

PL-ABZ-003



DESFIL

Development Strategies for Fragile Lands

**MONITORING AND EVALUATION SYSTEMS
USING A RELATIONAL NRM DATABASE**

A Discussion Paper

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ACRONYMS

AF	Agroforestry
ANRO	Agriculture and Natural Resources Office
API	Assessment of Program Impact
CBA	Cost-Benefit Analysis
CFA	Communaute Financiere Africaine
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CR	Communaute Rurale
DEFIL	Development Strategies for Fragile Lands Project
FAO	Food and Agriculture Organization
GIS	Geographic Information System
IARC	International Agricultural Research Center
ICRAF	International Center for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFAD	International Fund for Agricultural Development
IITA	International Institute for Tropical Agriculture
IMF	International Monetary Fund
KAP	Knowledge, Attitudes and Practices Survey
LOP	Life of Project
LUMP	Land-Use Management Practice
M&E	Monitoring and Evaluation
NGO	Nongovernmental Organization
NPA	Non-Project Assistance
NRM	Natural Resources Management
ORSTOM	Office de la Recherche Scientifique et Technique d'Outre-Mer
OTA	Office of Technology Assessment
PAM	Policy Analysis Matrix
POL/CDIE	Political/Center for Development Information and Evaluation
PRA	Participatory Rural Appraisal
PVO	Private Voluntary Organization
SFE	Soil Fertility Enhancement
SSA	Sub-Saharan Africa
SWC	Soil and Water Conservation
USAID	U.S. Agency for International Development

I. USE OF THE NRM ANALYTICAL FRAMEWORK TO IDENTIFY AND MONITOR INTERMEDIATE AND IMPACT INDICATORS

Participatory rural development that leads to the identification, development, and implementation of land use management practices that promote long-term increases in natural resources-based production systems is a key element necessary to achieve the goal and objectives of natural resources management (NRM) projects. For this reason, the projects can organize the community-based monitoring and evaluation (M&E) system according to the NRM Analytical Framework of the USAID Africa Bureau to:

- Track progress toward achieving the NRM project's goal and objectives. Both intermediate and impact indicators will need to be identified. Given the long-term nature of NRM interventions to achieve widespread impact from the NRM project, the project's intermediate indicators need to be plausibly linked to impact indicators;
- Increase knowledge about critical constraints to achieving the project's goal and objectives. The project's design is based on assumptions about cause-and-effect relationships between project outputs and impacts. These need to be challenged throughout the life of project (LOP) implementation and changed if the assumptions cannot be validated; and
- Increase program effectiveness in overcoming critical constraints. Even if the assumptions are valid about the critical constraints that need to be addressed, there are various programmatic options for each constraint. Consequently, feedback from the project should inform the project managers about the most effective options.

II. NRM DATABASE TO STORE, ORGANIZE, AND ANALYZE DATA TO DISCERN CAUSE-AND-EFFECT RELATIONSHIPS BETWEEN ENABLING CONDITIONS AND ADOPTION

In implementing this approach and using the NRM Analytical Framework, NRM projects should develop a relational, dynamic, and multidimensional database. This database is viewed as a repository of field data from which key information and lessons learned about land-use management practices are identified. The purpose of this database is threefold, which is to help:

- The NRM project to establish concise and effective intermediate and impact indicators for monitoring, evaluating, and reporting on performance/impacts of the USAID Mission's NRM program and projects, and for the API report;
- The host-country government at the national- and regional-level, nongovernmental organizations and private voluntary organizations, and other field practitioners to establish indicators for monitoring and evaluating the impact of their NRM interventions; and

- Research and extension, including USAID Mission staff and host-country government personnel, to further their analysis and design of NRM programs.

The relational database will include files and subfiles, which are organized according to the levels of the NRM Analytical Framework:

Illustrative Structure of a Relational NRM Database

File 1. Village profile (Level A)

Locator ID #: Census Bureau to the CR level
 Latitude/Longitude (degree/minute/second)
 Geo-referenced for GIS
 Village Name

Descriptions of biophysical conditions, infrastructure, ethnic groups, migration, and so forth.

File 2. Inventory of traditional and introduced practices (Level III)

Practice ID #: Practices coded and defined for standardization

File 3. Characteristics of users and nonusers of practices (Level III)

Household ID #: To track lessons learned as practices are adopted/adapted, abandoned, and so forth. Also to gather gender-disaggregated data relative to practices.

File 4. Impact on biophysical change (Level IV)

File 5. Impact on revenue/productivity (Level V)

File 6. Perceptions of enabling conditions (Level II)

File 7. Observed/measured socioeconomic incentives (Level II)

File 8/9. Cost/benefit analyses (Level II)

File 10. Policy implications/programmatic options (Level I)

For analytical as well as practical purposes, these main files can be broken down into smaller, more manageable ones. The database will be multidimensional, as it incorporates biophysical, technical, and socioeconomic variables. To establish a relational database, each file contains two common variables: village locator ID number and practice ID code number. Establishing a database on a yearly basis reflects the dynamics of users' adoption of

NRM practices, and will facilitate monitoring and evaluation over time. Linking files by practice is necessary to avoid ambiguity in the cause and effect relationships.

The structure of the database allows one to synthesize the available information in a format that links particular policy measures and incentives to the use of a NRM practice(s). The database also allows one to identify a policy and establish its eventual broad range impact on land use planning.

III. TEST ACTUAL VERSUS EXPECTED OUTCOMES

The NRM information management system would be used by the project to produce information over the life-of-project that would improve both monitoring and program effectiveness. The information gathered from a participatory approach at the rural community-level working with NRM project staff would be used during implementation of the project to continually identify/validate assumptions made during design of factors that influence land use management decisions. This work will help the project select the variables in the database to organize the data such that one can better infer critical cause-and-effect relationships. The most critical set of causal relationships concerns the factors that influence land use management decisions made by farmers, herders, and woodcutters in pursuit of better livelihoods.

For example, it appears that factors such as perception of secure tenure, access to markets, devolution of authority, access to credit, first-hand knowledge of an array of land use management practices, access to inputs, and timely access to technical assistance are among the factors (enabling conditions) that influence the adoption of practices that can increase productivity and/or reduce environmental degradation. But, are these the "necessary and sufficient" conditions? Are there more or are the above always necessary? Are some necessary for diffusion of short-term practices but others necessary for the diffusion of long-term practices? The NRM project aims at better understanding these causal relationships through implementing an effective information management system for monitoring and evaluating the land use management practices with an effective participatory approach for resource users' feedback over the LOP.

A second set of factors that the NRM project needs to identify/validate are the programmatic options for establishing the enabling conditions. For example, if the host-country government, seeking to increase productivity and reduce environmental degradation, determines that it needs to devolve more authority to local communities, is it sufficient to pass a law or are there other actions that are necessary?

IV. BASED ON ANALYSES, ADJUST PROGRAMMATIC OPTIONS

Based on the lessons learned during implementation of the NRM project, recommendations will be developed to readjust programmatic options that prove essential to establishing the enabling conditions necessary to promote the implementation of community land use management practices.

ANNEX

**ILLUSTRATIVE DATABASE FILES STRUCTURED ACCORDING TO
THE NRM ANALYTICAL FRAMEWORK**

Illustrative Database Files Structured According to the NRM Analytical Framework

File 1: VILLAGE. Profile of village where practices are being investigated.

VARIABLE	DEFINITION	CODES
MO/YEAR	Month and year of data collection	TBD
ECOZONE	Major ecological zone	TBD
COUNTRY	Country	TBD
ADMIN	Description of administrative levels in country (region, zone, etc.)	TBD
ID_NUMBER	Unique site designation number adopted from Census Bureau for geo-referencing	Code ID #
VILLAGE	Village name	TBD
LATITUDE	Latitude of village (degree/minute/second)	TBD
LONGITUDE	Longitude of village (degree/minute/second)	TBD
ETHNIC	Major ethnic groups in village	TBD
MIGRATION	Is there any migration in/out of the village?	TBD
GROUPS	Existence of organized group(s) in village	TBD
TA_GROUP	Who helped organize them?	TBD
RAINFALL	Average annual rainfall zone (mm)	TBD
FALLOW	Is fallow still practiced in village terroir?	TBD
INFRASTRUCT	Variables describing the social infrastructures in village (clinic, school, etc.)	TBD
POPULATION	Population of village (number of households)	TBD
NEARMRKT	How far is principle market(s) from the village?	TBD

File 2: LUMP INVENTORY. List of land-use management practices used in village under investigation.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
INTERVIEW	At what level is information being collected	1=village, 2=mixed subgroup, 3=men's subgroup, 4=women's subgroup, 5=household (mixed), 6=household (men), 7=household (women)
PRACTICE	Land-use management practice (LUMP)	Code ID #
LUMPTYPE	Type of LUMP	1=soil conservation, 2= soil fertility, 3=soil-water, 4=agroforestry, 5=forest management, 6=range management, 7=park/reserve, 8=wildlife, 9=watershed management
AREA	On how much area is practice used?	0=None, 1=1-25%, 2=25-50%, 3=50-75%, 4=75-100%
HOWLONG	How long has practice been used in village?	1= less than 3 years, 2=3 to less than 5 yrs, 3=5 to less than 7 yrs, 4=7 to less than 10 yrs, 5= 10 to less than 15 yrs, 6=over 15 yrs
CHANGE	Has use expanded, not changed, declined?	1=expanded, 2=maintained, 3=declined, 4=unknown
WHYCHGE	Major reason for change in use?	TBD
TRADADOP	Is practice traditional or introduced?	1=traditional, 2=introduced
PRODUCT	What major crop(s) does the practice contribute to produce?	1=cereals, 2=vegetables, 3=fruit, 4=firewood, 5=other forest products, 6=livestock products, 15-29=two main products, 30-39=three main products, 40-45=four main products
TECHCONS	What major biophysical/technical constraint(s) does practice aim to overcome?	1=soil erosion, 2=soil fertility, 3=water retention in soil, 4=vegetative cover, 20-25=two constraints, 30-32=three constraints

File 3: Characteristics of users/non-users of the practice by gender.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
PRACTICE	Land-use management practice (LUMP)	Code ID #
HOUSEHOLD	Household identification number	Code ID #
INTERVIEW	User or non-user of practice information	1=user, 2=non-user
GENDER	Gender providing information on practice	1= male, 2= female, 3=both
CHARACTER	Variables describing household characteristics	N_MEM, AGE, SEX, KIDS, HH_HEAD, etc.
LAND	Ownership of land on which practice is used	1=individually owned, 2=family owned, 3=rent from family, 4=rent from private, 5=rent from public, 6=common property, 7=common access
LABOR	Labor commonly used to carry out practice	1=family, 2=hired, 3=mix family/hired, 4=mutual help
CAPITAL	Common capital used with practice	1=own, 2=formal credit, 3=informal credit, 4=family help, 5=public grants
KNOWHOW	Technical knowledge of practice by users	1=low, 2=medium, 3=high
SOCIAL	Social status of group of users	TBD
EQUIP	Variables for number of equipment owned	N_PLOW, N_CART, N_SEEDER, N_OTHER, etc.
ANIMALS	Variables for number of animals owned	N_COW, N_SHEEP, N_GOAT, N_HORSE, N_OX, N_DONK, etc.

File 4: Impact on biophysical conditions.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
PRACTICE	Land-use management practice (LUMP)	Code ID #
SOILCONS	Impact on soil conservation	1 = short-term, 2 = medium-term, 3 = long-term a = positive, b = negative
SOILFERT	Impact on soil fertility	1 = short-term, 2 = medium-term, 3 = long-term a = positive, b = negative
WATERCO	Impact on water conservation	1 = short-term, 2 = medium-term, 3 = long-term a = positive, b = negative
WATERQU	Impact on water quality	1 = short-term, 2 = medium-term, 3 = long-term a = positive, b = negative
FORESTCO	Impact on forest cover	1 = short-term, 2 = medium-term, 3 = long-term a = positive, b = negative
FORESTSP	Impact on forest species	1 = short-term, 2 = medium-term, 3 = long-term a = positive, b = negative
WDLIFSP	Impact on wildlife species	1 = short-term, 2 = medium-term, 3 = long-term a = positive, b = negative

File 5: Impacts on sustainable increases in agricultural productivity.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
PRACTICE	Land-use management practice (LUMP)	Code ID #
MAJCOMM	Major commodity produced	TBD
MAJYIELD	Yields of major commodity	\$/kg per hectare
MINCOMM	Minor commodity produced	TBD
MINYIELD	Yields of minor commodity	\$/kg per hectare
INCOME	Farm/household income	1 = reduced, 2 = same, 3 = increased
WELFARE	Welfare of user	1 = worse, 2 = same, 3 = better

File 6: Perception of natural resources users/non-users regarding NRM practices.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
PRACTICE	Land-use management practice	Code ID #
SOURCE	Source of knowledge about practice	1=neighbor, 2=travel, 3=NARS, 4=IARC, 5=NGO, 6=extension, 7=farmer conference, 8=field-day
FINANCE	Perceived financial cost/benefit of practice	TBD
SOCIAL	Perceived social cost/benefit of practice	TBD
TECHNIC	Perceived technical cost/benefit of practice	TBD
RISK	Perceived risk from using practice	1=none, 2=minimal, 3=excessive
TENURE	Perceived tenure security associated with use of practice	1=less secure, 2=no change, 3=more secure
SECURITY	Perceived enhancement of food security	1=less secure, 2=no change, 3=more secure
OFF-FARM	Off-farm income impact on adoption	1=none, 2=some, 3=major factor
TIMERUN	Perception of cost vs. time to benefit	1=not important, 2=minor concern, 3=major concern

File 7: Socioeconomic incentives for using NRM practices.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
PRACTICE	Land-use management practice (LUMP)	Code ID #
CASH	Cash subsidies (for work)	1=received 2=not received
FOOD	Food for work	1=received, 2=not received
KIND	Other in-kind products or services granted	1=received, 2=not received
ASSISTANCE	Who provided technical/financial/managerial assistance?	TBD
TAX	Taxes associated with use of practice	1=applied, 2=not applied
PROFIT	Financial profitability from using practice	1=profitable, 2=not profitable, 3=no information
STABLTY	NRM practice provides yield stability	1=not important, 2=important
NO-RISK	NRM practice minimizes risk	1=not important, 2=important
CREDIT	Credit availability associated with practice	1=yes, 2=no
MARKET	Market access associated with practice	1=yes, 2=no

File 8. Cost of establishing and maintaining land-use management practices.

8.1 Physical input/output characteristics of establishing the practice.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
INTERVIEW	At what level is information being collected	1=village, 2=mixed subgroup, 3=men's subgroup, 4=women's subgroup, 5=household (mixed), 6=household (men), 7=household (women)
PRACTICE	Land-use management practice (LUMP)	Code ID #
LUMPTYPE	Type of LUMP	1=soil conservation, 2= soil fertility, 3=soil-water, 4=agroforestry, 5=forest management, 6=range management, 7=park/reserve, 8=wildlife, 9=watershed management
LANDUNIT	On how much area is practice used?	Estimate land area in hectares
RAW_MATL	Raw materials needed to establish practice	List and quantities of each
EQUIPMENT & TOOLS	Equipment and tools needed to establish practice	List and quantities of each
LABOR	Amount of work time spent to establish practice	Man-days of labor required
SERVICES	Transport requirements	Headbaskets, carts/wagons, truck, other
DURATION	Duration of land-use management practice	One growing season, semi-permanent, permanent, other
LUMPUNIT	Physical units of the practice produced	Tons of compost, number of demi-lunes per hectare, other

File 8 (cont.)

8.2 Per unit cost of establishing the practice.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
INTERVIEW	At what level is information being collected?	1=village, 2=mixed subgroup, 3=men's subgroup, 4=women's subgroup, 5=household (mixed), 6=household (men), 7=household (women)
PRACTICE	Land-use management practice (LUMP)	Code ID #
LUMPTYPE	Type of LUMP	1=soil conservation, 2= soil fertility, 3=soil-water, 4=agroforestry, 5= forest management, 6=range management, 7=park/reserve, 8=wildlife, 9=watershed management,
RAW_MATL	Raw materials needed to establish practice	List costs of each
EQUIPMENT & TOOLS	Equipment and tools needed to establish practice	List costs of each
LABOR	Amount of work time spent to establish practice	Value of man-days of labor required
SERVICES	Transport requirement costs	Costs of headbaskets, carts/wagons, truck, other
CAPITAL	Investment capital required to establish practice	TBD
LUMPUNIT	Physical units of the practice produced	Cost per unit of compost, number of demi-lunes per hectare, other

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File 8 (cont.)

8.3 Physical input/output characteristics of maintaining the practice.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
INTERVIEW	At what level is information being collected	1=village, 2=mixed subgroup, 3=men's subgroup, 4=women's subgroup, 5=household (mixed), 6=household (men), 7=household (women)
PRACTICE	Land-use management practice (LUMP)	Code ID #
LUMPTYPE	Type of LUMP	1=soil conservation, 2= soil fertility, 3=soil-water, 4=agroforestry, 5= forest management, 6=range management, 7=park/reserve, 8=wildlife, 9=watershed management
LANDUNIT	On how much area is practice used	Estimate land area in hectares
RAW_MATL	Raw materials needed to maintain the practice	List and quantities of each
EQUIPMENT & TOOLS	Equipment and tools needed to maintain the practice	List and quantities of each
LABOR	Amount of work time spent to maintain practice	Man-days of labor required
SERVICES	Transport requirements	Headbaskets, carts/wagons, truck, other

File 8 (cont.)

8.4 Per unit annual cost of maintaining the practice.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
INTERVIEW	At what level is information being collected	1=village, 2=mixed subgroup, 3=men's subgroup, 4=women's subgroup, 5=household (mixed), 6=household (men), 7=household (women)
PRACTICE	Land-use management practice (LUMP)	Code ID #
LUMPTYPE	Type of LUMP	1=soil conservation, 2= soil fertility, 3=soil-water, 4=agroforestry, 5=forest management, 6=range management, 7=park/reserve, 8=wildlife, 9=watershed management,
RAW_MATL	Cost of raw materials needed to maintain the practice	List costs of each
EQUIPMENT & TOOLS	Costs of equipment and tools needed to maintain the practice	List costs of each
LABOR	Amount of work time spent to maintain the practice	Value of man-days of labor required
SERVICES	Transport requirement costs	Costs of headbaskets, carts/wagons, truck, other
CAPITAL	Investment capital required to maintain the practice	TBD

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File 9: Costs and revenues of activities using land-use management practices.

9.1 Physical input/output characteristics of the activity using the practice.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
INTERVIEW	At what level is information being collected	1=village, 2=mixed subgroup, 3=men's subgroup, 4=women's subgroup, 5=household (mixed), 6=household (men), 7=household (women)
PRACTICE	Land-use management practice (LUMP)	Code ID #
LUMPTYPE	Type of LUMP	1=soil conservation, 2= soil fertility, 3=soil-water, 4=agroforestry, 5=forest management, 6=range management, 7=park/reserve, 8=wildlife, 9=watershed management
LANDUNIT	On how much area is the activity using the practice covering?	Estimate land area in hectares
INPUTS	Materials needed for the activity using the practice	List and quantities of each
EQUIPMENT & TOOLS	Equipment and tools needed to for the activity using the practice	List and quantities of each
SERVICES	Transport requirements of the activity	Headbaskets, carts/wagons, truck, other
CAPITAL	Operating capital required for the activity using the practice	TBD
LABOR	Amount of work time spent on the activity using the practice	Man-days of labor required
YIELD	Yield of major speculation	Kg per hectare, poles per hectare, other
BENEFITS	Value of other benefits accrued under the activity using the practice	TBD

File 9 (cont.)

9.2 Per unit cost and revenues of the activity using the practice.

VARIABLE	DEFINITION	ILLUSTRATIVE CODES
MO/YEAR	Month and year of data collection	Numerical description of month and year
ID_NUMBER	Site designation number	Code ID #
INTERVIEW	At what level is information being collected	1=village, 2=mixed subgroup, 3=men's subgroup, 4=women's subgroup, 5=household (mixed), 6=household (men), 7=household (women)
PRACTICE	Land-use management practice (LUMP)	Code ID #
LUMPTYPE	Type of LUMP	1=soil conservation, 2= soil fertility, 3=soil-water, 4=agroforestry, 5=forest management, 6=range management, 7=park/reserve, 8=wildlife, 9=watershed management
INPUTS	Costs of materials needed for the activity using the practice	List costs of each
EQUIPMENT & TOOLS	Costs of equipment and tools needed for the activity using the practice	List costs of each
SERVICES	Transport requirement costs	Costs of headbaskets, carts/wagons, truck, other
CAPITAL	Operating capital required for the activity using the practice	TBD
LABOR	Amount of work time spent to establish practice	Value of man-days of labor required
REVENUE	Revenues from major speculations	Crop yield values, values of tree products, other
BENEFITS	Value of other benefits accrued under the activity using the practice	TBD

File 10: Policies impacting on incentives to use NRM practices.

1. Year data is collected
2. Country
3. Village
4. Practices
5. Type of policies (macroeconomic, sectoral, and NRM specific)

Macroeconomic policies

6. Foreign exchange
7. Labor policies
8. Fiscal policies
9. Import policies
10. Export policies

Sectoral policies

11. Input pricing
12. Input subsidies
13. Output pricing
14. Subsidies on output
15. Rural infrastructure policies
16. Rural credit policies
17. Marketing of techniques and output policies
18. Tenure
19. Local governance
20. Village association/cooperative policies
21. Forestry code
22. Rural code (including forestry, and other natural resources)
23. Research on NRM practices
24. Training of users
25. Training of officials
26. Extension/demonstration of NRM practices