

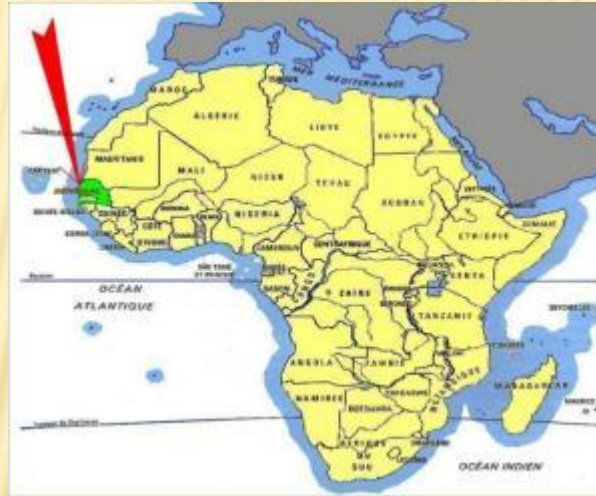
REPUBLIQUE DU SENEGAL

Un Peuple- Un But- Une Foi

MINISTRY OF AGRICULTURE AND RURAL EQUIPMENT

Irrigation schemes in the Senegal River Valley

Development, management and perspectives



Tsukuba Training

May 2018

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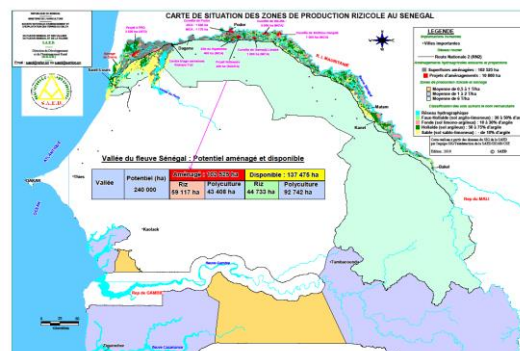
1. Description of the Senegal River Valley (SRV)
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ABBREVIATIONS AND ACRONYMS

- × ABEDA (BADEA): Arab Bank for Economic Development in Africa (BADEA)
- × CMRE: Center for Business-Management and Rural Economy
- × EIG: Economic Interest Group (Private organization in charge of management of schemes and water control entrusted by farmers union)
- × FoMAED: Mutual Fund for Maintenance of Irrigation and Drainage Facilities
- × FoMIIG: Fund for Maintenance of Infrastructure for Common-Use
- × FoMPI: Fund for Maintenance of Non-Transferred Irrigation Schemes
- × FoMUR: Mutual Fund for the Renewal of Pumping Stations and Hydro-mechanical Equipment
- × LIS: Large-scale irrigation schemes
- × LLUP: Land and Land Use Plans
- × MDC: Management and Development Company (a part of ODSR in charge of development and management work on Senegal River)
- × MIS: Medium-scale irrigation schemes
- × ODSR: Organization for Development of the Senegal River (Inter-state organization for water resource management of Senegal River)
- × PIS: Private Irrigation Scheme
- × PMD: Planning and Maintenance Department of SAED
- × RC: Rural Communities
- × SAED: Parastatal Company for Development and Exploitation of the SRV delta
- × SRV: Senegal River Valley
- × VIS: Village Irrigation Scheme
- × WADB: West African Development Bank

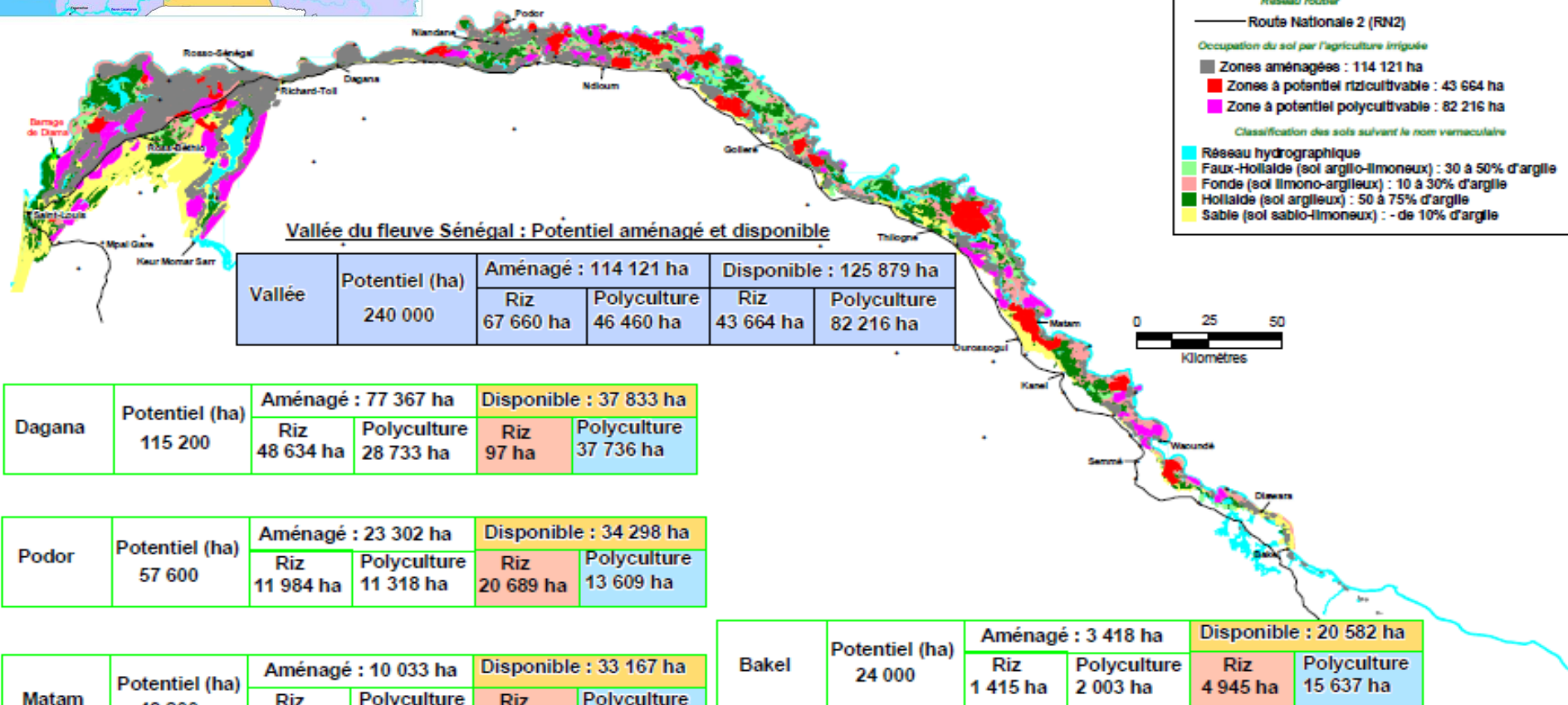
1. DESCRIPTION OF THE SENEGAL RIVER VALLEY (SRV)

1) POTENTIAL AND LOCATION



ZONES AMENAGEES ET AMENAGEABLES POUR L'AGRICULTURE IRRIGUEE DANS LA VALLEE DU FLEUVE SENEGAL

(Données obtenues à partir de la carte pédologique et géomorphologique de la FAO (1969 au 1/50,000) de la Vallée et du Delta du fleuve Sénégal, numérisées et simplifiées par la SAED)



LEGENDE

- Implantations humaines
- Villes importantes
- Réseau routier
- Route Nationale 2 (RN2)
- Occupation du sol par l'agriculture irriguée
- Zones aménagées : 114 121 ha
- Zones à potentiel rizicultivable : 43 664 ha
- Zone à potentiel polycultivable : 82 216 ha
- Classification des sols suivant le nom vernaculaire
- Réseau hydrographique
- Faux-Hollaïde (sol argillo-illimoneux) : 30 à 50% d'argille
- Fonde (sol illimono-argileux) : 10 à 30% d'argille
- Hollaïde (sol argileux) : 50 à 75% d'argille
- Sable (sol sablo-illimoneux) : - de 10% d'argille

1. DESCRIPTION OF THE SENEGAL RIVER VALLEY (SRV)

2) TYPE OF IRRIGATION SCHEMES IN SRV

- ✘ In the Senegal River Valley, irrigation schemes are classified into the following four categories by SAED according to the three criteria; method of financing (public or private), size (large, medium, and small—often by village groups), and management (transferred to beneficiaries or not) :
 - + **Large-scale Irrigation Schemes (LIS)** – Public irrigation schemes with the area greater than 1,000 ha equipped with dams and large pumping stations. Mostly, fully-mechanized rice production is practiced in LIS, and they are located mainly in the delta area and the middle downstream valley (PODOR);
 - + **Medium-scale Irrigation Schemes (MIS)** – Public irrigation schemes with less than 1,000ha to 50 ha. MIS appeared in the early 80's, and the development of the LIS and the MIS was accompanied by SAED's assurance on control over land;
 - + **Village Irrigation Schemes (VIS)** – Public irrigation schemes with the area of 20 to 50ha irrigated by motor pumps. VIS is often developed by manual labor of village groups;
 - + **Private Irrigation Schemes (PIS)** – Schemes that are financed by the private sector. PIS appeared since 1988 and have developed very rapidly, mainly in the delta area. These schemes are similar to VIS in their design, the size of which ranges from 5 to 100 ha.

1. DESCRIPTION OF THE SENEGAL RIVER VALLEY (SRV)

3) HISTORIC OVERVIEW OF THE DEV'T OF SRV

The development of irrigation schemes in the SRV can be divided into three main periods;

<1957-1972: Strong Government Control>

- During this period, the Government tried to establish a system for rural development that was administered with a total public control on the whole functions related to irrigation farming. This was due to the Post-Independence circumstance where SRV was a pastoral area without tradition or culture of irrigation farming, and the Government direct intervention was the only possible option to achieve development objectives set by the authorities (Total of 30,000 ha covered by irrigation schemes).

- The main actor in this period was, of course, the Government through SAED, whose role was to carry out necessary engineering studies of facilities, the development of irrigation schemes and even rice production itself. Rice producers in SRV played roles as farm laborers. In this context, SAED began to develop the Large-scale Irrigation Schemes (LIS)

- 9,000 farm households settled over 10,000 ha of land in 1972. Their productivity was very low ranging from 1 to 2 tons/ha in paddy.

- Droughts took place in many years in the 70s led the Government to shift its irrigation policy to the development of MIS and PIS, in additions to LIS.

1. DESCRIPTION OF THE SENEGAL RIVER VALLEY (SRV)

3) HISTORIC OVERVIEW OF THE DEV'T OF SRV

<1973-1987: Acceleration of the Development of Irrigation Schemes>

- To urgently respond to drought-related famine, VIS were developed because they were cheaper and more feasible. The models of VIS were developed by FAO and ODRS.
- The actors involved in the development of VISs are: (i) the Government (Central and Local), (ii) entrepreneurs and, (iii) the locals.
- Thus, the total area covered by VISs increased from 1,000 ha in 1975 to 10,000 ha and 33,000 ha in 1982 and 1987 respectively.
- At the end of the 1980s, the Government experienced a major economic crisis leading it to adopt a structural adjustment policy resulting in its withdrawal from rice production and related economic activities. Therefore it shifted to empower producers.

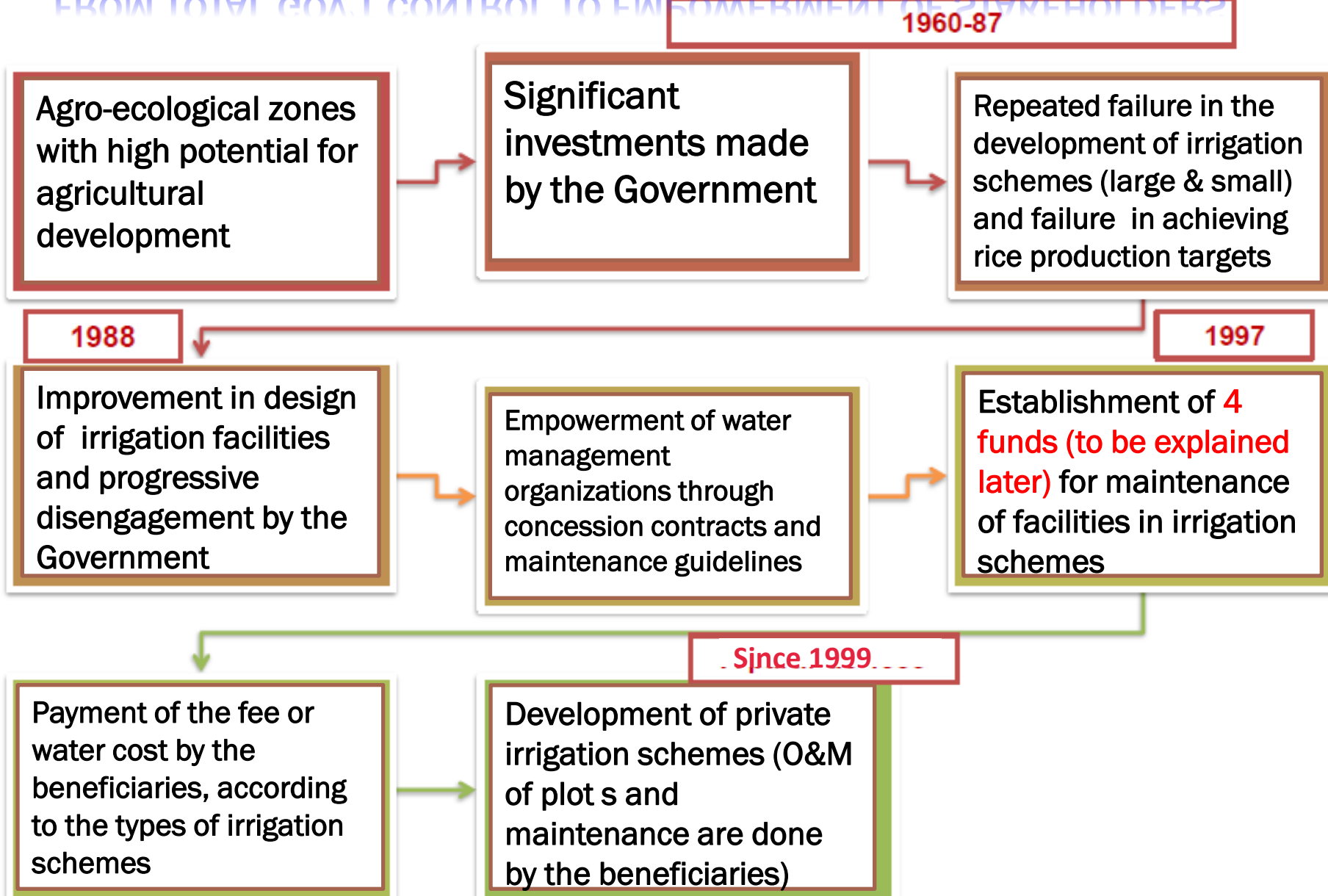
<Since 1987 to Date: the Government's Withdrawal>

- The Government has disengaged from rice production and other commercial activities. In the development of irrigation schemes, SRV observed the increase of basic private irrigation schemes (PIS) with low investment costs developed by the private sector without prior engineering. Besides the development of PIS, the Government carries out the rehabilitation of LIS and the development of new schemes, and new schemes are transferred to producer associations that are responsible for operation and maintenance.

1. DESCRIPTION OF THE SENEGAL RIVER VALLEY (SRV)

4) EVOLUTION OF DEV'T OF IRRIGATION SCHEMES IN SRV

FROM TOTAL GOV'T CONTROL TO EMPOWERMENT OF STAKEHOLDERS



2. CONCERNED STAKEHOLDERS AND THEIR ROLES IN DEVELOPMENT AND O&M OF IRRIGATION IN SCHEMES IN SENEGAL RIVER VALLEY (SRV)

Roles					
	Decision Making	Financing	Implementors	Supervision	Provision of support
Development of irrigation schemes	SAED	Government / Donors/ Beneficiary	SAED/ Private Contractors	Eng. Consulting Companies supervised by SAED	consultants
Maintenance/ Servicing	Unions (producers organizations)	Operators (FOAMED water fee) / public funds (grant)	Private Maintenance Service Providers	Eng. Consulting Companies Selected and supervised by SAED (via PMD / Committees)	SAED
Water Management	ODSR SAED/ Unions (farmer unions)	Union/ EIG (Via fee for ODRS)/ Government	ODSR/ SAED/ Unions	SAED	SAED
Technical Support/ Consulting (Cap.Dev't in water mgt)	EIG (private organization)	Government	SAED	Monitoring Committee to ensure the implementation according to TOR of SAED	SAED / Other Government Agencies

3. DEVELOPMENT OF IRRIGATION SCHEMES IN SRV

1) ACTORS INVOLVED IN PLANNING AND DECISION-MAKING

Several stakeholders are involved in the planning and decision-making in the developing irrigation schemes. Involved stakeholders vary according to the mode of financing on the facilities.

• **In the case of public financing**, the development of irrigation should be included in the Mission of SAED that is revised triennially and constitutes a kind of performance contract binding SAED to the Government of Senegal. Stakeholders involved in decision-making are:

- Government through the Ministry in charge of Agriculture
- SAED
- Development Partners (donors)

• **In the case of private financing**, the decision is made by the private actors that invest on irrigation production. The allocation of land is under the responsibility of the Rural Communities who have to inform SAED to see if the irrigation scheme is in compliance with the **Land and Land Use Plan**. However, there are cases where facilities are built without SAED's knowledge but with the water charge to be paid anyways. Eventually, SAED registers all of new private facilities.

3. DEVELOPMENT OF IRRIGATION SCHEMES IN SRV

2) CONSENSUS FORMATION

A – DEV'T & SIGNING ON THE CHARTER CONCERNING IRRIGATED AREAS

- ✘ This charter applies to all water users in both public or private irrigation schemes.
- ✘ It materialized the agreement and reciprocal commitments between SAED (water service provider), rural communities (authority over the use of land) and the producers (who invest at the plot level in irrigation schemes).
- ✘ The Charter was validated by the Prime Minister in 2006. Consultation procedure on the rules of water use and land security in this Charter is the basis for the allocation of land to the private sector in SRV for agricultural use.
- ✘ This charter is being applied gradually as the implementation of new projects concerning irrigation infrastructures (new infrastructure, rehabilitation, PIS). The terms of the contract-based mutual commitments are adapted, and improved during the implementation of projects

3. DEVELOPMENT OF IRRIGATION SCHEMES IN SRV

2) CONSENSUS FORMATION

B - INNOVATIVE & HIGH-QUALITY METHODOLOGY AND TECHNICAL TOOLS

- ✘ Over the last ten years, SAED and research teams (ISRA, CIRAD) developed the methodology for the formulation of Land and Land Use Plan (LLUP) to identify potentials, the rights and the use of natural and land resources within the areas belonging to the Rural Communities (RC) through protocols established with almost all the RC in SRV
- ✘ The objective of LLUP is to reduce land conflicts and ensure greater equity in access to land
- ✘ LLUP in all 42 RCs in SRV were formulated in the SAED's rural development project that had a component for the development of LLUP

3. DEVELOPMENT OF IRRIGATION SCHEMES IN SRV

3) PROCESS FOR IRRIGATION SCHEME DEVELOPMENT

✘ The process for development of irrigation schemes consists of two stages:

➤ **Conducting relevant studies in the following chronology:**

- ✘ Feasibility or preliminary study on the project
- ✘ Detailed design study
- ✘ Selection of contractor

The sequential process of the above elaboration goes as follows: development of terms of reference, determining specifications, short-listing of international consulting firms, consultation with their offices, calling for tender, evaluation of offers, selection of the contractor, negotiation and signing on the contract, submission of interim reports, submission of final reports.

It should also be noted that the selection process on the competition-base in accordance with the Senegalese public procurement code and/ or the directives on procurement by the financial donors.

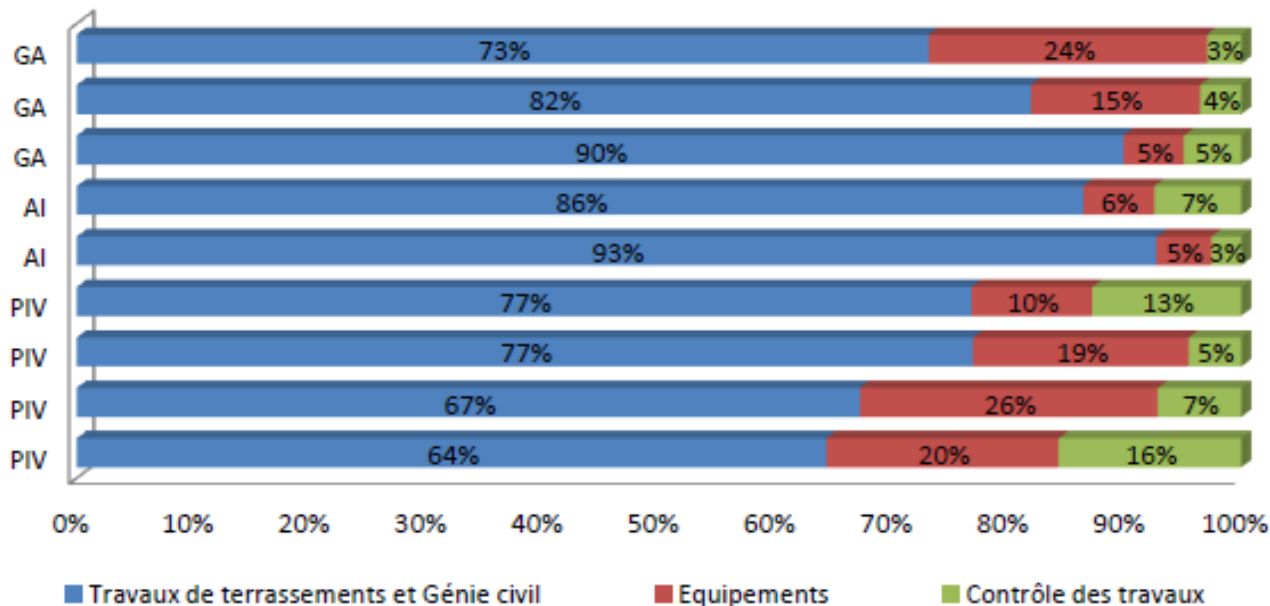
➤ **Development of irrigation schemes**

- ✘ All the above steps should be completed without objection by the financial partners, before initiating development work. Once this is ensured, the service order to start the work is finally sent to the contracted companies and concerned suppliers.

3. DEVELOPMENT OF IRRIGATION SCHEMES IN SRV

3) COST FOR IRRIGATION SCHEME DEVELOPMENT

	VIS				MIS		LIS		
Earthworks & Civil Engineering	3 319 098	3 779 617	2 750 000	2 784 834	5 342 375	4 569 170	6 844 682	3 733 211	4 492 136
Cost for equipment	1 028 126	1 438 759	662 062	376 954	270 647	323 809	395 491	662 062	1 465 651
Supervision of works	808 667	403 557	162 268	464 216	148 325	395 258	375 269	162 268	182 119
Total cost	5 155 891	5 621 933	3 574 330	3 626 004	5 761 347	5 288 237	7 615 442	4 557 541	6 139 906



Cost of earthworks and civil engineering represents between 63 and 93% of total costs

4. FINANCING FOR IRRIGATION SCHEME DEVELOPMENT

1) POLICY AND FINANCERS FOR PUBLIC INVESTMENT

- ✘ The investment policy in irrigation schemes is determined by successive mission letters of SAED which define the objectives, the programs and the measures of implementation as well as the obligations of the concerned parties.
- ✘ Generally, financing are provided for the rehabilitation of public irrigation schemes, the development of new water supply or drainage infrastructure, the development of new irrigation schemes and the facilitation of access to the developed land by family farms and private entrepreneurs
- ✘ Finance is generally provided by development partners (e.g. World Bank, ABEDA, WADB, Millennium Challenge, JICA, EU, AFD), mainly focusing on the rehabilitation of and new development of irrigation schemes in the SRV delta, and marginally in the middle part of SRV (Podor Department).

4. FINANCING FOR IRRIGATION SCHEME DEVELOPMENT

2) ACTORS FOR FUND MOBILIZATION

- ✘ In the case of public financing, SAED formulates a financing request that is part of their policies and programs defined by the Government. This request may be, in some cases, supported by related engineering studies. The Ministry of Agriculture transmits the request to the Ministry of Economy and Finance for a referral to potential donors. Once the donor is identified, this stage of fund search is concluded with the negotiation and signing on the Loan Agreement by the donor and Senegalese government represented by the Ministry of Economy and Finance.
- ✘ In the case of private financing, private developers/operators prepare and submit necessary documents for financing to banks or any other financial sources. The Government provides loan guarantee and the low interest rate is offered.

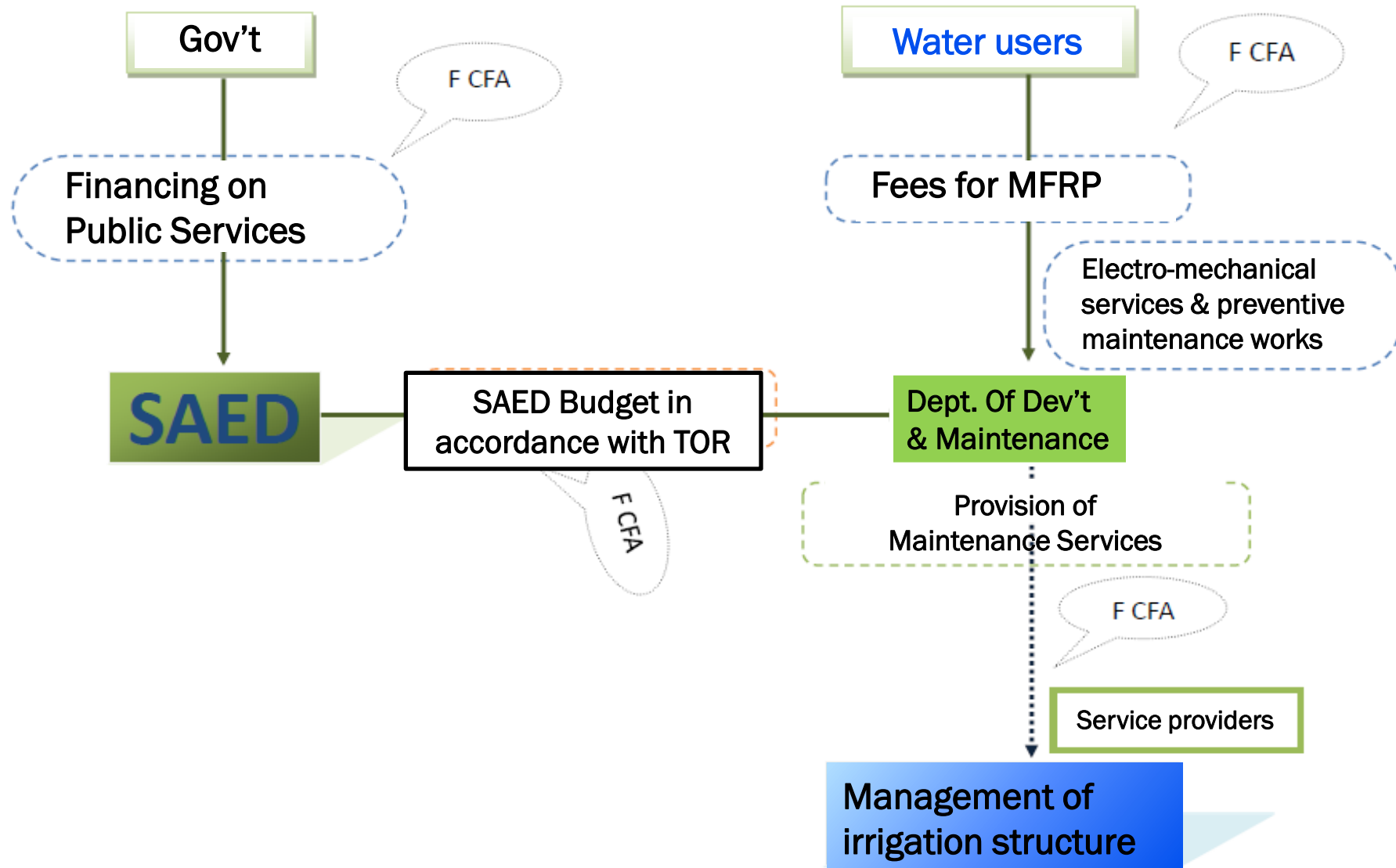
4. FINANCING FOR IRRIGATION SCHEME DEVELOPMENT

3) ACTUAL FINANCING

- ✘ *The following are the financers for physical structures:*
 - + Government finances the main structures of irrigation facilities.
 - + Private sector finances structures at plots and terminal canal level
 - + Local authorities finances intermediate investments on other structures that do not belong to the above two cases as shown below;
 - Collective investments (e.g. rural roads, electrification) whose costs are passed on through taxation.
 - "Owner" investments that is made by the owner of a given farm rented under a normal land-lease system for the construction of buildings or infrastructures. The costs are usually passed on through the rent

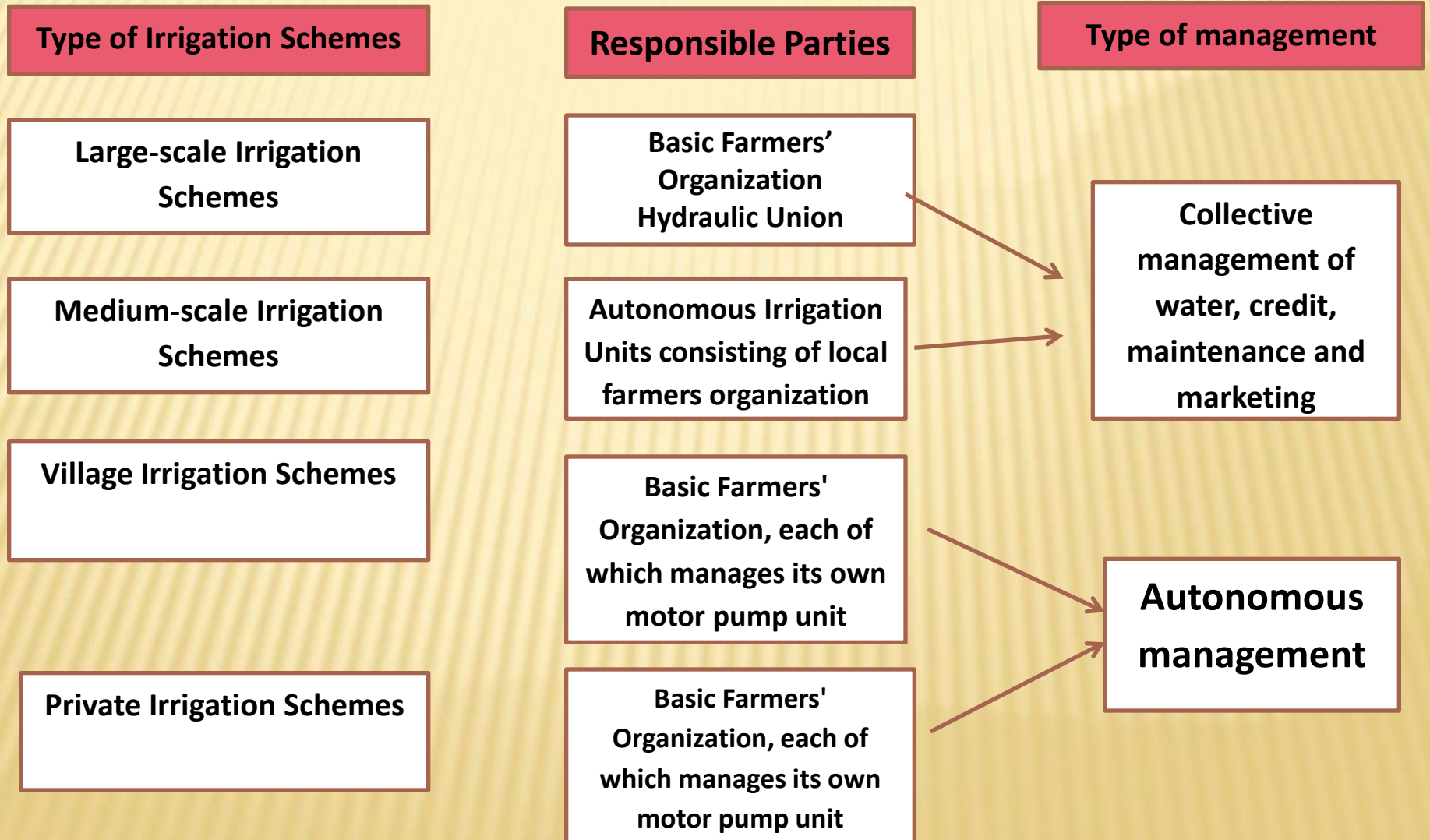
5. OPERATION & MANAGEMENT OF IRRIGATION SCHEMES

1) MANAGEMENT STRUCTURE



5. OPERATION & MANAGEMENT OF IRRIGATION SCHEMES

2) CONCERNED STAKEHOLDERS AND THEIR ROLES IN WATER MGT



5. OPERATION & MANAGEMENT OF IRRIGATION SCHEMES

3) COST OF WATER SERVICES AT RIVERS AND IRRIGATION FACILITIES

cost of water services	Purposes	Management Entities	All type of irrigation schemes	Gouvernement contribution
ODSR fee	Maintenance and management of Diama dam	MDC (a part of ODSR responsible for development and management works of Senegal River)	11 600 FCFA/ha during hot dry season	Annual membership fee to ODSR
			2 700 FCFA/ha during cold dry season	
			5 500 FCFA/Ha during raining season	
FoMAED fee from the concerned Users	Operation and maintenance of drainage canals	SAED	Drainage service :10,000 FCFA/ha/yr for land under cultivation	A part of the cost is covered by the Government
			Water supply and drainage service: 15,000 FCFA/ha/yr for cultivated land	

5. OPERATION & MANAGEMENT OF IRRIGATION SCHEMES

4) COST OF WATER SERVICES AT PLOTS

Components of the cost of water services	Purpose	LIS and MIS transferred	LIS, MIS VIS Non-transferred	VIS and PIS
	Parameters/ Elements			
Pooling for Depreciation Cost	For the renewal of pumping equipment	Cost of pumps	Standards (depreciation cost covered by the Government)	No formalized framework for pooling depreciation cost
		lifetime		
		Average areas cultivated in a year		
maintenance of the irrigation canals and scheme	To improve the efficiency of the irrigation canals	Standard rate (12,000FCFA/ha)	* Standard rate * Rehabilitation supported through the FoMPI	No formalized framework for the maintenance of the irrigation canals
Operation cost (Fixed cost)	For the proper operation of the hydraulic union or other management organizations	staff costs	staff costs	No formalized framework
		Travel expenses	Travel expenses	
		Average areas cultivated in a year	Average areas cultivated in a year	
Operation cost (Variable cost)	To ensure functional irrigation	Water available at dams	Water available at dams	Water available at dams
		Kw per hour price	Fuel cost	Fuel cost
		Efficiency of the irrigation canals	Efficiency of the irrigation canals	Efficiency of the irrigation canals

5. OPERATION & MANAGEMENT OF IRRIGATION SCHEMES

5) MEASURES TAKEN FOR SUSTAINABILITY

A - THE IMPLEMENTATION OF A POLICY AND A MAINTENANCE PROGRAM

- Policy for maintenance of irrigation facilities was formulated with AFD fund, adopted by an inter-ministerial committee in July 2002, agreed by the representative farmers' organizations of the SRV.
- As instruments and mechanisms for maintenance work, the following funds have been put in place, and are now operational:
 - Fund for Maintenance of Irrigation and Drainage Facilities (FoMAED);
 - Mutual Fund for the Renewal of Pumping Stations and Hydro-mechanical Equipment (FoMUR);
 - Fund for Maintenance of Infrastructures for Common-Use (FoMIIG),
 - Fund for Maintenance of Non-Transferred Irrigation Schemes (FoMPI).
- **FoMAED:** The fund is used for the maintenance operations of the irrigation facilities (headworks, main irrigation and drainage canals) in SRV in order to ensure proper functioning of facilities, thus the benefit from them. This fund is contributed by both the Government and the users.
- The resources needed to cover maintenance costs are calculated on the basis of the potential of irrigable rice areas. The amounts are paid in part by the farmers on the basis of the areas of irrigation schemes developed and the difference is paid by the Government

5. OPERATION & MANAGEMENT OF IRRIGATION SCHEMES

5) MEASURES TAKEN FOR SUSTAINABILITY

A - THE IMPLEMENTATION OF A POLICY AND A MAINTENANCE PROGRAM

- × **FoMUR**: The establishment of this fund helps defining a regulatory framework for the constitution and use of provisions that enables the maintenance and renewal of public pumping equipments
- × **FoMIIG** : This fund is financed entirely by the Government, and is intended for the maintenance of infrastructures for common-use such as rural roads, dikes and power lines. The fund is managed by SAED in consultation with the concerned Rural Councils.
- × **FoMPI**: This fund is used to finance the maintenance of non-transferred public irrigation schemes and the provision of support to VIS for the maintenance of their irrigation canals, maintenance and renewal of group motor pumps.
- × These maintenance funds are implemented by SAED with the finance from the Government and user contributions. 54% of the user fees was collected in 2014.

5. OPERATION & MANAGEMENT OF IRRIGATION SCHEMES

5) MEASURES TAKEN FOR SUSTAINABILITY

B – DEV'T OF CENTERS OF BIZ -MANAGEMENT & RURAL ECONOMY (CMRE)

- ✘ CMREs were created by a project financed by AFD in 2003, and SAED supports their operations such as provision of support to stakeholders conducting agriculture-related economic activities in accounting and legally formalizing their activities.
- ✘ CMREs support almost all the Water Users' Associations and Unions (which manage the water-use fee among other things), EIGs, producer organizations (which manage the agricultural credit for their members), private producers, processors/millers, and relevant service providers, among their members.

5. OPERATION & MANAGEMENT OF IRRIGATION SCHEMES

6) ACTUAL MAINTENANCE WORK



Carrying out earthworks

Rural Roads



Grass cutting along canals



Canal after the maintenance work



5. OPERATION & MANAGEMENT OF IRRIGATION SCHEMES

6) ACTUAL MAINTENANCE WORK



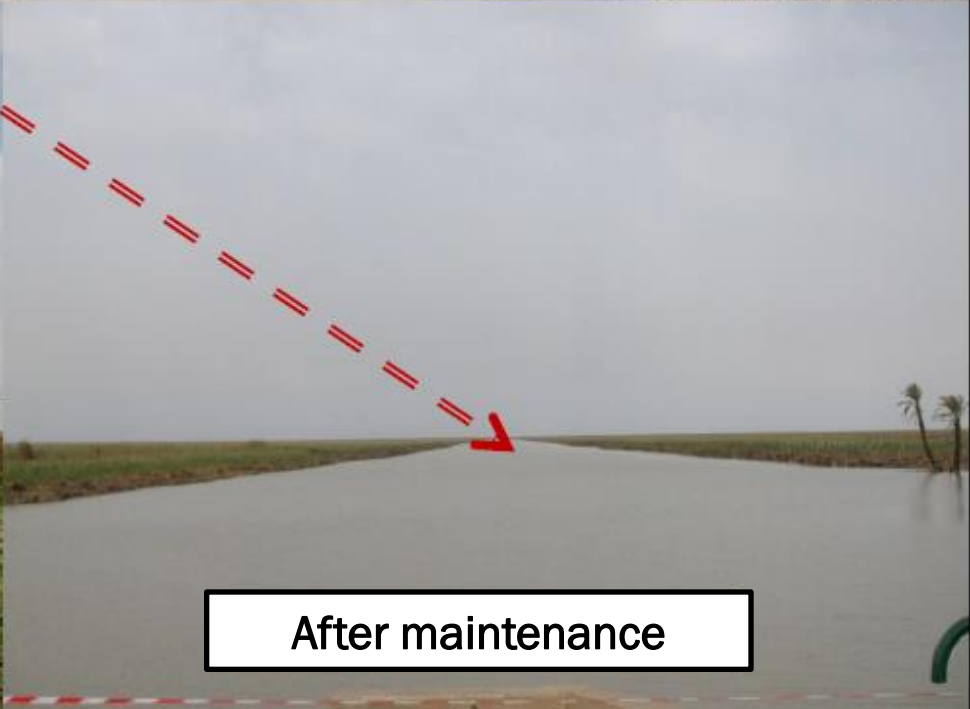
Before maintenance



During maintenance work



During maintenance work



After maintenance

6. IMPACTS OF IRRIGATION SCHEME DEVELOPMENT IN SRV

- × **Improving social justice by reducing inequalities in access to land**

The annual average growth rate of the rice cultivation area in SRV is 13% between 2013 and 2016, and it is essentially attributed by the expansion of VIS.

- × **Increase and diversified of rice farmers' income**

Irrigation schemes enabled double-cropping (two crop production seasons a year that triggered the significant increase in yields and demand for local rice improving and stabilizing farmers income

- × **Increased rice production**

Along the expansion of irrigation schemes, the rice production increased from 559,000 tons in 2014 to more than 950,000 tons in 2017.

- × **Contribution in improving the trade balance and thus food sovereignty,**

Rice imports decreased by 11% between 2015 and 2016 from 989,549 tons to 831,068 tons. The rate for rice self sufficiency has increased from 30% to 61% between 2012 and 2016.

- × **Strong contribution to the economic growth**

Rice sector is one of the main drivers for the development of agriculture sector (the agriculture sector annual growth is around 8.6% against 6.9% for the national economy).

THANK FOR YOUR ATTENTION

