Natural Resource Conservation in the Maribios Uplands of Nicaragua. III. Conceptual Framework for Incentives[1]

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ABSTRACT

Considerable work has been done on conservation incentives, but a simple, uniform decision-making criterion is still lacking. This paper develops a decision-making tool in the form of a three-part conceptual framework for establishing incentives for different type of farmers. Structural adjustment incentives (e.g., market pricing mechanisms), often needed by medium- and large-scale farmers, are not considered in this analysis. The three dimensions of the incentive problem are: types of farmers, conservation activities to be implemented, and the time frame and quantity of on-site net benefits generated by them. The framework helps to conceive and analyze the dimensions, and make a decision regarding incentives. A table containing the results for the three dimensions for each type of farmer is produced. The decisions on incentives to be offerred are based on estimates of the on-site net benefits generated by them. The conceptual framework was applied to the Maribios uplands of Nicaragua and incentives for their conservation were developed. The framework can be used for public lands as well as pastures, forested lands and protected areas.

Key words: Conservation incentives, decision making on incentives, incentives for upland development.

RESUMEN

Existe un considerable número de trabajos para incentivar la conservación. Sin embargo, no se dispone de un criterio uniforme analítico para la toma de decisiones. Este artículo desarrolla un marco conceptual tridimensional para establecer incentivos de acuerdo al tipo de agricultor. Las tres dimensiones del problema para la toma de decisiones en incentivos son: tipo de agricultor, actividades de conservación por implementar y beneficios que generan los incentivos aguas arriba. Ese marco permite analizar las dimensiones sobre las cuales se deciden los incentivos. El problema tridimensional se simplifica posteriormente en tablas bidimensionales para cada tipo de agricultor; en ellas se indica la decisión sobre los incentivos, que serán otorgados en cada hilera para cada tipo de agricultor y para cada actividad de conservación, con base en las estimaciones de los beneficios generados aguas arriba por actividades individuales o por varias de ellas. Este marco conceptual se aplicó a las condiciones de los Maribios de Nicaragua, y se desarrollaron los incentivos necesarios para la conservación de tierras altas. Puede utilizarse también para tierras públicas u de otro tipo, como pasturas, áreas forestales o protegidas.

INTRODUCTION

An analysis of land use, based on FAO (1989) land suitability classification methods as adapted by Sharma (1990) to the conditions of the Maribios volcanic range of Nicaragua, was made for two upland watersheds in Part I of this paper. Part II adapts known land use management, agro-forestry and other conservation techniques to the socio-economic reality and farmers' traditional practices for easier adoption. This paper develops a simple, systematic tool for decision makers to determine incentives to stimulate different groups of farmers to carry out activities related to natural resource conservation in the Maribios uplands (Sharma 1990).

Considerable work has been done on various types of incentives for conservation programs (de Camino 1985). Botero (1986) summarizes the topology of conservation incentives and gives guidelines for the introduction of conservation incentives in the uplands. However, a simple conceptual basis

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for determining the conservation incentives for different types of farmers and other land holders who have different land resources and socio-economic constraints is still lacking. Such a model is proposed here.

There are many strategies for creating participation in conservation measures (Botero 1986; Sharma 1992), including simplification of land use criteria and design of resource conservation technology to meet peoples' needs within their constraints, general political will, grassroots local organizations, a strong village-level extension organization, and training of farmers and extensionists. While the first two elements have been considered in Parts I and II of this paper, only conservation incentives are considered here. Structural adjustment incentives (market pricing mechanisms, export subsidies) are not considered.

Justification for incentives

Different types of benefits are generated by upland conservation activities (Gregersen *et al.* 1988). These are shown in Table 1, taken from Brooks and Gregersen (1966). These net benefits can also be classified over time as: immediate (within a year), short-term, medium-term, long-term, and a combination of all these. When a conservation activity results in immediate tangible net benefits, farmers do not usually need any incentives for adopting the activities, except in the form of demonstrations of technology or technical advice. However, for generating all other types of on-site net benefits, incentives for the farmers may be needed.

Almost all conservation activities by upland farmers have off-site (off-farm, downstream) tangible and/or non-tangible net benefits, which are received by the society or by the nation as a whole (Gregersen *et al.* 1988). It is because of these net benefits that incentives are justified on the principle of cost sharing among up-stream and down-stream beneficiaries. Thus, the use of public funds for conservation incentives or internalization of upland conservation costs into upland product prices are fully justified.

Criteria for incentives

Incentives should mainly be directed toward share croppers, small farmers, and generation of employment for landless laborers, as they represent subsis-

Table 1. Net benefits associated with watershed management projects and their location.

		Location of benefits	
		on-site (up-stream watershed)	**off-site (down-stream watershed)**
Types of benefits	Tangible (market)	I	I
	non-tangible (non-market)	III	IV

Quadrant I	Food crops, forage for livestock, animal products, fuelwood, plywood, lumber, other wood products, minerals, water, fisheries.
Quadrant II	Water for drinking, fisheries, irrigation, hydroelectric power generation, navigation, recreation municipal and industrial supplies, flood control benefits, sediment control for avoiding losses of reservoir benefits.
Quadrant III	Aesthetic values, wildlife habitat protection, health benefits of high quality water supplies, protection of aquatic ecosystems, landslide/mudslide control (minimization), preservation of biodiversity.
Quadrant IV	Protection of downstream riparian and aquatic ecosystem, high-quality water for recreation, aesthetic values.

Source: Brooks and Gregerson 1986

tence farmers in most developing countries and do not usually have financial resources for conservation. Medium-sized farmers may also need incentives for certain activities initially, e.g., forestry works, which produce delayed benefits. Large-scale farmers will rarely need or be attracted by incentives, as the value of incentives often is low compared to resources available to them, unless they are of the structural adjustment type (not considered in this article). However, technical advice is often an incentive for large-scale farmers.

As an strategy, direct incentives for a short period can quickly initiate participation in conservation measures (Sharma 1992). However, these direct incentives should, over the duration of a conservation project, result in a long-term rotative fund or similar mechanism which will guarantee availability of incentives even after a particular conservation project has terminated (Botero 1986). Farmers' organizations controlling rotating funds may be preferred, as social means of investment recovery can be more efficient than bureaucratic methods.

Incentives to the farmers should be given on the basis of: (1) their understanding of its purpose, (2) their request for incentives, (3) their need for them, and (4) activities related to those components of conservation technology which are normally not a part of day-to-day activities, i.e., which result in extra costs/labor or different cultural practices (Sharma 1990). Otherwise, the incentives may degenerate into compensation for work and result into termination of conservation activities once incentives are not available. The incentives can be direct or indirect (de Camino 1986). Examples of direct incentives are food for work, fully or partially subsidized labor costs for bottleneck activities, fully or partially subsidized or lent materials (forest and fruit tree seeds/plants, tools and equipment, materials for sealing cisterns and subsidized soil fertility tests for control of excessive fertilizer use). The subsidies should vary depending on the type of farmer (share croppers, landless laborers, small, medium, large). Examples of indirect incentives are guarantees of the effectiveness of a proposed conservation activity (e.g., against the loss of crop production due to fertilizer control and minimum tillage) (Sharma 1990).

A conceptual framework for decision making on incentives

A proposed conceptual framework is developed here as an aid to decision makers and planners who need simple, uniform, systematic criteria for offering conservation incentives (Sharma 1990). The main idea is analogous to the analytic framework of watershed management activities developed as an aid to land use planners by Hyfschmidt (1986) and Gibbs (1986). They conceptualized the watershed management process, system elements and activities in three dimensions. Decision-making on incentives can similarly be visualized. This decision-making problem is a complex one: How many incentives are needed, to whom, for what, and under which conditions? Incentives will be needed until a conservation activity is executed or starts paying for itself. Decisions on which incentives are needed depend on:

(1) Types of farmers or land holdings (if public land rehabilitation is also included, often the case in forestry).

(2) The recommended conservation activities normally not done by a farmer.

(3) The magnitude and time frame (immediate, short-term, medium-term, long-term or a combination) of on-site net benefits generated by a conservation activity stimulated by incentives.

This is depicted three-dimensionally in Fig. 1. Each cell of the cube represents a decision to be made on the kind of incentives needed for a given type of farmer based on certain types of on-site net benefits generated by a conservation activity. Hence, each cell in the cube can be called a decision cell. Fig. 1 is constructed only for activities recommended in the adapted technological package for the Maribios in Part II of this paper. However, similar figures can be constructed for other activities such as reforestation and forest management, protected areas, and pasture lands conservation. Public lands such as community, municipality or government lands are also included in Fig. 1, since the same rationale is valid for them.

Once the need for incentives is established, the decision on the types and numbers of incentives is based on the estimated net benefits generated to the farmer, the off-site (downstream) benefits generated (which justify the incentive), and estimated extra labor/costs expected from the farmer. On principle, the fewer the resources and longer the time frame for on-site benefits generated by a given activity, the

greater the need for farmer incentives. The number of incentives should be inversely proportional to the amount and time of on-site net benefits generated by a given conservation activity. Also, it should be directly proportional to the off-site benefits generated.

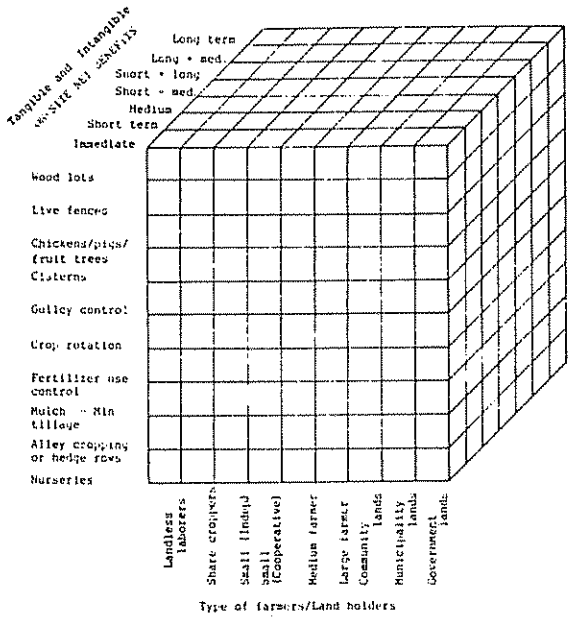

Fig. 1. Three dimensional conceptual framework for decision making on incentives for different type of farmers.

Application of the analytic framework for incentives

The conceptual analytic framework presented here is both a diagnostic as well as a planning tool. It disaggregates the incentive decision into the aforementioned three dimensions. By first conceptualizing appropriate decision cells of the cube in Fig. 1, the analysis can then be simplified into tabular form. The three dimensions are arranged in columns for each element of the first dimension (types of farmers) and the resulting decisions on the types and numbers of incentives needed are filled in for each row. Table 2 is an example of an analysis of each decision cell in Fig. 1, recommending the types and numbers of incentives to be offered for different types of farmers, and for different activities in the adapted conservation technology package not traditionally carried out a farmer in the Maribios of Nicaragua.

Similar tables can be constructed for pasture lands conservation, reforestation and forest management, or for activities related to protected area management. In the case of public lands (community, municipality and government), the same logic is used if they are to be rehabilitated and conserved through peoples' participation. Long-term leasing or ownership of these lands by redistribution for conserva-

Table 2. Specification of incentives to be given to different type of farmers for different conservation activities in the uplands of the Maribios, Nic.

Type of farmer	Recommended activities	Tangible and up-stream benefits to farmers	Incentives to be given
Land-less labors	-Gulley control -cisterns -nursery	Nil	Employment by food for work program or on payment
Share croppers	-Alley cropping or Hedge rows of pigeon pea -Min. tillage	-Short term (labor savings)	Guarantee of no loss in productivity
	Crop rotation	-Medium term	-Technical guidance only
	Fertilizer use control	-Short term (saving in costs)	-Free soil fertility tests -Guarantee of no loss in production
	-Cisterns	-Short + medium	-Free plastics, chicken wire mesh and cement for percolation control and free tools

(Cont. Table 2.)

	Chickens/pigs/fruits etc.	-Short + medium	-Free fruit tree plants for home gardens Initially free hydrid breeds of chickens and pigs etc
	-Gulley control	-Nil	-Employment by food for work or on payment
Small farmer (1.4-7 ha)	-Alley cropping or Hedge rows	-Short + medium	-Free seeds of *L. leucocephala* or free seedlings of *A mengium/ G sepium*
	-Min tillage	-Short + long	-Technical guidance only
	-Crop rotation	-Medium	-do-
	Fertilizer use control	-Short	-Free soil fertility tests
	-Gulley control	-Medium + long	-Free tools and plants -Subsidized labour by food for work
	-Cisterns	-Short + medium	-90% subsidized plastic, chicken wire mesh and cement for percolation control -Free tools
	Fruits/chickens/ pigs	-Short + medium term	-Initially free fruit plants and subsidized improved breeds of chickens/pigs etc
	-Live fence	-Medium	-Subsidized (90%) plants
	-Wood lots	-Medium	-Subsidized (90%) plants
Medium farmers (7-50 ha)	-Alley or hedge row cropping	-Short + medium	-Subsidized seeds/seedlings of trees initially
	-Min tillage	-Short + long	-Technical guidance only
	-Crop rotation	-Medium	-do-
	-Fertilizer use control	-Short	-Subsidized soil fertility test (initially only)
	-Gulley control	-Medium + long	-Loaned tools, subsidized plants and subsidized labor
	-Cistern	-Short + medium	-50% subsidized materials for percolation control and tools on load
	-Fruit/chickens/pigs	-Short + medium	-Fruit plants subsidized -Better breeds of animals to be loaned on actual price
	-Live fence	-Medium	-50% subsidized plants
	-Wood lots	-Medium	-do-
	-Pasture improvement	-Short + medium	-Free technical advise on soil fertility improvement by mixing leguminous crops Free technical advise on regeneration of bushes/trees -50% subsidized leguminous plants

tion-related sustainable production activities become important incentives to be considered in such cases.

A simple conceptual framework, as a uniform decision-making tool for determining incentives for upland conservation programs, is proposed here. This framework conceptualizes the incentive decision as a three-dimensional problem. The three dimensions are: the type of farmers/land holders, the types of conservation activities and the tangible or intangible on-site net benefits derived from the application of the adopted conservation technology. Based on these three dimensions, a uniform and systematic decision can be reached on the amount of incentives needed. The incentives should be justified by using on-site and especially off-site (downstream) benefits generated by the conservation activities of farmers. Activities which give immediate tangible benefits (within a year) are generally easily adopted by farmers and do not need any incentives, except for the demonstration of the effectiveness of the activity and/or free technical assistance. All other activities which generate short-, medium- or long-term benefits or a combination of these tangible or intangible benefits, may need incentives. As a rule of thumb, the number of incentives needed is inversely proportional to the timing and the quantity of on-site benefits. Also, incentives are usually directly proportional to the off-site benefits generated.

Based on this framework, incentives for various upland conservation activities have been proposed for the Maribios in Nicaragua. Incentives for conservation activities on public lands, pasture lands, reforestation, wild lands and protected areas, can also be similarly established using this conceptual analysis

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