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USAID ECONOMIC GROWTH PROJECT

ENVIRONMENTAL MITIGATION AND MONITORING PLAN

March 2010

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ACRONYMS

BEO	Africa Bureau Environmental Officer
EA	Environmental Assessment
EGSSAA	Environmental Guidelines for Small Scale Activities in Africa
EMMP	Environmental Mitigation and Monitoring Plan
GFSR	President's Global Food Security Response to high food prices
GMOs	Genetic Modification of [Living] Organisms
IEE	Initial Environmental Examination
IQC	Indefinite Quantity Contract
IRG	International Resources Group
MEO	Mission Environmental Officer
PCE	Projet Croissance Economique (Economic Growth Project)
PEA	Programmatic Environmental Assessment
PERSUAP	Pesticide Evaluation Report/Safe User Action Plan
QA/QC	Quality assurance and control
SAGIC	Accelerated Growth and Increased Competitiveness in Senegal

INTRODUCTION

Senegal has recently been included as a focal country under then U.S. President's Global Food Security Response to high food prices (GFSR). The GFSR is intended to address the impact of high global food prices, increase agricultural productivity, and alleviate barriers to the movement and procurement of food both locally and regionally in key vulnerable countries in Sub-Saharan Africa. The GFSR places a particular focus on staple foods and improved access to agriculture inputs and finance. These GFSR objectives complement and reinforce USAID/Senegal's SO 11 existing strategic framework and for the present time are being pursued as part of the SO 11 portfolio under an "increased food security" rubric.

International Resources Group (IRG) is the prime contractor for the Accelerated Growth and Increased Competitiveness in Senegal (SAGIC) Indefinite Quantity Contract (IQC) mechanism. In April 2009, IRG signed Task Order 5 under the SAGIC IQC. Through this new Task Order, the SAGIC team works towards increasing food security in Senegal through activities to achieve USAID/Senegal's three GFSR results:

- **GFSR1:** Increasing agricultural production and productivity
- **GFSR2:** Alleviating transportation, distribution, and supply chain bottlenecks
- **GFSR3:** Promoting sound market-based principles

Recently, USAID/Senegal asked IRG to ensure that its activities were being carried out as per the threshold determinations identified in the September 2009 Initial Environmental Examination (IEE) amendment for SO 11 (still under review within USAID). The USAID Mission made particular reference to the need to prepare a Pesticide Evaluation Report/Safe User Action Plan (PERSUAP) for activities intended to enhance agricultural productivity as part of the Projet Croissance Economique (PCE or Economic Growth Project) component addressing the Global Food Security Response program. This recommendation also noted that the PCE would need an Environmental Mitigation and Monitoring Plan (EMMP) because the amended IEE (and indeed the original SO 11 IEE of 2006) had determined that a number of planned activities merited a threshold finding of "negative with conditions." USAID also suggested the opportunity for synergy related to environmental management requirements with IRG's sister Wula Nafaa Project for which a comprehensive EMMP was finalized and submitted to the Mission in January 2010.

IEE BACKGROUND FINDINGS

Many of the activities foreseen as part of the PCE, including studies, research, policy dialogue and reform, capacity building and institutional strengthening, all key to lasting impact in the food security/agriculture sector, were determined to be **"categorical exclusions,"** which by definition do not have an impact on the environment or on the local population. They can and are proceeding without further direct compliance measures.

However, in preparing the amendment to the SO 11 IEE, USAID issued a **"negative determination with conditions"** per 22CFR216.3(a)(2)(iii) for the following activities linked to the GFSR, and thus to the PCE scope of work under Task Order 5:

- Irrigation and support to increased efficiency in existing irrigated areas
- Support to improved rainfed agricultural practices
- The multiplication and distribution of seeds of staple food crops
- The increased use of organic and inorganic fertilizer

- Improving farm to market roads
- Construction of food storage warehouses and cold storage facilities
- Activities supporting the development of entrepreneurial capabilities and/or small to medium-scale enterprise developments for the private sector and farmer associations.

Furthermore, the amended IEE includes the following conditions for these activities:

- Although expansion **within the boundaries of the existing irrigated schemes** is allowable, no expansion on to new sites and in particular, on undeveloped wetlands, can be undertaken as this would change the determination to a positive one (22CFR216.2(d)(ii) and would therefore require carrying out an environmental assessment (EA).
- This determination specifically excludes seeds resulting from the genetic modification of living organisms (**GMOs**).
- Promoting and/or procuring **fertilizers** will be done in conjunction with the guidance available in the Africa Bureau Fertilizer Information Sheet.
- No funds may be expended on **pesticide procurement or use**, until after an amendment to this IEE is approved that addresses the pesticide procedures outlined under 22 CFR 216.3(b) and a PERSUAP is completed and approved by the Mission Environmental Officer (MEO) and the Africa Bureau Environmental Officer (BEO).
- **Construction activities** will be conducted following environmentally sound practices presented in USAID's *Environmental Guidelines for Small-Scale Activities in Africa*, (Chapters 3 and 16). Prior to constructing facilities in which the total disturbed surface area exceeds 10,000 square feet, if any, the program will conduct a supplemental environmental review according to guidelines in the *Africa Bureau Environmental Procedures Training Manual* (Annex G). Construction may not begin until such a review is completed and approved by the REO.

CLARIFICATIONS REGARDING THE ACTIVITIES PLANNED UNDER PCE

This EMMP is principally focused on the GFSR Component whose activities are targeted at increasing agricultural productivity and production. PCE project staff has, however, confirmed that any activities related to irrigation will take place within the perimeters of existing irrigated areas, and that no new irrigation schemes will be promoted or funded?.

Rehabilitation of farm to market roads was originally foreseen as part of the activities to be supported under the GFSR component aimed at alleviating transportation, distribution, and supply-chain bottlenecks. It was subsequently decided that non-PCE resources would be used for this purpose if USAID decided that they should go forward.

The IEE Amendment has also deferred a threshold determination**,** per 22 CFR216.3(a) (7) iii, related to the possible involvement of GMOs because of the requirements of ADS 211, which mandates carrying out a Biosafety review for any activities involving the field testing or open release of GMOs prior to the environmental examination. USAID/Senegal does plan to support the development of regulations for safe, effective technological advances, including biotechnology. There is, however, some possibility that field testing of GMOs may be supported with resources from other sources working in the country and as part of Agency support for the program.

THE IMPORTANCE OF ENVIRONMENTAL MANAGEMENT WITHIN THE PCE

Beyond the need to be in compliance with USAID Environmental Procedures (Reg. 216), IRG and the PCE Team believe that there are other reasons for ensuring that its activities are being implemented in an environmentally sustainable manner. These include:

- The premises and principles behind the environmental mitigation and monitoring process provide us with another element of quality assurance and control (QA/QC) for the development process and its outcomes.
- The increased agricultural productivity needed to meet Global Food Security Response goals can only be achieved through the rational use of fertilizers and pesticides as part of improved farming systems. The proper use of these inputs will also have a profound effect on production costs and farmer margins which will be the long-term key to maintaining the vitality of the agricultural sector.
- Mitigating anticipated adverse socio-environmental impacts and monitoring the activities for unforeseen consequences, i. e., implementing this EMMP, will be fundamental to the long-term sustainability of our development efforts and investments.
- The outcome of environmentally sound development – "enhanced environmental quality"– can potentially give us an opening to and/or leverage in an increasingly competitive marketplace.
- A concern for socio-environmental consequences can be an integrating factor related to the links between food quality and hygiene.
- Over the longer term, the sound environmental management approach will lead to the introduction of more clean technology options which can also be a cost containment measure (energy, water, raw material, less solid waste, less effluent) essential to the economics of the sector.

PRINCIPLES FOR ADDRESSING ENVIRONMENTAL COMPLIANCE MATTERS WITHIN THE PCE PROGRAM OF WORK

This EMMP is being prepared with the specific intention of going "beyond compliance" as related to our responsibilities as a USAID contractor or Implementing Partner under Reg. 216. In addition to the conceptual and developmental focus discussed above, IRG is committed to ensuring that its compliance activities are both *practical and effective*. To this end, we will meet our responsibilities with the following principles related to the implementation of the EMMP in mind:

Implementation, not just documentation: The IRG approach to meeting its obligations as an Implementing Partner within the USAID/Senegal program is focused on ensuring that the implications of the "Environmental Procedures" are translated into positive actions. Too often the basic rationale for Reg. 216 gets lost in the shuffle related to the multi-faceted requirements for compliance. Sometimes the overwhelming focus on ensuring that the appropriate documentation is in place – an IEE, an EMMP or even a Programmatic Environmental Assessment (PEA) – becomes the *raison d'etre* of the process. Within the PCE, we will do our very best to ensure that the real expectations of Reg. 216, are being met,

i.e., that something affirmative is being done to avoid the adverse environmental impacts that may arise from the nature of USAID's programs in the country.

Integration rather than segregation: Similarly, we will strive to integrate the mitigation measures as a routine part of the management practices we are promoting rather than treating them, as so often happens, as a separate or segregated implementation requirement. The basic premise of the IRG approach to the PCE and its objectives of "increased production and productivity" are grounded in the notion of sustainability as a key to long-term food security and that one uses natural resources within the carrying capacity of the resource base whatever it is.

Capacity Building for Environmental Management: That the guidance contained in the various USAID guidance documents mentioned below for each of the program components will be used, beyond design and implementation of the component, for awareness raising and training both technical staff and community participants in the environmental management of their improved farming systems and/or natural resources management related value chains.

PROGRAM COMPONENTS AND THEIR SECTORAL EMMPs

The tables which follow provide the Environmental Mitigation and Monitoring Plans for each of the activities of the PCE that were accorded a threshold determination of "negative with conditions." By implementing these EMMPs we seek to avoid the possibility of adverse socio-environmental impacts that might be foreseen as an outcome of the planned activities. While in many cases, our mitigation plans will essentially follow the sector guidance provided by USAID, in some instances we will highlight "cause and effect" and provide more explicit information about the mitigation measures associated with particular potential adverse impacts. The intention is to also incrementally build capacity for sound environmental management among those with whom we partner and among the beneficiary population. Where required, the EMMP includes monitoring efforts to ensure that the mitigation measures are effectively avoiding adverse environmental impacts.

Increased Agricultural Productivity and Rehabilitated Irrigation Schemes
General Conditionality associated with irrigation activities. It is essential to note that the PCE will, as noted above, be working on sites that have been under irrigation programs for some time, maybe currently degraded and not meeting production goals. Many are in low-lying areas that have been subject to human interventions for some time. These activities will be implemented strictly following the sector guidance prepared and recommended by USAID in its Environmental Guidelines for Small-Scale Activities in Africa (http://www.encapafrica.org/egssaa.htm) and especially **Chapter 1 on Agriculture and Irrigation (**http://www.encapafrica.org/sectors/agriculture.htm **).** In addition and building on the efforts within USAID itself to further develop the guidance available on environmental sound management of small-scale irrigation, IRG and its partners will pay particular attention to the guidance available in the **Programmatic Environmental Assessment of Small-Scale Irrigation in Ethiopia,** which is also available on the ENCAP Africa Website **(**http://www.afr-sd.org/Publications/PEA.pdf). Of particular interest for local implementers of small-scale irrigation will be Appendix H of this PEA which is an **Environmental Planning Checklist for Small-Scale Irrigation** (See Annex 1 of this EMMP). It should be noted that IRG and its local partners fully understand that the full potential and productivity of these improved agriculture schemes for staple crops (consumption) will rest on an ability to bring appropriate modern technology and incorporate it into the present farming systems. This includes both fertilizer use and pesticide use. In the case of fertilizer, the PCE personnel will follow the guidance provided by USAID developed by the Africa Bureau of USAID, Office of Sustainable Development in the *Fertilizer Fact Sheet for Africa* (http://www.encapafrica.org/meo_course/specialTopics.htm#fertilizer). The PCE sister project, Wula Nafaa, has translated this document into French so that it can be more widely

assimilated here in Senegal and elsewhere in francophone Africa (See Annex 2). In light of the fact that these production systems will also likely require the use of pesticides, as part of an integrated approach to pest management, IRG will conduct a "small-scale irrigation and horticulture related PERSUAP (Pesticide Evaluation Report-Safe User Action Plan)," to ensure that these agrochemicals are properly used. It should be noted that the PERSUAP will take into account current national and regional (CILSS) practices regarding pesticide registration and use.

The EMMP action recommendations which follow address some of the most typical socio-environmental risks associated with the development and rehabilitation of small-scale irrigation perimeters in Senegal. The list is not exhaustive nor does it address all of the parameters of the restoration of the productivity of wetland areas used for agriculture within the PCE project area as this would be beyond the scope of the present exercise. Furthermore, it is important to note here that any environmental compliance review supposes that the chosen technology is being applied correctly. Furthermore, the rather ample environmental guidance documents noted above are part of the extensive and detailed literature generally available for the sub-sector of small-scale irrigation and on which the activities of this component will be based.

Activity	**Possible Adverse Impact**	**Proposed Mitigation Measures**	**Monitoring Indicators**	**Monitoring/ Reporting Frequency**	**Responsible Parties**	**Observations and/or Verification Checklist**
Restoration of an existing small-scale irrigation perimeter and its productivity.	Water Resources development related social conflict, such as property rights, farmer/livestock conflict, and water availability constraints.	The basis for this investment must be an agreement with the participant community that results in signed local convention or similar agreement (accompanied by in-depth awareness raising and training as part of the early steps to set up the work site) attesting to a high degree of social cohesion related to the investment and/or recognition of these potential issues and a willingness to abide by the need for negotiation and solution.	Monitoring of the number of times the participants must appeal to the CR for interventions about conflicts that they are unable to resolve themselves. A review of the local convention to ensure that it covers the full range of the experiences of the participants as the scheme is launched and operated.	As required during the entire year.	The Scheme Management Committee and the traditional authorities will be the main persons to resolve these issues and monitor the situation. They may appeal to the CR and/or PCE Partner personnel (e.g., local facilitator or ACF) to assist them as needed.	Transparent management of the Scheme Management Committee and its regular meetings should be part of the training package, and the PCE Partner personnel should verify that it is working well.
Engineering and drainage works within the site being restored.	Stagnant water or poor drainage within the perimeter can lead to an increase in the	Careful use of leveling technology to ensure correct bunding and drainage	Visual inspections during the production season to be sure that water	At the height of the rainy season and at the end of the production	A PCE Partner water resources engineer with support from the local	Verify that the site has been traced using appropriate leveling

Activity	Possible Adverse Impact	Proposed Mitigation Measures	Monitoring Indicators	Monitoring/ Reporting Frequency	Responsible Parties	Observations and/or Verification Checklist
	incidents of water related diseases, such as malaria or bilharzias.	works.	spreads evenly across the perimeter and drains as well.	season.	facilitator and the ACF, in collaboration with the leaders of the management committee.	technology.
Expansion of the perimeter.	Although the sites being chosen are mainly very flat, the actual extent of the expansion is sometimes hard to foresee because of micro-changes in topography, leading to possible displacement of other users or land-use change.	Here again, appropriate leveling technology will be employed to ensure that the bunding or diguettes established within the perimeter are well done, and also do not lead to siltation or sedimentation of the water course into which the wetlands drains.	Visual inspections during the production season to be sure that water spreads evenly across the perimeter and drains as well.	At the height of the rainy season and at the end of the production season.	A PCE Partner water resources engineer with support from the local facilitator and the ACF, in collaboration with the leaders of the management committee.	Verify that the site has been traced using appropriate leveling technology.
Construction and/or Rehabilitation Activities – Seed Laboratories or Crop Warehouses						

General Conditionality – As specified in the IEE, this EMMP has been prepared for "small-scale" construction activities and the PCE will abide by these limitations. USAID uses a working definition of small-scale construction as "Construction or repair of facilities where total surface area to be disturbed is under 10,000 sq. ft." These activities will be implemented strictly following the sector guidance prepared and recommended by USAID in its **Environmental Guidelines for Small-Scale Activities in Africa** (http://www.encapafrica.org/egssaa.htm) and especially **Chapter 3 on Small-Scale Construction.**

These guidelines consider the full range of impacts for the main phases of the activity, including: (1) site selection; (2) planning & design; (3) construction; and (4) operations. For each phase, there are a series of directed questions that will be adapted for and incorporated into a PCE prepared **"environmental planning checklist for small-scale construction,"** depending on the nature of the facilities being constructed or rehabilitated.

In addition to the "Small-Scale Construction" chapter in the Environmental Guidelines for Small Scale Activities in Africa (EGSSAA), in the instances where those facilities also include the provision of water and sanitary services, the PCE will follow the guidance for same found in **Chapter 16 on Water Supply and Sanitation** (http://www.encapafrica.org/sectors/watsan.htm).

Prior to constructing facilities in which the total disturbed surface area exceeds 10,000 square feet, if any, the program will conduct a supplemental environmental review according to guidelines in the *Africa Bureau Environmental Procedures Training Manual*, also found on the ENCAPAfrica website.

The table which follows highlights some of the special situations in which adverse environmental impacts can occur as part of small-scale construction or rehabilitation activities and outlines specific mitigation and monitoring measures to counter these possibilities.

Activity	Possible Adverse Impact	Proposed Mitigation Measures	Monitoring Indicators	Monitoring/ Reporting Frequency	Responsible Parties	Observations and/or Verification Checklist
Site selection for new facilities	Damage or disturbance to sensitive or valuable ecosystems	Ensure that site choice does not infringe on natural areas and avoid riparian corridors or wetland areas.	Visual observation of the Site Plan and a local area map confirm correct site choice.	A one-off verification, typically part of the site selection approval process.	PCE Construction Supervisor & Facilities Committee	Use digital photography to document different Views of the chosen site and incorporate them into the activity file.
Construction activities disturbing the site	Run-off of rainwater or erosion leads to sedimentation of adjacent surface waters.	Minimize disturbance of the site during construction and/or suitable containment barriers to prevent soil movement	Site inspections	Routine observations during the construction period	PCE Construction Supervisor & Facilities Committee	Map the site denoting any real sloping areas…may be less probable in the flat lands of Senegal.
Generation of construction debris and/or solid waste during operations	Contamination of ground or surface waters from materials used in construction or improper disposal of solid wastes generated during the operations of the facility.	Include waste management and clean-up as part of the construction contract or plan. Ensure that there are proper methods and infrastructure for managing solid wastes that may be generated from the facility.	Routine inspection visits during the construction phase. Handover to management committee confirms availability of solid waste management infrastructure.	Routine observations during the construction period. PCE organized handover process highlights the importance of this solid waste infra-structure	PCE Construction Supervisor & Facilities Committee	Document the facility with digital photos prior to handover. Crop warehouse facilities should probably have a contingency plan for managing solid wastes in the event of a large-scale crop spoilage incident.
Routine facility operations	Adverse impacts on neighbors because of increased warehouse use and/or the coming and going of vehicles.	One of the primary consideration in site selection for new facilities. In existing facilities ensure that the site plan orients the traffic away from neighbors if possible. Avoid using the facility outside normal business hours.	Facility managers should be aware of noise & traffic issues, and in touch with their neighbors on a routine basis to confirm that these are not issues.	Part of routine facility management, reported on as per overall reporting plan.	Facility management committee	

ANNEX 1. ENVIRONMENTAL PLANNING CHECKLIST FOR SMALL-SCALE IRRIGATION

1. Small-Scale Irrigation Site Identification and Characteristics (fill in the blanks)

Date Project Planning Began: _____

Expected Completion Date:_____ Present Status:_____

Site/Community Name:_____

Location (Region, Woreda, Village):_____

Approximate Altitude of Scheme: _____(masl): Agro-ecological Zone: _____

Cooperating Sponsor:_____

Brief Project History (proposed by, how identified, by whom):_____

_____

Community Concurrence: _____ How Reached:_____

Water User Association Established:_____

How Established:_____Date:_____

Number of Beneficiary Participants in WUA:_____

Number of Males: _____ Number of Females:_____

Percentage of Total Community to be Included in Scheme:_____

Area to be Irrigated: _____(hectares)—Type of Irrigation (Spring, Diversion, Storage, Spate, or Lift):_____

Average Size of Household Irrigated Plot:_____ (hectares)

Previous Use of Irrigated Area:_____

Is this (Check all that apply): a New Scheme : ____, Rehabilitation of Traditional Scheme:____, Upgrading of Traditional Scheme: _____, Rehabilitation of Modern Scheme: _____

Proposed Crops- Wet Season: _____, Dry Season: _____

Average Household Holdings Outside the Scheme: _____

Other Major Infrastructure or Investments linked to SSI: _____

_____ (e.g., roads, potable water, watershed management)

What is the total cost of the scheme: _____; broken down by cash costs: _____

Food aid cost equivalents: _____; community contribution in labor and in kind:_____

Estimate the costs in either US Dollars or Ethiopia Birr. Include all necessary investments required for the scheme to operate. Food aid costs should be calculated by multiplying the number of

person/days of labor by the equivalent value of the day's ration. Community contribution should be accounted for, including contributed free labor if any and the estimated value of the materials provided (stone, sand, soil, etc.).

What is the expected unit cost per hectare of irrigable land within the command area during the dry season: _____$/hectare.

What percentage of the annual operating budget, for the Woreda: _____, for the local area: _____, for the program of the Cooperating Sponsor:_____

Sketch Map Included: (to scale at 1:10,000 or larger).

2. Analyzing the Basic Parameters

Prepare a brief narrative response for all of the headings below that apply to the site.

Water Resources Availability

– How much water (lts/sec) is available for irrigation purposes?

– Is there an historical record of river/stream hydrology (yes/no) and how compiled?

– If not, how was amount calculated (briefly describe method); an additional sheet showing calculations should be added?

– Are there upstream users of the water, or could there be (explain)?

– Are there downstream users and how do they use water?

– Are they actively pursuing irrigation; using water for potable water supply or for animal consumption; Estimate their requirements (lts/sec)?

– How were downstream users consulted?

– What percentage of stream flow will be abstracted during lean period?

Other Uses and End Users

– Has the potential usage by people or animals been factored into the calculations of water use within the scheme, and if so, how so?

– Will the scheme attract additional herders and their animals in search of water, including from beyond the present community?

– Is there a need for maintaining minimum ecological flow during lean season; if not, why not?

– What precautions are being undertaken to guard against unnecessary leakage/evaporation within the scheme?

– Describe the methods by which D.A.s/WUA and the users themselves will measure/know about the annual/seasonal/periodic water availability.

Catchment Status

– What is the size of the catchment that supplies water to this scheme (estimate) in hectares?
– What is the present land-uses of the catchment (a sketch map may help to illustrate this point)?
– What is the condition of the catchment (good or natural, slightly degraded, moderately degraded, highly degraded, being rehabilitated)?
– Do the present activities include rehabilitating/ improving the catchment, and if so what will they entail?
– What percentage of the catchment will be treated each year, and by whom?

3. Estimating Crop Water Requirements

Prepare a brief narrative response for all of the headings below that apply to the site.
– What crops will be planted and which season?
– Crop water requirements per Hectare?
– An additional sheet describing likely crops and their water requirements in different seasons could be added.
– What source of information for the crop water requirements, describe?
– Which publications are the basis for this estimate of crop water requirements or how else was these amounts determined?
– What will be the likely percentage mix of the main crops, during the wet season and the dry season?
– How will the size of the command area change from wet season to dry season?
– Are there expectations/intentions about building up the command area during the break-in stage of implementation (explain)?
– Are these crops that are familiar to the users?
– In years of poorest rainfall, estimate what will be the area of irrigable land; and how will the cropping pattern change during the dry season (explain)?
– What are the expectations regarding production increases, in a good rainfall years (percent increase) and in a poor rainfall year (percent increase); worst case scenario (explain)?
– Give some examples of the expectations regarding increases in yield, by crops.

4. Farm/Scheme Land and Water Management and Conservation

Prepare a brief narrative response for all of the headings below that apply to the site.
– Do the proposed users have experience with SSI?
– Will there have to be land re-distribution (explain regularly/ annually/periodically)?

– What sort of water management technology will be used within the irrigated plots?
– Will the users be able to maintain the fertility of their irrigated plots, and how will they do so?
– What is the average slope of land within the command area?
– Will soil conservation measures within the scheme be required, and if so, briefly describe them?
– Are there indications of salinity problems in nearby similar SSI schemes?
– What did the measurements of water quality reveal (gms/lt), and of soil salinity (salinity class)?
– Is salinity likely to become a problem in this scheme, and if so, what measures will be taken to manage the problem (describe)?

5. Post Construction Follow-Up and Technical Assistance

– Will the farmers have to depend on support from Development Agents from the Regional Bureau of Agriculture for extension services?
– Are they available?
– Have the D.A.s been specifically trained in irrigated agriculture; have they received training specific to this site and its operations?
– Do the D.A.s need transport to reach the scheme and do they have it?
– Is there an operations manual to guide extension services?
– What other services will be provided by the D.A.s?
– Briefly describe the training provided and planned for the Water Users Association Officers and Users.
– Is there a water user's fee system and what are its principles (briefly describe)?
– Briefly describe the operations and maintenance requirements of the scheme and who will be charged with their implementation.
– What level of technical assistance from the Cooperating Sponsors will be required by the Water Users Association during the start-up phase of the irrigation activities?
– Have resources (staffing and budgetary) been set aside for this purpose?

6. Water Related Disease Hazards

– Has an environmental health assessment been part of the planning for this scheme, and if so, briefly discuss its results?
– Because of the importance of this particular theme, particularly at lower altitudes, the Cooperating Sponsor could provide a citation of the study findings as a supplement to their response to this section of the checklist.

– Is there health baseline data set available for the community and what are its most important quantitative findings (provide a list)?
– Briefly discuss expectations regarding community vulnerability.
– Briefly discuss expectations regarding environmental receptivity.
– Briefly explain the status of health services in the community, and are there plans for upgrading these services (describe these plans).
– What percentage of the community has access to potable water and where do they normally obtain it, in wet season and in the dry season?
– Does the program of the Cooperating Sponsor in this community, include a potable water supply component (briefly describe)?
– Is there a community specific nutritional baseline available?
– What are the household level nutritional goals of the scheme (describe)?
– How will these goals explicitly be achieved (describe)?
– What measures will be taken for provision of potable water for the work force during construction and for training the work force on water related disease hazards (describe)?

7. Displacement and Land-Use Changes

– Will there be displacement of farm plots as a result of scheme construction, and if so briefly describe (no. of households affected/area of land affected)?
– Will the command area change/shift as a result of rehabilitation or upgrading, and if so, briefly describe?
– What measures are planned to account for these displacements/changes (describe)?
– What percentage of the command area is likely to be devoted to cash crops and which ones?
– Where and how will these cash crops be marketed and by whom (describe)?
– What are the expectations regarding prices for these cash crops, transport and marketing costs, returns to the farmers (describe with as much quantitative data as possible)?

8. Monitoring Plans

– What indicators will be monitored to ensure that the activities are not leading to unforeseen adverse environmental impacts?
– Which of the planned mitigative measures (see below) will require further specific monitoring to be sure they are effective and how will this be done?

– How will environmental monitoring be linked to performance monitoring so as to avoid needless duplication of efforts and meeting reporting requirements?

9. Mitigative Measures Planning

– Identify the specific adverse environmental impacts foreseen during planning and describe the mitigative measures for each.

– How have the costs of these measures been factored into the feasibility considerations for the scheme in question?

– Will there be resources available for post-construction mitigation measures and who will provide for them?

ANNEX 2. FERTILIZER FACT SHEET FOR AFRICA

(FICHE D'INFORMATIONS DU BUREAU AFRIQUE DE L'USAID SUR L'ENGRAIS)

Contexte

La faible fertilité des sols est un problème dans la majeure partie de l'Afrique au Sud du Sahara (ASS). En outre, la réduction drastique des périodes de jachère ainsi que l'emblavement presque continu sans une restauration de la fertilité du sol ont détruit la base nutritive de la plupart des sols. Vers la fin des années 1990, tous les pays de l'Afrique au Sud du Sahara affichaient un solde annuel en éléments nutritifs du sol négatif[1]. Les pays qui ont le taux de perte d'éléments nutritifs le plus élevé sont ceux pour lesquels l'utilisation de l'engrais est faible et où l'érosion du sol est élevé. Parmi ces pays, on peut compter les hauts plateaux de l'Afrique de l'Est ainsi qu'un certain nombre de pays de l'Afrique de l'Ouest.

La faiblesse de la fertilité des sols est aussi un élément moteur de la conversion de certains espaces naturels au profit de l'extension des terres agricoles. Il est maintenant généralement admis par tous que l'intensification agricole est le seul moyen viable susceptible de préserver les espaces naturels clés tout en augmentant la sécurité alimentaire d'une population grandissante sur le continent et en générant une croissance économique par une amélioration de la productivité agricole. La dégradation des sols empêche la capacité des pays à prendre cette direction, et la perte des éléments nutritifs du sol est le facteur qui contribue le plus au processus de dégradation des sols. L'utilisation d'engrais minéraux joue un rôle important dans la stratégie d'arrêt de la dégradation des sols, de la restauration de la fertilité des sols et d'une meilleure gestion des ressources du sol indispensables à un développement agricole et économique durable.

Engrais et Procédures Environnementales de l'USAID (22 CFR 216)

On utilise souvent le terme générique de « produits chimiques agricoles » pour désigner à la fois les engrais et les pesticides. D'un point de vue de conformité environnementale (22 CFR 216), ainsi que d'un point de vue mise en œuvre au niveau du terrain, cela est inexact parce que cela implique qu'il faut appliquer le même niveau de précautions aux engrais que celui réservé aux pesticides. Alors que les pesticides sont soumis à une évaluation de leur impact sur l'environnement clairement définie [22 CFR 216.3 (b)(1)] et à un processus d'approbation pour promouvoir un usage plus sécurisé et une gestion intégrée des pesticides, de telles procédures ne s'appliquent pas aux engrais (des procédures d'approvisionnement sont cependant appliquées en cas d'achat en gros). Cependant, comme c'est le cas pour toutes les technologies, on recommande que les engrais soient utilisés avec soin selon les meilleures pratiques, en encourageant une gestion intégrée de la fertilité des sols, dans le cadre des conditions biophysiques et socio-économiques du moment et des résultats recherchés. Cette fiche d'informations à pour objet d'aider à l'atteinte de cet objectif.

Importance de la gestion de l'eau pour l'assimilation des éléments nutritifs

Une gestion correcte de l'eau est importante pour maximiser l'utilisation des éléments nutritifs par les cultures. Environ 97% de l'assimilation des éléments nutritifs par les cultures vient de la solution du sol (éléments nutritifs solubles dans l'eau), ce qui fait de l'eau le milieu de loin le plus important pour l'apport des éléments nutritifs ou des engrais. Cela veut également dire que, pour l'essentiel, la circulation des éléments nutritifs est liée au mouvement de l'eau. Dans les sols sableux, les éléments nutritifs

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[1] Henao, J. and Baanante, C. 1999. Estimating rates of nutrient depletion in soils of agricultural lands of Africa. Technical Bulletin. IFDC – T 48. IFDC, Muscle Shoals, Alabama. 76p.

circulent plus rapidement au niveau de la zone racinaire et du profil du sol que dans les autres types de sol et l'utilisation excessive de l'eau (ou les fortes pluies) peuvent occasionner des pertes d'éléments nutritifs par suite de lessivage. Les écoulements sont plus sérieux dans le cas des sols limoneux sableux ou sablo-limoneux qui présentent souvent des formations de surfaces en croûtes dures. Dans les sols plus lourds (comme les argiles), si les éléments nutritifs ne sont pas correctement incorporés, les risques d'écoulement de surface augmentent en cas de fortes pluies ou d'excès d'irrigation. Dans les conditions de culture sous pluie (comme c'est souvent le cas en Afrique au Sud du Sahara), une gestion correcte de l'eau prend une importance spéciale. En résumé, une bonne gestion de l'eau entraîne une utilisation plus efficace des engrais et un plus grand apport en éléments nutritifs et vice versa.

Tendances générales de la fertilité des sols en Afrique

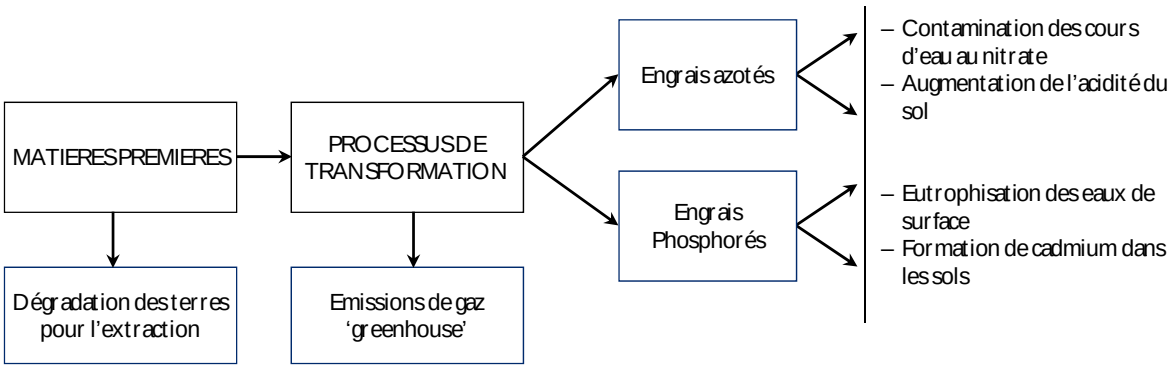
- Les paysans qui ont pris des dispositions pour conserver l'humidité ou augmenter la matière organique du sol sont ceux qui utiliseront le plus probablement les engrais minéraux. Quand, dans certains endroits, les paysans ont du capital, ils investissent souvent dans l'augmentation de la rétention d'humidité et /ou l'augmentation de la matière organique du sol d'abord, puis dans celle des engrais minéraux.
- Les paysans augmentent l'utilisation des engrais lorsqu'investir plus d'argent dans les engrais est considéré comme la meilleure option disponible. Cette augmentation peut être due par des changements dans ce qui suit : le prix de l'engrais, le prix des récoltes, la disponibilité de l'engrais, la disponibilité de l'eau, la disponibilité des semences, la connaissance sur la manière d'utiliser l'engrais, ou la rotation culturale.
- En Afrique de l'Ouest, la gestion intégrée de la fertilité des sols est progressivement adoptée. Elle consiste en une combinaison de l'utilisation des amendements du sol et des engrais minéraux, ce qui entrainera plus tard une amélioration de la fertilité des sols ainsi qu'une augmentation de l'efficacité et de la rentabilité de l'utilisation des engrais. Les pertes en éléments nutritifs dans l'environnement baissent.
- A la lumière des taux d'utilisations passés et actuels, les activités de l'USAID en Afrique à propos des engrais ne risquent pas de créer des problèmes environnementaux.

Guide d'Application des engrais

- Avant d'appliquer les engrais, évaluez la qualité des sols (fertilité).
- Une utilisation non discriminatoire des engrais chimiques devrait être évitée.
- Différentes sortes d'engrais sont nécessaires pour conserver la fertilité des sols à un niveau donné. Cela dépend de facteurs spécifiques du site comme le type de sol, les besoins en éléments nutritifs de la culture et les différentes sources d'éléments nutritifs disponibles. L'azote et le phosphore sont les éléments les plus importants qui manquent aux sols d'Afrique de l'Ouest.
- L'application des engrais doit se faire en tenant compte du contexte global des systèmes de cultures de l'exploitation. Ceci inclus l'utilisation du fumier et des résidus organiques, le travail du sol, la rotation des cultures ainsi que la récupération des eaux. Considérés ensemble, ces facteurs influencent l'efficacité de l'utilisation des éléments nutritifs.
- Quand les engrais sont utilisés, il est important d'appliquer le volume correct en fonction de la situation donnée. Le défit du paysan est de faire en sorte que l'apport en éléments nutritifs corresponde de la manière la plus étroite possible à la consommation en éléments nutritifs de la culture, minimisant ainsi les pertes. L'utilisation d'un excès d'engrais est à la fois coûteuse (gaspillage) et potentiellement destructrice pour l'environnement. Pour appliquer le volume correct, le paysan doit fixer son objectif de production.

Effets environnementaux potentiellement négatifs des engrais
Une application excessive d'éléments nutritifs peut à la longue causer une pollution. De telles pertes peuvent subvenir quand les éléments nutritifs migrent dans le sol suite à de grosses pluies, sont lessivés dans le sol au-delà de la zone des racines et finissent éventuellement par atteindre les eaux souterraines ou s'évaporent dans l'atmosphère sous forme de gaz volatile.

Les aspects d'impact environnemental peuvent être illustrés comme suit :



(Extrait d'Incitec Fertilizers)

Engrais azotés : les engrais azotés minéraux sont directement transformés en nitrate dans le sol par les organismes du sol. L'azote contenu dans la matière organique du sol et les engrais organiques sont libérés plus lentement. Les nitrates peuvent directement être lessivés s'ils ne sont pas utilisés par les cultures ou autre végétation. Le lessivage est plus probable dans les sols sablonneux après une grosse pluie. Les nitrates lessivés peuvent contaminer les eaux souterraines. Cela est particulièrement préoccupant si l'eau doit être utilisée pour la consommation humaine ou des animaux, puisque de fortes concentrations de nitrate peuvent représenter un danger pour la santé.

Les engrais azotés peuvent également accélérer le processus naturel d'acidification du sol. Certains engrais (par exemple l'ammoniaque anhydre et l'urée) peuvent dans un premier temps élever le pH des sols sur le site où ils sont appliqués mais, à la longue, ils peuvent les acidifier. C'est ce qui se passe quand l'ammonium est transformé en nitrate. L'acide produit lors du processus de nitrification est consommé si l'azote est absorbé par les plantes ou les organismes du sol, mais si les nitrates sont lessivés au-delà de la zone des racines, il se produit une acidification. L'acidification du sol diminue la disponibilité des traces de l'élément molybdène, favorise le développement de la toxicité de l'aluminium, du fer et du manganèse, et augmente les risques d'échec de la nodulation pour les légumineuses. Il peut être nécessaire d'avoir recours à la chaux là où l'acidité est un problème (obtenue naturellement à partir du carbonate de calcium) ou d'utiliser des espèces de plantes tolérantes à l'acide. Parmi une liste de plantes avec des variétés tolérantes à l'acide, on peut citer : le riz, le manioc, la mangue, l'acajou, le citron, l'ananas et la dolique.

Les engrais phosphorés : des volumes excessifs de phosphore sont connus avec la propagation des algues et l'eutrophisation des lacs et cours d'eau. Dans la plupart des eaux, le phosphore se comporte comme un facteur de limitation de la croissance parce qu'il y est souvent présent en faibles concentrations. Seules les algues n'ont besoin que de peu de phosphore pour vivre. Trop de phosphore « sur-stimule » la croissance des algues, ce qui pourrait enlever l'oxygène dissout dans l'eau qui est vital pour la vie aquatique. Le

phosphore est relativement immobile dans le sol de sorte que la conservation et les pratiques culturales qui réduisent l'érosion du sol peuvent réduire de manière significative l'apport de phosphore dans les cours d'eau et la nappe phréatique.

Les engrais phosphorés contiennent diverses impuretés provenant d'une part de la roche phosphate et d'autre part de l'acide utilisé dans la fabrication de l'engrais. L'augmentation du cadmium est la préoccupation principale car les éléments qui le composent sont toxiques pour les êtres humains. L'augmentation du cadmium peut être surtout observée dans certaines cultures comme la pomme de terre et les légumes à feuilles (laitue, épinard) et dans les organes (les reins et le foie) des animaux. Presque tous les engrais phosphatés contiennent des traces de cadmium et la concentration de cadmium varie considérablement d'une source à l'autre. Présentement, en Afrique de l'Ouest, des efforts sont faits pour mettre au point des processus viables susceptibles d'écarter le cadmium des roches de phosphate. L'extraction de la roche de phosphate constitue une source de revenus vitale pour un certain nombre de pays en développement de l'Afrique.

Effets des engrais sur la biologie des sols : Un sol de bonne qualité contient 93% de minéraux et 7% de substances bio-organiques. Les substances bio-organiques sont constituées d'humus (85%), de racines (10%) et d'organismes du sol (5%). La plupart des organismes du sol sont des décomposeurs (bactéries et champignons) qui sont responsables de la rétention des éléments nutritifs dans le sol. Pour que les éléments nutritifs deviennent disponibles, ils doivent subir une minéralisation grâce à l'interaction des décomposeurs et des organismes qui se nourrissent des décomposeurs (protozoaires, nématodes, microarthropodes et les verres de terre). Le développement de la plante dépend de l'immobilisation microbienne des éléments nutritifs. Quand le nombre de décomposeurs diminue dans le sol, un nombre plus important d'éléments nutritifs se perd dans l'eau souterraine et de surface. Des traitements exagérés à l'engrais chimique peuvent tuer les décomposeurs et autres organismes du sol, ce qui entraine une réduction de la rétention des éléments nutritifs et une contamination probable des eaux de surface et des eaux souterraines.

Résumé des meilleures pratiques de gestion de la fertilité des sols et de la santé

- Pratiquer la gestion intégrée de la fertilité des sols (GIFS) utilisant à la fois des sources organiques et inorganiques d'éléments nutritifs plutôt que l'une ou l'autre uniquement ;
- Utiliser des cultures de couverture en légumineuses (plus du phosphore) et des engrais verts en rotation avec la jachère ou en cultures associées ;
- Promouvoir les pratiques agro-forestières - en plus de la conservation des sols et de la production de bénéfices, les pratiques d'agro-foresterie transfèrent à partir de / recyclent à l'intérieur du profil de sol les éléments nutritifs (des niveaux profonds à la surface) ;
- Utiliser un labour de conservation plutôt qu'un labour profond (bien que le labour de conservation puisse être nuisible à des systèmes de production dans certaines régions[2])
- Utiliser du fumier de fermes et des ordures ménagères avec ou sans compost ;
- Choisir des cultures et des plantes associées qui sont très efficaces dans l'utilisation des éléments nutritifs.

[2] Hogmoed, W. 1999. Tillage for soil and water conservation in the semi-arid tropics. Phd thesis, Wageningen University, Holland.

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