GHG appraisal of Mekong Delta Water Resources Development Project (MDWRDP)

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Background

This working document does provide the results of an EX-ACT GHG appraisal of Mekong Delta Water Resources Development Project (MDWRDP) done by MDWRDP team during the EX-ACT workshop organized by FAO and World Bank from 14 to 17 June 2016 in Hanoi.

The Ex-Ante Carbon-balance Tool (EX-ACT) is an appraisal system developed by FAO providing ex-ante estimates of the impact of agriculture and forestry development projects, programmes and policies on the carbon-balance

Mekong Delta and Project intervention

The Mekong River features very large fluctuations in water flows between these rainy and dry seasons, with the dry season flow being barely 2 percent of that of the rainy season. The MKD thus experiences both flood inundation and water shortages, at different times of the year. During the rainy season nearly 50 percent of the MKD is flooded, either temporarily or for more extended periods. In the dry season, the flow of the Mekong is insufficient to prevent extensive and sustained saline intrusion.

Mekong Delta is threatened by different factors linked to Climate change. Scientists at the Mekong River Commission (MRC), an intergovernmental body, also warns that if the sea level continues to rise at its projected rate of around one metre by the end of the century, nearly 40% of the delta will be wiped out.

"Encroaching sea water from the south, a proliferation of hydro dams in the north and large-scale sand mining are endangering the delta", officials warn. As a result, an alarming 500 hectares (5 km2) of land is being lost to soil erosion every year, they say. *"The sea level rise is bringing up water so fast that our defences against it have failed," (*director of the Climate Change Coordination Office). According to the Southern Irrigation Research Institute, saltwater intrusion destroyed more than 6,000 hectares (60 sq

km) of rice field last year. *"Nearly half the delta population now has no access to fresh water and that's serious," says Le Anh Tuan, deputy director of the Research Institute for Climate Change. As inland river water gets saltier, rice farmers across the lower Mekong delta are responding by switching to shrimp farming or growing reeds. Salt water has been found 60km* (37.3 miles) inland (Khadra, 2015)

The Government has recently adopted two major strategies pertinent to the proposed project. These are: a National Targeted Program (2008) to respond to climate change, issued by MONRE and a Water Resources Development Strategy to 2020, issued by MARD. Both of these strategies mainly focus on the MKD, as it is considered to be the country‟s most vulnerable area. Still, the Government is determined that the Mekong Delta will remain a major national center for crop and aquaculture production even in the face of the array of risks and uncertainties outlined above.

Project Development Objective(s). The proposed project development objective (PDO) is to protect and enhance the utilization of water resources in the project provinces of the Mekong Delta Region in order to sustain gains in agricultural productivity, provide access to water supply for rural households, and contribute to climate change adaptation.

The project is part of a regional investment operation to assist the Cambodia, Laos, Viet Nam and the Mekong River Commission with the objective to establish examples of integrated water resource management practices in the Lower Mekong Basin at regional, national and sub-national levels, thus contributing to more sustainable river basin development in the Lower Mekong. Project development objective (PDO) is to protect and enhance the utilization of water resources in the project provinces of the Mekong Delta Region in order to sustain gains in agricultural productivity, provide access to water supply for rural households, and contribute to climate change adaptation. It does target the western part of the MKD including the following six provinces: An Giang, Ca Mau, Hau Giang, Soc Trang, Bac Lieu, and Kien Giang and the Municipality of Can Th. The budget is around 160 million US$.

Project Data used

The appraisal is done using tropical moist climate and LAC Soils. The GHG analysis is conducted on 20 years for a project area of around 79156 ha with 66205 ha or irrigated rice, 10600 ha of perennials and 2500 ha of annual crops

2.3. Other Land Use Changes

Fill with your description	Initial land use		Final land use	Message	Fire Use? (y/n)	Area transformed (ha) Without	*	With	*
Rice area lost without proj	Flooded Rice	→	Degraded		NO	19861.5	D		I
perennial-> degraded without	Perennial/Tree Crop (>10 yrs)	→	Degraded		NO	1569	D	0	D
perennial-> set aside without	Perennial/Tree Crop (>10 yrs)	→	Set aside		NO	1569	D	0	D

The baseline scenario is integrating a progressive reduction of irrigated rice due to reduced water resources and increased sea salted water intrusion in the delta on 19440 Ha (30% of the area) and 3180

ha of perennials. This land will be definitively lost for agriculture use without project. Data estimates of threatened Areas were provided by the project team as reflective of the latest updates (workshop of June 2016).

The project will (a) enable the application of the alternate watering and drying" method for rice irrigation which is part of the technical package being promoted for increasing yields and reducing costs; (b) diversification to the higher value crops (e.g., vegetables, perennials).

The untransformed irrigated rice area unmixed with other productions is of 38881 ha (trad rice 1) which is continuously flooded. 50% will be transformed in intermittently flooded with project support, while the other 50% will remain continuously flooded during cropping season. The current rice area already used for shrimp aquatic production on dry season is estimated at 4662 ha. It will become intermittently flooded during rice crop season

3.3.2. Flooded rice systems remaining flooded rice systems (total area must remain constant)

Fill with your description	Cultivation period (days)	Water regime: During the cultivation period	Water regime: Before the cultivation period	Area (ha): Area (ha)	Area (ha): Without	*	Area (ha): With
tradit rice 1	180	igated - Continuously flood	Flooded preseason (>30 days)	38881.5	38881.5	D	0
improved rice 1	160	igated - Intermittently flood	Non flooded preseason >180 days	0	0	D	19440.75
rice 2 with shrimp on dry season	120	igated - Continuously flood	Flooded preseason (>30 days)	4662	4662	D	0
improved shrimp rice 2	120	igated - Intermittently flood	Flooded preseason (>30 days)	0	0	D	4662
improved rice 1 non intermtt flooded	160	igated - Continuously flood	Non flooded preseason >180 days	0	0	D	19440.75

On the 10600 ha of perennials, 30% will be lost in without project situation while the whole area will be maintained and improved (improved practices, additional fertilizer and compost use, irrigation, pruning trees) with project

3.2. Perennial systems (agroforestry, orchards, tree crops…)

3.2.1. Perennial systems from other LU or converted to other LU (please fill step 2.LUC previously)

Description	Residue/ biomass burning	Yield (t/ha/yr)	Area (ha): Start	Area (ha): Without	Area (ha): With
Perennial after Deforestation	NO		0	0	0
Converted to A/R	NO		0	0	0
Perennial after non-forest LU	NO		0	0	0
Converted to OLUC	NO		3,138	0	3,138

3.2.2. Perennial systems remaining perrenial systems (total area must remain constant)

Fill with your description	Residue/ biomass burning	Yield (t/ha/yr)	Area (ha): Start	Area (ha): Without	*	Area (ha): With
existing fruit tree plantation in Mekong	YES	0.4	7448	7448	D	0
improved plantations	NO	0.8	0	0	D	7448
Set aside	NO	0	0	0	D	0

Aquaculture activity is threatened by current climate change conditions and production could be decreased by 50% as illustrated by baseline scenario without project. Project support does allow to increase production by 30%. Improved practices will make the use of feed more efficient. The project does cover a wide range of infrastructure investments (roads, canals, irrigation…) representing 333000 tCO2 of GHG emission (see beside buildings and irrigation systems)

Aquaculture (only emissions from N2O during fish production)

		Annual production (tonnes per year): Start	Without		With	
Production system 1	d shrimps	2664	1332	D	3463.2	D
Production system 2	description 2	0	0	D	0	D
Production system 3	description 3	0	0	D	0	D
Production system 4	description 4	0	0	D	0	D
Production system 5	description 5	0	0	D	0	D

Total (ha) 2664

Emissions from feeds		Annual quantity of feeds (tonnes per year): Start	Without		With	
Feed n°1	fe feed	4662	2331	D	5128.2	D

6.3. Construction of new infrastructure (irrigation systems, buildings, roads)

Description and unit to report	Surfaces: Without	Surfaces: With
Irrigation systems (in ha)		
Traveler sprinkle	0	7448
Surface without IRRS	0	43543.5
Please select	0	0
**IRRS = Irrigation Runoff Return System*		
Buildings and roads (in m2)		
Road for medium trafic (asphalt)	0	300000
Agricultural Buildings (concrete)	0	455000
Agricultural Buildings (concrete)	0	15960

GHG Project appraisal results

With a total GHG emission decreasing from 15,million tCO2 to 7.7 million tCO2, the preliminary results of GHG appraisal is estimated around 7.37 million Tco2 of mitigation impact on 20 years, or 369 000 tCO2 / year

Project Name	*MDWRD Mekong Delta Wat*		**Climate**	*Tropical (Moist)*					**Duration of the Project (Years)**	*20*
Continent	*Asia (Continental)*		**Dominant Regional Soil Type**	*HAC Soils*					**Total area (ha)**	*79156.4*
Components of the project	**Gross fluxes**			**Share per GHG of the Balance**					**Result per year**	
	Without	**With**	**Balance**	**All GHG in tCO2eq**					**Without**	**With**
	All GHG in tCO2eq			**CO_2**			**N_2O**	**CH_4**		
	Positive = source / negative = sink			**Biomass**	**Soil**	**Other**				
Land use changes										
Deforestation	0	335	335	270	65		0	0	0	17
Afforestation	0	-331	-331	-293	-39		0	0	0	-17
Other LUC	4,497,445	0	-4,497,445	-498,410	-3,980,208		-18,827	0	224,872	0
Agriculture										
Annual	25,452	-43,321	-68,773	0	-51,300		26	-17,499	1,273	-2,166
Perennial	138,704	-123,467	-262,171	0	-133,384		-67,118	-61,669	6,935	-6,173
Rice	9,738,450	6,894,901	-2,843,549	0	0		-7,702	-2,835,847	486,923	344,745
Grassland & Livestocks										
Grassland	0	0	0	0	0		0	0	0	0
Livestocks	0	0	0				0	0	0	0
Degradation & Management	0	0	0	0	0		0	0	0	0
Coastal wetlands	0	0	0	0	0		0	0	0	0
Inputs & Investments	611,728	876,961	265,233			109,541	-8,708	0	30,586	43,848
Fishery & Aquaculture	23,191	53,551	30,359			0	30,359	0	1,160	2,678
Total	15,034,970	7,658,629	**-7,376,341**	-498,433	-4,164,865	109,541	-71,970	-2,915,015	751,749	382,931
Per hectare	190	97	-93	-4.9	-52.6	1.4	-0.9	-36.8		
Per hectare per year	9.5	4.8	-4.7	-0.2	-2.6	0.1	0.0	-1.8	9.5	4.8

The biggest impact is due to avoided loss of agriculture lands or avoided land use changes which would have occurred without project through flooding and salinization (- 4.5 million tCO2) and to changes in rice production systems allowing wide methane reduction (equivalent to -2.8 million tCO2).

Performances of main improved practices

These Main improved practices provided by the project are appraised in term of performances per ha below. The protection of agriculture areas from degradation through flooding does present an impact of about 10 tco2 of mitigation per year. With an assumed equivalent investment cost per ha of 3200 US$ (infrastructure mostly), it drives to a cost per tco2 or 16 US$. Switch to intermittent irrigation of 24103 ha does provide 7.3 tco2 eq of mitigation impact per year, with a cost per T of around 6.9 US$.

	ha covered	estim. cost per ha	Mitigation /ha/ year	Cost per tco2
Preserved area	23000	$ 3,200	-9.77727	$ 16.4
intermittent irrigat	24103	$ 1,000	-7.26641	$ 6.9

Carbon intensity of production

The carbon intensity of the main production, rice is moving down from 2.14 tco2/ T rice to 0.99 tco2/ T of rice produced. Carbon foot print for maize- beans and for perennials are becoming negative with project due to the non destruction of cropped areas with project. Overall the gross emission intensity per ton of production inclusive of all input emissions is divided by 3 with project from 3.15 tco2 to 1,05 tco2/ ton of production.

	Production Tons per year		Gross emission Intensity (tco2/ T)	
	Without	**With**	**Without**	**With**
Maize- beans	7,500	9750	0.10	-0.24
Perennial	2,979	5660	2.33	-1.09
Rice production	227,648	347466	2.14	0.99
Fish production	1,332	3,463	0.87	0.77
Agregated prod	238,127	362,876	3.15	1.05

Discussion and recommendations

The "Mekong Delta Water Resources Development Project" aims is to protect and enhance the utilization of water resources in the project provinces of the Mekong Delta Region in order to sustain gains in agricultural productivity, provide access to water supply for rural households, and contribute to climate change adaptation. In the Mekong Delta, increased freshwater demand to support dry season agriculture has depleted groundwater sources, strengthened the penetration of saline intrusion, increasing the salinity of water sources and accelerating rates of land subsidence in the Delta, resulting in damages and/or loss of agricultural production. Climate smart strategies such as conversion from rice paddies to shrimp farming and/or improving agricultural practices also contribute to climate change mitigation, by reducing GHG emissions.