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**DESFIL**

**Development Strategies for Fragile Lands**

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**A MONITORING AND EVALUATION PLAN  
FOR  
USAID/NIGER'S STRATEGIC OBJECTIVE THREE**

Contract No. DHR-5438-C-1090-00

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USAID/Niger

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## EXECUTIVE SUMMARY

USAID/Niger's third Strategic Objective is *to improve land management practices for sustainable agricultural and livestock production*. The Strategic Objective 3 Team includes four Mission-funded activities whose objectives include transferring improved NRM technologies to Niger's rural producers. The Team's activities are the Africare project in Gouré, the Disaster Prevention and Mitigation project, the Agricultural Sector Development Grant Phase II project, and the Peace Corps biodiversity project. In the context of USAID's re-engineering and "managing for results," it is imperative to monitor and evaluate the impact of the third Strategic Objective at both the project and the S.O.3 Team levels. The S.O.3 Team is committed to reporting regularly on the indicators it has identified that show its impact on promoting the use of improved land management practices.

This report presents a Monitoring and Evaluation Plan for Strategic Objective Three. The plan has five major components: annual record reviews that will provide information for the Mission's API reports; a Pre-Test Survey in 1995 that will document households' current use of NRM practices; a large-scale, National Survey focused on household resources and use of NRM practices, which will be done as a baseline in 1996 and as a follow-up in 2000; a Mid-Term Survey in 1998, based on a subsample of the national survey; and special studies of specific topics and geographical areas as needed. A set of core indicators has been defined for S.O.3 and is a key component of the M&E plan. Their use will enable the S.O.3 Team to accumulate standardized data over time and build a cumulative database. The core indicators include key information such as men's and women's knowledge and use of new NRM practices, their incentives for and constraints on using the practices, and household investment in productive activities other than NRM.

The report's annexes contain relevant information that was used to design the S.O.3 M&E plan. An extensive summary of the NRM and NRM-related information that currently is available in Niger from numerous sources, including the GON and other stakeholders in the NRM arena, is in one annex. The viability and cost of using aerial videography to track the types and distribution of NRM practices throughout Niger, based on a recent trial exercise funded by ASDG II, is in another annex. A summary of the time, costs, and resources that were necessary to complete Niger's most recent large-scale, national survey also is provided.

"Les choses changent. Les années apportent du changement. Après la souffrance, le bonheur. Après le bonheur, la souffrance. Après la saison sèche, la saison des pluies. Et après la saison des pluies, la saison sèche à nouveau."

WoDaaBe  
in Maliki, 1984

## LIST OF ACRONYMS

AGRHYMET	Agro- and Hydro-Meteorology Center
API	Assessment of Program Impact
ASDG II	Agricultural Sector Development Grant Phase II
AV	Aerial Videography
CBNRM	Community-Based Natural Resources Management
CECI	Canadian Center for International Studies and Cooperation
CESP	Country Environmental Strategy Paper
CFD	French Cooperation Agency (Caisse Francaise de Developpement)
CIDA	Canadian International Development Agency
CILSS	Committee for Drought Control in the Sahel
C/GRN	Unit for the Management of Natural Resources
CSS	Customer Satisfaction Surveys
CUI	Cropland Use Intensity
DANIDA	Danish Cooperation Agency
DEIA	Department of Animal Husbandry and Industry
DEP	Department of Studies and Planning
DEFIL	Development Strategies for Fragil Lands Project, Chemonics International
D&G	Democracy and governance
DPM	Disaster Prevention and Mitigation Project
DSCN	Department of Statistics and National Accounts
FAO/CP	Food and Agriculture Organization/Cooperative Program
FEWS	Famine Early Warning System
GIS	Geographic information system
GON	Government of Niger
GTZ	German Cooperation Agency
ICRISAT	International Research Institute for Tropical and Semi-Arid Crops
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IGN	National Geographical Institute, France
IGNN	National Geographic Institute of Niger (mapping)
INRAN	National Agricultural Research Institute of Niger
IPDR	Training Institute for Rural Development
IRG	International Research Group
M&E	Monitoring and evaluation
MH/E	Ministry of Hydrology and the Environment
MP/F	Ministry of Planning and Finance

NDVI	Net Difference Vegetation Index
NGO	Non-governmental organization
NPA	Non project assistance
NRM	Natural resource management
ONAHA	National Office of Hydro-Agricultural Management
PA	Project assistance
PASP	Agro-sylvo-pastoral Project in northern Tillabery
PISRN	Project to Inventory and Monitory Natural Resources
PMP	Performance Monitoring Plan
PN/GRN	National Program for the Management of Natural Resources
PNLCD	National Plan to Combat Desertification
PRA	Participatory Rural Appraisal
RRA	Rapid Rural Appraisal
SAP	Early Warning System
S.O.	Strategic Objective
S.O.3	Strategic Objective 3
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Program
USAID	United States Agency for International Development
UNSO	United Nations Sahelian Office
UTA	Technical Support Unit, MH/E

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## I. INTRODUCTION AND ORGANIZATION OF THE REPORT

This report responds to USAID/Niger's need to monitor and evaluate the impact of its third Strategic Objective, which is *to improve land management practices for sustainable agricultural and livestock production*. The report presents a plan for monitoring and evaluating the Mission-funded activities under S.O.3. There are five major components of the M&E plan:

- \* Annual record reviews that will provide information for the Mission's API reports.
- \* A six-month Pre-Test Survey in 1995, that will document households' current use of NRM practices. Information from this survey also will provide the basis for designing a sampling strategy and questionnaire for a larger, baseline survey.
- \* A large-scale, National Survey focused on households' use of NRM practices, which will be done as a baseline in 1996 and as a follow-up survey in 2000.
- \* A Mid-Term Survey in 1998, based on a subsample of the national survey.
- \* Special Studies: case studies of specific topics or geographical areas based on individual activities' needs.

The complete M&E plan for S.O.3 is presented in Section II below. A discussion of some key technical issues that will arise in the Pre-Test Survey, and technical recommendations to resolve them, are in Section III.

The information on topics related to the M&E plan on which the Mission requested clarification is in four annexes at the end of the report. Annex I contains an extensive list of the different types of NRM and related data currently available from numerous GON and donor sources in Niger. The World Bank's M&E plans, IFAD's M&E data, and the types and sources of relevant socio-economic information are included in this annex. Annex II reviews the limitations, potential utility, and the cost of using Aerial Videography to monitor the distribution of NRM practices throughout Niger. Annex III summarizes the time, cost, and resources that were required to conduct Niger's 1993 Demographic and Health Survey. This information is useful as a basis for gauging the scale of those requirements for the surveys in the S.O.3. M&E plan. Annex IV summarizes relevant information about the household-level factors that influence agricultural productivity, including the use of NRM practices, from IFPRI's study of 15 villages in the Dosso department.

## II. A MONITORING AND EVALUATION PLAN FOR STRATEGIC OBJECTIVE THREE

### A. A Summary of the S.O.3 M&E Plan

The Mission's S.O.3. Team is committed to tracking the impact of its activities to improve rural Nigeriens' land management practices for sustainable agricultural and livestock production. The Team also is committed to reporting its impact to its members, AID/W, and the GON in the form of sound, useful information. This M&E plan is designed to meet those commitments. It consists of five major components, which are summarized in this section. Time-lines and full explanations of each component are in Sections B., C., D., and E. below.

Customer Satisfaction Surveys potentially are the sixth component of the M&E plan. The Mission is in the process of organizing its Customer Satisfaction Plan. AID/W has stated that its Customer Satisfaction Plan will be in place by September 1996, which implies that Missions will be required to conduct Customer Satisfaction Surveys thereafter. AID/W already has defined who "customers" are, what methods can be used to survey them (including formal surveys based on random samples, focus groups, PRAs), and the software program that can be used to analyze the data (RAOSOFT Survey). However, when this report was written, there was no clear directive about how often the CSSs must be done. In order to integrate the CSSs into the S.O.3 M&E plan and to have them contribute to the standardized S.O.3 data base that this plan builds, we recommend that they *use the standardized methodology* that is defined in Section B. below. The core indicator set can be tailored for use in an annual CSS or expanded if the CSS will be a larger survey.

**The five major components of the S.O.3 M&E plan are:**

1. **Annual record reviews**, in which Mission personnel will collect information from various GON agencies. Approximately one month of lead-time will be necessary to collect the information. In some cases it will be necessary to send a list of the information needed to GON offices at the department or arrondissement levels. The information and its sources are summarized in the table on the next page.

2. **A national Pre-Test Survey** that will be done in 1995. This survey will require six months to complete and has four major objectives: 1) to collect national, household-level data on the current use of NRM practices; 2) to provide sound information to design a sampling strategy for a larger national survey; 3) to field-test S.O.3's indicators; and 4) to produce a field-tested questionnaire for the larger national survey.

3. **A large-scale National Survey** to generate baseline data in 1996 and follow-up data for evaluating long-term impact in 2000. This survey will require nine months to complete. Its major objective is to collect national, household-level data on the use of NRM practices and related topics from a sufficiently large sample to allow secondary statistical analysis.

4. **A Mid-Term Survey** in 1998, based on a subsample of the National Survey, for monitoring and short-term impact evaluation.

5. **Special Studies:** case studies of specific topics or geographical areas done by individual S.O.3 activities, based on their particular information needs. Case studies could be done on topics such as women's or pastoralists' NRM strategies; constraints on/incentives for the adoption of specific NRM practices in specific areas; the conditions that led to the successful transfer of NRM technology in a specific area; or the long-term impact of a project in a specific area, such as IFAD in Badaguichiri.

## Information from Annual Record Reviews

S.O.3 Indicator	Source of Data
Number of registered community institutions actively managing natural resources.	These institutions may be registered at the national or regional levels; information is better sought at the department level. National and department level: Direction du Developpement Regional, MF/P. National level: C/GRN and national archives (an official journal).
Cumulative number of community forest management schemes.	Information will be found at the national level: Direction de l'Environnement, MH/E. Direction des Forets, de la Faune, de la Peche et de la Pisciculture, MH/E. Direction des Etudes et de la Programmation, DEP/MH/E.
Number of Nigerien organizations specializing in NRM, registered with the GON, and implementing activities.	National level: Ministry of the Interior and C/GRN. Department level: Direction du Developpement Regional, MF/P.
Number of sub-regional disaster response committees.	National level: SAP and Bureau du Premiere Ministere.
Percent of men and women in adjudicated land tenure cases aware of new land tenure laws.	Information is better sought at the department and arrondissement levels: Bureau de Justice. National level: Permanent Secretary of the Rural Code, Commission Fonciere. There will be 2-3 Commission Fonciere functioning in 1996.
Percent increase in national financing of projects promoting community-level NRM activities.	National level: Direction du Plan et la Programmation, MF/P.

## B. Standardized Methodology: S.O.3's Core Indicator Set and Sampling

### 1. Core Indicators and Sampling

Building a cumulative database during the eight-year span of S.O.3's strategic plan is a central objective of this M&E plan. This will allow continuous analysis and evaluation of activities' impacts over time and geographical areas. A *standardized methodology* is the key to building a *cumulative database* from diverse M&E activities, and we emphasize the importance of *both*. Standardization will enable the S.O.3 Team to compare key variables easily and to aggregate data from the level of individual activities to the Team-level.

The standardized methodology for the S.O.3 M&E plan is based on two key factors: a **core indicator set** and a **standard sampling strategy**. The standard sampling strategy will be devised for 1996 National Survey. We recommend that all the samples for the other M&E surveys done thereafter *use the same sampling strategy as* or *subsamples from* the National Survey. (The sampling strategy for the National Survey has not yet been identified; see Section D.2. below.) This will link the smaller data sets to the larger data sets (the National Surveys) and increase their explanatory power.

The **core indicator set** for S.O.3 is presented below. It has three components: a core indicator set for S.O.3, which includes both NRM indicators and credit indicators; a core indicator set for S.O.2; and two indicators from the Mission's cross-cutting strategic objectives. There are three components in the core indicator set because the Mission is considering using the National Survey to collect baseline data for S.O.3, S.O.2, and its cross-cutting S.Os. However, it is not necessary to use these three components together in a survey; each core indicator set can be used independently. Each S.Os. set of core indicators thus is an independent component that can be incorporated into different surveys. Using them will build a cumulative database of standardized data that easily can be analyzed, compared, aggregated over time and space. For example, if an S.O.3 activity conducts its own annual CSS and wants to collect some information about NRM at the same time, it should use the **S.O.3 core indicator set** to do so. If an S.O.2 activity conducts its own CSS and wants to collect some information about credit invested in NRM, it should use the **S.O.2 core indicator set** to do so.

Indicators that we have added or changed are indicated by an asterisk (\*).

### 2. S.O.3' Core Indicator Set

#### a. S.O.3's Core NRM Indicators

\*1. Percent of male and female household heads reporting use of one or more NRM practices. (Note: identifying "new" NRM practices is not an objective exercise, unless the S.O.3 Team makes an arbitrary decision, which is not recommended. In all likelihood there is a considerable difference between what the S.O.3 Team defines as "new" practices and what rural producers define as "new" practices. It is also likely that there are regional and intra-regional differences in rural producers' definitions of "new" practices. Whether rural producers are using "traditional" or "new" NRM practices should be immaterial; the objective of S.O.3's NRM inventory and M&E plan is to document changes in NRM strategies, which can include

both "traditional," "new," or other types of NRM practices. A complete NRM inventory must document all the practices that rural producers use, and document changes in their relative proportions over time, in order to 1) fully understand household NRM strategies and 2) identify appropriate intervention points for promoting "new" practices, that often can be linked to "traditional" ones. In addition, the S.O.3 results include using indigenous knowledge. Therefore the change in this indicator is important.)

\*2. Reasons why male and female household heads have (incentives for) or have not (constraints on) adopted NRM practices.

3. Percent of male and female household heads able to name one or more new NRM practices.

\*4. Sources of information about the new NRM practices named. (Diffusion.)

\*5. Number of men and women who invested (labor, credit, cash) in productive activities other than NRM and agriculture, and which activities. (Opportunity costs for NRM.)

\*6. Number of male and female household members who went on exode (short-term, internal or external migration) in the past year. (A measure of economic security that also will be used by the World Bank.)

\*7. Percent of male and female household heads reporting awareness of new land tenure laws.

\*8. Percent of male and female household heads that heard market and/or climate news during the past two weeks.

9. Number of wells attributable to project activities.

#### **b. S.O.3's Core Credit Indicators**

If the Mission decides not to include S.O.2 in the National Survey, the following core indicators from S.O.2 should be included because they are linked to S.O.3 and its information needs. If the Mission decides to include S.O.2 in the National Survey, the S.O.2 Core Indicators in Section 3. that follows should be used instead of these.

\*1. Number of male and female household heads who have obtained credit from formal credit institutions.

\*2. Amount of men's and women's loans from formal credit institutions (measure of investment in different productive activities.)

\*3. Use of men's and women's loans (shows types of productive activities that credit is used for, including NRM.)

\*4. Number and type of community credit groups (credit unions, cooperatives, men's/women's groups, banks.)

\*5. Use of village groups' loans (types of productive activities, including NRM.)

### **3. S.O.2's Core Indicator Set**

- \*1. Number of male and female household heads who have obtained credit from formal credit institutions.
- \*2. Amount of men's and women's loans from formal credit institutions (measure of investment in different productive activities.)
- \*3. Use of men's and women's loans (shows types of productive activities that credit is used for, including NRM.)
- \*4. Number and type of community credit groups (credit unions, cooperatives, men's/women's groups, banks.)
- \*5. Use of village groups' loans (types of productive activities, including NRM.)
- \*6. Percent of male and female household heads who know about MIS.
- \*7. Male and female household heads' evaluation of utility of MIS.
- \*8. Number of female household members who received education in literacy, numeracy, economic/civic rights, or democracy.

### **4. Indicators from Cross-Cutting S.Os.**

- 1. Percent of male and female household heads able to identify one or more health policy issues.
- 2. Percent of male and female household heads able to state one or more citizen's rights.

### **C. The 1995 Pre-Test Survey**

#### **1. Survey Purposes and Players**

We recommend a moderately sized, national survey focused on rural households' current use of NRM practices as the starting-point of S.O.3's M&E process. This "Pre-Test Survey" is essential because there is no existing, coherent set of empirical data to use for designing a national sample, and no data set that shows current usage rates of the different NRM practices at the national level. Therefore, an exploratory Pre-Test Survey is necessary to generate data that will be the basis for designing S.O.3's larger surveys. It also will produce the first set of national-level information about which NRM practices are used, and where.

The Pre-Test Survey has five major purposes. These are to: 1) design, field-test, and finalize the questionnaire that will be used in the 1996 National Survey; 2) field-test S.O.3's indicators and revise them as necessary; 3) generate a working NRM inventory that will be finalized in the National Survey; 4) provide empirical information to use for designing the

sampling strategy for all the other surveys that will be done; and 5) provide the provisional baseline data and a coherent, national-level report on household use of NRM practices, that the S.O.3 Team is committed to produce in 1995. The final report and databases will reside in USAID/Niger and the C/GRN.

The Pre-Test Survey will be done in collaboration with the GON institutions that have expertise in conducting large-scale rural surveys and those that are stakeholders in the national NRM program. This includes the Department of Statistics and National Accounts (DSCN), DEP-MAG/EL, UTA, C/GRN, and the SAP. We recommend that the Mission's S.O.3 Team provide a Technical Advisor who will supervise the survey, in collaboration with a Nigerien homologue and the GON. The DSCN, that conducted the 1988 national census and the 1993 Demographic and Health Survey (DHS) in collaboration with expatriate technical assistance, should have the material resources and expertise to be the primary partner in all the S.O.3 surveys, beginning with the Pre-Test Survey. USAID/Niger purchased three computers and a vehicle for the DSCN for the DHS survey, and the DSCN personnel were trained in data input and analysis. The DSCN has national census data and statisticians that can assist the Technical Advisor to design the sampling strategy for the Pre-Test Survey. Enumerators for the fieldwork can be provided by the GON offices above. The questionnaire content and survey methodology of the Pre-Test Survey will be negotiated with the C/GRN and other stakeholders in Niger's NRM program, so that the survey contributes to the GON's national NRM M&E program.

## **2. The Pre-Test Survey Time-Line**

The Pre-Test Survey will require approximately six months to complete. The fieldwork cannot be done during the peak agricultural periods when rural producers do not have time to be interviewed. The peak agricultural labor period is during June-August; demands on people's labor decrease somewhat during September-October, and are less during November-December. The rural interviews therefore should be done in the latter period. An illustrative timetable and the resources needed for the Pre-Test Survey is in the table on the next page.

## Time and Resources for the Pre-Test Survey: August 1995 to January 1996

Task	Personnel	Time	Location
Review existing literature and questionnaires, draft a questionnaire, work with a computer expert to ensure that the draft is efficient for data entry.	Technical Advisor (expatriate), national computer expert.	August, 3 weeks.	Niamey.
Field test and revise the questionnaire, in collaboration with the computer expert.	Technical Advisors (expatriate and Nigerien), national computer expert.	August-September, 4 weeks.	Rural areas.
Design a sampling strategy for the survey.	Technical Advisors, DSCN statisticians.	September, 2 weeks.	Niamey and rural areas.
Hire and train six enumerators. DSCN provides and trains two data inputters.	Technical Advisors.	September-October, 2 weeks.	Niamey and environs.
Field test and revise the questionnaire with the enumerators, in collaboration with the computer expert.	Technical Advisors, enumerators, two drivers, computer expert.	October, 2 weeks.	Rural areas.
Finalize and duplicate the questionnaire.	Technical Advisors, computer expert.	October, 1 week.	Niamey.
Conduct the Pre-Test Survey; concurrent data input.	Technical Advisors, enumerators, drivers, data inputters.	November, 4 weeks.	Rural areas (survey) and Niamey (data input).
Data analysis and write the draft report.	Technical Advisors.	December, 4 weeks.	Niamey and USA.
Write the final report.	Technical Advisor (expatriate).	January, 4 weeks.	USA.
<b>TOTAL TIME REQUIRED:</b>		<b>24 Weeks</b>	

## 1995 Pre-Test Survey for S.O.3 and S.O.2

Task, Resources	1995							1996										
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
<p><b>Planning and Preparation</b></p> <ol style="list-style-type: none"> <li>1. Technical Advisor arrives in Niger; Contractor</li> <li>2. Draft questionnaire; Technical Advisor and Homologue</li> <li>3. Field-test and revise questionnaire; Technical Advisor, Homologue</li> <li>4. Design sampling strategy; Technical Advisor, Homologue</li> <li>5. Hire and train enumerators; Technical Advisor, Homologue, GON</li> <li>6. DSCN trains data inputters; DSCN</li> </ol>																		
<p><b>Field Operations</b></p> <ol style="list-style-type: none"> <li>7. Field-train the enumerators; Technical Advisor, Homologue, enumerators</li> <li>8. Conduct the survey; Technical Advisor, Homologue, enumerators</li> </ol>																		
<p><b>Data Processing</b></p> <ol style="list-style-type: none"> <li>9. Data input concurrent with survey; data inputters</li> <li>10. Data verification and analysis; Technical Advisor, Homologue, data inputters</li> </ol>																		
<p><b>Data Write-Up</b></p> <ol style="list-style-type: none"> <li>11. Write draft report; Technical Advisor, Homologue</li> <li>12. Write final report; Technical Advisor</li> <li>13. National seminar to disseminate information; Technical Advisor, SO3 Team, GON</li> </ol>																		
<p><b>Task</b> [redacted]</p>																		<p><b>Summary</b> [redacted]</p>

## **D. The National Survey: 1996 Baseline and 2000 Impact Evaluation**

### **1. Take the Chevy to the Levee**

The Mission has been considering conducting a national NRM survey modeled on the DHS in scope and scale (a Cadillac). We do not recommend this; we recommend that the S.O.3 Team conduct a smaller national survey than the DHS (take the Chevy), for several reasons. The Niger 1993 DHS took two and a half years to complete, even though it used an on-the-shelf methodology; the Mission contributed \$560,000 and a vehicle to its cost, which was in addition to financial and material support from UNDP and FNUAP. It was based on a sample of 5,242 households in order to have 95+ percent certainty about responses about rare phenomena, such as the use of birth control in rural areas. The sample also included about 1,100 urban households, which are not necessary to include in the S.O.3 National Survey. NRM practices are reported to be relatively rare and clustered phenomena in Niger, but *data to confirm this and to estimate the sample size required for a national NRM survey that would produce statistically acceptable data for S.O.3 are not available until the Pre-Test Survey is completed.* A brief discussion of the factors that affect sampling strategies and sizes is given in Section 2. that follows. We recommend the "Chevy model" National Survey for S.O.3. M&E purposes. Based on a sound sample and a field-tested questionnaire from the Pre-Test Survey, it will meet the Team's data and impact evaluation requirements.

The National Survey will be done twice: in 1996 to generate baseline data and in 2000 as a follow-up survey to evaluate S.O.3's long-term impact on NRM. Both National Surveys will be built around the core indicator set defined for S.O.3 and field-tested in the Pre-Test Survey. It will require an expatriate Technical Advisor to work in collaboration with the DSCN, the C/GRN, and the other GON offices linked to the national NRM program. The players and process for conducting the National Survey basically is the same as for the Pre-Test Survey, except that the survey questionnaire will require minimal pre-testing, and the field work and data analysis will be larger in scale. The timeline for the National Survey is at the end of this section.

### **2. Sampling Strategies and Sizes**

Identifying a sound sample or sampling strategy is based on accurate knowledge (data) of the research population. Defining a sound sampling strategy to survey NRM users at the national level currently cannot be done in Niger because accurate, national-level data about which NRM practices are being used where does not exist. This lack of information also precludes stratifying the sample. In general, identifying appropriate strata and stratifying the population improves the quality of the final data analysis (ie, statistical estimates.) Two conditions must be met for effective stratification: 1) the strata must be mutually exclusive and 2) each household (for S.O.3's purposes) must be located in only one of the strata. The potential stratification criteria in Niger include agro-ecological zone, Cropland Use Intensity (CUI), cumulative rainfall levels, and Net Difference Vegetation Index (NDVI), and project/nonproject areas. Little is known about the characteristics of the natural resource managers or the NRM practices in these different strata in Niger. Potentially appropriate strata can be explored in the Pre-Test Survey, with the DSCN statisticians, and with the agencies in Niger that have biophysical data (CUI, rainfall levels, NDVI.)

## 1996 National Baseline Survey for S.O.3 and S.O.2

Task, Resources	1996							1997					
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar			
<p><b>Planning and Preparation</b></p> <ol style="list-style-type: none"> <li>1. Identify funding sources; USAID/Niger</li> <li>2. Complete TOR, initiate contract; USAID/Niger</li> <li>3. Technical Advisor arrives in Niger; contractor</li> <li>4. Review and finalize survey design; Technical Advisor, Homologue, SO3 Team, GON</li> <li>5. Review and finalize data processing design; Technical Advisor, Homologue, DSCN</li> <li>6. Hire and train enumerators; Technical Advisor, Homologue, and GON</li> </ol>													
<p><b>Field Operations</b></p> <ol style="list-style-type: none"> <li>7. Field-train the enumerators; Technical Advisor, Homologue</li> <li>8. Conduct the survey; Technical Advisor, Homologue, enumerators</li> </ol>													
<p><b>Data Processing</b></p> <ol style="list-style-type: none"> <li>9. Data input concurrent with survey; data inputters</li> <li>10. Data verification and analysis; data inputters, Technical Advisor, Homologue</li> </ol>													
<p><b>Data Write-Up</b></p> <ol style="list-style-type: none"> <li>11. Write draft report; Technical Advisor, Homologue</li> <li>12. Write final report; Technical Advisor</li> <li>13. National seminar to disseminate information; Technical Advisor, SO3 Team, GON</li> </ol>													
	Task		Summary										

Two factors are of major importance in determining final sample size: the *level of confidence* that the S.O.3 Team requires and the *margin of error* that it will accept. As the table below shows, the required precision of these factors significantly affects sample size. Note that this table is calculated for the case of a simple random sample on a qualitative variable that is normally distributed in a population and has only two values. (Some variables used in a survey about NRM are this type; for example, respondents only can answer "yes" or "no" about their use of an NRM practice.) Sample size increases when more than two responses are possible (for example: how many NRM practices can you name?) The sample size for S.O.3's surveys, particularly the National Survey that must provide sound data for statistical analysis, will be based on the Team's specifications of acceptable confidence levels and margins of error. As the table shows, high confidence levels and small margins of error require large samples; lower confidence levels and larger margins of error allow smaller samples. Because S.O.3's surveys are for management rather than research purposes, we recommend that confidence levels of 80 or 90 percent be used (this recommendation has been made elsewhere for monitoring systems; see in particular Casley and Kumar 1988: 86.)

The Effect of Confidence Levels and Error Margins on Sample Size\*

Acceptable Margin of Error	Confidence Levels			
	99 Percent	95 Percent	90 Percent	80 Percent
1 Percent	16,588	9,604	6,764	4,110
3 Percent	1,844	1,068	752	457
5 Percent	664	384	271	164

\* Sample sizes = for a simple random sample on a qualitative variable that is normally distributed in a population and has only two values.

## E. The 1998 Mid-Term Survey

### 1. Mid-Term Monitoring and Impact Assessment

The objective of the Mid-Term Survey is moderate-scale data collection for monitoring and mid-term evaluation during 1997-99, in between the two large National Surveys. It will provide information about rural producers and short-term changes in local NRM strategies. The Mid-Term Survey will be based on a subsample of the National Survey and the core indicator set, in order to contribute to S.O.3's cumulative database. Note that this survey can be replaced by annual or bi-annual CSSs, based on AID/W requirements, as long as the standardized methodology discussed above is used.

There are two options for doing the Mid-Term Survey. It can be done by the Mission's S.O.3 Team or it can be incorporated into the members' individual M&E systems, using the standardized methodology, and aggregated to the Team level. We recommend that it be done by the Team. This is more efficient and will relieve the S.O.3 activities of part of their M&E requirements while providing them with critical information.

The process of conducting the Mid-Term Survey will be similar in scope and scale to that of the Pre-Test Survey. Illustrative time-lines for the Mid-Term Survey and S.O.3's entire 1995-2001 M&E Plan are on the following pages.

## 1998 Mid-Term Survey

Task, Resources	1998							1999			
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
<b>Planning and Preparation</b>			▬								
1. Technical Advisor arrives in Niger; Contractor		▬									
2. Field-test and revise questionnaire; Technical Advisor and Homologue		▬									
3. Design sampling strategy; Technical Advisor, Homologue, DSCN				▬							
4. Hire and train enumerators; Technical Advisor, Homologue, GON				▬							
5. DSCN trains data inputters; DSCN				▬							
<b>Field Operations</b>						▬					
6. Field-train the enumerators; Technical Advisor, Homologue, enumerators					▬						
7. Conduct the survey; Technical Advisor, Homologue, enumerators					▬						
<b>Data Processing</b>						▬					
8. Data input concurrent with survey; data inputters					▬						
9. Data verification and analysis; Technical Advisor, Homologue, data inputters							▬				
<b>Data Write-Up</b>								▬			
10. Write draft report; Technical Advisor and Homologue								▬			
11. Write final report; Technical Advisor									▬		
12. National seminar to disseminate information; Technical Advisor, SO3 Team, GON										▬	
Task	Summary										

## Summary of USAID/Niger's S.O.3 Monitoring & Evaluation Plan, 1995-2001

Task and Quarter	1995			1996				1997				1998				1999				2000				2001			
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	
<b>Annual Records Review, 1995 Q3</b>	█																										
<b>1995 Pre-Test Survey</b>	█																										
1. Planning and Preparation, 1995 Q3 and Q4	█																										
2. Field Operations, 1995 Q4	█																										
3. Data Processing, Analysis and Write-Up, 1995 Q4 and 1996 Q1	█																										
4. 1995 Pre-Test Survey Completed, 1996 Q1	█																										
<b>Annual Records Review, 1996 Q3</b>																											
<b>1996 National Baseline Survey</b>	█																										
5. Planning and Preparation, Q3 and Q4 1996	█																										
6. Field Operations, Q4 1996 and Q1 1997	█																										
7. Data Processing, Analysis and Write-Up, Q4 1996 and Q1 1997	█																										
8. 1996 National Baseline Survey Completed, Q1 1997	█																										
<b>Annual Records Review, 1997 Q3</b>																											
<b>Annual Records Review, 1998 Q3</b>																											
<b>1998 Mid-Term Survey</b>	█																										
9. Planning and Preparation, Q3 1998	█																										
10. Field Operations, Q4 1998	█																										
11. Data Processing, Analysis and Write-Up, Q4 1998 and Q1 1999	█																										
12. 1998 Mid-Term Survey Completed, Q1 1999	█																										
<b>Annual Records Review, 1999 Q3</b>																											
<b>Annual Records Review, Q3 2000</b>																											
<b>2000 National Evaluation Survey</b>	█																										
13. Planning and Preparation, Q3 2000	█																										
14. Field Operations, Q4 2000 and Q1 2001	█																										
15. Data Analysis and Write-Up, Q1 2001	█																										
16. 2000 National Evaluation Survey Completed, Q1 2001	█																										

Task █ Summary ▾

### III. TECHNICAL RECOMMENDATIONS FOR THE S.O.3 SURVEYS

One issue to resolve in the Pre-Test Survey, in terms of collecting accurate data about the current use of NRM practices, is to determine 1) if there is a difference in peoples' investment in NRM in the land they own, compared to that they do not own (rent, borrow, or sharecrop); and 2) if people use different NRM practices in different types of fields (dune fields, cuvettes, lowlands, pastures). Appropriate questions have been drafted and are on the next page.

Data to identify **men's and women's constraints on and incentives for adopting new NRM practices** is key indicator in the S.O.3 core indicator set. Information about the incentives for adopting new NRM technology--such as the availability of credit, new land tenure laws, information--will help the Mission identify the factors that add up to enabling conditions for successful technology transfer. It also is crucial information for planning at both the activity and Team levels.

The draft questions below are designed to be addressed to both men and women, **separately**. Additional questions are necessary to interview women about their own grain fields, household gardens, community gardens, or other types of fields that they cultivate. It is imperative to interview men and women separately in order to determine whether they use different NRM strategies for different production systems.

Last season, did you do anything to make your soil fertile? To catch or hold water in your fields? To control erosion? Do you grow trees in or around your fields? What do you do to maintain your pasture land?

Practice	Used	Reasons for Using the Practice (more than one response allowed; use Code List)
Field trees		
Windbreaks		
Live fences		
Reforestation		
Community tree plantations		
Grass strips		
Gully plugs		
Water retention dikes		
Tassas (zais)		
Demi-lunes		
Tassas (zais)		
Plowing with animal traction		
Contour plowing		
Crop rotation		
Intercropping		
Use of manure (animal and plant wastes)		
Fallowing		Code List:
Compost		1. Lack of knowledge
Mulching		2. Lack of TA
Chemical fertilizers		3. Lack of labor
Herbicides		4. Not a landowner
Pesticides		5. Don't know
Improved seed		6. No response
Home garden		7. Other: _____

What kind of fields do you use the following practices on?

Practice	Used	Specify: Type/s of Field/s Dune fields, Lowlands, Cuvette, Pasture, Garden, Other
Field trees		
Windbreaks		
Live fences		
Reforestation		
Community tree plantations		
Grass strips		
Grass dikes		
Gully plugs (check dams)		
Water retention dikes		
Demi-lunes		
Tassas (zais)		
Plowing with animal traction		
Contour plowing		
Crop rotation		
Intercropping		
Use of manure (animal and plant wastes)		
Fallowing		
Compost		
Mulching		
Chemical fertilizers		
Herbicides		
Pesticides		
Home gardens		
Improved seed		
Rangeland management		

Is there a difference between what you do to help your crops produce on the land that you OWN, compared to on the land that you RENT or BORROW? Which practices do you use on your OWN land, and which do you use on RENTED or BORROWED land?

Practice	Used	Specify: Type of Land Tenure Owned, Rented, Borrowed, Sharecropped, Other
Field trees		
Windbreaks		
Live fences		
Reforestation		
Community tree plantations		
Grass strips		
Grass dikes		
Gully plugs (check dams)		
Water retention dikes		
Demi-lunes		
Tassas (zais)		
Plowing with animal traction		
Contour plowing		
Crop rotation		
Intercropping		
Use of manure (animal and plant wastes)		
Fallowing		
Compost		
Mulching		
Chemical fertilizers		
Herbicides		
Pesticides		
Home gardens		
Improved seed		

4. What else do you do to help your fields and your crops to produce?
5. What is your crop rotation, including fallowing?

Type of Field	Crop Rotation, by Year (specify crop/s or fallow)				
	Year 1	Year 2	Year 3	Year 4	Year 5
Dune					
Lowland					
Cuvette					
Pasture					
Other					

6. Which crops do you intercrop?
- Sorghum and millet
  - Millet and cowpeas
  - Sorghum, millet, and cowpeas
  - Other combinations: \_\_\_\_\_
7. What do you do to maintain your private pasture land?
- Don't have any
  - Nothing
  - Burn annually
  - Reseed annually
  - Plant trees
  - Other: \_\_\_\_\_
  - Other: \_\_\_\_\_

Do you know about other NRM practices, even if you do not use them? Which ones? Why don't you use them?

Practice	Known but not used	Reasons why not used (use Code List below)
Field trees		
Windbreaks		
Live fences		
Reforestation		
Community tree plantations		
Grass strips		
Grass dikes		
Gully plugs (check dams)		
Water retention dikes		
Demi-lunes		
Tassas (zais)		
Plowing with animal traction		
Contour plowing		
Crop rotation		
Intercropping		
Use of manure (animal and plant wastes)		Code List:
Fallowing		1. Insufficient knowledge
Compost		2. Lack of labor
Mulching		3. Lack of time
Chemical fertilizers		4. Lack of TA
Herbicides		5. Does not improve production
Pesticides		6. Don't know
Home gardens		7. No response
Improved seed		8. Other: _____

9. Last dry season, did you spend some of your time and energy doing NRM in your fields?

Yes

No

10. If yes: which practices?

11. If no: why not?

a. Lack of TA

b. Lack of labor

c. Not a landowner

d. Did something else in the fields, specify: \_\_\_\_\_

e. Other: \_\_\_\_\_

12. If no: what did you do with your time and energy during the last dry season (major economic activities)?

a. Went on exode

b. Petty commerce (nonagricultural products)

c. Petty commerce (agricultural products and livestock)

d. Off-season gardening

e. Process agricultural products

f. Artisanry

g. Local wage labor

h. Nothing

i. Other: \_\_\_\_\_

j. No response

13. How many men in this household went on exode last year? How many women?

14. Do you own land?

If yes: under which land tenure system (modern, traditional, Islamic, other)?

15. Do you feel that your land ownership is secure?

If yes: why?

If no: why not?

## ANNEX I

### NRM and Related Data Currently Available in Niger

#### I. Information from NRM Stakeholders

Interviews about NRM M&E systems and databases with both GON institutions and donors all led to the same conclusion: quantities of NRM-related data are available, but they do not constitute a coherent, national data set that will show the impact of Niger's diverse NRM programs over time. Individual donors and projects have not done a good job of monitoring and evaluating the impact of their NRM projects over time, so "before/after" data are nil. UNDP reported that it can provide only reports from the projects it has co-financed and in fact is interested in seeing S.O.3's M&E system for NRM. Interviews with the GON and donors also shows that M&E plans for most current NRM projects, including the World Bank-GON national program, have not yet been implemented. This means there will be considerable lag time before national data from the C/GRN and donors are available. Therefore, much "contextual" data exist for the S.O.3 Team's use, but very little is directly applicable to its specific indicators. Potentially useful contextual data are listed below.

The authors' time in Niger was limited and we present the information in this annex as representative, not exhaustive, of the NRM data that is available. We believe that we have identified most of the M&E activities and information relevant to USAID/Niger, but perhaps not all.

#### II. The World Bank's M&E Plans

The World Bank's Staff Appraisal Report (March 1995) reports that rural producers want to participate in monitoring and evaluating the NRM project. People "want to compare inputs to outputs, measure the results and compare [them] with [what] they obtained before under different techniques, methods and approaches." People and communities want information on the "quantity and type of inputs (including labor) used, hectares reclaimed from degraded land, increase in crop or pasture yields, costs incurred by them and assistance (technical and financial) received, incomes generated, savings made and credits obtained, and conflicts faced over land and natural resource issues and solutions adopted. They will compare these data with those from their initial situation...to help them better measure the overall benefits of NRM operations." Participatory diagnoses will be done at the design stage of the Terroir Management Plan and continue throughout the project. This implies that a participatory M&E system will be implemented to obtain local-level information that will be useful for the S.O.3 Team.

This project also will collect district- and national-level information. The former includes technical, financial, and socio-economic information (the evolution of community-level organizations and managerial skills, levels of technology accepted, degree of execution and compliance with local NRM management plans, changes in production systems, improvement in living conditions.) The latter includes information on the effectiveness of the terroir management approach, the time required for building confidence in the communities, conflict management, the adequacy of the legal and political framework to support the project, and program impact at all levels.

The Centre de Sahel, with the support of the World Bank, has identified four thematic areas for data collection. The first is the "rehabilitation of the natural resources endowment." There are nine indicators to monitor the current state, evolution, and utilization of soil, water, and vegetation. The second is "the improvement of living conditions of rural communities;" there are 10 indicators, including production intensification, increased incomes and purchasing power, reduced work load, and migratory flows. The third is community-level capacity-building related to NRM. Twelve indicators have been identified, including: organizational structures, existing regulatory frameworks (eg. for savings and credit, land use conflict management), technical capacity in NRM, and community networks with the external administrative and economic systems. The fourth area is capacity-building related to NRM policies and strategies, and coordination of national-level activities. Nine indicators will monitor the impact of the project on national capacity in the areas of legislation, level of success of the coordination process, and a useful NRM information network. The project's "key impact indicators" are listed in the appropriate categories below.

### **III. USAID/Niger Projects**

The SAP is planning to conduct an annual assessment of household food security at the arrondissement level. The number of households to be surveyed is not yet determined. The survey apparently will collect detailed information on household socio-economic status, agricultural production, livestock resources, and health status. It may be possible to negotiate with the SAP in order to include collecting information on households' use of NRM practices in this survey; in any case, it should be a source of useful, annual, household-level data for the S.O.3 Team.

The Peace Corps and Africare/Gouré's NRM projects already have chosen their indicators and organized their data collection systems. These two projects are collecting both biophysical and socio-economic data; their indicators are listed in those respective categories below. A table at the end of this section shows the relationship of their information and IFAD's to S.O.3's indicators.

### **IV. Biophysical Data**

The rest of this annex consists of the different categories of NRM information currently available from various sources in Niger, beginning with the category of "Biophysical Data." The other categories that follow are: Agricultural Production, Use of NRM Practices, Socio-Economic data, Base Maps, and Aerial Photos.

There is a significant amount of biophysical information available in Niger; the list below is partial and indicates the breadth of information available.

#### **A. Vegetation and Forests**

1. Map of the intensity of forest cover in all of Niger, in the process of being made by the UTA.
2. Inventory of the types of forest vegetation will be made by UTA when the above map is completed.

3. Images of the vegetation index (NDVI) that indicate vegetation volume, from NOAA satellite images, made by AGRHYMET every 10 days during the winter.
4. Estimation of the biomass of forage resources in the pastoral zone, from NDVI data and on the ground verification, made by PADE of MAG/EL.
5. Estimations of pasture biomass classified by type of vegetation in the department of Dosso, that will be made by the PISRN of MAG/EL.
6. Maps of the intensity of forest cover around five large urban centers, made by PUSF in the 1980s and now available in the documentation center of the UTA.
7. Maps of the intensity of forest cover around three large urban centers, made by the Energie II project in the 1990s.
8. Map of vegetation types and cultivation intensity south of where the 300 mm isohyet was located in 1975, based on data from 1975 and 1979, made by INRAN.
9. Africare/Gouré will make species lists to indicate good and poor pasture, halophyte/nonhalophyte plant species. Africare also will collect farmers' historical information about vegetation and mapping of cuvette vegetation, for information about vegetation density and diversity.

## **B. Soil**

1. Digitalization of the soil map of ORSTOM, available at SIGNER.
2. Digitalization of the geologic map of BRGM, available at SIGNER.
3. Map of the physiographic units south of where the 300 mm isohyet was located in 1975, made by INRAN.
4. Map of the land suitable for irrigation, made on the basis of the soil map and available at SIGNER.
5. "Unites paysagiques" for 56 village terroirs in Tillabery, based on aerial photographs and discussions with the villagers. The classification used by PASP was made in order to be understandable to the villagers.
6. IFAD is doing soil analyses in Tillabery and Diffa.
7. Africare/Gouré will monitor soil fertility, soil salinity measurements, dune movement, dune gully erosion, sand accumulation in cuvette soil, measurement of exposed tree roots due to wind-erosion, wind-erosion transects, identify and monitor plant indicators of soil fertility.

## **C. Meteorology**

1. Daily rainfall from 200 meteorology stations and data on temperature, winds, and humidity from about 40 stations, collected by the network of the Meteorologie Nationale du Niger.
2. "Images meteosat" and rainfall estimates based on cold cloud duration, that will be available from AGRHYMET.

## **D. Hydrology**

1. Geographical coordinates, water levels, water quality, and other technical information on 15,000 major water sources, from the SIGNER system in the Direction de l'Hydraulique.
2. Courbes of subterranean water levels estimated on the basis of mesures de piezometrie and topographic releves, from SIGNER.

3. Hydrologic data on water courses and ponds, from SIGNER.
4. Peace corps: number of wells of different types constructed and improved; number of water-lifting devices installed; number of irrigation systems created.
5. Africare/Gouré: water table levels in wells, depth of water table and water quality.

## **E. Agricultural Production Data**

### **1. GON: Agriculture and Animal Husbandry**

- a. Forecasts and estimates of cereal production, the area of land under cultivation, and yields, from the Direction des Statistiques Agricoles with financing from the DIAPER project.
- b. Statistics on livestock sales in 43 markets across the country, from MAL/EL.
- c. Map of cultivation intensity, made by the USGS for AGRHYMET, based on Landsat images.
- d. MAG/EL national statistics, including for all crops: area cultivated, production, exports, imports, prices.

### **2. IFAD**

The IFAD project (Programme Special National FIDA-Niger) began in 1989 in six sites (Diffa, Badaguichiri, Loga, Ouallam, Tehintabaradin, and Tehirozerine.) It has somewhat different objectives in the different sites. It is supporting the development of small irrigated perimeters in Diffa and Tillabery; promoting NRM practices for soil and water conservation in Badaguichiri; and supporting pastoral development in Tehintabaradin and Tehirozerine. Monitoring and evaluation activities began only in 1993; the project produces an annual M&E report. The head of the M&E unit reported that he does not have formal links with the C/GRN but that they meet informally to keep informed.

The project is assessing its impact by tracking agricultural production and income in its six sites, by collecting data from project and non-project households. It is measuring the yields of five major crops (sorghum, millet, peanuts, cowpeas, cotton, and garden vegetables.) The data is collected from random samples of villages and farmers, five farmers per village. The local Service Agricole and/or the project's technicians (vulgarisateurs) collect the production data.

### **3. IFPRI**

The IFPRI draft report ("Determinants of Land and Labor Productivity in Crop Production in Niger," draft, J. Hopkins and P. Berry, 1994) contains information on agricultural production from 135 households in 15 villages in Dosso department. The authors note that "measuring total field output, rather than just output of the principal crop, raises the estimated returns to land and labor substantially. Only 65 to 80 percent of the returns are captured by the principal crop."

#### 4. Africare/Gouré

- a. Average yields of vegetables, fruit, manioc, wheat, and other crops in the cuvettes. Yields will be recorded on a regular basis for each field or field zone and for each crop.
- b. Pests: presence of number and type of pests, including grasshoppers, caterpillars, aphids, nematodes, and rodents.

#### F. Use of NRM Practices

##### 1. Peace Corps

The Peace Corps is re-organizing its data collection system somewhat for its NRM project. More standardized data will be available from 80 volunteers in about 170 villages.

In 1993, Peace Corps provided USAID/Niger the following information:

- People trained in and practicing soil conservation techniques, number.
- Tree nurseries established, number.
- Trees outplanted, number.
- Woodlots established, number.
- New plant varieties introduced, number.
- People trained in and adopted national regeneration of tree seedlings in agricultural fields, number.
- People trained in improved gardening techniques, number.
- Community and individual gardens established, number.

This information will be available from Peace Corps in 1995:

- Fuelwood and tree surveys: inventory of species and uses.
  - New plant varieties introduced.
  - Native plant varieties re-introduced.
  - People using soil conservation techniques, number.
  - Number of hectares recovered with soil conservation techniques.
  - Community and individual tree nurseries started, number.
  - Which tree species planted.
  - Trees outplanted, number.
  - Woodlots planted, number.
  - Wind breaks planted.
  - People using natural regeneration of trees, number.
  - Community and private gardens established, number.
  - Meters of live fencing planted.
  - Seed banks established, number.
  - Illegal herding study.
  - Large mammal study.
- People taught environmental education, number.
  - Village-based land management committees started, number.

## 2. Africare/Gouré

Africare is tracking these indicators:

Garden wells constructed, number.  
 Live fencing created around cuvettes, number of meters.  
 New food and forage crops introduced and being grown, number of.  
 Dunes stabilized, number of hectares.  
 Trees planted, number.  
 Pastoral wells constructed, number of.  
 Number of tree nurseries established, their production and use rates.

## 3. IFAD, Programme Special National FIDA-Niger

IFAD has collected data on the number of hectares where new NRM practices are used since 1993. The practices that it is tracking are listed below. It also is collecting information on indicators such as literacy training and agricultural credit.

Soil and water conservation practices, all measured in "number of hectares:"  
 Tassas (zais) for forestry.  
 Demi-lunes.  
 Protection walls (50 cm high).  
 Machine plowing.  
 Animal traction plowing.  
 Reforestation strips.  
 Seeding pasture grass.  
 Compost pits, number of.  
 Total managed area.

### Gully management:

Gully stabilization with trees, number of meters of trees.  
 Gully plugs, cubic meters.  
 Cement bridges, number.  
 Dams made of cereal stalks, number.  
 Water infiltration dikes, number.

### Environment:

Trees produced, number.  
 Tree plantations, survival rates.  
 Mini-nurserymen trained, number.  
 Mini-nurserymen re-trained, number.  
 Area reforested, number of hectares.  
 Length of windbreaks and living fences, meters.

### In Diffa and Tillabery, where there are irrigated perimeters:

Quantity of seed distributed.  
 Demonstration plots, number.

Collective perimeters established, number.  
Individual perimeters established, number.

**Agricultural credit:**

Number of loans from FIDA, generally village-level.  
Amount of loans.  
Recovery rate.

**Literacy:**

Number of literacy centers built.  
Number of literate people.

**Management of cooperatives:**

Number of committees formed.  
Number of administrative counselors trained.

**4. USAID/Niger's Disaster Prevention and Mitigation Project**

This project will promote the use of new NRM practices, and track their use and impact at the village level.

**G. Socio-Economic Data**

**1. The Demographic and Health Survey, 1993**

Household demography (number and sex of members), men's and women's educational levels, women's and children's nutritional status, types of housing, material possessions.

**2. Peace Corps**

Number of people taught literacy; number of people taught numeracy; number of men and women attending village organization meetings.

**3. Africare/Gouré**

Africare reports that its M&E system is participatory and that most of the monitoring will be done by the villagers. Their system combines objective biophysical measures and people's perceptions of their natural resource base, such as soil fertility and the quality of vegetative cover. People's historical and current perceptions will be documented. One major component of the monitoring system is to have the villagers calculate the costs and benefits of the project's specific NRM interventions. The benefits are the differences in yields in fields with/without NRM practices; the costs are people's investments of labor and money. This calculation is expected to show the local agro-ecological constraints on agricultural production and the strategies to reduce them.

Another major component of the system is to conduct PRAs and socio-economic ranking exercises in order to assess the community resources that could be invested in NRM. Africare

also will measure the impact of the project's interventions at the community level. The PRAs will be done at the beginning and the end of the project. Ten percent of the households in each village will be interviewed, in order to "etablir une politique d'investissement realiste." Africare plans to evaluate the impact of the project interventions at the village level and on the beneficiaries socio-economic status. The project will document changes in people's attitudes their terroir and in their ability to influence the quality of their lives. Both quantitative and qualitative data will be used.

Specific indicators: in each household, number of economically active and nonactive members; household demography (number of men, women, and children; number of visitors and migrants); number and type of fields owned; principal crops cultivated; number and type of animals owned; different sources of household income and their relative importance. This information will show household-level capacity to invest in new NRM strategies.

WID indicators: number of trained women, follow-up on on small animal production, and grain mills.

#### **4. Poverty Profile, UNDP and DSCN, 1994**

This report contains national-level information on the Nigerien population. Its utility is limited because the population is quantified in terms of four socio-economic levels (not poor, very poor, poor, somewhat poor.) The information is not analyzed at any other level (such as regional). Information on diet, nutritional levels, housing, and income is included.

#### **5. National Census, 1988**

Data on the spatial distribution of the population, migration, household demography, demographic and social characteristics, education, economic activities, fertility and mortality rates, and housing. Documents and data available at the DSCN.

- a. Approximately 20,000 villages and hamlets, in the process of being numbered and geo-referenced by AGRHYMET, on the basis of old maps of the IGN (France).
- b. 17,000 villages and hamlets, numbered and geo-referenced by the Direction de l'Hydraulique, based on their data on water sources.
- c. Approximately 20,000 villages, hamlets, and water sources numbered as part of the 1988 census.

#### **H. Base Maps**

1. Maps of Niger at 1:200,000, made by IGN (France) in 1954-56, sold by IGNN.
2. Administrative limits to the canton level digitalized by the USGS for AGRHYMET and available free at AGRHYMET.
3. Maps of the region north of Niamey at 1:50,000, made in 1990-94 by a Japanese project and sold by the IGNN.
4. Maps of the Agadez region at 1:50,000, made in 1990-94 by IGN (France) and sold by the IGNN.

## I. Aerial Photos

1. Complete coverage with aerial photos at 1:60,000, made by the IGN (France) in 1975 and currently sold by the IGN (France); should be sold by IGNN soon.
2. Aerial photos of the region north of Niamey, taken in about 1992 by IGN (France).
3. Aerial photos of the region around Agadez taken in about 1992 by IGN (France) as part of their support for the IGNN.

## ANNEX II

### **Aerial Videography: An Option for Measuring Program Impact on the Ground**

#### **I. The Options for Collecting Data on Numbers of "Managed Hectares"**

Data that show change over time in the number of hectares where NRM practices are used throughout Niger ("managed hectares") is one way of measuring S.O.3's program impact. This information would be a basic, empirical measurement of program impact, but it is costly to obtain. There are three ways to obtain these data: aerial videography, hiring technicians to do on-the-ground measurements, and using secondary data from various agencies. Based on an aerial videography (AV) pre-test funded by ASDG II, the estimated annual cost to do an Area Frame Sample would be approximately \$285,000 the first year and \$230,000 each following year. National-level data could be extrapolated from this sample. An alternative would be to video specific project intervention areas, in order to track change over time in those areas only. The estimated annual cost for that would be approximately \$75,000. However, the site-specific videos would not provide a basis for extrapolating to national-level changes. A summary of the pros and cons on using videography to monitor project impact, based on ASDG II's pre-test, is provided below. Because a national database quantifying the distribution of NRM practices does not exist and because it would be useful for all the stakeholders involved in NRM, another alternative would be to split the annual cost of the national AV sample among the stakeholders.

Hiring technicians to measure the physical area where NRM practices are present has so many drawbacks that it is impractical, particularly to collect national-level data. Conventional wisdom from development experience shows that the combination of an exacting job and the low level of technicians hired do it generally produces poor data. The alternative is to hire competent technicians, train them, and pay them well. The caveats are that competent technicians probably would not want the job, and that the cost would be very expensive in terms of both time and money. An alternative would be to conduct this on-the-ground measurement in a small, random sample of project and non-project villages. This would provide some site-specific information on project impact, but the information could not be extrapolated to the national level.

Quantitative information about the use of NRM practices currently is available from a few sources in Niger. IFAD's village technicians collect information (number of hectares, number of trees, number of meters) about the 20 agro-sylvo-pastoral practices the IFAD project is promoting in its six sites. The World Bank states that rural producers will collect information on the number of hectares reclaimed from degraded land. The Peace Corps can provide information on the number of hectares recovered with soil conservation techniques and numbers for forestry practices (such as number of trees planted, species, survival rates, meters of live fences). The data from these different sources cannot be aggregated to the national level, but they will provide some project- and site-specific information.

## II. Aerial Videography

One technique for estimating the area in Niger in which NRM practices are used is to do a limited number of aerial videography overflights, which would constitute a national videography sample. Extrapolating from the NRM practices documented in this sample would provide an estimate of the total national area in which NRM practices are used. The estimated cost of doing a national videography sample is \$285,000 (budget below.) There are some limitations on using this technique. As Brunner recently reported, most NRM practices in Niger are rare and clustered phenomena ("Niger Aerial Videography Demonstration," Brunner and Sidle, 1994.) As a result, the minimal national random sample recommended by an expert for an Area Frame Sample (35 transects at a cost of \$285,000) might produce poor estimates of which NRM practices actually are on the ground. The alternative would be to invest more money in sampling, which would produce better information about the national distribution and extent of NRM practices. Better sampling also would provide a sounder basis for stratifying Niger into NRM monitoring/videography areas.

The minimal national random sample of 35 transects cited is from an area frame sampling expert. His estimates are based on discussions with Brunner concerning the distribution and variability of a group of standard NRM technologies in West Africa. It is important to note that he did **not** have a chance to review the Nigerien aerial videography data from the overflights of October 1994 that are the basis of Brunner's report. His recommendations about sampling therefore are preliminary, and might be revised after reviewing the data. The budget estimates below therefore are preliminary. **The final sampling intervals and costs could be significantly higher.**

Some technical considerations are worth mentioning briefly. First, Brunner states that aerial videography is "an appropriate sensor for natural resource monitoring and inventory when used as a component of a comprehensive environmental information system that includes satellite image analysis, GIS, and GPS, along with appropriate ground measurements." Second, the imagery is limited by relative low spatial resolution and narrow field of view; it is generally used for covering small areas. Third, direct estimates of area cannot be made because of distortion by the camera lens. Brunner reports that the percent of the sample area overflown in which there are NRM practices could be estimated. Estimates of the national area where NRM practices are present would be based on estimates from the sample area (the sample overflights, for example, the minimum of 35 transects), which introduces the problem of compounded error.

ASDG II organized a list of project impact indicators according to the Africa Bureau's five-level NRM Analytical Framework, and tested the assumption that these can be identified using aerial videography. The results are shown in the three tables below. The test overflights in Niger showed that 21 of the 55 indicators can be identified using AV (Brunner and Sidle 1994). Thirteen of these are widespread so they would be captured with small samples of video coverage. But many of the soil and water conservation practices (demi-lunes, diguettes, infiltration ditches) are found mainly in project intervention areas, and would not be captured with small video samples. In terms of using AV to monitor the presence of NRM practices on the ground (ie, to monitor them as project impact indicators), this test has three major implications: 1) a large video sample is necessary to ensure that all the indicators are detected; 2) some indicators will be missed if a large sample is not possible, which implies a choice

among which indicators are tracked; and 3) purposely sampling project intervention areas to track use and diffusion of the indicators is an option. The choice between a large video sample that captures all the NRM practices on the ground or a smaller, purposive sample of project intervention areas, in order to do the same, evidently is the bottom line. The former would produce information representative of the entire country; the latter would serve only for monitoring change in specific project areas.

The estimated annual cost of a national AV sample to document the distribution of NRM practices throughout Niger is \$230,000. Brunner notes that most projects require annual AV overflights. The choice thus is to monitor the national impact of USAID's NRM program at an annual cost of \$230,000, or to focus on assessing project impact in specific intervention areas. The latter could be done with the Africare/Gouré project or in the Maradi area where historical NRM data exist and ASDG II will collaborate with current projects. The estimated annual cost of using AV to assess project impact in a specific intervention area is approximately \$75,000.

The following three tables contain the project impact indicators that ASDG II organized according to the Africa Bureau's NRM Analytical Framework, in order to test the assumption that they can be identified using aerial videography:

**NRM Practices That Can Be Identified Using Aerial Videography**

Level 3: Monitoring NRM Practices	Visible*
Farm-level indicators: Ratio of fallow to cropped land	Yes
Crop rotation	Yes
Trees or grass on field boundaries	Yes
Density of trees in fields	Yes
Field trees	Yes
Live fencing	Yes
Windbreaks	Yes
Rock ridges, demi-lunes	Yes
Wells	Yes
Manure or compost	?
Mulching/crop residues in fields	?
Tree seedlings protected in fields	?
Other natural regeneration practices	?
Use of chemical fertilizer	No
Community-level indicators: Percent of farmers in villages adopting a given number of NRM practices	Yes
Area covered by gestion de terroir plans	No
Area covered by forest management plans	No
Area of land designated as grazing reserves	No

\* ? = insufficient evidence to determine if the indicator can be reliably detected on video imagery.

NRM Practices That Can Be Identified Using Aerial Videography

Level 4: Monitoring Conditions & Trends of Natural Resources	Visible*
Farm-level indicators: Rate of soil loss in farm fields	Yes
Soil moisture holding capacity	Yes
Soil infiltration rates	?
Soil fertility (pH, CEC)	?
Community-level indicators: Number and length of gullies in target watershed	Yes
Number and duration of seasonal ponds	Yes
Changes in vegetative cover (density & extent of tree cover)	Yes
Changes in condition & trend of rangeland resources	Yes
Relative abundance of wildlife	Yes
Condition & extent of pasture at end of dry season	Yes
Relative abundance of "minor forest products"	No
Depth of water table	No
Output of wells	No
Local rainfall	No

\* ? = insufficient evidence to determine if the indicator can be reliably detected on video imagery.

**Project Impact Indicators That Can Be Identified Using Videography**

Level 5: Monitoring People-Level Impacts	Visible*
Farm-level indicators: Number of livestock	Yes
Crop yields	?
Net returns to land (CFA/ha)	No
Net returns to household labor	No
Ratio of purchases to sales of agricultural products	No
Extent of use of chemical fertilizer	No
Community-level indicators: Area cultivated	Yes
Number of livestock supported by year-round pasture/fodder in the community	?
Population density (people/sq.km.)	No
Land use pressure (people/sq.km. of arable land)	No
Percent of production-insufficient households	No
Number of privately owned wells or barrages/retenues	No
Number of dry-season gardens	No
Percent of community with secure access and control of cropland or pasture	No
Number of local enterprises/entrepreneurs	No
Percent of local population that goes on exode for more than one month	No

\* ? = insufficient evidence to determine if the indicator can be reliably detected on video imagery.

## ANNEX III

### **The Demographic and Health Survey: a Summary of Time, Costs, and Required Resources**

#### **Overall Time and Cost**

The DHS field work and final report were completed in approximately 2.5 years. Planning and conducting the survey in Niger required about one year; a short report based on 10 tables was published three months after the survey was completed, and the final report was published approximately 12 months after the survey was completed. **The total cost to USAID was \$560,000 plus the cost of purchasing a vehicle;** FNUAP and UNDP also provided some material and financial support. The cost to USAID for expatriate TA and travel to Niger was \$180,000; the cost of 165 days of TA in the USA was approximately \$55,000; and the total local costs were \$325,300. The latter includes an expenditure of \$25,000 for computers and software that might not be required again. An itemized budget is provided at the end of this annex.

#### **Management Organization**

The Direction Statistique et Comptes Nationaux (DSCN) was responsible for the survey, in collaboration with the Direction Technique du Ministere de Sante Publique, and the Ministries of Developpement Social, de la Population, Promotion de la Femme, and with Macro International. One objective was to develop national capacity and resources to conduct such surveys.

Project management: the National Director, Idrissa Alichina Kourgueni, was given authority over a Direction Nationale to do the work. The Director was assisted by a Technical Director, Bassirou Garba, who was responsible for training supervisors and enumerators, and for coordinating the computer work. Nigerien consultants were responsible for translating the questionnaire into Haoussa and Djerma, and for training the enumerators to conduct the interviews these two languages. An expatriate Technical Coordinator was provided and expatriate TA for sondage, questionnaire design, personnel training, and data management and anlysis.

#### **Personnel Organization**

A technical team selected from the DSCN supervised the fieldwork. It consisted of: an epidemiologist from the Ministere du Sante Publique, a sociologist from the Ministere du Developpement Social, some statisticians and demographers from DSCN, and a consultant in demography.

Sixteen team leaders and quality controllers were selected from the enumerators trained for and used in the pretests. Thirty-three enumerators, all women, were selected based on their training results and aptitude tests. These enumerators were trained for one month.

There were eight survey teams. Each consisted of four enumerators, a controller, a team leader, and a driver. The field work took four months to complete.

### **Computerized Data Management**

Six technicians were trained in data input. The "Integrated System for Survey Analysis" program developed by Macro International was used to input the survey data.

### **Sampling Strategy**

A nationally representative sample of approximately 6,000 women was selected, based on data from the 1988 national census, with TA from an expatriate sampling expert. The country was divided into three strata for sampling: Niamey, other urban centers, and rural areas. The department of Agadez, the arrondissement of Bilma, and the zone of Arlit were excluded from the sample; this was justified because they represent < 1% of Niger's population. There are 4,479 enumeration areas (zones de denombrement) and good maps of each one from the 1988 census. Two hundred and thirty-five (235) enumeration areas were drawn from this total. Each enumeration area was censused to generate a list of its households. A sample of households was drawn from the census list of each enumeration area. Ten to 45 households were interviewed in each area.

The final sample consisted of: 309 households in Niamey, 529 in other urban centers, and 4,404 in rural areas. Total: 5,242 households interviewed.

### **Relevant Data for S.O.3 from the DHS**

Four questionnaires were used in the survey: one for the household, one for the woman, one for a subsample of about 1,800 husbands, and one to record community-level information on infrastructure and health care.

The data relevant to S.O.3 collected in the DHS survey are:

1. Household demography (size and composition), including sex of household head and educational levels of men and women household heads.
2. Nutritional status of women and children < 5 years of age (anthropometric data).
3. Housing conditions (electricity, source of water, type of toilet, types of floors and roofing, and number of rooms for sleeping.)
4. Material possessions inventory (radio, television, refrigerator, bicycle, motorcycle, car.)

These data are good indicators of household nutritional and economic status, and show urban/rural differences. Change in household nutritional and economic status based on these indicators will be shown in the results of the next DHS. These are good contextual data for S.O.3. USAID should determine if these DHS data can be analyzed at the regional or enumeration area levels, in order to have even better contextual data.

**Timetable for the DHS Survey and Report**  
(Some of these tasks were done simultaneously.)

Task	Number of Months
Survey design and translation of questionnaire	3
Plan de sondage and define the census zones	2
Census the households in each zone	4
Pretest the questionnaire	2
Finalize the questionnaire	1
Plan the data analysis and tables to produce	3
Train the survey enumerators	1
Train the computer inputters	1
Data collection (fieldwork)	4
Data input	6
Write the first draft report	2
Finalize the report	2
Preparation the summary report (resume)	1
Print the report and the summary report	2
Present the national seminar	1
Audit	1

**DHS Budget for Expatriate Technical Assistance**

Item	\$U.S.
Labor and overhead	71,500
Travel (RT DC/Niamey/DC x 13 trips)	37,000
Per diem	34,075
Communications	1,500
G & A	21,611
Subtotal	165,686
Fee	13,255
TOTAL:	178,941

**DHS Budget for Local Costs**

<b>Item</b>	<b>\$U.S.</b>
<b>Salaries of temporary staff</b>	
Administration	8,500
Sampling	7,000
8 survey teams	52,000
Data entry	8,000
<b>Total:</b>	<b>75,500</b>
<b>Per diem</b>	
Sampling	10,000
Survey	55,000
<b>Transportation</b>	
Fuel	60,000
Repairs and maintenance	20,000
Insurance	3,700
<b>Materials</b>	
Document reproduction	20,000
Tape recorders	600
Computers and software	25,000
Scales and measuring equipment	3,500
Office supplies	5,000
<b>Production of reports</b>	<b>15,000</b>
<b>Other</b>	
Translation and other local contracts	6,000
Publicity	5,000
Travel to IRD main office	11,000
<b>Contingency</b>	<b>10,000</b>
<b>Total local costs:</b>	<b>325,300</b>
<b>Total expat costs:</b>	<b>178,941</b>
<b>GRAND TOTAL:</b>	<b>505,000</b>

Note: In addition to this budget, USAID/Niger purchased a vehicle and IRD provided approximately 165 days of TA in the U.S. through core DHS Project funds.

## ANNEX IV

**IFPRI: Determinants of Land and Labor Productivity in Crop Production in Niger**

IFPRI's 1994 report on the factors that influence agricultural productivity contains very useful information for USAID/Niger's ANP program ("Determinants of Land and Labor Productivity in Crop Production in Niger," IFPRI, 1994). The report is pertinent both as contextual information and as a basis for reflecting on additional indicators for S.O.3's M&E system.

IFPRI's research was conducted in five zones in the department of Dosso, where 24% of Niger's total population lives. The zones were: northern and southern Boboye, Southern Dallol Maouri, Gaya Plateau, and Gaya River. Borders with Benin and Nigeria run through these zones. The research was conducted in 15 villages and 135 households. The general characteristics of each zone are summarized in the table below.

The researchers' conclusions fit the model described for Africa in general. Their data show that labor is a major factor in agricultural productivity in Niger, as other authors report (eg. S. Berry 1991). A more interesting conclusion, in terms of S.O.3, is that **agricultural productivity is highest in the rural households with the largest nonfarm incomes**, because they can afford to hire labor. "[P]reliminary statistical analysis suggests that the ability to hire labor, at the critical labor bottleneck period, may be a factor leading to increased productivity. Households with the liquidity to hire labor (those with the highest levels of nonfarm income) have significantly higher yields (nearly double)" (IFPRI 1994, page 58). The rural producers' strategy for productive agriculture thus is to diversify the household economy, by incorporating nonfarm economic activities in it, and invest in agricultural productivity by hiring labor. This has a significant implication for S.O.3's objective of promoting new NRM practices as a means of increasing production: it is contrary to rural households' current economic strategy. That is, rural men and women invest part of their time and energy in nonfarm activities, which produce cash to fund agricultural production and to support their households.

**Investing in NRM technology** in an environment where rainfall accounts for about 80% of the variance in crop production would be a significant opportunity cost for farming households. The conclusion is that 1) indicators to track opportunity costs are necessary and 2) programmatic planning must recognize the significance of NRM as opportunity costs.

This economic diversification is classic risk aversion, a traditional and necessary strategy in the harsh Sahel, where rainfall accounts for 80% of the variance in crop production. Persuading farming households to change that time-tested strategy and increase their investment in agriculture, in the form of NRM, will be difficult. The IFPRI research highlights two salient facts that should be taken into account in S.O.3's monitoring and evaluation work. First, Niger's risky agricultural environment compels farmers to diversify their production out of agriculture and NRM. Those farmers who diversify are able to invest in the labor and inputs that increase their productivity. **Therefore, in order to understand the probability that NRM practices will be adopted, it is necessary to understand non-farm economic opportunities. If the opportunity cost of investment in NRM is high, then the investment will not occur.** Thus, the S.O.3 M&E system should attempt to measure the farmers' opportunity costs for investing in NRM.

Seven major nonfarm economic activities were reported in the study. These are, in order of frequency in the five zones: food processing, which generally is women's work, (4 zones); petty commerce, which generally is men's work, (3); gathering [wild foods?] (3); artisanry (3); maraboutage (2); transport (1); and fishing (1). Two other forms of economic diversification were important in the two study zones with the lowest food security (4-6 months): seasonal migration (exode) and animal husbandry. People obviously are choosing to diversify away from agriculture and into other economic activities, particularly those in the areas of lowest agricultural production. "The low opportunity cost of labor during the non-peak period suggests that it may be difficult to induce farmers to invest more of their labor resources in agricultural activities during this period since opportunities outside agriculture are likely to offer higher marginal returns" (IFPRI 1994, page 58). The S.O.3 Team believes that investing in NRM (ie agriculture) will improve production; farming households believe that the way to make ends meet is to invest in other activities. A significant factor that influences these different beliefs is **time-frames**: the farmers' short-term need for immediate survival, versus the donor's long-term view of future benefits. This is another key area to explore in field work, through focus groups as well as surveys. It is interesting to note that rural economic diversification is based on agriculture: "Although rural incomes are highly diversified, the agricultural sector remains the leading sector in the rural economy. In four of the five study regions, income from the agricultural sector (crops, livestock, and agricultural wage labor) dominates, accounting for 55 to 76 percent of household income" (IFPRI 1994).

Households in the Sudano-Sahelian zone in the upper economic terciles (based on livestock ownership, the largest share of non-agricultural income, and the highest level of rainy season nonfarm income) have "significantly higher input expenditures per hectare" than households in the lower economic terciles. Households with higher proportions of nonfarm income and access to more production credit also have significantly higher yields (IFPRI 1994, page 49). "This suggests that **nonfarm income is being used as a liquidity source for resource investment** and increased hired labor use which in turn has led to higher yields" (ibid). The influential factors are somewhat different in the Sudano-Guinean zone, where households in villages with good infrastructure or weekly markets have significantly higher levels of input expenditures and significantly higher net returns to land and labor (ibid). Thus the correlates of agricultural productivity and producers' strategies are site-specific; they invest in labor (Sudano-Sahelian zone) or in seed and manure (Sudano-Guinean zone). This indicates that the Sudano-Guinean zone is the more appropriate area for looking for and promoting new NRM technology.

IFPRI also concludes that income diversification in combination with a good market infrastructure is necessary for increases in agricultural productivity: "overall infrastructure and presence of a weekly market have significant positive effects on input use and productivity." That is, households with diversified economic strategies and marketing opportunities are agriculturally productive. If local infrastructure and markets are a strong influence on households' investment in agriculture, these are additional factors (or indicators) to be explored by the S.O.3 Team.

The conventional wisdom that African farmers are net food purchasers is supported by this research. Household expenditures on basic grains (millet, sorghum, and fonio) account for the single largest commodity share of household expenditures, 39% (IFPRI 1994). Eighteen percent

of any increase in income will be spent on these grains, and on maize (ibid). These expenditures may be useful indicators to track household well-being (food security). This information points out the utility of including a two-week recall of food purchases in S.O.3's surveys (which must be done in the same month each time).

The overall conclusion of this research is well worth considering, in terms of S.O.3's objectives. According to IFPRI, "Agriculture cannot be successfully intensified without addressing seasonal labor constraints through improved technologies and better institutional options for credit provision. ...the sustainable intensification of agriculture in western Niger....requires investment in infrastructure, market reforms, seasonal labor-augmenting technologies, and the alleviation of credit/liquidity constraints. The precise mix of each will depend on location-specific characteristics."

## BIBLIOGRAPHY

Africare/Gouré Project  
1994 Gouré NRM Evaluation and Monitoring Plan, First Quarterly Report, Gouré,  
Niger.

Africare/Gouré Project  
n.d. Systeme Suivi Socio-Economique.

Brunner and Sidle  
1994 Niger Aerial Videography Demonstration, Washington, D.C.

Casley, Dennis J. and K. Kumar  
1988 The Collection, Analysis and Use of Monitoring and Evaluation Data, Johns  
Hopkins University Press, Baltimore.

Direction de la Statistique et des Comptes Nationaux  
1992 Demographic and Health Survey, prepared by I.A. Kourgueni, B. Garba and B.  
Barrere, with Macro International Inc. and Direction Generale du Plan, Ministere des Finances  
et Plan, Arlington, Virginia.

Hecht, Joy E.  
1994 Mise en Place d'un Reseau de Suivi Environnemental au Niger, Volume I, DATEX  
Inc., IRG/SDSA II, Washington, D.C.

Hopkins, Jane and P. Berry  
1994 Determinants of Land and Labor Productivity in Crop Production in Niger, (draft  
final report), IFPRI, Washington, D.C.

IFAD  
1993 Rapport Annuel 1993, Suivi Technique des Activities, Ministere de l'Agriculture  
et de l'Elevage, Programme Special National FIDA-Niger, Unite de Suivi-Evaluation, Niamey,  
Niger.

World Bank  
1995 Staff Appraisal Report, Washington, D.C.