

# INTEGRATED VALLEY BOTTOM/WATERSHED ECOSYSTEM MANAGEMENT PROGRAMME FOR INCREASED CLIMATE CHANGE RESILIENCE



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CLIMATE TECHNOLOGY CENTRE & NETWORK

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## Foreword

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This project note has been prepared in connection with CTCN technical assistance provided at the request of the Ministry of the Environment, Water and Forestry of the Republic of Guinea. Apart from national economic development policies (Poverty Reduction Strategy Paper, Five-Year Development Plan, etc.), the Republic of Guinea Conakry has put together a series of policies to improve people's resilience in the face of the harmful effects of climate change. These include the National Adaptation Plan of Action (NAPA), the Initial National Communication and, more recently, the Intended Nationally Determined Contribution (INDC). This contribution provided an opportunity for Guinea to highlight the fundamental importance of taking account of climate change adaptation in the country's development process. The INDC stresses that adaptation is essential to anticipate the impacts of climate change and thereby reduce the costs and damage they cause. It also pointed out to the international community the huge efforts that Guinea needs to make to cope with the negative effects of climate change, as well as to shoulder its responsibilities in relation to the vulnerability of the West African sub-region.

Implementation of the project ideas and strategies is, however, still very limited due to lack of the expertise needed to put together "bankable" projects that can be financed by climate donors.

This is the background to the request for technical assistance made by the Republic of Guinea, through the National Environment Department, to the CTCN (Climate Technology Centre and Network) to overcome this barrier to access to finance for adaptation projects.

This assistance has helped to support a community of "champions" to come up with consolidated project ideas. The present programme of sustainable management of valley bottom/watershed ecosystems to boost resilience is one of the five projects/programmes with strong climate change adaptation potential selected by the national authorities.

This concept note aims to present the broad lines of the project and enable potential funders to assess the relevance of the project with regard to the expected impacts and their own strategic orientations. The next step will be to determine the procedure for putting together a complete project file, taking account of the specific access requirements of each international donor.

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## Summary project presentation

<b>Project name</b>	<b>INTEGRATED VALLEY BOTTOM/WATERSHED ECOSYSTEM MANAGEMENT PROGRAMME FOR INCREASED CLIMATE CHANGE RESILIENCE</b>
<b>Project area</b>	Middle Guinea: Mali and Koubia prefectures Upper Guinea: Kouroussa and Dabola prefectures
<b>Main project partners</b>	Ministry of the Environment /DNE Ministry of Agriculture/DNGR/IRAG Ministry of Energy and Hydraulics/DNH Ministry of Decentralization /DNDL Ministry of Fishing /DNP
<b>Summary</b>	<p>Valley bottoms in Guinea form an ecosystem where significant increases in agricultural production (crops and aquaculture) are possible. Valley bottom cropping was practised in the past by some indigenous communities, but has now been partly given up because of their difficulties in controlling water cycles, setting up and maintaining the necessary schemes and monitoring the quality of the cropping environment. The abandonment of a number of valley bottoms has increased pressure on the slopes and hillsides which suffer constant degradation as a result of bushfires, deforestation, soil impoverishment and mining activities which cause the silting and sanding up of watercourses. The drastic fall in crop yields, repeated water stress and moves by farmers to other activities posing a greater threat to the environment are some of the constraints faced by communities who now wish to develop these valley bottoms.</p> <p>This programme has arisen from the need to find integrated solutions for the sustainable management of these ecosystems. Consequently, to improve the productivity of family farming, restore the ecological balance between slopes and valley bottoms, enable producers (farmers, fish-farmers and herders) to adapt to climate change and increase the security of the water supply of the downstream network, the programme plans to trial an approach in Middle Guinea and Upper Guinea including: (i) hydro-agricultural schemes to control water in the valley bottoms; (ii) development of agricultural productivity through the dissemination of good practice, agricultural diversification and rice-fish farming to increase yields and income; (iii) conservation and restoration of watersheds through good practice such as agro-forestry to make better economic, ecological and social use of these ecosystems, particularly the valley bottoms, on a sustainable basis; (iv) a dynamic process of consultation and participation of local stakeholders organized and mobilized to facilitate the identification and rollout of innovations and land tenure solutions, whilst taking account of community interests.</p>

**Goal:** Enhance the climate change adaptation capacity of farmers and rural communities in general through sustainable management of the agro-ecological systems of the valley bottoms and their watersheds in Upper and Middle Guinea.

**Specific objectives:**

**SO1** - Improve control of water management through building hydraulic infrastructure appropriate for the different types of valley bottoms and beneficiaries' needs and capacities;

**SO2** - Bring about a sustainable increase in valley bottom productivity through the development of good practice, crop diversification and added value production;

**SO3** - Preserve the watersheds through ecologically, socially and economically efficient agro-forestry systems.

**SPECIFIC OBJECTIVE 1: Improve control of water management through building hydraulic infrastructure appropriate for the different types of valley bottoms and beneficiaries' needs and capacities**

**Result 1:The developed valley bottoms are sustainably farmed by producers**

*Principal activities planned:*

**R1A1** -Identification of appropriate schemes and the farmers concerned and establishment of a process of local consultation and mobilization.

**R1A2** - Technical and financial finalization of the intended schemes and formalization of farmers' participation.

**R1A3** - Creation of the hydro-agricultural schemes and establishment of management committees.

**Result 2: The hydrological regime at the outflow of the valley bottoms increases the security of the water resource in the downstream network**

*Principal activities planned:*

**R2A1** -Identification of sites to install limnometric stations.

**R2A2** –Establishment and operation of the limnometric stations.

**SPECIFIC OBJECTIVE 2: Bring about a sustainable increase in valley bottom productivity through the development of good practice, crop diversification and added value production**

**Result 3: Increase in crop and aquaculture production in the valley bottoms and its economic value**

*Principal activities planned:*

**R3A1** - Training of producers in appropriate techniques and good practice depending on the products concerned.

**R3A2** – Hands-on support and advice for producers during the first production cycles.

**R3A3** - Establishment of strategies to increase added value for producers.

**SPECIFIC OBJECTIVE 3: Preserve the watersheds through ecologically, socially and economically efficient agro-forestry systems**

**Result 4: The slopes above the developed valley bottoms are restored and put to sustainable agro-forestry use in a participatory process at community level**

*Principal activities planned:*

**R4A1** - Identification of appropriate schemes and the producers concerned and establishment of a process of local consultation and mobilization.

**R4A2** - Training and support for producers in appropriate techniques and good practice depending on the products concerned.

**R4A3** - Establishment of strategies to increase added value for producers.

<b>Total project duration</b>	<b>5 years</b>
<b>Budget estimate</b>	<b>USD 15,000,000</b>

## 1. Background

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### 1.1 Introduction

#### ➤ **Water resources in Guinea and recent developments**

Considered as the water tower of West Africa, Guinea is the source of several rivers in the sub-region and has a very dense hydrographic network, with 1165 watercourses rising in the Fouta Djallon and Daro mountain ranges. National hydric potential is an estimated 13 billion m<sup>3</sup> of underground water and 226 km<sup>3</sup>/year of renewable water (FAO, 2005). The country has 23 river watersheds, including 14 international watersheds. These complexes have been the site of different types of development varying according to region and project focus. At regional level, Guinea is a member of ECOWAS, the Gambia River Basin Organization (GRBO), the Senegal River Basin Development Organization (OMVS) and the African Union.

Over the last two decades, Guinea has experienced a significant reduction in rainfall, resulting in great seasonal variability in the flow of streams and rivers and an increasing number of extreme hydro-meteorological events. Flow variability is also a consequence of degradation of the slopes due to various causes, including inappropriate agro-pastoral practices exacerbating water and wind erosion and changing the hydrological regime of the watercourses. Rainfall deficits have had a huge influence on flow to the extent that hydrological parameters (particularly flood magnitude) are no longer in phase with annual rainfall variation. In addition, the low level of underground water reserves contributes to a reduction in flow from the watersheds. Generally speaking, the flow of watercourses has tended to decrease over the last decade. Furthermore, the main watercourses in the Niger basin are presently suffering the effects of loss of vegetation cover and soil humidity, together with increased erosion and the destruction of gallery forests. Guinea's hydric potential derives from rainfall. Some watercourses that used to be perennial now no longer flow in the dry season.

Climate projections for Guinea suggest that this situation will persist. According to the NAPA (2007), watercourses will, in places, experience a flow reduction of more than 50% of the current average by 2100. This phenomenon will be common to all regions of the country and very marked for those situated to the north of the 10th parallel. Between 2050 and 2100, the flow of the Niger will decrease from 16% to 28% at sensitivity 2.5°C and from 23% to 54% at sensitivity 4.5°C.

#### ➤ **Guinea's main commitments and initiatives in combating climate change and link with economic development priorities**

On 7 May 1993, Guinea ratified the United Nations Framework Convention on Climate Change. Several documents of international significance were prepared by Guinea under the UNFCCC on combating climate change. The National Adaptation Plan of Action (NAPA) on climate change, adopted on 4 December 2007, is Guinea's reference strategy document on implementation of climate change adaptation activities. The NAPA puts forward a list of priority target projects for implementation to improve Guinea's adaptation capacity. A total of 25 project ideas were submitted in the NAPA, split between the following priority operational themes: i) water resources; ii) the coastal zone; iii) forestry; iv) crop and livestock farming; and v) cross-cutting themes. In 2016, only two projects from the NAPA had been implemented and a third was in the start-up phase.

Guinea submitted its Initial Nationally Determined Contribution (INDC) when taking part in the 21st Conference of the Parties (COP) in Paris in 2015. This contribution gave Guinea an opportunity to stress

the fundamental importance of taking account of climate change adaptation in the country's development process. Guinea's commitments in this respect include i) preservation of the quality and quantity of water resources for the benefit of the people of Guinea and the West African region; and ii) support for rural communities' adaptation efforts to develop agro-sylvo-pastoral techniques enabling them both to continue their activities and to preserve the resources on which they depend.

### ➤ **Reconciling adaptation and economic development**

Adaptation priorities are bound up with the country's challenges in respect of economic development and environmental preservation. Poverty primarily affects rural communities who more directly depend on natural resources and are also most vulnerable to the impacts of climate change. Guinea's adaptation priorities therefore fit in with broader priorities in terms of economic development, combating poverty and preserving resources.

One of the main objectives of the first Poverty Reduction Strategy Paper (PRSP) adopted in 2002 was to improve income opportunities for the poor through sustainable development of the rural sector. It was followed in 2007 by PRSP II and then more recently, in 2013, by PRSP III. The National Investment and Food Security Plan (PNIASA), which covers the period 2011-2015, gives pride of place to the development of rice production, due to its importance both for the national economy and for food security. The PNIASA also devotes one of its programmes to sustainable natural resource management, which includes the development of forest/wildlife ecosystems, reforestation and the implementation of climate change adaptation measures amongst its objectives and which acknowledges the strategic importance of natural resources for Guinea.

### ➤ **The current agricultural situation**

Agriculture is a vital sector of Guinea's economy, accounting for 24.9% of GDP in 2004. Almost 70% of the population live in rural areas and make their living mainly from farming (Poverty Atlas, 2008). Farmers account for 61% of the population, but 80% of the poor. Although the country has land resources amounting to 6.2 million ha of arable land, only 1.37 million ha are currently under cultivation. Irrigable land potential amounts to 362,000 ha, of which only 30,200 ha have been developed. The dominant cropping system practised on the country's various soils is of the traditional slash and burn type, with natural fallow periods varying in length depending on region. Due to lack of mechanization, 64% of farms are of less than 2 ha and only 4% cover more than 7 ha. Farming is dominated by food crops, principally cereals and tubers. 78.2% of women work in the farming sector, but only 49.3% of men. (PNDA/2007).

The low productivity of the agro-sylvo-pastoral sector gives rise to recurrent food shortages. The productivity of rice, the staple food in Guinea, is not sufficient to cover the real needs of the country which is experiencing population growth of 3% per year. Over the last five years, Guinea has imported around 330,000 tonnes of rice per year. There is also a deficit in animal protein, 63% of which comes from fish (FAO).

### ➤ **Hydro-agricultural schemes in Guinea**

The total area of valley bottoms and plains is an estimated 362,000 ha. Evaluation of hydro-agricultural schemes shows that projects set up during the period of the Agricultural Policy Development Paper (1998 – 2005) resulted in the development of around 17,000 ha, of which 8500 ha of valley bottoms, 3000 ha of plains and 5000 ha of mangrove. Work on the valley bottoms and plains covered all the

natural regions. The hydro-agricultural schemes implemented in Guinea came nowhere near to exploiting the entire potential. Moreover, the schemes did not produce the expected positive results on communities and were of short duration. Several inadequacies were seen, particularly gaps in terms of i) design and carrying out the work; ii) management, maintenance and servicing of the schemes; iii) human resources and organizations capable of managing the infrastructure; and iv) knowledge of sustainable development of valley bottoms and management of water users' associations.

### ➤ **The degradation of the slopes**

Due to the lack of development and failure to control water in the valley bottoms, farmers turned to intensive cultivation of the slopes, so that a large proportion of farming currently takes place on the hillsides. The farmer prepares the land through clearance, cutting down trees, burning and stump removal. As a result, the land is continually exposed to the full force of the sun, gully erosion due to run off and the silting up of the beds of watercourses.

## 1.2 Description of the programme areas

### ➤ **Middle Guinea**

Middle Guinea holds 14% and 18% of the country's potential in terms of valley bottoms and plains respectively. In Fouta Djallon, farming activities focus on herding in the foothills and horticulture in the valley bottoms. Middle Guinea makes a significant contribution to national production of certain crops such as potatoes, onions, maize, fonio and tree fruits. Herding is an important activity in the region, undertaken by 70% of its rural population. Most of the soils (known as Bowé and Ndantari in the Pular language) are seriously degraded. The main crops are fonio, maize and cassava, followed by groundnuts, rice and horticultural products. The north-west of this area (Gaoual-Koundara plains) has the largest concentration of cattle due to the humid pasture available in the middle valleys. The increasingly marked imbalance between availability of grazing in the dry season and growing livestock numbers has caused pastoral activities to shift towards Maritime Guinea.

### ➤ **Upper Guinea**

Farming is the mainstay of Upper Guinea, making a very significant contribution to national production of several food and cash crops (cotton, mangoes, oranges, cashews, yam, cassava, fonio, groundnuts and maize). Cattle make up 34% of the national livestock population, with sheep making up 25% and goats 17%. Upper Guinea has considerable potential in terms of surface and underground water. The main crops such upland rice, cassava, groundnuts and, more recently, cotton, are rainfed. Uncontrolled flooding from streams and rivers allows rice to be grown on the plains. This region has great agricultural potential, with arable land estimated at more than 2.7 million hectares (100,000 ha of alluvial plains), of which 400,000 ha are apparently cultivated each year. The social tensions which appeared at the time of establishment of the hydro-agricultural schemes reflect some of the main tenure issues encountered in the region.

## 2. Programme logic

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### 2.1 The valley bottom complex approach

This project is based on the valley bottom complex approach already adopted in Guinea, an idea arising from activities carried out by the Gueckédou agricultural project (PAG) in Forest Guinea since 1986. This approach especially concerns small family farms and helps farmers to achieve sustainable valley bottom development through good environmental management of the village land. In this integrated approach, emphasis is placed on ensuring the continuity of the valley bottom developments, crop diversification and greater security of tenure to tackle the food security problems faced by farming families in the lean season.

The approach consists of establishing schemes using simple, low-cost water control techniques (management of spring water, groundwater, run-off water and rainwater). This is complemented by fish farming, diversification and intensification of agro-forestry on the adjacent slopes.

Previous trials of the valley bottom complex approach resulted in: i) an increase in the yields of a number of food and cash crops (rice, oil palm, coffee, pineapples, etc.); (ii) an increase in family income (6 – 10 million Guinean Francs per year per hectare of developed valley bottom;); iii) sedentarization of farmers and reduction in rural exodus, helping to reconstitute the village social fabric; and iv) better hydro-climatic balance (recharging of groundwater, protection of spring heads and replenishment of watercourses from groundwater).

Training the farmers, understanding their needs and regular technical follow-up are key elements in the success of this approach.

Sustainable improvements can be brought about in the productivity of the valley bottoms and slopes through the implementation of adapted endogenous and exogenous practices, such as the intensive rice production system (SRI), crop diversification, crop rotation, use of compost and manure, rice-fish farming and integrated pest management. On the slopes, agro-forestry, reforestation, use of cover crops, live hedging, alley cropping, slope protection with vetiver, lined wells, night enclosure of livestock, composting, use of improved stoves, stone bunds, crop rotation and sowing under plant cover (SCV) are amongst the practices that could be adapted according to zone and producer capacity.

#### ➤ Favoured crops for the valley bottoms and slopes

In Middle Guinea, the most suitable valley bottom crops are rice, maize, horticultural products, potatoes and beans, and possibly soya. Favoured crops on the slopes are fonio, maize, sweet potato, groundnuts, sago, potatoes in the rainy season and tree fruits. Herding is widespread on the slopes and there is huge potential to develop fish farming in association with lowland rice production.

In Upper Guinea, priority is given to horticultural products and a combination of fruit tree cropping and horticulture in the valley bottoms. Rice, maize, cotton, yam, millet, sorghum, cassava, groundnut, cashew and tree fruit production, along with herding, are the main farming activities on the slopes. Aquaculture offers major opportunities in Upper Guinea. Shea nut and locust bean trees under assisted natural regeneration (ANR) occupy considerable areas on the slopes and are a source of income for women.

#### ➤ The potential of rice-fish farming

Rice production can be combined with fish farming over one or two cycles in the valley bottoms. Farmers can gain more autonomy in dietary and economic terms, mark out their boundaries and create sustainable added value for their families and communities through learning rice-fish farming techniques as currently practised in the forest region.

In a situation of more marked food insecurity in rural areas due to the harmful effects of climate change, low income, high transport costs and uncertain supply, the products of local fish-farming ponds are very attractive to consumers and can improve rural communities' resilience by reducing the vulnerability of their ecosystems to the current and future effects of climate change.

Integrated rice-fish farming makes it possible to intensify exploitation of the natural environment on a sustainable basis : i) in a humid tropical environment, ponds established in the valley bottoms can be used to farm species that are often either under-exploited or not exploited appropriately; ii) the ponds improve the availability of water for farming – they replenish the groundwater and regulate the flow of small surface streams; and iii) in the rice fields, farming fish together with rice optimizes use of land and water resources and improves the fertility of the plots, particularly by limiting erosion due to run-off, thereby reducing the need for fertilizers and pesticides.

Fish-farming schemes make use of agricultural by-products such as rice bran, palm kernel, groundnut and cotton cake and livestock manure, whilst facilitating submerged rice cultivation. Farmed fish is a fresh, high-quality product which is lucrative for producers and accessible for the majority of rural or urban consumers. Rice-fish farming activities in Forest Guinea have resulted in average fish yields estimated at 1500 kg/ha/year and average paddy rice yields of 2000 - 3000 kg/ha/year.

## 2.2 Constraints

The main constraints relating to implementation in Upper and Middle Guinea are as follows:

- Lack of tenure security;
- Conflicts between farmers and transhumant herders;
- Mining;
- Producers' illiteracy;
- Rural exodus;
- Producers' advancing age;
- Producers' inadequate access to farm services (research and advice);
- The weak structure of such professional organizations as do exist;
- The non-existence and/or non-enforcement of laws and regulations (rural land tenure, water code, etc.);
- Producers' difficulties in accessing credit and markets.

It should be noted that a study of rural land tenure is under way as part of the preparation of the National Agricultural Development Policy (NADP). This study makes provision for a rural tenure code which did not previously exist. Enforcement of that code will take account of tenure issues affecting the valley bottoms and slopes and will be a positive factor in the sustainability of the schemes.

## 2.3 Expected impacts

This pilot programme is already under way on a significant scale (14,400 beneficiaries) in quite varied situations. Success should lead to the establishment of a national programme, because potential for valley bottom development exists in all regions and can generate positive impacts on the hydrological

regime of cross-border watercourses. The programme intends to generate significant positive impacts in three ways:

- economically speaking, the GDP of a farmer in Guinea is estimated to be €300 per year; the project's ambition is to bring this income up to a minimum of €450 per year by the end of the second year of operation and €600 per year as of the third year;
- in social terms, improved production will boost food security within communities, while increased income helps to enhance resilience in the face of difficulties (health problems, accidents, external environment) and improve quality of life;
- in environmental terms, restoration of the slopes will help gradually to reverse the trend towards soil degradation.

Working on a complete ecosystem (valley bottoms/slopes – cropping/herding) can have systemic impacts: water, soils, food, income, etc.

### 3. Programme description

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#### 3.1 Strategic vision of the programme

This programme represents a continuation and strengthening of activities already undertaken in the sector by other operators. The programme will help communities to be less dependent in their farming activities on decreased rainfall and the greater variability of rainfall patterns through developing the valley bottoms and small irrigation schemes on the basis of a shared needs assessment. At the same time, it will help to restore degraded slopes to encourage integrated natural resource management.

The basic concept underlying the programme is the organization and professionalization of producers, grouped together around production basins with known potential and identified (or to be identified) outlets. Beyond the schemes as such, the programme aims to: i) promote sustainable production destined for the commercial circuits, whilst meeting producers' requirements within the framework of a participatory approach; and ii) lift the main constraints, i.e. the lack of water control, the under-equipment of farms and/or businesses downstream and the inadequate organization of the various operators.

Priority will be given to improving the existing position and to low-cost schemes. The programme will be an integral part of a village territory and adopt a spatial approach with a view to sustainability. It will aim in particular to protect nearby watersheds, as sanding up of the valley bottoms is becoming a concern in some regions due to lack of adequate upstream work. This spatial approach will be combined with a "supply chain" and value chain approach, stressing the interdependence of the various links in the chain: development, production, processing and packaging, marketing.

The programme will be participatory in nature, particularly in identifying the valley bottoms to be developed and strengthening professional and inter-professional organizations. The beneficiaries will be the various operators in the rice, maize, horticulture, fruit tree and fish-farming sectors and particularly the small farmers, producers or their groups, traders and processors.

#### 3.2 Goal and specific objectives

The goal of the **Integrated valley bottom/watershed ecosystem management programme for increased climate change resilience** is to enhance the climate change adaptation capacity of farmers and rural communities in general through sustainable management of the agro-ecological systems of the valley bottoms in Upper and Middle Guinea.

##### **Specific objectives**

Specifically, the programme aims to:

**SO1** - Improve control of water management through building hydraulic infrastructure appropriate for the different types of valley bottoms and beneficiaries' needs and capacities;

**SO2** - Bring about a sustainable increase in valley bottom productivity through the development of good practice, crop diversification and added value production;

**SO3** - Preserve the watersheds through ecologically, socially and economically efficient agro-forestry systems.

##### **Expected results**

<b>Result 1:</b> The developed valley bottoms are sustainably farmed by producers
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**Result 2:** The hydrological regime at the outflow of the valley bottoms increases the security of the water resource in the downstream network

**Result 3:** Increase in crop and aquaculture production in the valley bottoms and its economic value

**Result 4:** The slopes above the developed valley bottoms are restored and put to sustainable agro-forestry use in a participatory process at community level

### 3.3 Activities

In accordance with the expected results of the programme, the activities to be carried out are:

**R1A1** - Identification of appropriate schemes and the farmers concerned and establishment of a process of local consultation and mobilization.

**R1A2** - Technical and financial finalization of the intended schemes and formalization of farmers' participation.

**R1A3** - Creation of the hydro-agricultural schemes and establishment of management committees.

**R2A1** - Identification of sites to install limnometric stations.

**R2A2** – Establishment and operation of the limnometric stations

**R3A1** - Training of producers in appropriate techniques and good practice depending on the products concerned.

**R3A2** – Hands-on support and advice for producers during the first production cycles.

**R3A3** - Establishment of strategies to increase added value for producers (storage, processing, outlets)

**R4A1** - Identification of appropriate schemes and the farmers concerned and establishment of a process of local consultation and mobilization.

**R4A2** - Training and support for farmers in techniques and practices depending on the products concerned.

**R4A3** - Establishment of strategies to increase added value for producers (storage, processing, outlets)

### 3.4 Programme area

The project will cover the Mali and Koubia prefectures in Middle Guinea and Kouroussa and Dabola prefectures in Upper Guinea. The proposed programme areas are:

In Middle Guinea: Mali prefecture with potential to develop 171 ha and Koubia prefecture with potential for 65 ha. In both prefectures, most of the valley bottom areas are found in the Woundou, Silamè and Litty sub-basins.

In Upper Guinea: Kouroussa prefecture with potential to develop 176 ha and Dabola prefecture with potential for 132 ha. In both prefectures, the valley bottoms potentially suitable for development are located essentially in the Mafou and Banié sub-watersheds.

The total valley bottom area to be developed is 550 ha. The area of restored slopes will follow a ratio of around two hectares of slopes for one hectare of valley bottom. As a result, the total area of restored slopes will be 1200 ha. The number of target farmers is around 2000.

### 3.5 Programme steering

Precise steering procedures will be determined during the project note consolidation phase. Nevertheless, according to the preliminary outline, an implementation partner will be associated with the programme (NGO or international agency) to ensure success. In addition, the programme's stakeholders would have the following roles:

Stakeholders/implementers	Role
National Water and Forests Department	Restoration and rehabilitation of degraded forest. Promotion of agro-forestry
Guinée Ecologie	Identification, establishment and restoration of ecological corridors, spring heads and banks of watercourses.
Guinea Parks and Reserves Office	Restoration and creation of protected areas
Ministry of the Environment, Water and Forests/ DNE	Technical support
Ministry of Agriculture/IRAG	Capacity-building for producers through training on good production practice
Ministry of Livestock	Identification and dissemination of adaptation-related pastoral techniques.
Local communities	Beneficiaries and implementers
Prefectural authorities	Support at local level
Geo-synaps Guinée	Mapping of sites
GTP/SAP, ECOAGRIS, COSIE, etc.	Information system, environmental and forestry databases
Thematic Mapping and Remote Sensing Office	Thematic mapping
National Local Development Department/MATD	Local community involvement (PDL)
National Observatory of the Republic of Guinea (ONRG)	Mapping, thematic studies
National Geographic Institute	Mapping
Ministry of the Budget	Contribution of the National Development Budget
Environmental NGOs	Awareness-raising
Biodiv-Guinée	Awareness-raising, identification, creation and restoration of ecological corridors, spring heads and banks of watercourses.

### 3.6 Risks connected with programme implementation

Several risks have been identified that could compromise the implementation or continuity of the project:

- The tenure risk:** As regards the programme's approach to tenure issues, it should be possible to find common ground within the rural communities through consultation, mobilization and participation. Official recognition at national or local level of the tenure status of the valley bottoms will precede any operations to develop these areas. The enforcement of the new rural land tenure code will tackle tenure issues relating to the valley bottoms and slopes.

- **Risks relating to inadequate maintenance and servicing:** Management committees (CGP) will be set up to deal with the maintenance and servicing issues involved in the schemes and their members will receive training in irrigation water management and maintenance of the hydraulic structures.
- **Risks relating to water quality:** water quality in the valley bottoms can suffer serious, rapid degradation due to a number of factors. As a result, it is essential to monitor quality and be able rapidly to diagnose the causes of degradation and the corrective measures required. A support team trained to do this work will therefore be permanently present in the programme areas with a view to passing on analytical and corrective capacities to the local stakeholders.
- Risks relating to wandering livestock: to reduce nuisance caused by the presence of herds in the cropping areas, the following measures are planned:
  - wire fencing or live hedging;
  - stone fences alongside a thornbush hedge, a very widespread practice in Upper Guinea;
  - defining (marking out) the grazing areas in each village territory by agreement with the farmers and herders;
  - enforcement of the pastoral code.

## 4. Human and financial resources required by the programme

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### 4.1 Human needs

A project team will comprise a programme leader, a person in charge of the component focusing on hydro-agricultural schemes and monitoring water resources, a farmer training and support officer, a person dealing with added value production, a person in charge of the community consultation and mobilization component and an administration and finance officer. The team will be based in Middle Guinea to facilitate closer contact with the field. It will have administration, accounting and financial back-up from the implementation partner.

A team responsible for training and supporting producers will be set up for each prefecture, based at local level in close proximity to the programme areas. It will comprise one agricultural trainer per 40 farmers in the first year of cultivation (i.e. 50 trainers) and one per 80 farmers for the following years (i.e. 25 trainers). Two producer training and support officers, one for each region, will be responsible for managing the teams. The cost of training farmers according to the PLA - IMNR (Participatory Learning and Action - Integrated Management of Natural Resources) method is an estimated USD 100,000, i.e. USD 20,000/year for five years for the two areas (Upper and Middle Guinea).

The valley bottom development scheme will be designed and implemented by two specialist teams, one per region, which will also provide support with maintenance and good management practice for two years on a degressive basis.

### 4.2. Equipment and infrastructure (investments)

The programme plans to develop several sites which will require the installation and use of appropriate plant and equipment, to be specified in more detail when drawing up the final programme document.

The programme provides for the installation and operation of a network of limnometric stations, as well as the supply of five rain gauges per project area to be monitored by the scheme operators.

#### 4.3. Preliminary budget estimate

Expected results	Activities	Amount (USD)
<b>Expected result 1 :</b> The developed valley bottoms are farmed and maintained by producers	Identification of appropriate schemes and the farmers concerned and establishment of the process of local mobilization	600 000
	Technical and financial finalization of the intended schemes and formalization of farmers' participation	480 000
	Creation of the hydro-agricultural schemes and establishment of management committees	2 495 000
	<b>Sub-Total Expected Result 1</b>	<b>3 575 000</b>
<b>Expected result 2 :</b> The hydrological regime at the outflow of the valley bottoms increases the security of the water resource in the downstream network	Identification of sites to install limnometric stations	35 000
	Establishment and operation of the stations	950 000
	<b>Sub-Total Expected Result 2</b>	<b>985 000</b>
<b>Expected result 3 :</b> Increase in crop and aquaculture production in the valley bottoms and its economic value	Training of producers in appropriate techniques and good practice depending on the products concerned	600 000
	Hands-on support and advice for producers during the first production cycles	600 000
	Establishment of strategies to increase added value for producers (storage, processing, outlets)	1 200 000
	<b>Sub-Total Expected Result 3</b>	<b>2 400 000</b>
<b>Expected result 4 :</b> The slopes above the developed valley bottoms are restored and put to sustainable agro-forestry use	Identification of appropriate schemes and the farmers concerned and establishment of a process of local consultation and mobilization	600 000
	Training and support for farmers in techniques and practices depending on the products concerned	6 240 000
	Establishment of strategies to increase added value for farmers (storage, processing, outlets)	1 200 000
	<b>Sub-Total Expected Result 4</b>	<b>8 040 000</b>
	<b>TOTAL</b>	<b>15 000 000</b>

## Appendices

### Logical framework

Hierarchy of objectives	Performance indicator	Monitoring mechanism	Assumptions and risks
<b>Goal :</b> Enhance the climate change adaptation capacity of farmers and rural communities in general through sustainable management of the agro-ecological systems of the valley bottoms in Upper and Middle Guinea.	Productivity and diversity of crops from the developed areas in the valley bottoms and restored areas on the slopes.	Technical monitoring report on production and comparison with the baseline situation established prior to the development and support.	Extreme climate events; Failure of the local participatory process.
<b>Specific objectives (SOs)</b>			
<b>(SO1)</b> Improve control of water management through building hydraulic infrastructure appropriate for the different types of valley bottoms and beneficiaries' needs and capacities	Number of hectares of developed valley bottoms under cultivation.	Field visit report; Evaluation report; Installation acceptance report.	Inadequate government contribution to project implementation; Weak support from technical and financial partners.
<b>(SO2)</b> Bring about a sustainable increase in valley bottom productivity through the development of good practice, crop diversification and added value production .	Productivity of crops and added value production.	Establishment of the baseline situation; Internal monitoring report; External evaluation.	External threat to production; Variation in prices and availability on the markets.
<b>(SO3)</b> Preserve the watersheds through ecologically, socially and economically efficient agro-forestry systems .	Number of hectares of restored slopes under agro-forestry systems	Establishment of the baseline situation; Internal monitoring report; External evaluation.	Inadequate government contribution to project implementation; Weak support from technical and financial partners .

Expected results (R)	Performance indicator	Sources of verification	Expected results
<b>(R1)</b> The developed valley bottoms are sustainably farmed by producers	Area of developed valley bottoms under cultivation and maintained	Field visit report; Evaluation report; Installation acceptance report; Monitoring report on maintenance of the installations.	550 hectares of valley bottoms developed, farmed and maintained
<b>(R2)</b> The hydrological regime at the outflow of the valley bottoms increases the security of the water resource in the downstream network	Improved regulation of watercourse flow downstream of the schemes	Limnometric stations monitoring the flow	30% increase in average flow in the dry season
<b>(R3)</b> Increase in agricultural production in the valley bottoms and its economic value	Increase in crop yields and producers' income	Production monitoring reports; sale price monitoring system; evaluation report	869 valley bottom farmers see a 30% increase in their income; more than 6000 direct beneficiaries
<b>(R4)</b> The slopes above the developed valley bottoms are restored and put to sustainable agro-forestry use	Area of restored slopes under agro-forestry systems	Production monitoring reports; sale price monitoring system; evaluation report	1200 upland farmers see a 30% increase in their income; more than 8400 direct beneficiaries