mississippi. Watershed management is the management of the lands, animals and people of a watershed so as to achieve the maximum benefits to man, while conserving the soil, forests, range and the water itself.*

-Département de l'Agriculture, des Resources Naturelles
et du Développement Rural (DARNDR),
Gouvernement de la République d'Haïti, 1962.

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List of Project Acronyms

Agroforestry II	AFII
Agroforestry Outreach Project	AOP
Agriculturally Sustainable Systems and Environmental Transformation	ASSET
The Artibonite Project	ATP
Appui à la Valorisation du potentiel Agricole du Nord, pour la Sécurité Économique et environnementale/ Feed the Future	AVANSE/FTF
Le Développement Economique pour un Environnement Durable/The Durable Economic and Environmental Development	DEED
Développement Rural Intégré Petit-Goâve-Petit Trou de Nippes	DRIPP
Forest and Parks Protection Technical Assistance Project	FPPTP
Hillside Agricultural Program	HAP
The Haiti Pilot Project	HPP
Macaya Biosphere Reserve	MBR
L'Organisme de Développement du Nord	ODN
Organisation de Développement de la Vallée de l'Artibonite	ODVA
Productive Land Use Systems	PLUS
Pwojè Sove Tè	PST
Secretariat Technique á l'Aménagemen des Bassins Versants	STABV
Targeted Watershed Management Project	TWMP
Watershed Initiatives for Natural Environmental Resources	WINNER

Executive Summary

A variety of public and private institutions have initiated landscape-level land management[1] projects in Haiti since the first multilateral development project of the United Nations was implemented there in 1948. The rubrics guiding these projects have been diverse: *sustainable rural development*; *integrated landscape management*; *agro-ecosystem management*; *agroforestry*; *ecosystem stewardship; and watershed management*—to name just a few. Despite a vast nomenclature that reflects real differences in landscape-level land management approaches and policies, most such projects implemented in Haiti have moved along a temporal trajectory toward the following set of shared, complementary objectives:

i) Natural resource conservation, management, and/or restoration;

ii) Improving and/or increasing agricultural productivity; and

iii) Improving the lives of project beneficiaries by increasing economic activities.

The success or failure of landscape-level land management projects in Haiti has not been determined by these complementary objectives, but by the differential emphasis of overall project approaches and policies toward achieving these objectives.

The present report opens with a brief history of ecological degradation in Haiti—a necessary exercise for two reasons: (1) understanding how ecological degradation has proceeded historically in Haiti is required for mitigating future degradation; and (2) as the rural landscape has been altered significantly since the earliest landscape-level projects were implemented, a grasp of current ecological conditions in Haiti is also necessary.

After providing a brief ecological history, the report then shifts to examine fifteen different landscape-level land management projects executed in Haiti between 1948 and 2014, detailed in the form of brief but summative case studies that highlight salient project features, and differences in approaches and policies. The primary findings presented below emerge from these fifteen case studies, the preceding ecological history, and a review of many documents presented in the bibliography of this report. The bibliography serves as a point of reference for further inquiries, guided by citations throughout this report.

The primary findings from the review of literature and case studies suggest:

- There is wide consensus on the need for landscape-level land management in Haiti, and increasing consensus on watersheds[2] as the appropriate location for effective project implementation. The majority of Haiti's population is embedded in an agrarian landscape that relies on agricultural production as their primary livelihood strategy. Agricultural possibilities will continue to decline without effective landscape-level land management strategies. Centuries of deforestation and climatic drying have made access to water a major determiner of on-going agricultural production. Since rainfall is increasingly variable and unreliable in many of the denuded locations in Haiti, watersheds represent one of the most effective locations for landscape improvement efforts.
- There have been two common approaches or models to landscape-level land management projects that have been enacted in Haiti. Both require trade-offs. The 'macro-level' approach favors complete

1 Here and throughout this report, ***landscape-level land management*** is conceptualized as an overarching category that refers to varied large-scale efforts at land management, including but not limited to 'watershed management'.

2 ***Watershed management*** indicates efforts at landscape-level land management that are delineated by varied conceptual and operational definitions of a watershed.

landscape coverage at the expense of social and ecological heterogeneity. The 'plot-based' approach favors highly adaptive, plot-specific policies at the expense of full landscape coverage. The former has tended to emphasize ecological outputs through command-and-control models, while the latter has tended to emphasize both social and ecological outputs, developed through beneficiary participation in all levels of project identification, formation, implementation, and ownership.

- 'Macro-level' approaches to landscape-level land management are frequently marked by the following features:
  - ✧ Macro-level approaches tend to target entire watersheds, but still often fail to achieve 100% coverage;
  - ✧ Macro-level approaches tend to come with *a priori* assumptions and solutions developed by experts, which frequently rely on a complete restructuring of local agricultural or land management practices, rather than building on existing structures. This trend frequently results in less-than-enthusiastic participation or in resistance to participation from project beneficiaries;
  - ✧ 'Participation,' from the perspective of macro-model project implementers, is frequently viewed as beneficiaries' initial adoption of technologies or practices, and the contribution of time or labor toward this initial adoption;
  - ✧ One of major reasons for the failed efforts of many macro-level landscape management projects in Haiti has been the adoption of a laundry list of project objectives meant to address the complexities of the problem—an emphasis on *breadth* over *depth*, but an emphasis applied indiscriminatingly across all lands and inhabitants within a landscape. The attempt to implement wide-ranging objectives through a top-down manner frequently results in project funds and personnel stretched thin, with fewer project objectives ever fully realized.
- 'Plot-based' approaches to landscape-level land management are frequently marked by the following features:
  - ✧ Plot-based approaches tend to account for the inter- and intra-heterogeneity of land, society, markets, roads, etc., of landscapes;
  - ✧ Plot-based models frequently rely on prior and ongoing research to assess and address these levels of heterogeneity;
  - ✧ Plot-based approaches have tended to adapt project objectives in an iterative, farmer-driven process;
  - ✧ Plot-based approaches necessarily involve local participation at all stages of project identification, implementation, ownership, management, and continuity;
  - ✧ Plot-based approaches rarely achieve 100% project coverage within a given watershed; and
  - ✧ Plot-based approaches have proved the most successful in terms of project adoption by beneficiaries and continuity after the end of the project cycle.
- Case studies show a clear, diachronic trend away from 'macro-level' approaches, toward 'plot-based' approaches.

  The 15 case studies presented in this report, and other cases reported on in the literature review, indicate that 'plot-based' approaches tend not only to be more effective, but are increasingly embraced in Haiti over 'macro-level' models. This is especially true of arable land holdings, which are highly fragmented across most landscapes in Haiti.

  In certain cases, such as instances of large tracts of government-owned land, uninhabitable areas, or large plots of collectively-owned land held by networks of kin, the case for 'macro-level' approaches may still be made. However, the long-term success of landscape-level land management approaches with these former two land categories—characterized by a lack of local land ownership and thus low investment—has historically proved untenable.

- Despite a historical trend away from 'macro-level' models toward 'plot-based' models, both approaches have failed to achieve their objectives at different times for some of the following reasons:
  - ✧ One historical determinant of landscape-level land management project success or failure has been the differential emphasis placed on varied project objectives. Project objectives selected for emphasis often appear to be driven by the *a priori* demands of donors or implementing agencies, often emphasizing a particular technology, approach, or model that ultimately proves incompatible in the Haiti context. The results have been low adoption rates or low continuity after project timeframes expire;
  - ✧ Unsuccessful projects were frequently weighted down by multiple competing objectives that aimed to recognize the interrelated complexity of landscape-level land management, but simultaneously stretched project resources thin in an effort to address this complexity;
  - ✧ Successful programs limited the scope of what might be accomplished within the confines of the project timeframe, and focused on a few clearly defined policies tied to even fewer and more-clearly defined objectives;
  - ✧ Successful programs frequently took a substantial period of preparation to align the visions and goals of donors, varied project partners, stakeholders, and beneficiaries;
  - ✧ Successful programs involved local participation at all levels, including project identification, preparation, and implementation; and
  - ✧ Allowing processes of stakeholder alignment and multi-tiered collective participation permitted successful programs to identify meta-objectives and policies that addressed a multitude of concerns important to all project stakeholders, leading to higher levels of project adoption, participation, ownership, and achievement of objectives.
- Land tenure does not appear to be an impediment to beneficiary participation. Haitians utilize both informal and formal systems of land tenure, which permit the inheritance, management, leasing, sale, and purchase of land. While these tenure systems are complex, and thusly can appear insecure, experience demonstrates that they are highly functional and commonly do not represent an impediment to the implementation of landscape-level land management projects in rural Haiti. As the leasing of land is a common, established practice in rural Haiti, *access to land* appears to be a larger determiner of investment incentives to farmers than informal or formal tenure status.
- Land security is a potentially volatile issue that deserves reflection.

  Considering historical and contemporaneous land grabs and forced displacements, land insecurity from external forces represents a real concern, particularly with projects that target large parcels of arable land. However, the vast majority of arable plots in rural Haiti have been divided into fragments that are discontinuously dispersed across landscapes, serving as a *de facto* protective measure against external threats to land security. Larger plots of land are collectively owned by kin groups, but typically agriculturally unproductive, which may also serve to protect them against external forces.
- Participatory models have demonstrated more success than other more command-and-control approaches.

  The historical command-and-control approaches to landscape-level land management, including watershed management, have been met with skepticism and suspicion on the part of local project beneficiaries in Haiti. Within these projects, levels of participation have been low, as have levels of adoption. Experience suggests that participatory approaches are crucial to long-term project success. Since local farmers occupy watersheds and are the direct project beneficiaries, their inclusion in all aspects of project identification, preparation,

and implementation is crucial to project success and sustainability. Successful project approaches included multiple stakeholders, such as members of local government, and local governing groups, community groups, church groups, and other solidarity structures.

- Frequently effective government participation is limited by overlap between project and political administrative delineations and ecological zones.

  Many watershed management projects in Haiti wrestle with the fact that rivers and their tributaries do not adhere to either the political boundaries of Haiti's departments or subsequent administrative units, or to the distribution of ecological zones in the country (Delatour et al. 1984). The differences between ecological zones have been greatly diminished (Ehrlich 1985), adding doubt to models that delineate watersheds and policies based exclusively on ecological life zones.

- Project continuity
  As of yet, all documented examples of landscape-level land management schemes in Haiti have suffered from issues of funding and project sustainability after donor cycles have concluded. In Haiti, virtually all support has been through non-governmental donors and it is unclear in most cases if the internal rate of return of project investments make them viable without sustained donor support.

Nearly seventy years after the first landscape-level land management project of the United Nations was executed in Haiti, similar projects continue to be implemented, and many continue to suffer avoidable historical shortcomings. The broader development community and project beneficiaries in Haiti have much to learn from the past in order to most effectively design and implement successful landscape-level land management projects in the future. This meta-analysis has been crafted for this very audience, as a point-of-departure for future efforts at landscape management in Haiti. The key findings listed above summarize a review of the literature and the fifteen case studies subsequently presented in this report. The reader interested in a more nuanced, in-depth understanding of how these individual cases unfolded in Haiti is encouraged to consult the extensive bibliography of sources at the end of this report.

Background

Centuries of deforestation in Haiti have played out on an overwhelmingly mountainous terrain that receives seasonal rains and torrential downpours from frequent tropical storms and hurricanes. The standard of living for many rural Haitians has been negatively impacted as a result of deforestation and removal of the vegetative cover. Some of these impacts, such as the loss of valuable topsoil, have been directly observable, but other impacts of deforestation in Haiti have been less visable.

Ecological Vulnerabilities

From a strictly ecologically standpoint, deforestation in Haiti has caused or contributed to:

- **Damage to Haiti's riparian systems and the soil-silting of lakes and unique coral reefs;**
  The lack of a protective vegetative cover has led to an increase in the rapidity of surface water runoff out of watersheds, reducing the ability of rainwater to recharge the aquifers. Since Haiti's rivers are aquifer-fed, river water levels have been lowered, and in many cases permanent rivers have become seasonal. Soil-silting of lakes is raising water levels, changing water salination levels, and destroying or threatening fresh-water, brackish water, and ocean fish habitats (Hotz and Christian 2015).
- **A decline and loss of Haiti's diversity of endemic flora and fauna;**
  Haiti is home to some of the highest levels of biological diversity in the Caribbean (Swartly and Touissant 2006). The disappearance of potentially rare, endemic flora and fauna represents a loss of unknown proportions. The erosion of specific soil profiles results in a decreased ability of native flora to regenerate, paving the way for exotic or invasive species that lower overall biological diversity due to an increasingly homogenized habitat for both flora and fauna.
- **Increased climatic drying;**
  The decline of a protective vegetative layer subjects Haiti's land to increased *evapotranspiration*—the drying of soil through direct exposure to sun and wind, which work together to wick away surface moisture. The heat rising from arid land drives away higher moisture air, in many cases reducing the likelihood of rainfall, and causing the pseudo-drought phenomena experienced throughout much of rural Haiti for the last several decades. The social science literature is replete with well-documented testimonies of Haitian farmers who contribute drought and pseudo-drought conditions directly to the over-cutting of trees.
- **Increased terrestrial vulnerability to the effects of tropical storms and hurricanes;**
  Without complex root systems to hold Haiti's mountainous terrain in place, entire mountainsides frequently wash out during tropical storms and hurricanes. Streams and rivers swell from immense groundwater runoff, causing flooding, increased erosion and widening of riparian systems, and the soil silting of lakes and ocean habitats. Individual trees and remaining tree stands are subject to higher exposure from wind than trees aggregated in forests, resulting in the widespread downing of remaining arboreal stands. The effects of tropical storms and hurricanes are not only exacerbated due to Haiti's deteriorating ecosystems, they also contribute to that deterioration in an iterative, degenerative terrestrial cycle.

Human Vulnerabilities

Since most rural Haitians are embedded in an agrarian landscape and rely on agricultural production as their primary livelihood strategy, the ecological and landscape degradation noted above directly contributes to:

- **Nationwide declines in agricultural productivity;**
  The production of soil takes thousands of years but major losses of topsoil in Haiti may transpire in a single storm. As the majority of Haiti's population is understood to be dependent on agricultural production as a primary livelihood strategy, and some 80% of rural households rely on agriculture (World Bank 2015: 27), the loss of valuable topsoil has an insidious and deleterious long-term effect on agricultural productivity. Haiti's GDP *per capita* fell by an average of 0.7% between 1971 and 2013 (World Bank 2015: 1), weather-related damages and losses caused an average decline of 2% of GDP per year in Haiti from 1975 to 2012, and approximately 50% of tropical storm related losses in Haiti's productive sector have fallen in the agricultural domain (World Bank 2015: 14). The silting of freshwater, brackish water, and reef habitats have caused a dramatic decrease in viable fish and aquatic resources, which has adversely affected the livelihoods of those rural residents dependent on fishing as their major livelihood strategy.
- **A resultant widespread rural out-migration;**
  Decreased agricultural productivity in many areas of Haiti has increased rural out-migration, as few other economic opportunities currently exist in rural areas (World Bank 2015: 35). While many Haitians would rather stay in the countryside, a complex set of environmental, social, technical and economic factors incentivizes the trend to leave the countryside that started in the 1930s and accelerated in the early 1980s (*ibid.*). Rural Haitians have migrated to larger towns and cities, the capital city of Port-au-Prince, or have become members of the expansive Haitian diaspora abroad. Port-au-Prince, initially constructed to hold tens of thousands of people, had swelled to a greater metropolitan area of approximately three million people by the time of the 2010 earthquake. According to the US Census of the same year, approximately one million Haitians lived in the United States, and this figure represented only 43% of the entire Haitian diaspora abroad (Wah 2013: 59).
- **Increased exposure to environmental hazards;**
  Regrettably, the crowded and marginalized urban spaces where many rural Haitian migrate frequently present more environmental health hazards than those found in the deteriorating ecological conditions of rural areas. The rapid spread of cholera and the chikungunya virus, and the high mortality levels of the 2010 earthquake, are testament to the fragile living conditions of many urban areas in Haiti.
- **Increases in hunger, malnutrition and under-nutrition.**
  Those Haitians that abandon rural areas lose access to year-round and seasonal supplementary sources of nutrition from rivers, streams, woodlands, orchards, communal courtyards, and gardens, which may otherwise augment their diets. Instead, many urban-dwelling Haitians are forced to rely on purchased foodstuffs, frequently imported and of low nutritional value. Imports in Haiti have increased from approximately 30% of GDP in the early 1980s to some 50% of GDP in the early 2010s, with food imports representing approximately 35% of total imports over the last ten years (World Bank 2015: 17)

  The traditional rural breakfast of corn or sorghum porridge is increasingly replaced by imported spaghetti, topped with mayonnaise and ketchup. The traditional rice varieties of the Artibonite valley are increasingly replaced with lower-cost but less nutritious, imported white rice exported from the United States[3]. Citrus and other natural fruit juices that are available in rural areas of Haiti are increasingly replaced with high-sugar energy drinks, and rurally-produced bread is frequently replaced with high-sugar biscuits and crackers.

  Those Haitians that elect to remain in rural areas also suffer from increasing levels of hunger, malnutrition, and under-nutrition. The

3 Known in Haiti as 'Miami rice,' due to the common location of exportation.

BOX 1. Conceptual Definitions of 'Landscape-level Land Management' and 'Watershed Management'

Here and throughout this report we define ***landscape-level land management*** approaches in Haiti as attempts to address the interrelated human and ecological vulnerabilities noted above, in the context of large land management projects executed at the landscape level, which focus on improving or introducing new livelihood strategies that ostensibly improve the lives of project beneficiaries. This report distinguishes ***watershed management*** as a variant of landscape-level land management approaches—increasingly embraced in the case of Haiti as the appropriate locus of project execution—and delineated by varied conceptual and operational definitions of what constitutes a watershed.

deterioration of natural resources has decreased the availability of many traditional sources of dietary supplementation. One traditional strategy of mitigating crop failure—reducing the number of meals consumed a day—is fast becoming the new norm of rural Haiti, as rains come less-frequently and soil fertility declines.

- **Increased human vulnerabilities to tropical storms, hurricanes, and extreme climatic events.**
  Despite large increases in rural-out migration, the majority of the Haitian population continues to reside in rural areas. Rural Haitian populations often encounter tropical storms and hurricanes that may cause landslides. Landslides also block important road systems, preventing access to hospitals, and to important transportation routes for farmers dependent on marketing their agricultural goods at regional and national markets. A World Bank report noted that Haiti has a higher number of disasters per km^2 than the average of Caribbean countries, and estimates that in 2008 alone, 15% of GDP was lost due to hurricanes and tropical storms (World Bank 2015: xi). Typically there is little governmental support for rehabilitation of damaged infrastructure, and local residents must mobilize with hand tools to clear the roads that are crucial to the economy of their internal market systems.

An increased awareness and acknowledgement of these historical and contemporaneous trends in human and ecological vulnerabilities has given rise to an emphasis on landscape-level approaches to land management in Haiti, and increasingly a shift toward targeted watershed management.

Outline of the Report

This report reviews the available literature as an initial point-of-departure, providing a diachronic overview of sixty years of landscape management research and integrated landscape project activities in Haiti, spanning eight decades. The reporting period extends from the early efforts of the first integrated development program of the United Nations in Haiti in 1948, through the 2014 consummation of project activities associated with the USAID-funded Watershed Initiative for National Natural Environmental Resources (WINNER).

Section I of this report opens with a brief environmental history of Haiti, followed by an analysis of the current state of environmental conditions, and closes with an examination of contemporary human and landscape vulnerabilities to acute and chronic environmental degradation and extreme climatic events. Section II of the report provides a brief summary of 15 regional or national landscape-level land management projects enacted in Haiti since the middle of the 20th century. Section III concludes the report with a summary of important themes and applicable lessons that crosscut the history of landscape-level management projects in Haiti. Section IV provides a bibliography of important documents related to the issues examined in this report. This bibliography is intended to serve as a resource for future researchers, policy-makers, program administrators, project implementers, and project beneficiaries working on landscape-level land management projects in Haiti.

SECTION I:
The Historical and Contemporary Environment of Haiti

LOOKING BACK TO MOVE FORWARD

Proceeding from the logic that development initiatives seek to improve the lives of project beneficiaries, an understanding of the drivers of ecological degradation in Haiti is paramount and should be a first step for future research or landscape-level management project identification, preparation, and implementation.

The Historical Deforestation of Haiti

The gradual removal of the original forests of Haiti is a complex process that spans five centuries and continues today. Popular accounts frequently rely on a gross simplification of this process, framing deforestation in Haiti as the result of an ecologically-disconnected peasantry, with little forethought to the consequences of their environmentally deleterious actions. To illustrate, deforestation in Haiti is frequently contributed to the production of charcoal, though the vast majority of Haiti's original forests fell far before the charcoal trade roared to life in the early decades of the 20th century. The brief history of deforestation provided here corrects some of these misconceptions, offering a pragmatically abbreviated chronology with particular focus on acute events and chronic trends that are likely to have a direct bearing on the success or failure of future landscape-level management plans for Haiti.

The Colonial Period

The ecology of the island of Hispaniola remained fairly unexploited for most of the 16th century, as Spanish colonial interests were focused on the procurement of gold rather than the extraction of natural resources or agricultural production (Lindskog 1998). In the late 17th century the environment of the island began to change rapidly with the renewed human presence of French emigrants and enslaved people from West and Central Africa.

Anthropogenic influences on the environment of Haiti began to register a visibly notable change during the agricultural intensification activities promoted by 18th century colonial powers (Moya Pons 2007). Cultivation of the initial colonial export crops—sugar, tobacco, indigo and cotton—saw the clearing of lowland plains (*ibid.*). The colonial plantation strategy of cultivating lowland agricultural production was pursued on several grounds: (1) lowland areas are more accessible by roads; (2) plains in Haiti are predominantly coastal and in closer proximity to maritime vessels; (3) uniform plains had higher levels of moisture or were otherwise irrigable; and (4) many of the lowlands of Haiti contain rich, alluvial soil deposits.

The initial low-elevation locus of agricultural production in Haiti did spare the removal of trees and vegetative cover from surrounding mountain ranges. The booming colony required wood for a variety of purposes, but principally for construction and fuel-wood used in sugar refinement for the increasing number of plantations (Catanese 1999). Later, trees were cleared from higher elevations to cultivate coffee—a lucrative export crop (*ibid.*). Records from the early colony and the new Republic are replete with mention of the felling of large hardwood trees, and the encroachment of less desirable tree species (Tarter 2015b).

In particular, the colonial period saw the commencement of a wood-extraction based economy. French ships carrying enslaved people from the African continent returned to Europe with hulls loaded with valuable timber (Diamond 2005). While the more easily accessible areas of Haiti suffered arboreal denudation during this period, many remote forest stands remained protected by their relative isolation due to the lack of accessible inroads.

The Post-Independence Period

Toward the end of the 13-year Haitian revolutionary period, lowland colonial plantations were burned and equipment destroyed. After the 1804 declaration of independence, the vast majority of Haitians fanned out throughout the mountainous areas of the country, establishing the traditional *lakou* (collective kinship habitations) of rural Haiti. Through the *lakou* system, Haitian farmers successfully resisted multiple attempts by early leaders of the fledgling Republic to reinstate the plantation model of agricultural production (Moral 1961).

The historical dispersal of humans from lowland plains and their subsequent resettlement in mountainous areas resulted in an unusual occurrence: the reestablishment of the lowland forests of Haiti. Analyses of tree pollen from a sediment core extracted from Lake Miragoâne in southern Haiti noted a large arboreal expansion after 1804 (Brenner and Binford 1988). This regenerative arboreal expansion has direct bearing on the current state of Haiti's ecology—a point that will be revisited subsequently, and which has policy programming implications for landscape-level land management in the current era.

While the lowland areas of Haiti temporarily reestablished with trees after the destruction of the colonial plantation system and a decentralizing nationwide migration, it was only a temporary reversal of the predominant trend—an on-going removal of arboreal and vegetative covers.

Deforestation during the post-colonial era was not caused by the production of charcoal, which did not commence on a large scale in Haiti until the early decades of the 20th century. Two principal forces drove tree removal in newly-independent Haiti: (1) Haitian government payments on a war indemnity to France, financed by timber concessions to private companies; and (2) the clearing of land for agricultural production, enacted by hundreds of thousands of farm families spread throughout the rural countryside (Tarter 2015b).

In 1825 Haitian president Jean-Pierre Boyer agreed that Haiti would pay France a post-war indemnity of 150 million francs—a paralyzing amount for the new Republic—as reparations to French slave and plantation owners for income lost after the world's first successful slave revolt. The indemnity agreement, ostensibly established to ensure that France would not reinvade Haiti, is a historically curious concession, considering France's multiple, failed attempts to retake the former colony.

The Haitian government supported indemnity payments to France largely by selling forest concessions to foreign timber corporations. In 1838, the indemnity was renegotiated to nearly half of the original amount, with the requirement that the remaining amount be paid in full in 30 years (Moya Pons 2007; Bulmer-Thomas 2012). Four years later, legal mahogany exports doubled, and in 1842 exceeded 4.0 million cubic feet (Moya Pons 2007).

Despite this surge in timber exportation, hardwood trees were still abundant in Haiti late into the 19th century. As one observer noted in 1878, 'the variety of [hardwood] production seems to be almost infinite, and the supply inexhaustible' (Stuart 1878: 267).

After many of the easily accessible lowland areas of Haiti had been exploited for wood, the principal means of extracting timber shifted to dragging felled trees into the small mountain streambeds that form the many tributaries of Haiti's multiple watersheds (Chandler 1842). With the arrival of annual torrential rainfall, these seasonally dry or low-flowing streambeds would swell, carrying the felled trees into increasingly larger rivers and eventually toward deltas where

they could be prepared for export by maritime vessels (*ibid*.). Despite this shift deeper into the interior of Haiti, the mountainous nature of the country and the difficulty of accessing remoter areas protected many remaining hardwood stands.

Deforestation in the 20th Century

The first three decades of the 20th century saw the removal of most remaining hardwood forest stands in Haiti, the overexploitation of secondary arboreal growth, and the continued encroachment of former forestland by exotic tree species. The early decades of this century are marked by the US Marine occupation (1915-1934) and their establishment of a network of new roads and the improvement of earlier roads constructed by French colonialists (Leyburn 1941). The new network of improved roads in Haiti facilitated increased travel between rural and urban areas. While these new roads also encouraged urban migration, the increased urbanization during this period was not unique to Haiti—it was a phenomenon experienced globally. As Haiti increasingly urbanized—like many countries of the Caribbean—the demand for agricultural and wood products increased to meet urban needs.

The changing Haitian landscape was the result of a complex interaction between immediate drivers and underlying causes of land-use change. Rapidly increasing population coupled with a decrease in agricultural productivity, spatial extensification of agricultural production and the reduction of previously fallow periods, urbanization and increasing demand for food and fuel, the expansion of road networks connecting the previously isolated hinterland to growing markets, and complementary though parallel land and tree tenure regimes all played their role in the evolution towards the highly dispersed and decentralized food and wood production system observed in Haiti today.

As Haitians in areas of close proximity to urban centers intensified their agricultural production, charcoal production was shifted to the next geographically proximate location that was accessible by roads. As existing roads were limited to the national highways and lesser roads of poor condition, deforestation on a national level continued in a geospatially differential manner. Once previously forested or brush-covered areas gave away to agricultural production, charcoal production shifted again. From east of Port-au-Prince, charcoal production shifted offshore, to the island of La Gonâve; from La Gonâve, charcoal production moved to the northwest peninsula; from the northwest peninsula, charcoal production swung to the more remote southern peninsula, and to a lesser extent to the central plateau (Smucker 1981; Conway 1979; Voltaire 1979). The result of the extension of the agricultural frontier was the near-to-complete arboreal denudation of easily accessible areas, largely following in a sequential order based on geographical proximity to the ever-swelling capital city and smaller urban agglomerations. Today, the lack of access to arable land is an on-going frustration expressed by younger members of society.

The latter half of the 20th century saw the establishment of hundreds of kilometers of new roads, which opened up the vast remainder of previously inaccessible areas the country. The community-based organization Harmonisation de l'Action des Communautés Haïtiennes Organisées (HACHO), operating in the northwest of Haiti, shifted to focus on road construction in 1968. By 1982 HACHO had constructed a network of over 600 kilometers of unpaved roads (Brinkerhoff et al. 1983). In the mid-1970s, USAID financed the Agricultural Feeder Roads Project, constructed over 300 kilometers of new roads by December 1982 (USAID 1983). Multiple road projects in Haiti also originated at the hands of local community councils and were spurred by the initiative of local churches or foreign missionary groups (Smucker et al. 1979).

Considering just the USAID and HACHO projects, more than 900 kilometers of new roads were established in Haiti from around the 1970s through to the early 1980s. Nine hundred kilometers of new roads is a remarkable addition

to a country that does not exceed 300 kilometers at its lengthiest continuous extent (Tarter 2015b). Since new roads were constructed off of existing arterial highways, their construction opened up many of the more remote locations in Haiti. These new roads reversed the historical phenomenon of just a few accessible areas targeted for agriculture and charcoal production, and original charcoal producing areas experienced significantly less pressure than in former decades.

Toward the end of the 20th century, almost all land area of Haiti had been dedicated to agricultural production (crops and livestock). Today, there is hardly any parcel of land that is not being dedicated to some kind of productive use, profoundly influencing the current state of the environment of Haiti (Tarter 2015b), with agricultural production commonly being the primary objective with sizable integration of trees and woody vegetation.

THE CURRENT CONDITION OF THE RURAL ENVIRONMENT OF HAITI

Centuries of deforestation in Haiti have played out on an overwhelmingly mountainous terrain that receives seasonal rains and torrential downpours from frequent tropical storms and hurricanes. Exacerbated and accelerated by the exposed agricultural fields of a densely populated rural countryside, deforestation and alluvial soil erosion have produced predictable environmental consequences: the loss of topsoil, decreasing soil fertility, overall agricultural decline, and rural out-migration. A less-predictable consequence of deforestation was the widespread encroachment of exotic tree and shrub species, to collectively cover approximately 3/4ths of Haiti's land surface by approximately 2010 (Tarter 2015b; Churches et al. 2014; White et al. 2013).

As early as 1830, the space created by the absence of original hardwood forests was rapidly filled by at least two exotic tree species: mesquite[4] (*Prosopis juliflora*), and to a lesser extent, logwood[5] (*Haematoxylum campechianum*) (Tarter 2015b). By 1930, the former tree species was the most common tree in the dry forests that dominate the majority of Haiti's varied ecosystems, and the most utilized tree species for charcoal production (Gill 1931). By the 1940s, *Prosopis juliflora* was the most common tree in some 80 different forest-transect surveys conducted in an area north of Port-au-Prince (Curtis 1947). In 1976, the author of the first in a series of preliminary reports, which would eventually lead to the largest tree-planting project in the history of Haiti, concluded that managed *Prosopis* plantations could meet all of Haiti's domestic wood needs (Earl 1976). Multiple authors of the widely-cited 1985 Haiti Environmental Profile Report noted the widespread extent of *Prosopis* trees and the long tradition of Haitian farmers managing the species for wood and for charcoal production (Ehrlich et al. 1985). By 1991, the World Bank reported that natural *Prosopis* stands dominated approximately 1/10th of Haiti's land surface (World Bank 1991).

In a recent nation-level remote-sensing analysis of high-resolution satellite imagery from 2010 and 2011, trees were found to cover approximately 1/3rd of the surface of Haiti, and trees and woody shrubs combined to cover 3/4ths of the surface of Haiti (Churches et al. 2014). A similar ratio of tree and shrub coverage was reported in an analogous study of the large offshore island of La Gonâve, based on high-resolution satellite photos from 1990 and 2010 (White et al. 2013). And finally, in a broader study of land changes within the Greater Antilles between 2001 and 2010, researchers discovered that 26 different Haitian municipalities underwent significant changes to woody vegetation (8 decreased and 18 increased) and 48 municipalities experienced significant changes in mixed-woody plantations (9 decreased and 39 increased) (Álvarez-Berríos et al. 2013: 88-91). In overall land percentages for the entire country, woody vegetation experienced a 1% increase while mixed-woody/plantations increased by 4%, or 368 km^2 (89). These studies combined point to an arboreal phenomenon that stands in stark contrast to popular conceptions of tree-cover in Haiti (Tarter 2016), and demands further elucidation.

4 *Bayawonn or bayahonn*, in Haitian Creole.
5 *Kanpèch*, in Haitian Creole.

In 2012, geographers from Virginia Tech undertook a land-use/land-change analysis of Haiti's largest offshore island of La Gonâve, using two high-resolution Landsat satellite images, twenty years apart, from 1990 and 2010 (White et al. 2013). Both images in this analysis were selected from late January—in Haiti's dry season—to control for seasonal variability in vegetation and to diminish cloud cover. In this classification, researchers considered five different land-cover types that were mutually exclusive and exhaustive of all other land types in the area. Several complementary and higher-resolution (30 cm/pixel) satellite photographs were consulted in the accuracy assessment of the image classification, in combination with the analysts' knowledge of the area, and a two-month field excursion to visit a stratified[6] random sample of validation points to ground-truth the classifications. The team averaged 61 points of verification for each of the five land-use categories (n=301 total), locating the random geospatial coordinates with hand-held GPS units. The overall accuracy of their 2010 classification was 87%, with a *Kappa* coefficient of 0.84 (White et al. 2013: 498). The results show that the percentage change in land area on La Gonâve from 1990 to 2010 for Agricultural land, Forest/DV[7], Shrub, and Barren/Eroded land classes, were −39.73%, −22.69%, +87.37%, and −7.04%, respectively (White et al. 2013: 499).

While the overall percentage of the 'Forest/DV' land-cover decreased over 20 years by 22.7%, the 'majority of 1990 agricultural lands were converted to shrub (45.01%) and forest lands (34.23%),' and '56.2% of the barren/eroded land area in 1990 has been revegetated' (White et al. 2013: 499-500). Thus, the entire land surface of La Gonâve in 2010 (excluding water and masking the < 2% cloud cover) was 40.4% covered with woody shrubs and 46% covered with Forest/DV (White et al. 2013: 499). The researchers' observations support the hypothesis of an arboreal shift in Haiti:

> There is strong evidence on La Gonâve indicating that previously cleared areas in the lowlands (regions of poor soil nutrients derived from limestone regolith and limited soil horizons) are beginning to revegetate initially with xerophytic species as agricultural land is abandoned after soil exhaustion. This process was discussed as a common experience in informal interviews with farmers on La Gonâve.
>
> (...)
>
> Revegetation on La Gonâve is primarily illustrated by the increase in shrub cover. Though shrub was the second largest land cover type in 2010, field observations indicate that the majority of the Shrub class cover varied along the scrub-dense vegetation gradient. Revegetated areas are composed of secondary succession forest, predominantly Acacia species [*bayawonn*[8]] maturing from shrub to grove. Woody shrubs are regularly harvested for charcoal production and for export roughly at the pole stage (...) A large portion of the residents' financial income on La Gonâve is supported by the charcoal export to the mainland. The shrub cover may be caught in a perpetual cycle of harvest and revegetation rarely reaching early succession or the pole stage in growth (White et al. 2013: 503).

While forest cover on La Gonâve has decreased, it has been replaced by woody shrubs, largely in the form of *Prosopis*, which appear to be managed

6 The random sample strata were fifteen 52-meter elevation increments, to look for elevation-based influences (White et al. 2014: 498).

7 According to their classification, the latter category (Forest/DV) 'is composed of all vegetation growth levels beyond the shrub stage' (White et al. 2013: 496).

8 White et al. (2013) now believe that the acacia species noted in this passage is in fact *bayawonn*, and have made this correction in a subsequent manuscript they are preparing from the same data (White et al., email communication, 3/23/2015). The authors indicate that *bayawonn* on La Gonâve is cut at the ground level, with some coppice limited to a few stems rather than multiple stems (*ibid.*). In other words, as in the colonial era, barren and abandoned agricultural lands were encroached by *bayawonn* from lowland areas, and these trees are now 'harvested on a regular basis for charcoal production' (White et al. 2013: 503).

for charcoal production[9]. Overall, the 'shrub' coverage on La Gonâve increased by 87.4% from 1990 to 2010 (White et al. 2013: 503).

In a similar study, a geographer, geologist, and a natural resource management specialist collaborated to determine forest cover for the entire country of Haiti (Churches et al. 2014). The authors used five Landsat satellite images (2010-2011) from Haiti's dry season, which provided coverage of the entire country. After a series of standard renderings and corrections, the authors reclassified their satellite images using FAO's forest class definition, thereby creating a *low* (FAO) to *high* (authors') range of percentage-tree-cover. These image classifications were verified through the application of a stratified[10] sample of 1,525 random reference points to higher resolution satellite imagery. Their 'tree cover' class had a users' accuracy of 86% and a 0.81 *Kappa* coefficient, and the overall classification accuracy ranged from 78% (reference point counts) to 83% (class proportions) (Churches et al. 2014: 211). The results of the nationwide analyses showed that in 2010-2011, trees covered between 29.4% and 32.3% of Haiti's land surface,[11] and that 'shrub/herbaceous' areas covered between 45.7% and 48.6% of the land surface. Rather than a thinly dispersed arboreal covering, trees are aggregated in fragments and patches (Churches et al. 2014).

It should be noted that both studies used slightly different land-use classifications: in the island of La Gonâve study, researchers combined 'forest' and 'dense vegetation' into one category,[12] and classified woody 'shrub cover' as separate category (White et al. 2013); in contrast, the nation-wide study aggregated 'shrub,' 'herbaceous,' and 'agricultural' land-uses into one category,[13] and used a single category for 'tree cover'[14] (Churches et al. 2014).This aggregation is a setback for establishing nationwide percentages of managed charcoal woodlots, which would be best inferred through the woody vegetation that may have been split in both studies between tree and non-tree categories. Nevertheless, both the La Gonâve and the nationwide study use a single category that operationalizes trees in the same way, and similarly restricts smaller shrubs, and all other land uses. In the La Gonâve study, approximately 46% of the island's land surface is covered with forest and dense vegetation beyond shrubs (White et al. 2013: 499), while the nation-wide study found approximately a third of Haiti's land surface is tree-covered (Churches et al. 2014).

In a broader study of land changes within the Greater Antilles between 2001 and 2010, 26 different Haitian municipalities (*sections communales*) underwent significant changes to woody vegetation[15] (8 decreased and 18 increased); 36 municipalities underwent significant changes in agriculture/herbaceous[16] (25 decreased and 11 increased); and 48 municipalities experiences significant changes in mixed-woody/plantations[17] (9 decreased and 39 increased) (Álvarez-Berríos et al. 2013: 88-91). Across municipalities of significant change, there was an 8% loss of woody vegetation, a 114% loss of agriculture/herbaceous, and a 133% increase in mixed-woody/plantation (Álvarez-Berríos et al.

9 White, personal communication (3/23/2015).

10 Strata were based on the land use distributions from their initial classification (Churches et al. 2014: 209).

11 Includes 'water', 'wetlands', 'bare/non-vegetated' and 'cloud' categories.

12 'Forest/Dense Vegetation class is composed of all vegetation growth levels beyond the shrub stage. Forest lands were considered to have a tree-crown areal density of ~10% or more' (White et al. 2013: 498).

13 'Vegetation less than 5 m in height or lacking definite structure such as stems or shoots. Woody vegetation included if crown cover is <10% and height <5 m. Includes all agriculture' (Churches et al. 2014: 207).

14 'Vegetation greater than 5 m in height with a canopy cover of ≥10%. Includes mangroves. Does not include fruit-tree plantations' (Churches et al 2014: 207).

15 "Woody vegetation was trees and shrubs with >80% cover" (Álvarez-Berríos et al. 2013: 86).

16 'Agriculture/herbaceous vegetation was annual crops, grasslands, and pastures with >80% cover' (Álvarez-Berríos et al. 2013: 86).

17 "Mixed-woody/plantations was woody vegetation with a 20 to 80% cover, including agriculture/herbaceous vegetation or bare soil as background, as well as all forms of plantations and perennial agriculture" Álvarez-Berríos et al. 2013: (86).

2013: 88). Conversely, in overall land percentages for the entire country, woody vegetation increased from 1%, agriculture decreased from 4%, and mixed-woody/plantations increased from 4% (Álvarez-Berríos et al. 2013: 89). Municipalities that experienced losses or gains were widely geographically distributed.

The sum of these three remote-sensing analyses suggests that the arboreal expansions that occurred in the post-independence period may be in swing again. Figures 1 and 2 represent the most recent and most empirically grounded estimates of arboreal coverage in Haiti. While most of Haiti's original hardwood forests are gone, much of the land is now covered by a combination of trees and woody shrubs (see Figures 1 and 2). This current reality stands in stark contrast to depictions of Haiti as a lunar landscape devoid of trees. Ultimately this difference depends on how terms like 'forest' and 'tree cover' are understood. The phenomenon begs at least three important questions: (1) how did this arboreal encroachment occur; (2) how has it gone largely unnoted; and (3) what implications does this new landscape, which dominates much of contemporary rural Haiti, have on efforts to initiate landscape-level management schemes in Haiti?

The arboreal landscape that currently characterizes the Haitian countryside is the result of several phenomena and their interactions in an iterative cycle (Tarter 2015b). The historical deforestation of Haiti simultaneously removed original hardwoods and depleted many of the soil profiles necessary for the regeneration of original hardwood species. Deforestation also exacerbated a drying trend on Hispaniola that began as early as the middle of the Holocene epoch (Higuera-Gundy et al. 1999). Climatic drying led to further cutting of original trees for wood and charcoal, as a necessary reaction to declining agricultural possibilities.

Another permissive influence in the spread of these tree species can be indirectly traced from the Haitian land succession system, which is based on the Napoleonic Code of the colonial period. In this system, all agriculturally productive land in Haiti is inherited bilaterally and divided equally amongst all siblings, male and female. While certain unproductive familial land is considered sacred, inalienable, and is never divided (Herskovits 1937), in contrast, arable plots become smaller every successive generation at every new cycle of inheritance (Murray 1977).

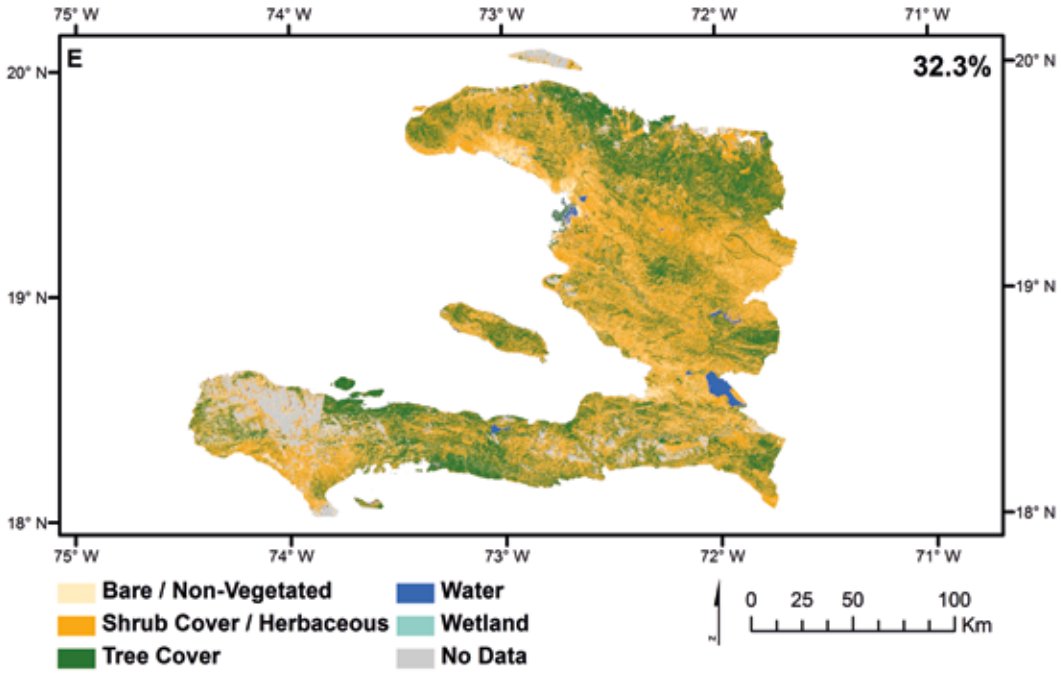
The inheritance of land plots that may be prohibitively small for agricultural production was initially met by an adaptive strategy on the part of Haitian farmers, which aligns with the theory of economist Ester Boserup (1965): the agricultural fallow period was shortened or eliminated (Murray 1977). While the land fallow-shortening strategy worked for a time, the associated agricultural intensification ultimately accelerated processes of declining soil fertility, climatic drying, and erosion.

The exotic tree species (*Prosopis juliflora* and *Haematoxylum campechianum*) that now dominate much of the rural landscape of Haiti are highly adapted to poor soils, low moisture, and prolonged drought (Tarter 2015b). Much of the land that was eventually rendered agriculturally useless in Haiti became covered by these tree species, which are prolific seeders, propagate in a variety of novel ways, rapidly encroach into new territory, and are protected from foraging animals by thorny trunks and branches (*ibid.*).

The predominance of these trees provides some ecosystem services, such as nitrogen fixation and the protection of the soil from chronic weathering by the elements and by acute weather from tropical storms and hurricanes. The deep taproots and lateral rooting of these species help break apart the limestone substrate that underlies much of Haiti's topsoil, permitting a more rapid regeneration of soil in areas of extreme degradation, and a more rapid percolation of surface water into the aquifer. In some cases, fast growing-trees in Haitian farmer-managed woodlots have served as *de facto* nurseries, providing the necessary conditions for the regeneration of indigenous hardwoods, other trees and plants, and as habitat for animal species (Smucker and Timyan 1995).

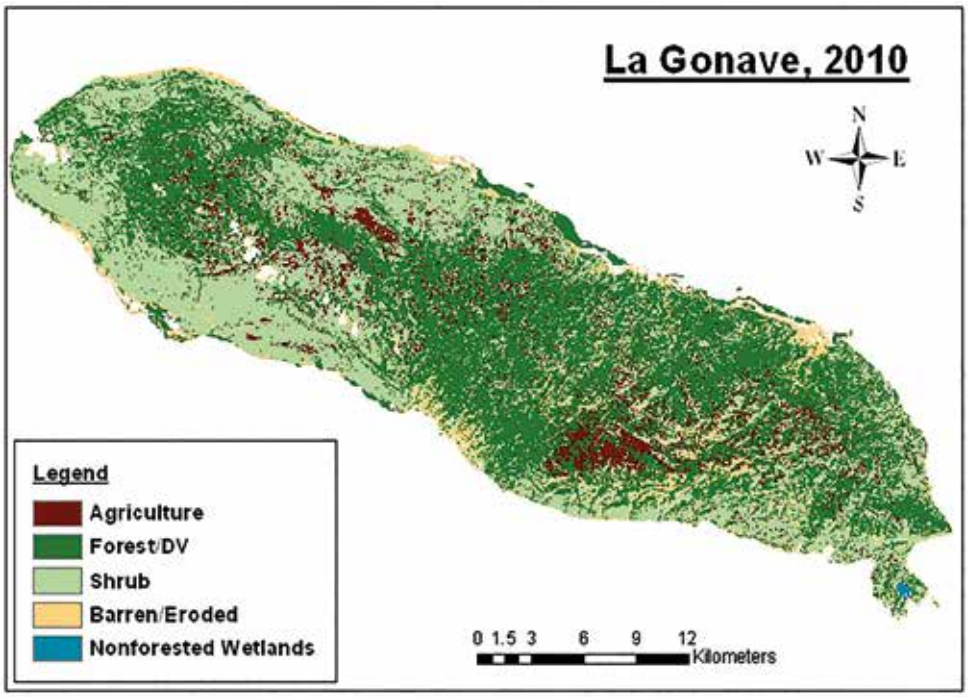
Yet the most-immediate benefit of Haiti's current arboreal expansion is not in the form of

FIGURE 1. The Current Extent of Tree and Shrub Cover in Haiti in 2010.



(Churches et al. 2014: 212)

FIGURE 2. The Current Extent of Tree and Shrub Cover on the Island of La Gonâve, Haiti: 1990 and 2010.



(White et al. 2013: 500)

ecosystem services, but as an economic input to the farmers who manage these species sustainably for continued charcoal production (Tarter 2015b). *Prosopis juliflora* and *Haematoxylum campechianum* coppice aggressively from the stump; where original hardwoods disappeared when cut, these rapidly spreading exotic plants continue to return after multiple cuts, making them ideal species for charcoal production (*ibid*.). Charcoal production is not easy - it is labor intensive and often pays less than agricultural food crops. But charcoal production using managed woodlots of coppiced trees is nevertheless a welcome possibility in rural Haiti in the light of declining harvests and increasingly chronic crop failures.

The trees and woody shrubs that populate much of rural Haiti in the form of managed woodlots failed to spread at the national level in the first part of the 20th century because charcoal production was centralized in a few accessible locations: not only were original forests rapidly depleted of original trees, but overexploitation of wood resources also prevented a notable establishment of these subsequent exotics. But the advent of 900 kilometers of new roads took pressure off these few original locations, decentralizing charcoal production at a national level and permitting the spread and reproduction of exotic species at a rate that eventually contributed, in part,[18] to their current extend in the rural Haitian landscape (see Figures 1 and 2).

This brief history together with our understanding of current levels of tree coverage in Haiti challenge at least one misguided narrative that pertains to landscape-level development projects in Haiti: that charcoal production is responsible for the denudation of Haiti's forests and that the key to successful reforestation is the elimination of the charcoal trade. On the contrary, much evidence exists that the charcoal trade in Haiti occurred after much of the deforestation of original forests and that charcoal practices are currently meeting urban energy needs, decades beyond the dire warnings of analysts during the wood crises years of the 1970s and 1980s.

18 It is undeniable that the current arboreal expansion in Haiti may be partially contributable to other causes, such as the nationwide tree-planting efforts of the 1980s and 1990s. However, rural out-migration, the abandonment of formerly productive land, and an increase in pseudo-drought conditions all provide the necessary conditions for the spread of the species thought to dominate much of the rural countryside at this time in history.

Land Inheritance, Land Tenure and, Land Security

Many common misconceptions repeatedly find their way into the development literature on Haiti, regarding land inheritance, land tenure, and land security. An illustrative example of such misconceptions is the notion that Haitian farmers do not have secure tenure of their land. However, numerous studies have taken up the issue and all have reached the same conclusion: land tenure in rural Haiti is secure and not an obstacle to landscape-level land management (Murray 1977, 1978b, 1987; White and Runge 1994, 1995; White 1992; White and Jickling 1995; Smucker et al. 2005, 2007).

Several general features pertaining to land inheritance, tenure, and security, which may inform landscape-level land management processes, hold true across much of rural Haiti:

Land Inheritance

- All land is inherited bilaterally and equally between siblings, male and female;
- While all inherited land is capable of division, and all inheritors may claim an equal share of land, not all inherited land is immediately divided;
- Arable land is usually divided immediately, rendering land suitable for cropping into successively smaller and more fragmented plots each generation;
- Manly arable plots of land are frequently too small to meet the needs of a single farm family; the phenomenon of fragmented arable plots is circumvented by the strategy of most farm families to acquire several such parcels through purchase; as a result, arable plots are not only

fragmented and small, but typically distributed in a discontinuous pattern across the landscape; most arable land plots are alienable, and the selling and purchasing of such plots is widespread and common.

- In many areas of Haiti, farmers also have access to land collectively held by kin members. Such land is typically much larger in size because it has been neither informally nor formally divided, frequently owing to the land's lower capacity for agricultural crop productivity. Such lands typically have steeper slopes, a less preferential aspect (rain and sun exposure), poorer soils, and are generally less desirable than flatter, frequently lower-elevation, arable lands. These lands are typically used for the production of charcoal, as a location to tether foraging animals, and sometimes as fruit orchards and coffee groves. These collectively owned lands also meet other needs, including non-material needs, such as a location for the veneration of the ancestors and other spirits of the Vodou (voodoo) pantheon (Tarter 2015a). The utilization of such land functions through a complex internal system that permits kin members to enter and equitably access available resources. However, due to reluctance or a lack of impetus to divide such lands, several generations of kin members may claim access to the land, complicating the management of the land's resources, and increasing the likelihood that the land will remain undivided.

Land Tenure

- Rural Haiti operates on two complimentary systems of land tenure - one is informal and the other is formal (Murray 1977);
- The informal tenure system has high *internal* security: it is widely recognized and respected within communities and often functions on agreements between neighbors or kin, in the presence of neighbors or kin, and therefore may a traceable material record of use and access;
- The formal land tenure system functions and is legitimized through the legal apparatus of the Haitian Government, and has higher levels of *external* validity than the informal system;
- Both the formal and informal tenure systems are secure in different ways, and Haitians rely on both systems for different needs; and
- Rural Haitians also benefit from a land leasing system, which may be an informal agreement between the land-owner and lessee, or may be formalized by the use of a local notary.

A basic understanding of land tenure is important for any effort to promote or institute landscape-level management projects in rural Haiti. The current land tenure systems are complex but generally not an impediment to project participation, investment, and ownership. The Haitian land tenure system is complex, but functional.

By using the informal tenure system, rural Haitians avoid the fees and taxes associated with dividing land formally (Murray 1977, 1978b, 1987; White and Runge 1994, 1995; White 1992; White and Jickling 1995; Smucker et al. 2005, 2007). Rural Haitians utilize the formal land tenure system when land sales and purchases are undertaken outside of the kinship network or outside of the village context (*ibid.)*.

The vast majority of rural Haitian farmers are content with their current land tenure systems, which are not only functional, but are also historically adaptive (Murray 1977). Land tenure reform is rarely listed in the litany of needs expressed by Haitian peasants themselves, though access to land arable is an on-going frustration expressed by younger members of society, at least historically (Murray 1977, 1981).

Land Security

The situation in Haiti is different in regards to land security. Haiti has a long history of urban elites and rural *gran don* (a wealthy rural middle class) attempting to control the peasantry through opportunistic land purchases, 'legal' maneuvering, and varied strategies of displacement (Trouillot 1990; Steckley and Shamsie 2015). A subsequent case study on the Péligre Dam provides an illustrative example of this well-documented

historical trend. It is entirely possible that aspects of the land tenure system in place in rural Haiti developed in part as a strategy to mitigate land insecurity. Given that the vast majority of arable land in Haiti is represented as a patchwork of discontinuously dispersed and privately owned fragmented plots of land, the issue of land security is perhaps less than in earlier historical periods when the aggregation of arable land in the hands a fewer land-owners might engender a higher tendency to land grabs and predatory land acquisition.

History suggests that while land security, land inheritance practices, and land tenure systems in rural Haiti are complex, they are fully functional and in no way impede the 'plot-based' approaches to landscape-level improvement projects. However, given the fragmented nature of most land plot holdings, 'macro-level' approaches to landscapes are unlikely to meet much success at this point in the history of rural Haiti.

Soil Conditions in Haiti

The loss of soil is the most immediate and observable effect from the initial deforestation of Haiti. The UNESCO Haiti Pilot Project noted degrading soil conditions as an issue of concern as early as the mid-20th century. The decline of agricultural productivity due to soil degradation has since been systematically documented in Haiti (Zuvekas 1978; Pierre-Louis 1985; Bargout and Raizada 2013).

The effects of erosion, declining soil fertility, and decreasing arable plot sizes have led to a nationwide agricultural decline. Despite this trend, the majority of the rural-dwelling Haitians continue to pursue agriculturally based livelihood strategies, supplemented heavily by remittances sent from Port-au-Prince and diaspora abroad.

Soil and the Relationship to Ecological Zones of Haiti

One of the most commonly employed systems for the classification of ecological zones in tropical and subtropical areas was developed by forester L.R. Holdridge in the early 1940s, but has since been adapted and applied on a global scale. Because Holdridge's system was developed in Haiti, it continues to be the primary classificatory schemes used in much of the literature related to the ecological aspects of landscape-level land management in Haiti. The system delineates nine different zones based principally on the metrics of annual precipitation, mean annual temperature, the potential evapotranspiration ratio (PET), and considerations of elevation (Holdridge 1947, 1967).

Four of the Holdridge Life Zones (HLZ) cover less than 1% of Haiti's land, while the remaining five constitute notable percentages (Delatour et al. 1984). The largest zone, *Subtropical Moist Forest*, representing approximately half the entire land area of Haiti, is found at an elevation of ~800 meters. It receives 1,200-1,800 mm of annual rainfall, and supports the largest percentage of small-holding peasant farms (Delatour et al. 1984; Ehrlich 1985). The *Subtropical Moist Forest* zone was traditionally home to large stands of mahogany and tropical oak, now replaced principally with avocado and mango trees (*ibid*.).

The second largest HLZ is *Subtropical Dry Forest*, constituting 19% of Haiti's land, falls under 400 meters of elevation, receives an annual mean rainfall between 800-1,000 mm, experiences seasonal droughts, but has deep, irrigable soils, and is highly agriculturally productive (Delatour et al. 1984). Common trees in the *Subtropical Dry Forest* zone include *Phyllostylon brasiliensis, Prosopis juliflora* and *Guaiacum officinalis*. Viable crops include mangoes, limes, tobacco, cotton, plantains, sugar cane, and sisal.

While these two HLZs constitute approximately 70% of Haiti's land surface, they and the other zones are unevenly distributed across Haiti's landscape. Thus, it remains a challenge to incorporate 'one-size-fits-all' program policies at the landscape level. A private consulting firm consolidated and adapted Holdridge's ecological zones for Haiti in order to incorporate population density levels and

more detailed crop production profiles (Capital Consult 1982, as noted in Delatour et al. 1984). This improved classification system nevertheless still fails to account for the uneven distribution of ecological zones across Haiti (*ibid.*).

Another phenomenon affecting ecological classificatory schemes for rural Haiti concerns the fact that the rural landscape has been so drastically altered that few zones currently represent the original characteristics outlined by Holdridge (Ehrlich et al. 1985). This is largely due to the removal of arboreal and vegetative cover, and subsequent loss of flora and fauna defining topsoil.

Curtis noted that in one area of Haiti with evenly distributed rainfall, the plant communities that demarcated varied ecological zones were determined by soil texture and topography (Curtis 1947). The loss of topsoil and the subsequent exposure of underlying and more uniform soil profiles, coupled with on-going climatic drying and less predictable season rains, has made moisture the new *de facto* determinant of ecological zones in Haiti. This is most evident in the spread of *Prosopis juliflora* well beyond the lower elevation zones where it initially established; on-going climatic drying increased the habitat of this and other drought-tolerant invasive tree species. Recognition of this leveling of ecological featured in traditionally dissimilar ecological zones suggests that strictly ecological approaches to watershed management in Haiti are increasingly less important—a crucial point that will be returned to subsequently.

As moisture increasingly dictates the ecological and agriculturally productive capacities of the current Haitian countryside, many landscape-level land improvement projects have shifted increased focus toward watersheds as the appropriate unit of intervention in meeting the three complementary goals mentioned at the onset of this report.

Livestock in Rural Haiti

Livestock is prolific across rural Haiti and many Haitians keep pack animals (horses, mules, and donkeys) for transporting goods and animals raised for milk or for meat consumption (cows, pigs, and goats). For many Haitian families, livestock serves as a type of savings, allowing people to sell or eat the animals in times of increased financial pressure.

Appropriate measures to contain livestock are an important consideration for the preservation of plants and trees within a landscape, and Haitian farmers, whose livelihoods depend on this protection, are particularly cognizant of this. In considering reforestation efforts, we must consider livestock and their role in rural Haiti. Here we will briefly discuss the role of cows, pigs, pack animals and goats on landscapes.

Cattle ownership in Haiti has been on a consistent national decline in Haiti since the peak time before the French presence on the island, when buccaneers drove cattle along the southern peninsula from Les Cayes toward the slaughter houses of Port-au-Prince. Today, due to the steep slopes that cover 85% of Haiti's mountainous terrain, in many locations the raising of cattle is simply not feasible. In the places where cattle ownership is common practice, cows are herded together and rarely left to graze freely.

Pig ownership has declined over past decades. While the Creole pig was traditionally the most-commonly raised livestock in Haiti, mass eradication campaigns of the early 1980s have reduced their prominence significantly. Many rural Haitians still own and care for pigs, but the vast majority of swine in Haiti are tethered in the shade of courtyards and not permitted to forage freely. Similarly, pack animals (horses, donkeys, mules), in part due to their value, are tethered and not permitted to range freely.

The situation with goats, however, is much more complex, and Haitians in different areas have developed a series of systems that permit the ranging of goats in different circumstances and at different times of the year, including tethering, yoking or free ranging.

- In areas where goats are tethered, the purpose of tethering is always the same: to prevent the animal from wandering into one's own or another's garden. Typically goats are tethered

TABLE 1. Principal Watersheds of Haiti.

River/hydrological basin/zone	*Catchment area/km²*
Artibonite	9500
Cul-de-Sac	1580
Cayes-Jacmel-Anse à Pitres	1219
Bombardopolis-Gonaïves	1147
St Marc-Cabaret	1090
Limonade-Ouanaminthe	1065
Côte de Fer-Baînet	1060
Môle St Nicolas-Moustique	987
Trois Rivières	897
Corail-Anse à Veau	877
Estère	834
St Louis du Sud-Aquin	706
Grande Rivière du Nord	699
La Quinte	690
Ile de la Gonâve	680
Petite Rivière de Nippes-Grand Goâve	661
Tiburon-St Jean	660
Léogane-Carrefour	651
Cayes	634
Grande Anse	556
Port de Paix-Port Margot	543
Roseaux-Voldrogue	540
Grande Rivière de Jacmel	535
Grande Rivière de Nippes	459
Cavaillon	380
Jérémie-Les Irois	364
Limbé	312
Cap Haïtien	312
Fonds Verettes	190
Île de la Tortue	179

Sources: OAS – Mission d'Assitance Technique Intégrée 1972: 491 (as reported in Delatour et al. 1984: 33; Swartley and Toussaint 2006: 14-15)

on a farmers privately owned land, but may occasionally be tethered by agreement on another farmer's land. In virtually all instances, goats are tethered on agriculturally marginal land and are never tethered on agriculturally productive land with actively growing crops.

- In other areas, such as the Plaine du Cul-de-Sac, farmers place a wooden yoke, consisting of three individual pieces of wood, around the neck of their goats. This prevents goats from entering private gardens and saves crops within.
- In many areas in Haiti, after all members of a given village have harvested their crops, past the end of the rainy season, goats are seasonally permitted to roam freely, eating the parts of plants that have no commercial or any other value.

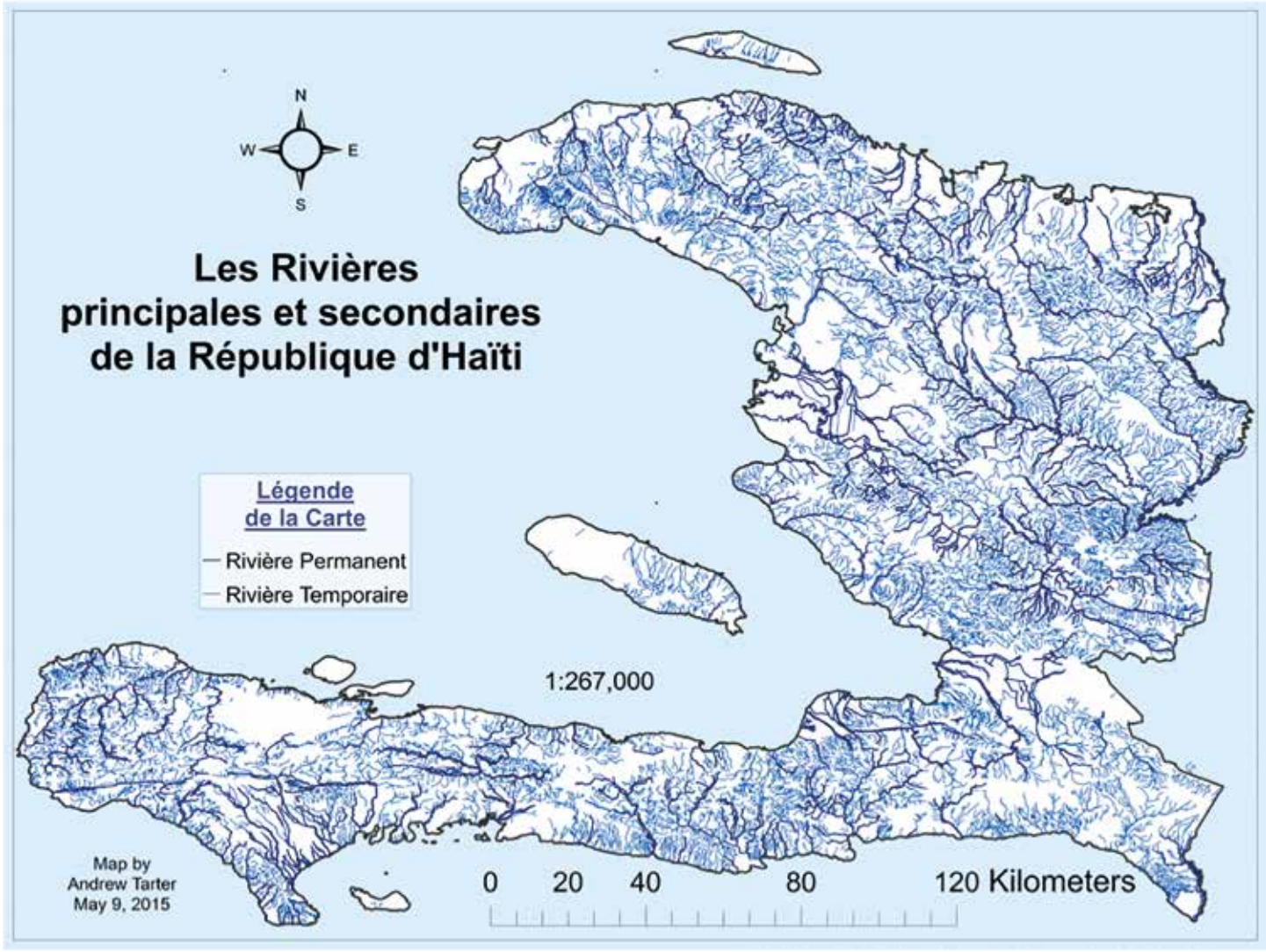
In all cases, livestock is a consideration for landscape level restoration and specifically reforestation efforts. Given the practices of restraining livestock, reforestation efforts on any public land will see the greatest impact of livestock.

Hydrology in Haiti

There are approximately 160 major rivers and hydrological basins in Haiti (see Figure 3), representing around 30 principal rain catchment areas[19] (Ehrlich et al. 1985) (see Table 1). Only a small percentage of watersheds in Haiti fall principally within nationally recognized conservation areas: *Fonds Verettes, Grande Anse, Cul-de-Sac, Roseaux-Voldrogue, Ravine du Sud, Rivière l'Acul, Rivière Port-à-Piment, Rivière les Anglais, Rivière Cavaillon, Rivière Glace, Rivière Roseaux* and *Grande Rivière de Jacmel Basins* (Swartely and Toussaint 2006: 18). The vast majority of watersheds in Haiti fan out across governmental administrative boundaries, ecological zones, and the privately and securely

19 Swartley and Toussaint 2006 suggested 33 major watersheds, while Smucker et al. 2007 suggested there are 54 major watersheds.

FIGURE 3. Principal and Secondary Rivers, Haiti.



owned plots[20] of millions of small family farms (*ibid*.).

While the permanent rivers and streams of Haiti are spring-fed through a vast network of aquifers, it must be recognized that the aquifers themselves are recharged by rainfall capture (Swartley and Toussaint 2006). Rain falls variably in Haiti, with precipitation driven by the north-eastern trade winds.

With the exception of the slowly flowing Artibonite—the country's largest river—many rivers in Haiti are both short and swiftly flowing. Vegetative cover and arboreal root systems in some watersheds prevent rapid runoff, and allow the rainfall to percolate through the limestone substratum that represents some 80% of Haiti's underlying land formation (Swartley and Toussaint 2006).

In contrast, rain in denuded watersheds rapidly descends into streams and rivers and ultimately leaves the watershed with a reduced rate of percolation into aquifers. This trend is reflected in the 15% of the country that is composed of plains and valleys but which contains approximately 85% of Haiti's available groundwater (Knowles et al. 1999: 14). The remaining 15% of groundwater is found in mountainous areas and comes from springs that originate from multiple aquifer types, including karstic, fractured, low permeability, and indigenous aquifers (Knowles et al. 1999: 15-17).

By 1978, 12 of the 30 major watersheds in Haiti were completely deforested, and by 1985, the most forested watershed supported only 37% arboreal coverage, and was expected to be entirely deforested by 2042 if trends continued (Ehrlich 1985: 28-31). Overall the ability of aquifers to recharge has decreased with deforestation to the point where the water table now fluctuates seasonally by up to 15 meters in many parts of the country (Knowles et al. 1999). Freshwater is nevertheless still available locally from varied aquifers, including fractured limestones, sandstones, conglomerates, and schist aquifers (Knowles et al. 1999: 17).

20 The average plot size in Haiti is approximately 1.4 hectares (Zuvekas), though most Haitian farmers own several different plots of land.

SECTION II:
Landscape-level Management Projects in Haiti

The Logic of Watersheds as a Landscape of Intervention

Recall that Haiti has a predominantly agrarian society with increasingly less access to water due to on-going climatic drying, droughts, and a decline in the predictability of seasonal rainfall. Access to water is the most-pressing concern for most rural Haitian farmers, as it represents the determining factor for the success or failure of agriculture production. The reduced recharge capacity of aquifers in Haiti—due largely to the rapid runoff and departure of rainfall from watersheds—is one of the most-pressing long-term human and ecological vulnerabilities facing the country. Efforts to prevent or slow groundwater runoff in Haiti's watersheds represent one way of mitigating dropping aquifers. All of these human and ecological concerns combine to explain the common rationale behind integrating landscape-level management projects in Haiti within watersheds.

The Geospatial Distribution of Rivers in Haiti

Water takes the path of least resistance *en route* to the lowest possible elevation (sea level). The mountainous terrain of Haiti has resulted in the fairly even distribution of rivers and riparian systems throughout the country (see Figure 3). Early efforts at identifying critical watersheds in Haiti for project interventions struggled with reconciling the overlap in distribution between watersheds and government administrative boundaries (Delatour et al. 1984).

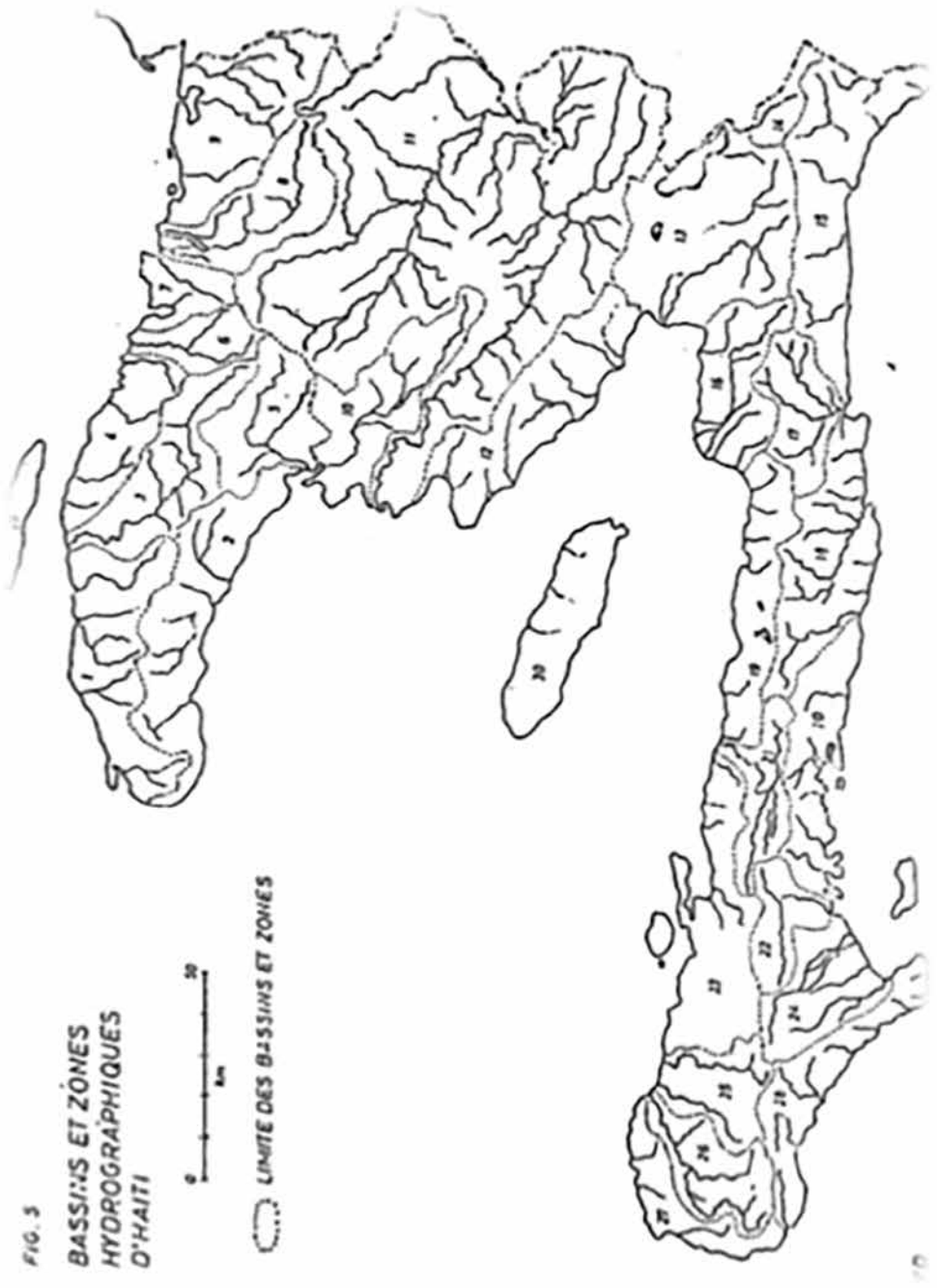
An early attempt at consolidating watershed and administrative boundaries involved grouping more than 100 watersheds into 30 regions (1972 OAS study cited in Delatour et al 1984: 31-37). Figure 4 displays this early watershed delineation map. A further effort was made to divide the aggregated 30 watershed areas into seven regions, and is displayed in Figure 5 (Wolf 1975, as cited in Delatour et al 1984: 31-37). Despite the explicit acknowledgement of grouping 100 watersheds into 30 geographical areas for pragmatic reasons, the aggregation from the OAS report has led some researchers to mistakenly report that Haiti has only 30 major watersheds.

The 2007 USAID Environmental Vulnerability Report (EVR) noted that watershed areas in Haiti have never been systematically and quantitatively compared (Smucker et al. 2007: v). The EVR team developed a thematic map that categorizes watersheds in Haiti into four areas of varying priority, based on the following criteria: (1) soil potential; (2) population vulnerability; (3) market vulnerability; (4) road vulnerability; and (5) irrigation vulnerability (Smucker et al. 2007: v-vii). Figure 6 displays the map of watershed vulnerability based on these criteria (Smucker et al. 2007: vi).

The Ministry of Environment (MdE) has also released a map (see Figure 7) that delineates watersheds in Haiti (Ministère de l'Environnement N.D.: 23). The MdE map is likely based on the 1972 OAS map, which grouped some 100 watersheds together for policy reasons (see Figure 8).

The difficulties associated with conceptualizing, operationalizing, and delineating watersheds—and subsequent difficulties concerning the overlap of political administrative boundaries—present a major watershed governance challenge in Haiti. To illustrate, a given watershed may overlap administrative units with notably different priorities and resources. Rivers do not adhere to man-made political boundaries, and attempts to involve local and regional government in the management of entire watersheds will continue to grapple with this reality.

FIGURE 4. An Early Delineation of Haitian Watersheds, Aggregated into 30 Areas.



(1972 OAS study cited in Delatour et al 1984: 31-37).

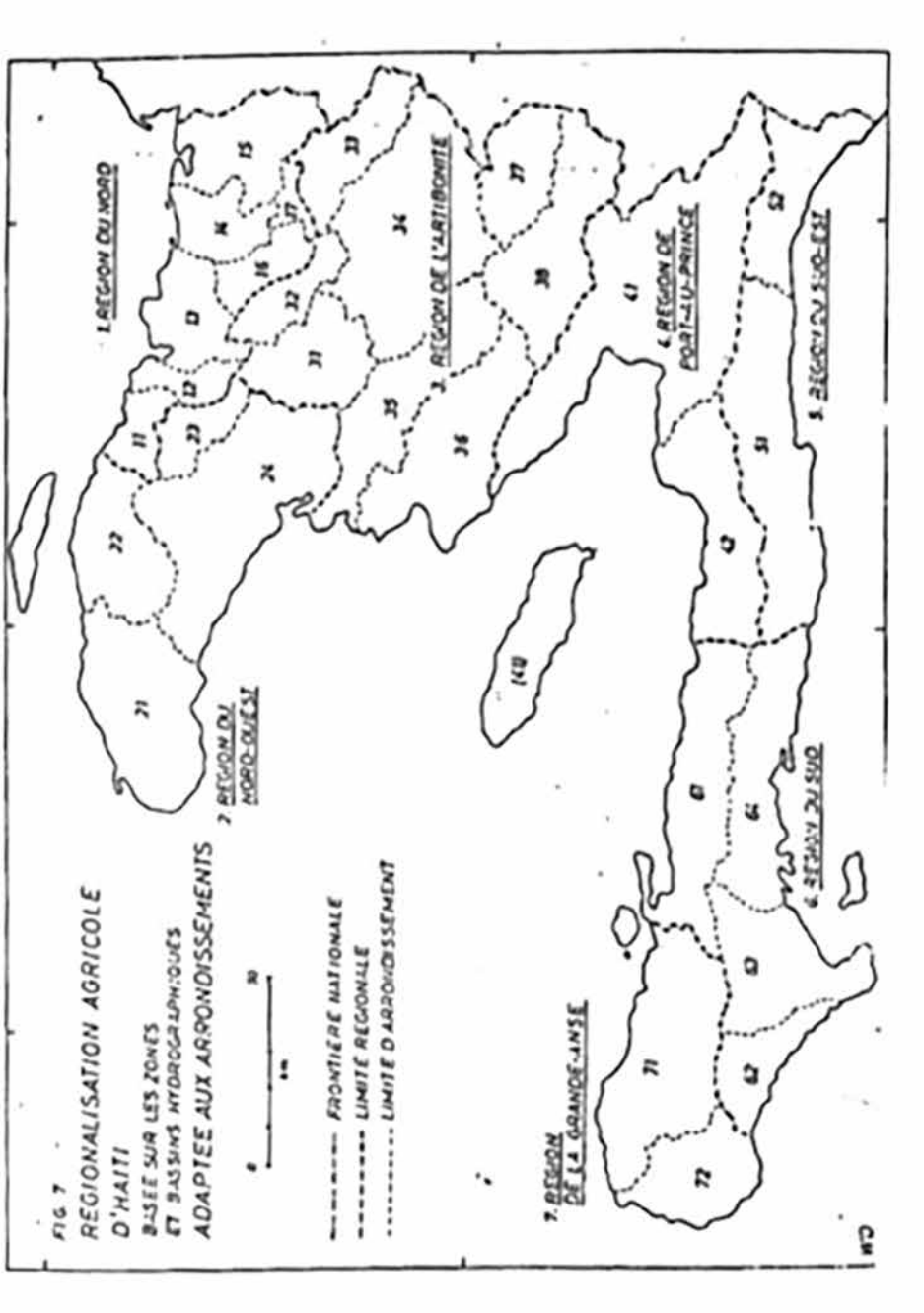
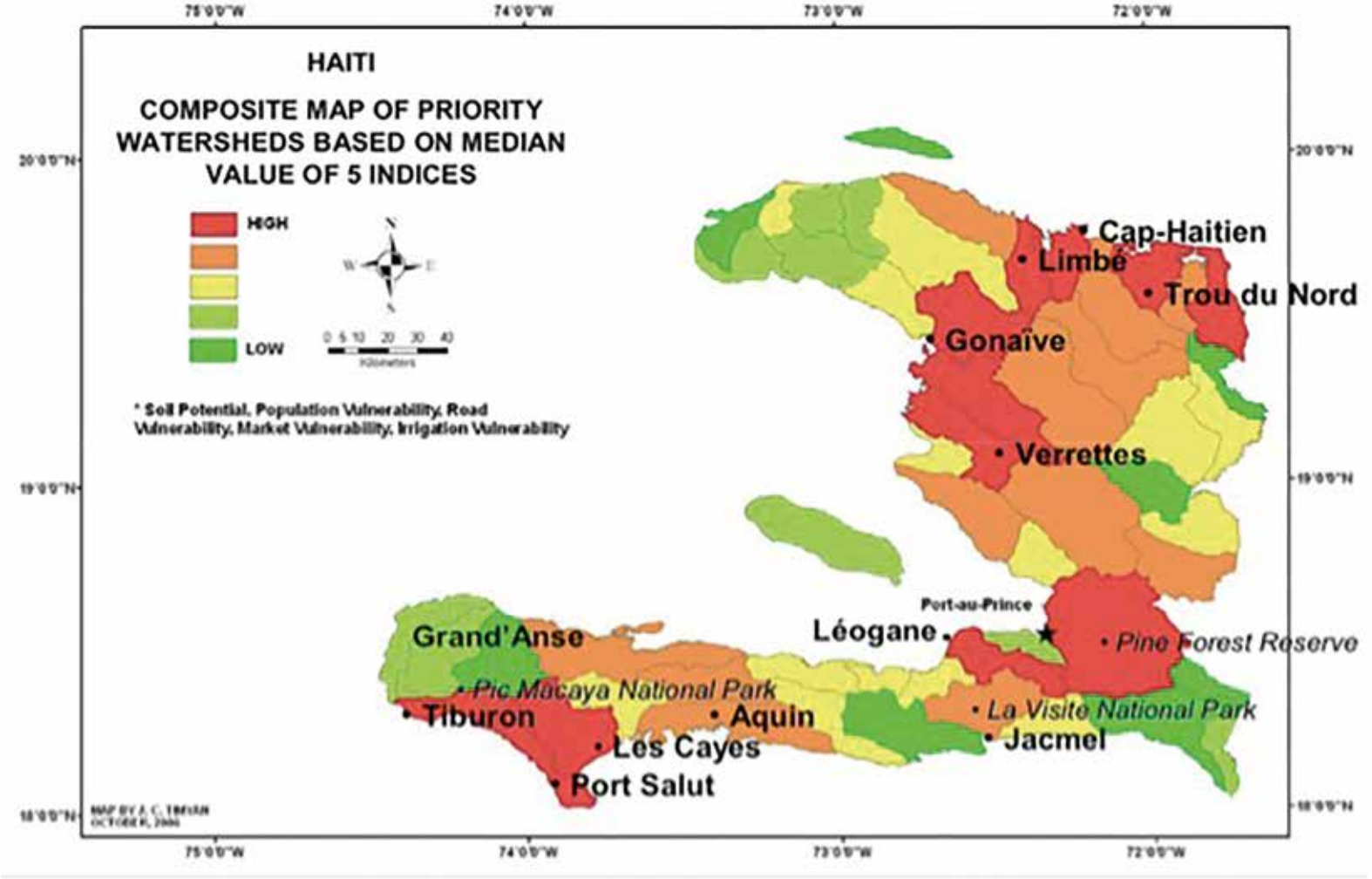


FIGURE 5. An Early Grouping of Watersheds Adapted by *Arrondissements* and Divided into Seven Principal Areas.

(Wolf 1975, as cited in Delatour et al 1984: 31–37).

FIGURE 6. Watershed Prioritization Map for Project Interventions, Haiti.



(Smucker et al. 2007: vi)

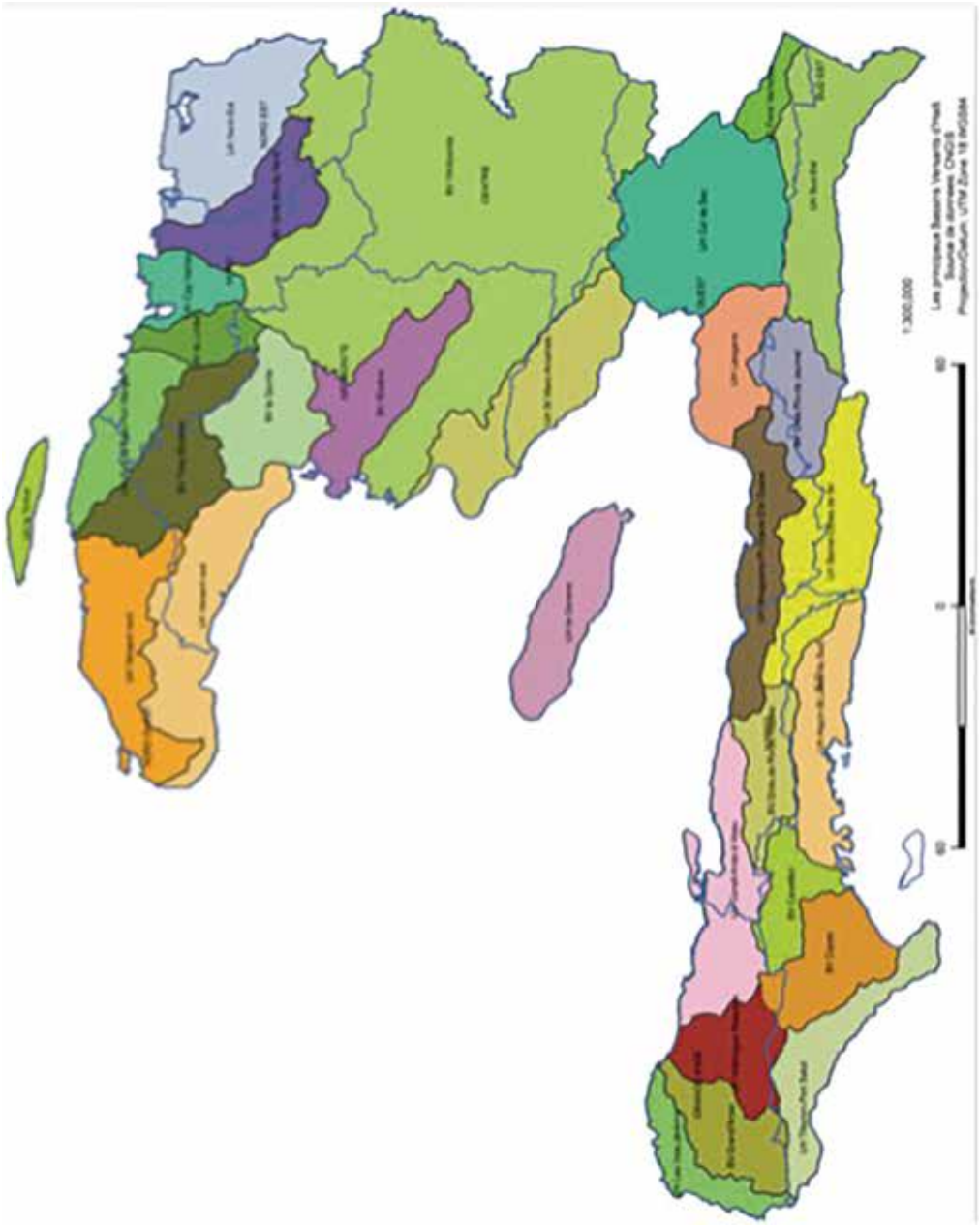
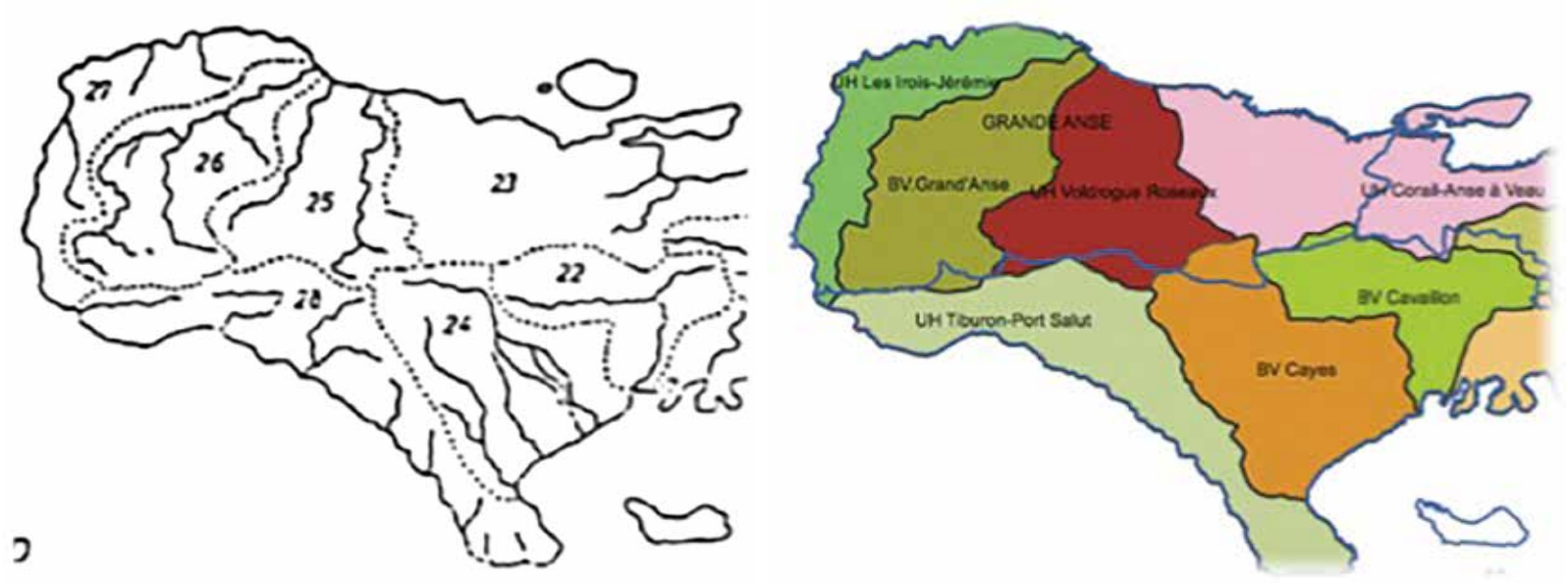


FIGURE 7. Watersheds of Haiti, According to the Ministère de l'Environnement. (Ministère de l'Environnement N.D.: 23)

FIGURE 8. Current MdE Map (Right) Ostensibly Based on 1972 OAS Grouping (Left).



(Left: 1972 OAS study cited in Delatour et al 1984: 31-37; Right: Ministère de l'Environnement N.D.: 23)
Note: The dotted lines in the OAS map (left) delineate aggregated watersheds

Case Studies on Landscape-level Land Management Projects in Haiti

The success of future landscape-level land management efforts in Haiti rests on a solid understanding of approaches and policies leading to previous project successes and failures. The inherent complexities in human and environmental vulnerabilities, issues of land inheritance, land tenure, and land security, an historical leveling of ecological heterogeneity in some parts of Haiti, the degradation of Haiti's hydrological systems, and the difficulties facing the delineation of watersheds and their adherence to established internal political boundaries have all been highlighted as common challenges faced by previous project planners and implementers.

The following 15 summaries of landscape-level land management efforts in Haiti attempt to highlight some of the internal challenges faced by a variety of different project approaches and policy choices. On one hand, the selection of theses case studies presented was pragmatic—many were included because of present accessibility to the reports. To illustrate, one survey identified over 115 different watershed management projects in progress in the year 1987 alone (Pierce 1988), yet individual reports on these projects are either nonexistent or were unavailable at the time of writing of this report. Therefore, an implicit assumption of this report is that an absence of evidence regarding a particular landscape-level project or approach should not be considered as evidence of absence regarding the applicability, success, or failure of such approaches. However, an examination of the case studies makes it clear that important lessons in landscape-level land management have gradually surfaced and been incorporated over time as policy. In this sense, the case studies are illustrative of important lessons learned over time, in the Haiti context of land management.

It should also be noted that the case studies presented here are derived from project evaluations, often conducted by the very projects' implementing agencies. Such reports cannot be assumed as independent or objective evaluations of individual project success or failure (see APPENDIX A for a further elucidation of challenges regarding the literature). Instead, the case study summaries provide a sampling of varied landscape-level land management project models, approaches, and shifts in policies over time. Table 2 provides a list of the 15 cases summarized below.

Case 1

The Haiti Pilot Project (HPP)

On November 26th, 1949, the Haitian Minister of Education and the head of UNESCO's Division of Fundamental Education met in Paris to sign an accord that would create the world's first multinational development initiative. The first clause of the first UN-Haiti agreement stated that the perimeter of the Marbial Valley intervention area 'shall be interpreted to mean the watershed of the River Gosseline' (UNESCO 1949: 3). Two years earlier, the Haitian Director of Adult Education in Port-au-Prince had presented the Marbial Valley of Haiti to the second General Conference of UNESCO as an ideal location for a UN development pilot project. The project location was framed as ideal not only because the area exemplified the poverty that was characteristic of some areas of Haiti, but also because conditions in Marbial were compounded by the iterative influences of overpopulation, deforestation, erosion of agricultural soils, and overall challenging agricultural conditions (Verna 2015: 7-8).

Launched in 1950, the *Haiti Pilot Project* (HPP) was based on an extensive research survey undertaken by Swiss anthropologist Alfred Métraux[21]. Métraux noted, refined, and

21 Métraux worked with the support of new graduates from the recently created Faculté d'Ethnologie (Department of Ethnology/Anthropology) at L'Université d'État d'Haïti (The State University of Haiti), and seasoned

added causal direction to earlier associations raised at the General Conference, noting that soil erosion was the result of rapid deforestation, overpopulation had exerted additional pressures on agriculturally productive land, and small land-holdings prevented the implementation of agricultural intensification measures such as the use of the plough (Watras 2015: 225). The goals of the HPP were integrative in the sense that they aspired to improve health, improve agriculture, develop natural resources, develop small-scale industries, and promote cooperative associations. The particular approach that guided the above objectives was based in the theory of 'fundamental education' (FE).

Despite the project's delineation by the local watershed, the acknowledgement of interplay between complex socio-environmental challenges, and an integrative approach, the HPP is widely acknowledged to have failed. When Métraux revisited the Marbial valley in 1956, he later reported in a private correspondence that the project "had virtually no effect. The conditions of life of the Valley have hardly altered and the project itself is virtually defunct" (Métraux, as quoted in Verna 2015: 26).

Lessons Learned

- The project employed a lengthy list of objectives to tackle the inherently complex nature of rural development. By employing several different projects to target a host of interrelated dimensions, it emphasized breadth over depth, failing to achieve any single goal.
- The project had a misguided primary emphasis on an *en vogue* educational model. Without including direct project beneficiaries like local farmers in problem identification, management and implementation, the project failed to produce any notable difference to the land.

Haitian ethnographers such as Remy Bastien and Suzanne Sylvain (Verna 2015: 19).

Case 2

Organisation de Développement de la Vallée de l'Artibonite (ODVA)

Another attempt at integrated development within a Haitian watershed occurred around the same time, with the Haitian government's creation of the *Organisation de Développement de la Vallée de l'Artibonite* (ODVA). The first phase of ODVA was financed by a 4 million US dollar loan from Eximbank, later expanded to 40 million (Delatour et al. 1984). The Inter-American Development Bank financed the second phase of the project (*ibid.*).

ODVA originally focused on the construction of the Péligre dam, an associated irrigation network, and mechanisms for flood control and drainage (*ibid.*). The generation of electricity was the primary goal of the project. If evaluated based on this goal, the ODVA may be considered a failure. While the engineering aspects of the dam were completed by the late 1950s, it was another decade before the generators were installed (Delatour et al. 1984).

The construction of the dam itself had several unexpected and disastrous results. In particular, roads built to construct and service the dam opened up vast areas of the upper watershed that had previously remained protected by isolation (Howard 1997: 7). Forests of the upper watershed were rapidly felled after the dam's construction. The newly exposed soil began to erode and rapidly built up at the bottom of the dam, significantly deceasing its energy productivity (Howard 1997: 7). The original engineers that designed the dam based their sedimentation estimates on studies from the 1920s, and predicted the dam would have a 180-year lifetime (Howard 1997: 8). However, some 25 years after the construction, the sedimentation rate was three times what

engineers had estimated (*ibid.*). By 1997, the dam's capacity was at 50% (*ibid.*).

Howard outlined how some wealthier Haitians with advanced knowledge of the project purchased lowland areas that would later become irrigated, resulting in a major displacement of rural families (Howard 1997). The area also experienced a boom in population in anticipation of the dam.

Despite the bad press for a protracted execution, Delatour et al. (1984) noted that rice production in the area boomed in conjunction with the project, though they suggest the rice boom may have been in large the result of increased food prices since 1971 (*ibid.*). From the 1970s onward, rice had been the most profitable agricultural crop in Haiti (*ibid.*). The increase in food prices, the high value of rice, and the sudden availability of water for irrigation provided the incentive for farmers to increase their production (*ibid.*). Rice production eventually declined when US policy severely reduced the economic profitability of Haiti's domestic rice market.

Lessons Learned

- This 'macro-level' approach to watershed management did not adequately involve all members of society equitably and resulted in land grabs and opportunistic land purchases to the benefit of some wealthy Haitians and at the expense of supposed local beneficiaries (Howard 1997).
- By not incorporating the beneficial aspects of a 'plot-based' approach alongside their 'macro-level' approach, project participants mono-cropped rice and consequently farmers across the regions suffered collectively when the local rice marketed collapsed with the importation of US-government subsidized 'Miami rice' from farmers in the United States.

Case 3

Développement Rural Intégré Petit-Goâve-Petit Trou de Nippes (DRIPP)

A bilateral agreement signed in 1973 between the governments of Canada and Haiti created the *Développement Rural Intégré Petit-Goâve-Petit Trou de Nippes* (DRIPP) project. Like the Haiti Pilot Project, DRIPP was clearly integrative in theory, with goals to initiate a regional development program that focused on "pedology, hydrology, erosion, culture, animal husbandry, fisheries, health, education, transportation, industry, commercialization, credit, cooperatives, enterprise, communication, arts and crafts, and land tenure" (DRIPP 1978: 3, as quoted in Delatour et al. 1984: 47).

Canadian partners attributed the failure of DRIPP to the need to work through multiple government departments and ministries (Delatour et al. 1984). Other suggested that the project's well-intentioned focus on involving and empowering local grass-root organizations, channeling credit through farmer associations, utilizing collective storage facilities, and promoting all of these activities through "pilot [demonstration] parcels" all ignored several important factors (*ibid.*). First, all of these suggested activities did not take into account the realities of local land tenure or the geography of production in Haiti. Second, rather than acknowledging the reality of an entrenched, traditional social system in the area, the project assumed that social structures could be ignored or bypassed. As Delatour et al. rhetorically inquired, "Is it reasonable to assume that in 4 or 5 years one [project] may overturn two centuries of social practice?" (Delatour et al. 1984: 47). The same analysts suggested the project failure was ultimately the result of "conceptual ambiguity and of the failure to precisely define a coherent strategy that would encompass the whole area in its physical heterogeneity" (Delatour et al. 1984: 51).

TABLE 2. Case Studies of Landscape Projects in Haiti, 1948-2014.

#	Year	Project Name	Acronym	Implementing Agency/Partners	Funder/Donor
1	1948-1953	The Haiti Pilot Project	HPP	UNESCO	UNESCO, ACLS, Rockefeller Foundation
2	1949-1963;1972-?	The Artibonite Project	ODVA	Organisation de Développement de la Vallée de l'Artibonite	IDB, Haitian American Dev. Org.
3	1973-?	Développement Rural Intégré Petit-Goâve-Petit Trou de Nippes	DRIPP	Agence Canadienne pour le Développement International	
4	1976-1991+	L'Organisme de développement du Nord: Soient Développement Rural du Nord I (DRN I) 1977-1982; Soient Développement Rural du Nord II (DRN II) 1983-1989	ODN	L'Organisme de développement du Nord	World Bank
5	1981-1989	Agroforestry Outreach Project (*Pwojè Pyebwa*)	AOP	PADF and CARE at program level; hundreds of NGOs at project level	USAID
6	1987-1988	Secretariat Technique á l'Aménagemen des Bassins Versants	STAB	MARNDR, USAID, FAO, World Bank, a representative of NGOs, and 2 agronomists	USAID
7	1987-1991	Agroforestry II	AFII	PADF, CARE	USAID
8	1989-1994	Productive Land Use Systems	PLUS	CARE, PADF, SECID / Auburn Univ., NGOs, farmers	USAID
9	1987-1994	Targeted Watershed Management Project: Pwojè Sove Tè (PST); Macaya Biosphere Reserve (MBR)	TWMP: PST and MBR	NGOs, Associates in Rural Development, Union des Cooperatives de la Region du Sud (UNICORS), U. of FL.	USAID, MacArthur Foundation, UNDP
10	1996-?	Forest and Parks Protection Technical Assistance Project	FPPTP	GOH Ministries of Environment and Agriculture	World Bank
11	1997-2002	Agriculturally Sustainable Systems and Environmental Transformation	ASSET	Féderation de Groupements des Planteurs de Belle Fontaine	USAID
12	2001-2005	Hillside Agricultural Programupper watersheds of:Rivière Grise; andRivière Blanche	HAP	Middle-men producers and exporters	USAID
13	2008-2012	Le Développement Economique pour un Environnement Durable /The Durable Economic and Environmental Development: Montrouis (W. Department); Limbé in (N. Department)	DEED	Development Alternatives Inc. (DAI)	USAID
14	2009-2011	Watershed Initiatives for Natural Environmental Resources	WINNER	Chemonics	USAID
15	2011-2015	Appui à la Valorisation du potentiel Agricole du Nord, pour la **Sécurité Économique et environnementale** / Feed the Future: FTF/North (201318); FTF-West/WINNER (2009-11)	AVANSE/ FTF	Development Alternatives, Inc. (DAI)	USAID

Lessons Learned

- Project objectives did not take into account land tenure, ecological heterogeneity, and the nature of the entrenched local social system.
- Rather than focus on a few achievable objectives, the project attempted to address a myriad of sub-objectives that recognized social and ecological heterogeneity. This heterogeneity was addressed in a voluminous and unmanageable number of diverse and unlinked projects that stretched staff and resources thin.
- The project suffered from issues of inappropriate administrative oversight and unknown delineation of project roles and responsibilities at the highest levels of oversight.

Case 4

L'Organisme de développement du Nord (ODN)

L'Organisme de Développement du Nord (ODN) was initially established by presidential decree in 1976 (La Tortue 1993) as a four-year project that would "rehabilitate and expand irrigation systems, provide credit to mostly small farmers, carry out agricultural trials and seed multiplication, improve technical assistance, set up an animal health service, rehabilitate two municipal markets and an abattoir, repair and construct feeder and access roads and improve [the] rural water supply" (World Bank 1976: d, as reported in Delatour et al. 1984: 55).

Despite the fact that project goals were later refined and narrowed, the second phase of the project relied almost entirely on farmers' adoption of technical inputs that amounted primarily to improved varieties of traditional crops, supported by research and extension promoted by the aforementioned government entities (Delatour et al. 1984).

The World Bank funded the second phase of the project, but not before mandating that involved government agencies sign bilateral agreements indicating that their failure to uphold their roles and responsibilities would result in the ODN reassuming these responsibilities (Delatour et al. 1984).

Approximately a decade and a half and 45 million US dollars later, the targeted area failed to reach any of the espoused goals (La Tortue 1993). An independent assessment of the program concluded that the ODN suffered from a lack of strong management, too many unrelated goals that did not reflect the needs of the project recipients, ineffective project coordination and management, a dependence on external funding, and the ceding of project implementation to the institutionally weak Ministries of Agriculture, Public Works, BCA and SNEP (Delatour et al. 1985, La Tortue 1993). In short, the ODN suffered from the same broad focus and lack of clearly defined objectives as the ODVA project, coupled with reliance on an historically weak public sector for project implementation (*ibid*.).

Lessons Learned

- Despite that the project later refined its overly-broad objectives, they focused exclusively on a 'macro-level' approach by pushing a one-size-fits-all solution—technical inputs in the form of improved varieties of local crops.
- Despite having later narrowed it's objectives, the project suffered from a weak administration that didn't have well-defined goals and responsibilities for all those involved in project implementation.
- The project relied entirely on rain-fed irrigation, which made beneficiaries unlikely to become adopters of the technical solutions of the project, which they viewed as inherently more risky than their time-tested methods of production.
- Ultimately, by excluding local participation in the decision-making process, the project failed to: (1) recognize the ecological heterogeneity of the land, thereby, failing to address the different ecological approaches needed across the land; and (2) recognize the potential failure of introducing new and improved varieties

of crop that were already part of traditional crops used by farmers. Farmers' resistance to the use of technology for crops that were already part of their traditional system could have been foreseen had the project used local beneficiaries in the decision-making process.

Case 5

The Agroforestry Outreach Project (AOP)

The *Agroforestry Outreach Project* (AOP; *Pwojè Pyebwa*) was a tree-planting project funded by USAID. At higher levels of management the project was implemented through two large NGOs already involved in related development work at the national level in Haiti: (1) the Pan American Development Organization (PADF); and (2) CARE. These large NGOs oversaw the project through numerous small private volunteer organizations and nongovernmental organizations working locally throughout the country (Murray and Bannister 2004).

The AOP approach was tailored to a series of conditions thought to positively affect project success, including: (1) adapting the project to the pre-existing Haitian land tenure, tree tenure, and market systems; (2) an elevation of micro-economic over macro-ecological themes; (3) a decision to initially bypass the Haitian government and operate exclusively through the two overseeing NGOs and hundreds of local implementing NGOs; (4) a joint-venture model in which smallholders supplied the land and labor and the project supplied capital inputs in the form of free tree seedlings; (5) the use of small container seedling technology rather than backyard nurseries; and (6) a management policy that openly encouraged farmer-induced deviations from the project on decisions of tree-planting and harvesting schedules (Murray and Bannister 2004: 384).

The AOP was the largest tree-planting project in Haiti's history and spanned a decade from 1981-1991. Important tenets and lessons learned from the AOP continued to inform PADF projects through a second decade, from 1992 to 2000 (see subsequent case studies on AFT II, PLUS, ASSET).

Using a purely 'numbers served' evaluative metric, the AOP involved 1/3rd of rural farm families in Haiti, and saw the planting of approximately 68 million trees. An estimated 1/3rd of trees planted ten years prior were still standing in 1995 (Smucker and Timyan 1995). An interesting and unexpected side effect of the project was that trees planted in woodlots created conditions favorable to the germination of local tree species that had been assumed unlikely to regenerate (*ibid*.).

Lessons Learned

- The project proceeded from an overarching policy that emphasized social benefits over ecological benefits (economically *productive* activities over ecologically *protective*). Ecological improvements were considered a beneficial consequence of the targeted focus on improving farmer incomes.
- The project implementers acknowledged realities of the local land tenure systems and promoted an *agroforestry* approach (plot-based) over traditional *reforestation* (macro-level) approaches.
- The AOP project achieved nationwide coverage by establishing a highly-effective organizational structure based on several larger regional NGOs overseeing the activities of hundreds of smaller NGOs, private volunteer organizations, community groups, churches, and famer associations.
- Farmers were encouraged to deviate from project objectives and encouraged to cut their trees when they wanted (participatory over command-and-control).
- Despite higher levels of beneficiary participation than previous projects, assumptions in the form of appropriate technical inputs—fast-growing exotics—overlooked autochthonous Haitian wood and charcoal woodlots instead of working within these established systems.

Case 6

Secretariat Technique à l'Aménagement des Bassins Versants (STABV)

The minister of the Ministry of Agriculture, Natural Resources, and Development (MARNDR) initiated a plan to develop and implement a coordinated and integrated national watershed program with the overarching objective to reverse hillside degradation in Haiti (Pierce 1988). An initial planning group was formed with advisors from USAID, FAO, the World Bank, a representative of NGOs, and two Haitian agronomists (*ibid*.). This group produced a document entitled 'Guidelines for Watershed Management', which gave birth to STABV.

In 1987 a 4-year project supporting STABV was launched with funding from USAID (*ibid*.). The Secretariat was designed as a national planning and coordinating mechanism for all partners involved in watershed management in Haiti (*ibid*.). STABV had two secondary objectives that met the overarching program objective: (1) to develop a clear national watershed management program; and (2) to improve existing projects' effectiveness and long-term independence (*ibid*.).

Rather than participating in project implementation, STABV was a program that dealt principally with long-term strategies, information exchange, project designs, project evaluations, and conflict resolution (Pierce 1988). A major obstacle that was effectively overcome was to align a diversity of viewpoints concerning appropriate watershed approaches and to resolve conflict between competing partners. For example, the initial STABV effort to determine who was doing what, and where, was met by impatience and resistance from partners that felt that acting immediately was the best strategy (*ibid*.). In other cases, competing objectives and ideas threatened to derail cooperation.

Ultimately, a strategy of proceeding slowly, acknowledging differing viewpoints, directly addressing conflict, and aligning objectives and visions through consensus and compromise paid off: STABV became the most knowledgeable institution on watershed management in Haiti, assembled a large database of all existing research and knowledge, and developed essential connections with all key players (*ibid*.). STABV conducted an impressive inventory of watersheds and related projects and identified 116 projects operating in Haiti during 1987. The STABV program was ended prematurely after one year, when funding was revoked by USAID due to political instability (*ibid*.).

Lessons Learned

- This program serves as an exemplar of the efficacy of a plot-based, participatory approach to project oversight. By being truly participatory in every stage and by involving multiple stakeholders from local government to individuals from the community (Smucker et al. 2007), it ensured diversity of opinions that gave way to a more comprehensive watershed management plan that addressed locally identified problems.
- This project adapted its approaches and objectives through an iterative, farmer-driven process thereby not only ensuring higher rates of participation and adoption (White 1992; White and Runge 1995; White and Jickling 1995; Smucker et al. 2005; Smucker et al. 2007), but also ensuring that the goals were directly related to project beneficiaries.

The project was entirely dependent on outside funding and ended when access to funding was prematurely cut short.

Case 7

Agroforestry II (AFII)

The *Agroforestry II* (AFII) project was essentially an extension of the AOP, with a shift in focus toward increasing soil conservation activities. The refined project objectives included: (1) sustainable increases in farmer productivity and income; through (2) soil conservation measures; introduced by (3) planting trees and other plants;

with (4) oversight to institutionalize farmer-led demands for interventions, materials and extension services (Bannister and Josiah 1993: 242).

Like the AOP before it, AFII was a nationwide project executed through a hierarchical structure of NGOs. The project design was informed by socio-economic background studies conducted before the commencement of the project. A noteworthy approach used in this project was the inclusion of a vast NGO network that made participation of various stakeholders possible (Bannister and Josiah, 1993: 248). Socio-cultural analyses were also conducted to identify locally defined values and attitudes to tree planting (Murray, 1981). Despite the focus on collaboration and local participation, the introduction of agroforestry techniques to farmers was not truly driven by traditional knowledge of such practices. Existing knowledge of farming systems was largely ignored in the development of agroforestry techniques.

Lessons Learned

- The use of socio-economic studies was crucial to the success of this project. Insights from the aforementioned study pointed to the importance of incorporating local opinions and farmer participation (Murray, 1979, 1981).
- The project used a plot-based approach by using socio-cultural analyses to identify local sensibilities of tree planting (Murray, 1981) so that project goals could be oriented towards locally identified farmer interests (Murray, 1981, Conway, 1984).
- Collaboration with a network of NGOs was central to the project's success. It not only allowed access to a large number of farmers but also provided opportunities to make the project planning an iterative process (Bannister and Josiah 1993: 249).
- Although the project had made a conscious effort to employ a truly participatory approach, certain aspects of participation had a macro-level, command-and-control approach (Bannister and Josiah 1993: 250). The project could have benefited from a more methodical participation between farmers and project staff to work within existing agroforestry systems and practices.

Case 8

Productive Land Use Systems (PLUS)

Initiated in 1989, *Productive Land Use Systems* (PLUS) continued many of the policies, practices and projects that developed under AOP and Agroforestry II. However, the project shifted exclusively from tree planting to four primary objectives: (1) increasing food production; and (2) increasing farm family income; through (3) sustainable agricultural practices; that (4) protect natural resources and the environment. The project was supported by USAID with an investment of approximately 30 million USD.

PLUS activities included promoting and increasing fruit tree production, farm system improvements, and the establishment of stable marketing systems. The project used a farmer-driven approach in its extension services. Local organizations were used to identify traditional forms of agricultural systems. The program continued in the implementation model of AOP, AFII, and PLUS. The application of PLUS technologies continued even after the end of the project. Severely eroded sites gained a considerable amount of soil depth, land values increased up to 3 times its original value and traditional crops were turned into cash crops (Smucker 2001) to name a few of the project accomplishments.

Lessons Learned

- A farmer driven approach allowed for an integration of traditional knowledge systems and greater enthusiastic participation by the farmers that resulted in the continued adoption of introduced technologies well after the project ended.
- The initial adoption and eventual sustenance of introduced technologies owes itself to

approaches that: (1) built on existing agricultural systems; (2) used simultaneous ecological and social incentives; (3) involved farmers in market negotiations (Smucker 2001); and involved (4) collaboration with multiple stakeholders.

- Ecological improvements resulted in a three-fold increase in some property values.

Case 9

The Targeted Watershed Management Project (TWMP)

The overarching goal of the *Targeted Watershed Management Program* (TWMP) was to slow ecological degradation in the southwest of Haiti. The project was funded with an investment of approximately 17.7 million USD and spanned the period of 1987-1994. By 1992, the project had planted approximately 250,000 trees and created some 20,000 jobs (PADO 1994: 5).

The TWMP ran two main projects: (1) Pwoje Sove Tè (Project Save the Soil); and (2) the Macaya Biosphere Reserve. The TWMP worked through four NGOs that collaborated with peasant organizations in the ecologically sensitive and diverse upper watersheds of the Pic Macaya National Park. The project was envisioned as a pilot, with the idea of extrapolating the learned lessons to hillside management at the national level. One of the principal conservation strategies of the project was to employ local farmers or local residents in conservation and public works projects in order to alleviate pressure on, or to shift activities away from, agricultural production within the park.

Lessons Learned

- The project attempted to slow ecological degradation (emphasized ecologically *protective* over socially *productive* approaches) by targeting a seven-river watershed (macro-level approach over a plot-based approach).
- Efforts to involve local beneficiaries emphasized employment that would draw people out of agricultural work within the park perimeter rather than focus on improving existing income generating strategies of farmers living within the park (command-and-control versus participatory approaches).

Case 10

Forest and Parks Protection Technical Assistance Project (FPPTP)

In 1996, the World Bank funded the *Forest and Parks Protection Technical Assistance Project* (FPPTP), which was implemented by GOH Ministries of Environment and Agriculture. This project built on *The Targeted Watershed Management Project* (TWMP) activities in the Macaya Biosphere Reserve, and other projects that had established similar programs in two other national protected areas: (1) Parc La Visite; and (2) the Pine Forest Reserve. Both of the latter two project areas were located at the headwaters of watersheds identified as critical intervention sites.

The FPPTP worked closely with the forest service and parks services of the agricultural ministry. The project also worked in buffer zones around the parks and attempted to implement local co-management through protected area councils that represented civil society and local elected officials (Smucker et al. 2005). The main objectives that were enumerated were to: (1) support and strengthen governmental intervention in forest and park protection; (2) launch activities catered towards the protection and management of parks; and (3) lessen the strain on protected areas through initiating activities that increased farm productivity, opened up off-farm employment opportunities and strengthened local organizations. Unmet project objectives were attributed to a lack of financial support from the Government and the lack of specified roles for the individuals involved in the project.

Lessons Learned

- A great amount of focus was directed towards environmental development without linking social approaches, which were addressed separately.
- The roles and responsibilities of each party involved were not clearly stated nor was the inter-relationship between the goals articulated.
- Sufficient external funding and continuity of funding were major project obstacles.
- Ultimately a macro-model approach, the project viewed 'participation' as the adoption of technologies and practices by the local beneficiaries, who were not involved in problem-identification nor in the decision-making process.
- There were *a priori* assumptions made by project experts that did not fully consider local, traditional land management practices, resulting in a lack of enthusiastic participation by beneficiaries.

Case 11

Agriculturally Sustainable Systems and Environmental Transformation (ASSET)

Operating from 1997-2002, the *Agriculturally Sustainable Systems and Environmental Transformation* (ASSET) program's overarching goals were to: (1) improve natural resource management; (2) increase agricultural productivity; (3) increase income generation; and (4) improve the ability of farmers to both plan and manage their natural resources (Israel et al. 2001). Geographically the project was located within the upper watershed of Rivières Grise and Rivières Blanche, which serve as major sources of water supply to Port-au-Prince. The project was designed to function at the macro level (Smucker et al. 2007). Farmers were enticed to participate in the project by forming community groups that could contribute to planning and labor supply. The project stressed water conservation in particular, and claimed to have planted 2 million trees (*ibid.*).

Lessons Learned

- The project worked directly with beneficiaries to identify their most pressing needs (water catchment systems).
- The project incentivized the formation and participation of community groups, working with such groups to establish the beneficiary-identified water catchment systems.
- The formation and involvement of community groups is also attributed to successes in limiting free-range grazing and mobilizing community labor (Israel et al. 2001).
- Project outcomes were considered scalable but had limited effect due to constraints in project resources (*ibid.*).

Case 12

Hillside Agricultural Program (HAP)

The goal of the *Hillside Agricultural Program* (HAP) was to increase farmers' marketing and productivity through natural resource management (Smucker et al. 2007). The project operated from 2000-2007. These goals aligned with USAID's strategic objectives of sustainable increases in income for the poor and the slowing of environmental degradation. The HAP took a value-chain approach and focused on coffee, cacao, and mangoes for export. The project also worked closely with middle-men producers and exporters to boost farmer-producer income. The sustainability of the project after the implementation period is not known (Smucker et al. 2007).

Lessons Learned

- The approach shifted to an emphasis on value chain improvement.
- Activities implemented by HAP were community-oriented and based on local participation.
- The project involved a combination of social and ecological approaches. While it focused

on slowing environmental degradation by increasing environmentally sustainable agricultural productivity, it simultaneously targeted reduction of poverty by employing approaches that strengthen farm family food security.

- The long-term project outcomes are not known.

Case 13

Le Développement Economique pour un Environnement Durable/The Durable Economic and Environmental Development (DEED)

Operating under contract from USAID from 2008-2012, the *Durable Economic and Environmental Development* (DEED) project focused activities within two different Haitian watersheds: (1) Montrouis (West Department); and (2) Limbé (North Department). According to the USAID web site, the overarching objective of DEED was to "initiate investment in sustainable natural resource management at the scale and density needed to produce future positive landscape level changes in environment, infrastructure, and economic vulnerability in watersheds."[22] The contract was later modified to "jump-start planned Food Security programs in the Northern Corridor" (*ibid.*). After October of 2010, project activities were limited to the Limbé watershed, which covers 90,000 hectares. The project was envisioned from the start as a model that could be replicated in other watersheds, and purports to have created a collaborative process of watershed management. Project activities commenced with a large survey in the watershed, covering 500 individual farm family interviews and approximately 200 meetings with community based organizations[23].

22 http://www.usaid.gov/news-information/fact-sheets/haiti-economic-development-sustainable-environment-deed

23 http://pdf.usaid.gov/pdf_docs/Pdaco669.pdf

Lessons Learned

- It is evident that the project implemented lessons learned from previous case studies and employed a vast array of collaborative approaches, but the lack of insufficient reports of evaluation of DEED make it difficult to enumerate lessons learned from this project.

Case 14

Watershed Initiatives for Natural Environmental Resources (WINNER)

The *Watershed Initiatives for Natural Environmental Resources* (WINNER) was funded for 127 million USD by USAID, operating from 2009-2014. The project was overseen by the private Chemonics development firm, and later incorporated within the USAID-funded Feed the Future project as 'Feed the Future, West'.

The ambitious undertaking of the WINNER project accomplished many laudable goals, but according to a USAID internal audit, the project failed to meet crucial ecological and human rights standards (USAID 2012). The project has also been criticized for focusing on farmers that are active in economic markets, which may not reflect the most vulnerable of populations, included the poorest farmers and women (Fuller-Wimbush and Fils-Amié 2014). The Oxfam report suggested that many project activities were carried out in areas without roads and thus lacked access to markets, which was at odds with the objectives of the project (Fuller-Wimbush and Fils-Amié 2014). Is it not known if project-promoted activities have continued after the recent close of the project.

Lessons Learned

- Beneficiaries were not involved in determining the criteria for project involvement nor in the needs assessment, and this affected technology adoption rates for some groups.
- Gender, while explicitly addressed in project concept reports, was difficult to address within

the existing social structure, and thus project goals to address gender fell short.

- The use of expensive technological inputs—such as tractors over traditional tilling—was effective but expensive and proved difficult to maintain.
- WINNER was effective at some measures of institution building at local levels, such as the establishment of local CRDDs[24] (Sustainable Rural Development Centers), but did not systematically connect to higher-level regional and national governmental structures.
- Difficulties related to geographical boundaries resulted in only partial participation of some communities, causing inter-community resentment and jealousy.

Case 15

Appui à la Valorisation du Potentiel Agricole du Nord, pour la Sécurité Économique et Environnementale (AVANSE) / Feed the Future (FTF)

Feed the Future (FTF) was initially funded by USAID with approximately 88 million USD, for project operations to span from 2013-2018. The implementing partner was a private development outfit, Development Alternatives, Inc. (DAI). While the project incorporated the WINNER project (2009-2014) under the name 'Feed the Future West', activities in the north of the country covered six different watersheds: Limbé, Haut du Cap, Grand Rivière du Nord, Trou du Nord, Marion, and Jassa.

The project activities in the west and north reflect alignment with the USAID's three development corridors: Cap Haitian, Cul-de-sac Plain, and St. Marc/Cabaret. Project activities focused on mangoes and cocoa as export crops, and had tertiary focus on nutrition education, nutrition health services, and food fortification. The project had several explicit agreements with private sector corporations, which represented a significant shift from working with small-holder farmers. The primary goals of FTF were: (1) increasing agricultural productivity; (2) stabilizing watersheds above selected plains; (3) strengthening agricultural markets; and (4) delivering nutrition messages and services.

An Oxfam report found that while the project was achieving notable gains related to project objectives, farmer participation was lacking beyond the initial planning stages (Fuller-Wimbush and Fils-Amié 2014). Recommendations included the increased involvement of project recipients at all stages of project implementation, with particular focus on increasing the involvement of women (*ibid.*).

Lessons Learned

- Inadequate efforts to include the "active participation [of beneficiaries] throughout all stages of the project, including both the design and implementation processes" (Fuller-Wimush and Fils-Amié 2014: 6) led to a lack of project adoption and continuation.
- Failure to adequately involve women ignores the important role that women play in agricultural marketing (*ibid.*) and many aspects of on-farm agricultural processing.
- The emphasis on working with private sector corporations shifted principal benefits away from small-holding farmers.

Summary of Section II

Landscape-level land management projects have been initiated in Haiti since the middle of the last century. The 15 projects summarized here are not exhaustive, but are nevertheless instructive. While few projects have resulted in permanent landscape improvements, several important trends can be parsed from these brief summaries, and are discussed subsequently.

24 The CRDDs will be used in a new landscape-level development project, with oversight by Chemonics/Haiti and a research component housed in the University of Florida.

SECTION III:
Changes to Models of Landscape-level Land Management in Haiti, Lessons Learned, and Conclusions

Changes to Models of Landscape-level Land Management in Haiti

The overarching conceptual model of landscape-level land management has the most direct effect on project policies, and by extension virtually all other aspects of consideration related to the management of a given area. Historically, landcape-level land management in Haiti has emphasized either the conservation of ecological resources or the improvement of economic conditions of project beneficiaries—*protective* versus *productive* approaches to land use. To an increasing degree, projects have shifted over time to emphasize both protective and productive approaches.

Early efforts at landscape-level land management in Haiti took an ecological restorative approach to the landscape, focusing on the implementation of large-scale soil conservation structures (rock walls, contours, terracing, tree planting) or irrigation systems and dams (Murray 1978, 1978b, 1979, 1980). Ecologically restorative projects were designed primarily by engineers and implemented on both private and public land, largely without the input or involvement of the Haitian peasantry. These approaches led to rural Haitians' widespread distrust of landscape-level projects, viewing them as government mechanisms to control or sequester privately-owned lands (Murray 1978, 1978b, 1979, 1980).

As Section II demonstrated, there has been a leveling of differences between the original ecological life zones of Haiti, which have historically guided the logic behind many of the ecological approaches to landscape-level land management. The increasingly uniform nature of ecological zones in Haiti is in part a result of the removal of original plant and tree species, the loss of original topsoil, and on-going climatic drying. The rapid encroachment of *Prosopis juliflora* and other exotic tree and shrub species that currently cover much of the surface of Haiti is testament to this trend (see Churches et al. 2014; White et al. 2013). These phenomena suggest that ecological preservation or conservation approaches to landscape-level land management are increasingly less important in the interim.

What appears to be the single most important element for improving livelihoods and agricultural productivity in Haiti is the absence or presence of soil moisture. The presence of moisture presents opportunities for ecological restorative efforts and agricultural production. The absence of moisture presents opportunities for ecologically restorative efforts with an aim to regain and retain soil moisture. Acknowledgement of this reality has led to a shift in landscape-level land management projects in Haiti over time, toward the management of watersheds as targeted units of intervention.

A dual emphasis on human and ecological well-being is a logical approach, considering that these factors mutually influence each other; the local environment determines to some extent the suite of livelihood possibilities available to local residents, and the on-going pursuit of differential livelihood activities has a bearing on many aspects of the local environment. Said differently, many Haitians make their homes within watersheds, making them both extractors and stewards of natural resources.

A shift in landscape-level land management policies, to incentivize local participation, initially occurred in Haiti around the 1970s, principally through food-for-work schemes or low-income, labor-intensive, temporary employment positions. Increased local participation has occurred only gradually, despite the availability of research that demonstrated that projects are better able to meet their objectives when the project beneficiaries are involved at all levels of project planning and implementation (White 1992; White and Runge 1995; White and Jickling 1995).

Despite a gradual shift from purely ecological projects to projects that address not only the needs of beneficiaries but include them in all levels of planning and identification, two common approaches to watershed management persevere in Haiti. Pierce (1988), building on the Secretariat Technique á l'Aménagemen des Bassins Versants' (STABV) review of over 100

FIGURE 9. Differing Approaches to Watershed Management.

Policy	Approach A	Approach B
Watershed coverage	100%	Parcel by parcel
Conservation measure	Structural: contour canals, rock walls	Vegetative: grass strips, hedgerows
Motivation	Direct payment	Extension, credit, demonstration plots
Sustainability	Low: work stops when project end	High: work continues
Cost per hectare	High	Low
Results	Achieved quickly	Achieved slowly
Spill-over effects	Low or nonexistent	High
Receptivity to problems by project staff	Downplayed: seen as inpediments	Explored: seen as clues to solutions
Agricultural inputs	Provided free	Provided at cost
Relation to existing farming systems	Superimposed upon existing practices	Integrated with farming practices
Measurement indicators	No. of hectares treated or linear meters installed	No. of farmers involved and plots treated

(reproduced from Pierce 1988: 12)

watershed management projects, first noted these two common approaches to watershed management in Haiti: (1) 'watershed-level models'; and (2) 'plot-based models'. Since both models are frequently employed within watersheds for similar reasons, the title of the former is a true misnomer. Watershed-level models simply target all land in a watershed in a uniform manner, where plot-based models target willing participants in a tailored and adaptive manner. Pierce's table of models and policies (Pierce 1988: 12) is reproduced in its entirety above (see Figure 9).

White (1992) made a similar distinction as Pierce (1988) in his review of the literature, noting that previous watershed management projects can be dichotomized between "equipment du territoire" approaches versus an "agricultural parcel" approach (Smolikowski 1989, as cited by White 1992, p. 6). White noted that the "equipment du territoire" approach was "characterized by large-scale prescriptions for contiguous land treatments, large ravine treatments, mechanical rather than biological structures, and monetary and commodity incentives to attract peasant participation," and that such projects have been widely criticized by development practitioners for a lack of adoption or project continuity (Lilin and Koohafkan 1987; and Lilin 1986; as referenced by White 1992, p. 6).

According to White (1992: 6), in contrast to the "equipment du territoire" approach, the "agricultural parcel" approach proceeded from the logic that:

(1) farmer remuneration was not necessary for technique adoption and even acted against technique maintenance and diffusion;

(2) a number of low input, indigenous, anti-erosion techniques existed which could be improved; and

(3) peasants have a natural incentive to conserve soil in order to increase agricultural production (White 1992: 6).

White noted that this new 'agricultural parcel' approach has been increasingly adopted in Haiti since the 1980s:

> This new approach has proven widely successful as numerous famers have voluntarily adopted and maintained soil conservation measures. The approach embodies a farmer rather than an engineering perspective of soil erosion, and views watersheds as primarily a set of agricultural parcels rather than as one contiguous physical unit. Projects which use the 'agricultural parcel' approach generally employ classical agricultural development strategies: training and hiring field extension agents; integrating basic agricultural themes into resource conservation dominated extension programs; and conducting basic, adaptive agricultural research. Such projects also tend to include or be associated with programs in community development or public health and have often carried the title of 'integrated' watershed management projects (White 1992: 6).

The 2007 Environmental Vulnerability Report also outlined several different models of landscape-level management projects attempted in Haiti, and varied policies that crosscut some of these models[25]. It is important to note that many of the so-called 'models' noted by Smucker et al. (2007) are actually strategies—or as Pierce rightly calls them, 'policies' (Pierce 1988). What Pierce (1988) called 'Approach A' is essentially what White referred to as the "equipment du territoire" approach (White 1992), and what Smucker et al. referred to as 'Watershed-Based Strategies' (Smucker et al. 2007). Likewise, Pierce's 'Approach B' is synonymous with White's 'agricultural parcel' approach, and with the 'Plot-Based Model' from Smucker et al. (2007).

Recognizing that all three of these meta-analyses (Pierce 1988; White 1992; and Smucker et al. 2007) distinguish between two principal model types, despite several different policy approaches, allows us to elucidate the basic parameters of these approaches—which subsequently provides a framework for evaluating how these approaches compare to the stated goals and objectives of the Haitian government.

'Micro-level' or 'Plot-based' Models

Plot-based models acknowledge Haitian farmers' long-standing resistance to adopting new agricultural innovations (Erasmus 1952). Rural Haitians know well that the systems they have developed over time are reliable, while engaging in new practices may expose them to less predictable vulnerabilities. Plot-based interventions also acknowledge Haitian farmers' diverse holdings of multiple plots of different types of land throughout rural areas, and emphasize an adaptive approach that recognizes differences in land plot size, plot-use history, slope, aspect, soil quality, available moisture, spatial proximity to water or roads, and other important factors.

No single strategy of inputs or approaches is considered paramount in plot-based approaches, but rather a suite of options are available to community groups through agricultural extension offices. This process reflects the variability in socioeconomic conditions of project beneficiaries and an equal variability in ecological and spatial plot conditions, both within single watersheds and between different watersheds.

Plot-based models have typically funneled donor support through a hierarchical structure with several large, nationwide NGOs implementing program policies through a vast network of projects implemented through local NGOs and community groups (AOP, AFII, ASSET, PLUS, DRIPP, TWMP, HAP). Extension agents in plot-based models tend to be recruited hired, trained, and employed locally rather than bringing on strangers from disparate areas of the country.

25 Several of these Smucker et al. policies-models are reproduced in APPENDIX A of this report. For example, the 'market based model' (Smucker et al. 2007) is easily incorporated as a policy strategy in either of Pierce's two models (see Figure 9 below).

'Macro-level' or Entire Watershed Models

The macro-level management models tend to focus more on ecosystem restoration of entire watersheds, working with wealthier landowners that have large plots of land, boosting agricultural productivity with a sight toward export crops, forming partnerships with the private sector, and addressing infrastructure related to value-chain and export processes (ODVA, ODN, FPPTP, DEED, WINNER). Macro-level models have sometimes relied on scaling up from plot-based strategies, which has been met with highly variable success. More often, the macro-level models have applied a 'one-size-fits-all' approach, which does not reflect high levels of internal heterogeneity in society, markets, ecology, landscapes, and watersheds. A common response to this heterogeneity by implementers of macro-level approaches has been a laundry list of project objectives that stress breadth over depth (Delatour et al. 1984). The embracing of such ambitious goals has often diluted the efforts of project personnel and budgets, and beneficial results for project participants (*ibid*.).

Haitian Government Models

In 2009, the Ministries of Agriculture (MARNDR) and Environment (MdE) were invited by USAID to participate in a policy forum and to present their current positions on watershed management in Haiti (Bush and Sildor 2009). In common, the ministries agreed on the following approaches (reproduced from Bush and Sildor 2009: 8):

- Both ministries support a participatory approach in which the local communities and other civil society actors play an important role prioritizing actions and in decision-making;
- Both ministries support the principle of decision-making at the lowest practical level[26]—although details are lacking about what this may mean in practice;
- The concept of a Local Management Committee (CGL) is accepted by both ministries;
- Both ministries accept the leadership role of the Mayors, *Asecs* and *Casecs* in organizing the CGL;
- Both the MARNDR and the MdE have acknowledged the importance of economic factors that influence the choice of agricultural practice and technologies by local communities and individual planters;
- The explicit recognition of an ecological approach, (e.g., a "ridge to reef" concept) is supported by both ministries—a concept consistent with the watershed delimitation model[27]; and
- Both ministries agree that coordination with the Government's Civil Protection agency is essential (reproduced from Bush and Sildor 2009: 8).

But both Ministries also differed in their approaches to watershed management, in notable ways. The principal differences in approach between the two ministries included (reproduced from Bush and Sildor 2009: 33):

- The different weight assigned to the importance of conservation, production, and protection;
- Different models of geospatial intervention: the MARNDR and DEED favor a hydrographic delimitation (i.e. the watershed) while the MdE favors an ecosystem approach in which the geographic zone would be determined by an assessment and analysis of the ecosystems present in the zone[28]; and

26 Supporting decision-making at the lowest level is illustrative of plot-based approaches to watershed management.

27 This recognition should not necessarily be interpreted as support for what we have termed 'ecological' approaches (the earliest landscape management schemes enacted in Haiti), or support for a 'macro-level' model. In many ways, the name of the model reported above is a misnomer. The geographical perimeters of both macro- and plot-based models are delineated by the boundaries of a given watershed. The 'ecological approach' noted in the USAID report above appears to be simply an acknowledgment of varied ecosystems ("ridge to reef") within the delineation of watershed.

28 Again, these appear to be differences on ideas of appropriate delineation and not on the overall

- The different institutional arrangements for incorporating local management plans into larger scale planning tools: The MARNDR proposes that section level plans are integrated into Plans Communaux de gestion des ressources naturelles, which are then merged into a plan départemental de l'agriculture, while the MdE would like local planning to be integrated into the Schema Directeur d'Amenagement et de Gestion de l'Environnement (SDAGE)—a mechanism proposed in the 2006 MdE Décret (reproduced from Bush and Sildor 2009: 33).

Haitian Government Policies on Watershed Management

The specific policies guiding the overall approaches of the Ministries of the Environment and Agriculture also varied and contained areas of overlap, and are reproduced in APPENDIX B (Bush and Sildor 2009: 30-32).

Since the approaches of ministries may be refined, adapted, or changed entirely from time to time, particularly after the appointments inherent in presidential elections and the frequent replacing of ministers, the above set of principles should be used as a starting point to verify if and how Haitian Government policy approaches to watershed management have changed since 2009.

Lessons Learned

The following points represent the primary take-aways from case studies covering eight decades of landscape-level and watershed-level land management projects in Haiti, drawing in particular from the summative reviews of Delatour et al. (1984), Pierce (1988), White (1992), Smucker et al. (2007), and from numerous other documents consulted in the writing of this report.

Issues of Appropriate Administrative Oversight and Perimeters of Project Delineation

- Nearly all watershed management projects in Haiti wrestle with the fact that rivers and their tributaries do not adhere to either the political boundaries of Haiti's departments or subsequent administrative units, or to the distribution of ecological zones in the country (Delatour et al. 1984).
- The differences between ecological zones have been greatly diminished in many parts of Haiti (Ehrlich 1985), adding doubt to models that delineate watersheds and policies based exclusively on ecological life zones.

Ecological (*protective*) versus Social (*productive*) Approaches

- Strictly ecological approaches to landscape and watershed management in Haiti have largely been unsuccessful: they were met with skepticism on the part of beneficiaries, suffered low adoption rates, and have rarely resulting in lasting change of landscapes or behaviors.
- Social approaches have demonstrated higher rates of project participation, adoption, ownership, success, and project continuation (White 1992; White and Runge 1995; White and Jickling 1995; Smucker et al. 2005; Smucker et al. 2007).
- Ecological and social approaches should not be mistakenly considered as mutually exclusive, despite the historical tendency to do so; both work better as complimentary policies tied to economic incentives (Murray and Bannister 2004).
- The diachronic trend appears to be toward recognition of the mutual compatibility of ecological and social approaches to landscape and watershed management.

approach. Neither ministry is supporting what we have termed 'ecological' approaches in the sense of the large-scale preservation or conservation efforts that marked the earliest landscape-level land management projects in Haiti. Nor has either ministry advocated for an entire watershed strategy (macro) or a plot-based strategy (micro). Their differences appear to regard the perimeter of delineation, not model or approach.

Participatory Approaches versus Command-and-Control Approaches

- The historical command-and-control approaches to landscape-level land management, including watershed management, have been met with skepticism and suspicion on the part of target project beneficiaries. In these cases, levels of participation tend to be low, and impact has been questionable. Based on the review of the literature, command-and-control approaches have frequently been the model of ecological models of landscape-level and watershed management.
- Participatory approaches to landscape-level management appear to be crucial for sustainable project impact. Since local farmers occupy watersheds and are the direct project beneficiaries, their inclusion in all aspects of project identification, management, and implementation has proven crucial to project success (White 1992; White and Runge 1995; White and Jickling 1995; Smucker et al. 2005; Smucker et al. 2007).
- Successful project approaches included multiple stakeholders, such as members of local government and local governing groups, community groups, church groups, and other solidarity structures (Smucker et al. 2007). Frequently unsuccessful project approaches viewed participation as simply the contribution of land or labor.
- Participatory approaches allow beneficiaries to identify desired improvements and improved technologies.
- Participatory approaches, with higher levels of local investment and ownership, are likely to see higher levels of continuity after the end of project timeframes.

Macro-level Approaches versus Plot-based Approaches

- Many of the above approaches (participatory vs. command-and-control; ecological vs. social; protective vs. productive) have neatly collated together in projects enacted in Haiti. In this report and elsewhere, these varied approaches have been conceptualized into larger models that we have referred to as 'macro-level' and 'plot-based' approaches. The principal differences between macro-level approaches and plot-based approaches include:
  - ✧ Plot-based approaches tend to account for the inter- and intra-heterogeneity of land-holdings, ecological zones, society, markets, roads, etc., of watersheds;
  - ✧ Plot-based models rely on prior and ongoing research to assess and address these levels of heterogeneity;
  - ✧ Plot-based approaches adapt policies in an iterative, farmer-driven process;
  - ✧ Plot-based approaches necessarily involve local participation at all stages of project identification, implementation, and ownership;
  - ✧ Plot-based approaches rarely achieve 100% project coverage within a given watershed; and
  - ✧ Plot-based approaches have proved the most-successful in terms of project adoption by beneficiaries and continuity after the end of the project cycle.

In contrast:

- Macro-level approaches tend to target entire watersheds, but still frequently fail to achieve 100% coverage;
- Macro-level approaches tend to come with *a priori* assumptions and solutions developed by 'experts', which frequently rely on a complete restructuring of local agricultural or land management practices, rather than building on existing structures. Improved technologies are also often promoted without considering beneficiaries input on the value or applicability of these improved technologies. These trends often result in less-than-enthusiastic participation or in resistance to project participation.
- 'Participation' from the perspective of macro-model project implementers is frequently

viewed as beneficiaries initial adoption of technologies or practices, and the occasional contribution of time or labor.

- One of major reasons for the failure of macro-level landscape management projects in Haiti has been the adoption of a longlist of project objectives meant to address the complexities of integrated landscape-level land management—an emphasis on breadth over depth, but an emphasis applied indiscriminatingly across all lands and inhabitants within a watershed.
- The attempt to implement wide-ranging objectives through a top-down manner frequently results in project funds and personnel stretched thin, with few project objectives ever fully realized.

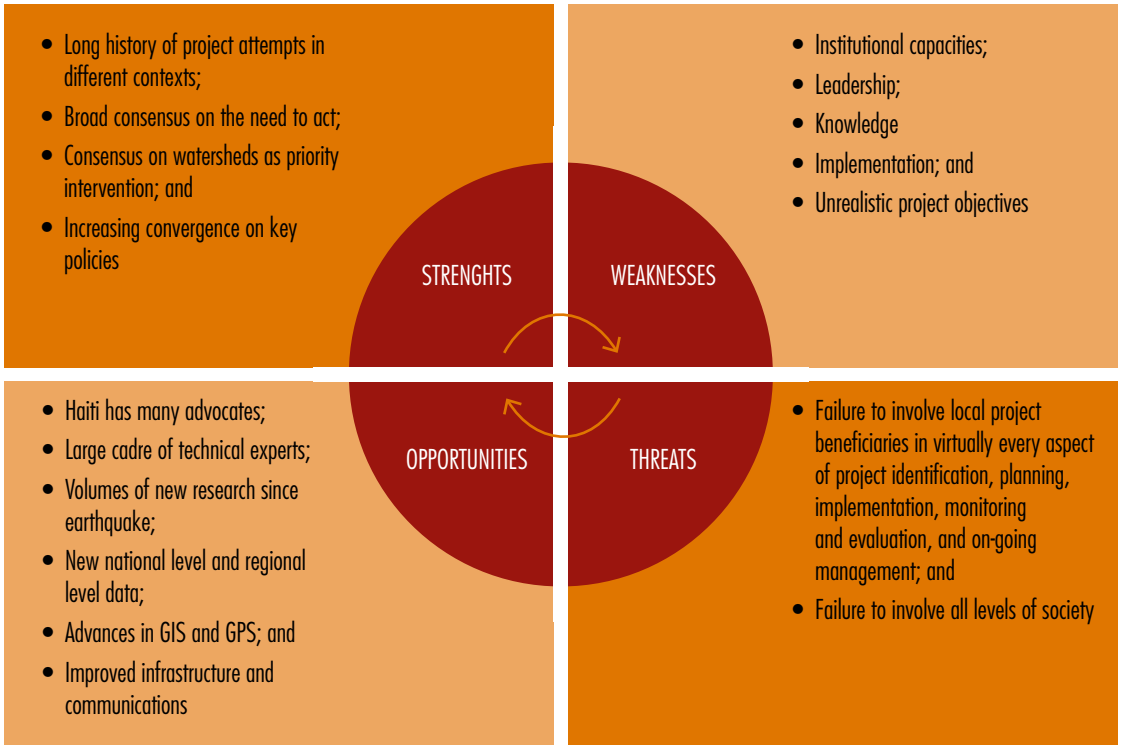
Despite real differences in our bifurcated model outlining the two primary approaches to landscape-level land management in Haiti, we recognize that there are valuable aspects to both models. Effective landscape-level land management in Haiti should draw on the lessons learned from the 15 case studies in designing new models of governance that incorporate the most effective strategies and policies from both models.

Land Inheritance, Land Tenure, and Land Security

- Haitian systems of land inheritance, land tenure, and land security are generally not a constraint to participation in plot-based models of landscape-level land management projects focused on mixed social and ecological approaches. This is because such approaches reflect the reality of these issues in Haiti:
  - ✧ Most farm families in Haiti own or have access to multiple plots of land;
  - ✧ Most arable land is divided equally each generation between all sibling inheritors, male and female;
  - ✧ Plot sizes of arable land are small: the average size of land plots in Haiti is 1.4 hectares;
  - ✧ Land held collectively by kin groups tends to remain consolidated and is therefore found in larger holdings;
  - ✧ Land collectively held by kin tends to be of lower quality, is frequently situated on steep slopes, poor soils, and usually has low to no arable potential;
  - ✧ Arable land-holdings are discontinuous across the landscape;
  - ✧ Haitians employ two parallel and complementary systems of land tenure (one formal and one informal);
  - ✧ Land tenure in Haiti is complex, but functional;
  - ✧ Land tenure in rural Haiti is internally secure; and
  - ✧ The issue of land security in Haiti deserves careful consideration in any landscape-level land management program (see the Péligre dam case study in this report).
- 'Macro' level approaches that address strictly ecological improvements to landscapes may be able to enact some of their goals on agriculturally unproductive land, which frequently correlates to large plots of land held collectively by kin groups, or government-held land.

While no two watershed or landscape-level land management approaches enacted in Haiti have been identical, these insights crosscut the experiences from nearly all previous projects, and can serve as generalizable lessons learned from the fifteen case studies briefly presented in this report.

FIGURE 10. Strengths, Weaknesses, Opportunities, and Threats (SWOT) Gap Analysis.



Conclusion

The fact that few landscapes and fewer watersheds in Haiti are now under efficient management, despite decades of previous efforts, suggests that researchers, practitioners, development agencies, donors, the Haitian government, and project beneficiaries have much to learn from the past. Learning from the past avoids duplication, saves time and resources and also promotes the best interests of project beneficiaries.

The choice to open this report with a focus on the history and the contemporary state of the environment of rural Haiti was strategic. Understanding how the current ecological state of rural Haiti has developed is paramount to understanding early landscape-level land management approaches. Furthermore, as the landscape of Haiti has changed dramatically since these early attempts, a grasp of the current state of the environment in Haiti is necessary for refining older policies and developing new policies that reflect these changes.

The review of the current state of Haiti's environment reveal a paradoxical phenomenon: 1/3rd of the country is covered by patches of trees, while 3/4th of the country is covered by a mixture of trees, woody shrubs, and vegetation. The immediate effect of this arboreal and vegetative cover in Haiti is beyond the scope of this report, but is treated elsewhere (Tarter 2015b).

Knowing how previous landscape-level land management and watershed management projects enacted in Haiti have historically succeeded or failed, is important in the process of learning from the past. Knowing how to proceed for the success of future projects with similar aims is equally crucial. We conclude with a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis based on the insights

highlighted in this report. It is our hope that the suggestions offered here can serve as a preliminary guide in the formation of future landscape-level land management projects designed for Haitian beneficiaries. Figure 10 presents a diagram of the pertinent insights offered in the concluding analysis, and highlights an underlying assumption of our conclusion: strengths can be applied to address weaknesses; and threats represent opportunities to be addressed.

Strengths

There is widespread agreement among all stakeholders and beneficiaries of landscape-level land management in Haiti: the rural countryside continues to suffer ecological degradation. This degradation has detrimental consequences for the largely agrarian population of Haiti and watershed approaches to landscape-level land management are crucial to maintaining and strengthening the agrarian base of the country. The consensus on the pertinence of the issues of landscape-level land management facing rural residents of Haiti is well-established.

One of the strongest assets available to inform and improve future landscape management in Haiti rests on the long history of varied program approaches. These approaches have been enacted in various parts of the country, at differential scales, with notably different approaches, and varied levels of success.

At the broadest level it appears that some progress is being made: approaches have moved along a slow but iterative trajectory that has increasingly converged on the consensus of several of the key points mentioned in this report.

Weaknesses

Despite enthusiasm across stakeholders for the implementation of effective landscape management in Haiti, several weaknesses must be acknowledged. Failure to acknowledge such weaknesses risks the addition of another failed project to a long list extending from at least the middle of the 20th century. And while failed projects represent a loss of donor funds, they most-importantly represent a dangerous meddling in the lives of project beneficiaries living at the margins of ecological and human vulnerabilities.

Conceptually, the historical and contemporaneous impediments to landscape level management can be categorized as the result of weaknesses inherent in: (1) institutional capacities; (2) leadership; (3) knowledge; (4) implementation; and (5) unrealistic project objectives.

Institutional Capacities

Weaknesses of institutional capacity are global, human phenomena, not unique to Haiti or to the Haitian government. Historically, the Haitian government has suffered from low-to-non-existent budgetary support, under- or unpaid employees, non-merit based position appointments, a lack of access to technologies and tools that aid in effective governance, and allegations and cases of widespread internal corruption. The most immediate and visible result of these historical trends has been the modification of the *modus operandi* of many institutions, to bypass the government entirely and work through nongovernmental organizations (NGOs) or other nongovernment channels.

Yet, institutional capacity, particularly organization continuity, has also been weak in many of the development partners at work in Haiti, regardless of their choice to work within or outside of the Haitian government. Like governments, many institutions suffer from periodic turnover and the refinement or shift of priorities affiliated with election cycles, the state of the economy, or changes in public opinion. In short, there is a lack of institutional memory analogous to the brain drain phenomenon, illustrated in some measure by the Haitian diaspora abroad.

Leadership

An historical paucity of landscape-level land management champions is reflected in all levels of project management and implementation. At the highest levels, the institutional turnover

touched on above effectively eliminates any possibilities for sustained leadership.

As the 15 case studies illustrated, many projects fail to include project beneficiaries in a meaningful way, beyond symbolic food-for-work programs, or the temporary contribution of labor or land. The result has been a low level of project adoption by participants, both on short and long-term horizons. This trend is at times exacerbated by underlying currents within Haitian society, which may favor the retention of power in the hands of local elites or wealthy families, rather than placing local beneficiaries in positions of leadership.

Knowledge

Another major impediment to effective landscape management in Haiti can be described by reference to the image of high-quality research collecting dust in the vaults of various public and private institutions. This phenomenon is partly due to the inaccessible nature of many early reports that were produced in non-electronic format, and partly attributable to poorly planned projects.

A second weakness concerns the repeated citing of outdated secondary sources. To illustrate, it is commonly reported that Haiti has 30 major watersheds; in fact, Haiti has over 160 major watersheds, which were pragmatically grouped in the early 1970s into 30 geographical areas. The continued citation of this aggregation has resulted in widespread misinformation about this most-basic fact related to hydrology in Haiti. Regrettably, this tendency for outdated and questionable data to be cited into commonly accepted truth is not the exception to the rule.

Implementation

Development project timeframes are frequently tied to donors' funding cycles, which can result in a well-documented pressure to rush projects or burn through budgets before the end of a given donor's grant period or the close of an institution's fiscal year. There is an underlying sense of urgency in regard to development in Haiti, perhaps fueled by doomsday narratives that may be effective in soliciting project donor support, but less-frequently reflect realities on the ground.

In a similar vein, funding partners frequently operate on short timeframes that are unrealistic to the nature and needs of project timelines. Shifts in governance, policies, and markets in countries that supply the coffers of many funding institutions may have an immediate effect on the continuity of projects, regardless of the stage of implementation.

Finally, a lack of involvement of local project beneficiaries at all levels of problem identification, formation, oversight, and virtually all other aspects of effective project implementation has had a negative effect on both adoption rates and long-term project continuity.

Unrealistic Project Objectives

A regrettably common phenomenon in the development landscape of Haiti concerns the embracing of unrealistic project objectives that appear to support overarching project goals. This flaw can be understood as an attempt to address problem complexity by explicitly acknowledging the interconnectedness of various domains related to the problem. However, history has demonstrated that a laundry list of noble objectives designed to support overarching project goals frequently results in institutional lethargia or paralysis, as material and human resources are diffused and stretched thin. Acknowledgement of complexity is important, but attempts to envision a single project as the save-all solution to problems that span multiple domains has met with overall failed results.

Opportunities

There are several tangible opportunities at this juncture in history, which suggest effective landscape-level land management in Haiti is within reach. The earthquake of 2010 thrust Haiti into the media and international consciousness and attracted the attention of many genuinely concerned and well-intentioned individuals and institutes; Haiti has a new cohort of advocates.

Many researchers with expertise in different knowledge domains and from experiences in other areas of the world threw themselves into research and development in Haiti, bringing a level of expertise in research design that was sorely missing for many decades. The result has been the subsequent production of voluminous amounts of up-to-date and more-reliable data and analyses on various systems and challenges in Haiti. The advent and improvement of remote sensing technologies has given shape to some of the most robust regional and nation-level data and analyses available for Haiti. Increased availability of communication technologies have improved the sharing of information on a level unprecedented in Haiti, permitting a more thorough understanding of processes at play on a national level.

The improvement of communication technologies in Haiti has also allowed the increased involvement of the Haitian diaspora abroad. The Haitian diaspora injects the largest and most-direct lifeline of financial support directly to hundreds of thousands of families in the rural countryside of Haiti. The realization of this new reality presents a myriad of opportunities for working with the Haitian diaspora to leverage other opportunities in rural Haiti, which may help improve the management or mitigate the further degradation of fragile watersheds, or other landscape-level land management approaches

Threats

Perhaps the largest threat to effective landscape management in rural Haiti is the failure to properly involve local project beneficiaries. As the case studies and meta-analyses illustrate, too often project involvement has been purchased or incentivized in ways that do not translate into long-term project adoption. True improvement of landscapes and livelihoods requires a level of project adoption that is genuine and based on incentives that will remain long after the last development professional packs up and leaves Haiti. Such a level of project investment and ownership is only possible through the involvement of local project beneficiaries in virtually every aspect of project identification, planning, implementation, monitoring and evaluation, and on-going management. Typically this has only transpired in Haiti when beneficiaries of all levels of society are active partners at all levels of the project.

Recommendations

The vast majority of this report has been descriptive. We turn now to offer 11 modest prescriptive recommendations for future planners, partners and participants in landscape-level land management projects in Haiti, borne out of the literature reviewed and the case studies examined herein. These recommendations are not exhaustive. If one central, implicit message of this report can be ventured, it is this: circumstances vary—such a message should likewise be understood in context of the 11 recommendations offered here:

1. Efforts at landscape-level land management in Haiti should strike an appropriate balance between: (a) natural resource conservation, management, and/or restoration; (b) improving and/or increasing agricultural productivity; and (c) improving the lives of project beneficiaries by increasing economic activities.
2. Striking the above balance suggests that project planners should target watersheds as the appropriate unit of landscape-level land management interventions at this time in Haitian history.
3. Project planners should closely examine and adopt policies from both the 'macro-level' and 'plot-level' models presented in this report, in the context of their specific project objectives and specific circumstances.
4. Planners should avoid unrealistic efforts to restructure or reform the land tenure system in use in rural Haiti, and instead develop mechanisms for understanding, engaging, and working within this existing system.
5. Project planners should take care to consider how every single project activity might affect land security—a potentially volatile issue with profound human rights implications.

6. Planners should ensure the incorporation and participation of actors, stakeholders, and beneficiaries from multiple levels and sectors of society, in processes of project identification, formation, and execution.
7. Planners should listen to project beneficiaries as a first step, rather than employing strictly command-and-control approaches based on *a priori* assumptions of appropriate technologies or behavioral changes suggested by outside experts.
8. Project planners should take the necessary time to align the nomenclature, goals, objectives, and visions of different actors, stakeholders, and beneficiaries to ensure the clarity and harmony necessary for shared communication, understanding, trust, and ultimately project success.
9. Ensuring local and national government participation in watershed management in Haiti requires methods for addressing the challenges inherent in the overlap between political boundaries and watershed delineations.
10. Planners should recognize that there is vast ecological and social heterogeneity across landscapes in Haiti, and work to produce policies that recognize these differences rather than promoting activities that attempt to minimize them.
11. Planners should recognize and work to mitigate the fact that effective landscape-level land management projects typically require longer than the 5-year cycles that typically characterize donor contributions and project timelines.

Readers are encouraged to consult the bibliography below for further reading on the descriptions and prescriptions offered in this report.

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SECTION V:
Appendices

APPENDIX A: Challenges to this Literature Review

The literature on landscape management in Haiti is voluminous, and a thorough undertaking of all literature was not possible.

Development reports are frequently influenced by the mandates of the producing institution. Many reports failed to adequately describe their research design and data sources, or acknowledge potential sources of bias in their methods and conclusions. In some cases reports are clearly driven by the implicit or explicit agendas of the institution or the individual researcher, and fail to note any project shortcomings or need for policy refinement. This trend is illustrated by the authors' review of several evaluations that praised projects widely acknowledged (in Haiti) to have failed.

A final related shortcoming of evaluating literature on development projects in Haiti concerns an historical lack of data, questions of data accuracy, issues of data accessibility for particular periods of time, and uneven topical and temporal coverage.[29] The unfortunate result of this phenomenon has been that many Haiti researchers must rely on dated or outdated sources. The issue is compounded when researchers cite secondary or tertiary sources. Figures provided in a 2010 report might derive from a secondary source published in the 1980s, which relied on partial or questionable data from the 1950s. An illustrative example of this tendency can be found in the case of the 1972 OAS report that aggregated 100+ watersheds in Haiti into 30 pragmatically organized zones. This report has since been cited to the point where many researchers suggest that there are only 30 major watersheds in Haiti.

Stated more succinctly, the available literature on landscape management projects in Haiti varies not only qualitatively, but also in quality and objectivity. The solutions to these challenges are beyond the scope of this report, but point to the necessity of independent, objective project analyses, based on field-site visits and off-the-record interviews with project personnel and project beneficiaries.

29 While certain historical periods (eg. The period surrounding the 2010 earthquake) are replete with literature, other periods (eg. The period surrounding the Duvalier presidencies) are marked a significant decline in published research.

APPENDIX B: Landscape Level Management Schemes in Haiti

(Reproduced from Smucker et al. 2007: 18-22):

Landscape Engineering

From the 1950s to the 1970s there were bilateral projects with the Government of Haiti using an approach commonly described as "équipement du territoire," a landscape engineering strategy. These projects were done on both private and public lands using a top-down management approach to cover large, contiguous areas with conservation structures. Soil conservation was considered to be a strictly technical problem to be solved by engineers installing mechanical structures, mainly rock walls and contour canals, using paid (cash or food for work) labor. Neither land tenure nor the interests of peasant landowners were taken into account.

In many cases this resulted in very expensive rock walls constructed on infertile, steep, and droughty garden plots. The cost of installing the structures was many times greater than the value of any added increment of crop yield due to these conservation effects. In general this model is noted for its unsustainability and its near total lack of upkeep of the structures, most of which eventually disintegrated. This model should be discarded; although, there were some limited positive results derived from teaching farmers certain techniques or introducing tree species.

Civic Infrastructure and Job Creation

Job creation projects that became widespread during the middle 1990s share certain characteristics with the landscape-engineering model in that public works projects were accomplished with paid labor. Some of these

projects made a serious effort to respond to the specific needs and local characteristics of rural localities, for example, the rehabilitation and expansion of irrigation works operated by grassroots water user organizations outside of Mirebalais. Others merely served as a pretext to distribute salaries for political reasons and had no lasting results. In the future, job creation projects will be required as a needed element of watershed management, especially for infrastructure repair and treatment of water courses, but such efforts must fit within an overall strategy so that resources are used efficiently.

Plot-Based Models

Beginning in the 1980s, donors funded agricultural extension projects through grants and cooperative agreements directly with NGOs. They specifically sought a greater understanding of peasant farming systems and tried to design field approaches accordingly. Programs emerged which engaged in tree planting and many other types of soil conservation techniques beyond the rock and canal structures favored previously. Fund management was often done by a large international NGO acting as an umbrella agency, receiving funds from the donor and in turn administering smaller agreements with local NGOs or farmer groups of various sizes and strengths.

Some projects concentrated their activities in smaller regions while others spread out over larger areas. The basic unit of work within the NGO or community-based farmer organization (CBO) was the farmer work group, and project interventions were offered from a basic list of contour and gully soil conservation practices, tree planting, crop seed improvement, fruit tree grafting, marketing, and institutional strengthening activities. Extension agents were selected by the contracting groups from within their own members; these were trained by project technicians and acted as liaisons between project staff and participating farmers.

These projects were not designed to cover whole watersheds. Farmers did not treat all of their plots, which varied in their slope, distance from the residence, security of access, soil fertility, contribution to household economy, and other factors. The principal reason farmers chose not to treat all plots was undoubtedly the high threshold costs for doing so. Treating degraded hillside slopes "correctly" was beyond the means of most farm families. Significant landscape-level changes did occur in some regions due to plot-based project interventions, and three such case studies are presented later in this chapter. This was an interesting period because new technical approaches and new partnerships between technicians and farmers were developed, and the implementing agencies attained greater understanding of peasant farming systems. Nevertheless, the plot-based model, although useful, was not designed to solve the fundamental problems of watershed protection.

Watershed-Based Strategies

The stated focus of these projects is the watershed, or more realistically, a portion of a watershed. This focus defines the geographic limits and the intended type of outcomes, which are primarily environmental and intended to benefit the broader society by reducing the damage to infrastructure. Paradoxically, design of watershed projects is often based on lessons drawn from plot-based projects where the objectives are mainly concerned with increasing agricultural income rather than producing environmental benefits for downstream users. Resolving the differences between these contrasting objectives will be crucial to designing an effective watershed project. The technical approach and outreach, funding and benefit-flow mechanisms vary across projects.

Much debate has taken place in Haiti about watersheds, especially since the release of a report by Löwenstein (1984) on the deteriorating condition of the Macaya watershed; however, no satisfactory watershed-level solution has yet evolved, even though some interesting results

were obtained along the way. For example, the USAID-funded ASSET project…worked for three years in the Grise/Blanche watersheds and was designed to work at a landscape scale (Israel *et al.* 2001); however, the project did not have a major effect on flooding, sedimentation, or water supplies in the lower watershed. This was due largely to the project's limited scale of operation in the upper watershed.

In general, evaluation of watershed projects points to the importance of designing approaches that consider charcoal markets, animal markets, infrastructure, household water supply, and appropriate social structures. Most importantly, building local social capital needs to be taken to a new level when considering watershed-level interventions. It is imperative to consider off-farm externalities and build new social links that protect the interests of participating farmers whose long history of economic and social disadvantage has led to the creation of their present systems. These persistent systems will not readily be put at risk.

Market-Driven Models

This approach seeks to augment small farmer income by developing or improving marketing links for agricultural crops. The objective of the marketing strategy is to assist farmers to generate sufficient profits to cover their normal agricultural expenses plus the additional expenses required to invest in better germplasm and soil and water conservation. In other words, the intent of project designers is for marketing to drive improved natural resource management.

A market driven strategy was introduced in the Productive Land Use Systems project (PLUS) and then substantially expanded by the Hillside Agricultural Program (HAP) since 2001. The HAP project included natural resource management components in the early years, but specific NRM interventions were eliminated in 2003 due to funding cuts. HAP marketing activities have successfully created new opportunities for tree crops (coffee, mangos, and cacao) that have benefited farmers by boosting farmgate sale prices. This may have had a positive effect on the environment, but the project has not tracked the effect of marketing on NRM. Furthermore, HAP promotes improved marketing opportunities for a given crop regardless of where it is grown, so the effects are not concentrated nor do they consider whole farming systems and their impacts on the watershed. The narrow scope of marketing projects limits their ultimate effect on natural resource management. Nevertheless, marketing is a key consideration and must be central to future watershed projects (see "Tree Products and Trade" later in this chapter).

(Reproduced from Smucker et al. 2007: 18-22).

APPENDIX C: Watershed Management Principals of the Ministries of Environment and Agriculture

(Reproduced from Bush and Sildor 2009: 30-32):

Ministry of Environment

Principle 1: The objectives set for the management of natural resources and biodiversity are society's choice.

Principle 2: Management must be decentralized and conducted at the lowest possible level.

Principle 3: The managers of an ecosystem including a watershed must consider the effects (real or potential) of their activities on adjacent ecosystems or elsewhere.

Principle 4: Given the advantages of good management, it is important to understand the economic context of the ecosystem. All management programs should (a) reduce market distortions that have an negative impact on biodiversity; (b) align the incentives that favor the conservation and sustainable use of biodiversity; (c) internalize the external costs and benefits of ecosystem management.

Principle 5: The ecosystem approach should be applied only at the appropriate scale.
Principle 6: Given the time scales and the different phases that characterize ecological processes, the management of ecosystems should set long term objectives.
Principle 7: An ecosystem approach should determine the appropriate balance between conservation and use of biological diversity.
Principle 8: An ecosystem approach should consider all the available information—including scientific data, but also local knowledge and practices.
Principle 9: An ecosystem approach should include all social sectors and all the pertinent scientific disciplines (reproduced from Bush and Sildor 2009: 30-32).

Ministry of Agriculture

Principle 1: Intervention should be in the context of the municipality level Natural Resources Management plan established by the Conseil Municipal for setting priorities. The plan should address the technical and methodological criteria fixed by the MARNDR (before execution, all projects must go before the DDA for review, possible revisions, and a final decision made by the central office).
Principle 2: Supporting structures (NGO, private sector, government agencies) should aim to help the collectivités territoriales and agricultural associations appreciate the resources in their area and to identify actions to increase their value. After an assessment of physical, land-tenure, economic, and social factors an action plan will be prepared and implemented.
Principle 3: Through their representatives as members of collectivites territoriales and agricultural organizations, the local population will participate in all the steps involved: request for assistance; assessment of constraints, opportunities, and needs; seeking and participating in fund raising; deciding on priority actions (zoning, techniques, participating communities, calendar, etc.); financial management, monitoring and evaluation; making adjustments.
Principle 4: All actions must be the result of negotiation at each step among the users of the resources and the supporting partners. This negotiation should eventually give rise to management agreements.
Principle 5: The approach should be gradual: projects should improve the existing situation but without abrupt short term changes in social or environmental status quo. Priority should be given to supporting existing agricultural organizations. The techniques applied should be integrated technically, economically and socially into existing production systems. They should particularly take account of the characteristics of the zone, take advantage of local knowledge, be integrated into the agricultural calendar, be adapted to local materials and the local availability of labor.
Principle 6: The objectives and strategies of management plans should be aligned with the priorities of the users—which is most often the maximization of revenue. Management should aim at both conservation and production:

- Actions are not necessarily targeted at the most degraded areas; on the contrary, there should exist sufficient agricultural potential to allow investment costs to be recovered.
- Actions should be capable of becoming economically independent.
- For each agricultural product, the whole value chain should be strengthened (production, post harvest systems, processing, commercialization).
- Actions must be economically viable in the short term—especially if the community situation is precarious.

Principle 7: Emphasis should also be placed on non-farm income-generating activities (ecotourism, rehabilitation of access roads, stabilization of gullies, agri-processing, artisanal products) in order to reduce demographic pressures on natural resources.

Principle 8: Supporting measures must ensure the technical and organizational training of the communities.

Principle 9: Supporting agencies should assist the communities to manage the financial resources allocated to the project in order to help the communities develop their skills and competence in financial management. However, the level of funding should be aligned with the capacity of the communities to manage these funds.

Principle 10: It is a basic principle not to finance local unskilled labor for intermittent work on soil conservation (reproduced from Bush and Sildor 2009: 30-32).


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