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The World Bank

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IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-53023)

ON A

GLOBAL ENVIRONMENT FACILITY TRUST FUND GRANT

IN THE AMOUNT OF US\$4.95 MILLION

TO THE

REPUBLIC OF MOLDOVA

FOR AN

AGRICULTURAL POLLUTION CONTROL PROJECT

19 January 2010

Europe and Central Asia Region
Sustainable Development Unit
Ukraine, Belarus and Moldova Country Unit

CURRENCY EQUIVALENTS

(Exchange Rate Effective 12/03/2009)

Currency Unit = MDL

MDL 1.00 = US\$ 0.09

US\$ 1.00 = MDL 11.13

FISCAL YEAR 2010

ABBREVIATIONS AND ACRONYMS

ACSA	Agency for Consultancy and Training in Agriculture
APCP	Agricultural Pollution Control Project
CAPMU	Consolidated Agricultural Projects Management Unit
CAS	Country Assistance Strategy
CPS	Country Partnership Strategy
EU	European Union
GEF	Global Environment Facility
GEO	Global Environment Objective
ICA	Incremental cost analysis
ICR	Implementation Completion and Results Report
IDA	International Development Agency
MAFI	Ministry of Agriculture and Food Industry
MECTD	Ministry of Ecology, Construction and Territorial Development
NGO	Non-Governmental Organization
PAD	Project Appraisal Document
PDO	Project Development Objective
PIU	Project Implementation Unit
RISP	Rural Investment and Services Project
SL	Supplemental Letter
TACIS	Technical Assistance for Community of Independent States
US\$	United States Dollars

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MOLDOVA
Agricultural Pollution Control Project

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A. Basic Information			
Country:	Moldova	Project Name:	Agricultural Pollution Control GEF Project
Project ID:	P075995	L/C/TF Number(s):	TF-53023
ICR Date:	01/21/2010	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	REPUBLIC OF MOLDOVA
Original Total Commitment:	USD 5.0M	Disbursed Amount:	USD 5.0M
Revised Amount:	USD 5.0M		
Environmental Category: B		Global Focal Area: I	
Implementing Agencies: Consolidated Agricultural Project Management Unit			
Cofinanciers and Other External Partners:			

B. Key Dates				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	09/04/2002	Effectiveness:	04/09/2004	03/22/2004
Appraisal:	10/01/2003	Restructuring(s):		
Approval:	02/26/2004	Mid-term Review:	03/26/2007	03/26/2007
		Closing:	12/31/2009	12/31/2009

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Satisfactory
Risk to Global Environment Outcome	Moderate
Bank Performance:	Moderately Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance			
Bank	Ratings	Borrower	Ratings
Quality at Entry:	Moderately Satisfactory	Government:	Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
Overall Bank Performance:	Moderately Satisfactory	Overall Borrower Performance:	Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	Indicators	QAG Assessments (if any)	Rating
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA):	None
GEO rating before Closing/Inactive status	Highly Satisfactory		

D. Sector and Theme Codes		
	Original	Actual
Sector Code (as % of total Bank financing)		
Agricultural extension and research	10	10
Central government administration	20	20
Forestry	10	10
General water, sanitation and flood protection sector	30	30
Irrigation and drainage	30	30
Theme Code (as % of total Bank financing)		
Land administration and management	17	17
Other rural development	33	33
Pollution management and environmental health	33	33
Water resource management	17	17

E. Bank Staff		
Positions	At ICR	At Approval
Vice President:	Philippe H. Le Houerou	Shigeo Katsu
Country Director:	Martin Raiser	Luca Barbone
Sector Manager:	John V. Kellenberg	Marjory-Anne Bromhead
Project Team Leader:	Cora Melania Shaw	Aleksandar Nacev
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F. Results Framework Analysis

Global Environment Objectives (GEO) and Key Indicators(as approved)

The Project's Global Environmental Objective is to reduce, over the long-term, the discharge of nutrients and other agricultural pollutants into the Danube River and Black Sea through (i) collaboration with agro-industry and farmers benefiting from the Rural Investment and Services Project (RISP) and (ii) interventions in a pilot watershed area.

Revised Global Environment Objectives (as approved by original approving authority) and Key Indicators and reasons/justifications

The GEO was not revised. At mid-term, the target number of households installing individual manure platforms were reduced from 1,200 to 450 and the target number of communal platforms was reduced from eight to three as the initial communes were making slow progress in establishing operationally and financially viable waste management(GEO Indicator #4). Funds were formally reallocated to the faster disbursing Component 1 Activities under RISP.

(a) GEO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Increased awareness of environmental issues in agro-industry and among farmers.			
Value (quantitative or Qualitative)	Four percent of people surveyed aware of environmental issues in agriculture.	A target was not set at appraisal.		58 percent of people surveyed aware of environmental issues in agriculture.
Date achieved	04/30/2002	12/31/2009		07/22/2009
Comments (incl. % achievement)	While a percentage evaluation of the achievement is not possible due to the absence of a target, the increase in public awareness of environmental issues in agriculture is significant.			
Indicator 2 :	Increased number of agro-processors adopting mitigation measures and increased area of agricultural land with resource conservation technologies and increased production of organically-certified products.			
Value (quantitative or Qualitative)	Baseline not available	No target set for farmers. At least eight agro-industry plants with wastewater treatment plants (WWTP). No target set for application of resource		59 farms installed adequate manure storage facilities. 7 agro-processors installed WWTPs. Efficient irrigation technology introduced on 720ha of land exposed to soil

		conservation technologies.		erosion on 27 farms. Grassed waterways, buffer strips, forest belts on 253ha (9farms)
Date achieved	03/22/2004	12/31/2009		07/22/2009
Comments (incl. % achievement)	While the percentage of achievement cannot be measured since no target was set at appraisal (the M&E framework at the time did not require performance targets), the number of interventions is significant.			
Indicator 3 :	Demand for project interventions by farmers outside pilot watershed area (PWA) and from other riparian countries.			
Value (quantitative or Qualitative)	0	A target was not set at appraisal.		Three village platforms built in two rayons outside the PWA. Moreover, several villages outside the PWA requested the blueprints for individual and communal platforms.
Date achieved	03/22/2004	12/31/2009		07/16/2009
Comments (incl. % achievement)	While percentage of achievement cannot be measured due to lack of target, replication by 3 villages with own funds is a significant achievement. Serbia, Croatia and Romania with WB loan started APCPs, but attribution is unrealistic.			
Indicator 4 :	Eight commune/village stores constructed together with 1,200 household manure storage facilities			
Value (quantitative or Qualitative)	Zero villages with communal and individual platforms.	8 villages with communal platform and 1,200 individual platforms.		3 villages with communal platform and 450 individual platforms.
Date achieved	03/22/2004	12/30/2009		07/22/2009
Comments (incl. % achievement)	40% achievement. Additionally 218 other households built platforms at their own cost. Government and Bank team agreed not to fund more communal platforms due to low capacity to operate the first three. Funds were shifted to similar activities on farms.			

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Equipment provided for manure handling and field application.			

Value (quantitative or Qualitative)	Villages with communal platforms have no equipment for manure handling and field application.	Equipment provided to villages with communal platforms.		Equipment provided to villages with communal platforms.
Date achieved	03/22/2004	12/31/2009		07/22/2009
Comments (incl. % achievement)	100% achievement. Additionally, the Ecological fund supported one of the recipient communes in the purchase of a tractor and a trailer for increased collection capacity.			
Indicator 2 :	Two embankments reinforced in wetland area; three concrete and 10 wooden bridges installed to provide access.			
Value (quantitative or Qualitative)	Embankments damaged. Access to wetland for management purposes limited.	Two embankments reinforced, three concrete and 10 wooden bridges installed.		Two embankments reinforced, three concrete and 10 wooden bridges installed.
Date achieved	03/22/2004	12/31/2009		07/22/2009
Comments (incl. % achievement)	100% achievement.			
Indicator 3 :	A monitoring system to determine the impact of project interventions on soil quality installed. Relevant laboratory staff trained.			
Value (quantitative or Qualitative)	No soil quality monitoring in place.	Soil quality monitoring system in place; relevant laboratory staff trained.		Soil Institute (IPA) received 15 units of specialized equipment for measuring soil loss in demonstration plots, and laboratory equipment and training for testing soils and providing advice on farm nutrient management.
Date achieved	04/22/2009	12/31/2009		07/22/2009
Comments (incl. % achievement)	100% achievement.			
Indicator 4 :	Policy framework for non-source pollution meeting EU criteria.			
Value (quantitative or Qualitative)	Policy framework for non-point source pollution not compliant with EU criteria.	Policy framework for non-point source pollution meeting EU criteria in place.		A law on non-point source pollution control was not enacted. However, the Project supported several technical publications related

				to environmentally friendly agriculture which helped the Law on Ecological Farming and the Law on Soil Conservation to be br
Date achieved	04/22/2009	12/31/2009		07/22/2009
Comments (incl. % achievement)	50%. In the absence of a law on non-point source pollution it is difficult to speak of a full legal framework which the indicator suggests.			
Indicator 5 :	Adoption of Code of Good Agricultural Practices.			
Value (quantitative or Qualitative)	No Code of Good Agricultural Practices exists.	Code of Good Agricultural Practices adopted.		Code of Good Agricultural Practices adopted.
Date achieved	03/22/2004	12/30/2009		07/22/2009
Comments (incl. % achievement)	100% achievement.			
Indicator 6 :	Public and farmers aware of the potential to improve income while protecting the environment.			
Value (quantitative or Qualitative)	Baseline value not specified in PAD Annex 1 or other formally adopted M&E plan.	Target not specified in PAD Annex 1 or other formally adopted M&E plan.		36% of farmers in areas were environmentally friendly practices were demonstrated adopted at least one such practice.
Date achieved	04/22/2009	12/31/2009		12/31/2008
Comments (incl. % achievement)	Lack of baseline makes it impossible to evaluate result in percentage terms.			

G. Ratings of Project Performance in ISRs

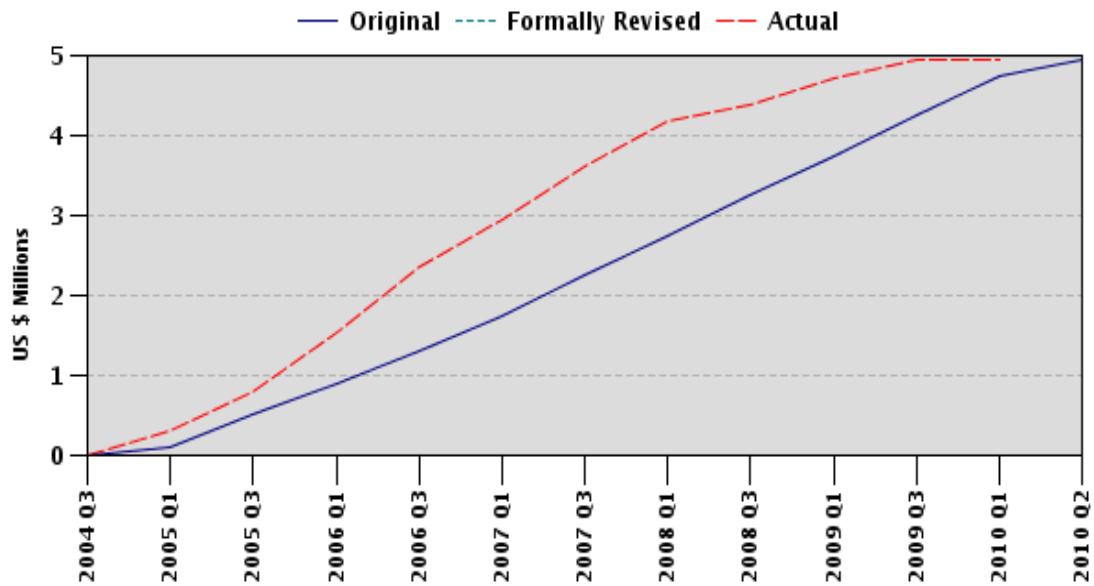
No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	04/21/2004	Satisfactory	Satisfactory	0.30
2	06/10/2004	Satisfactory	Satisfactory	0.30
3	12/16/2004	Satisfactory	Satisfactory	0.53
4	12/28/2004	Satisfactory	Satisfactory	0.66
5	05/14/2005	Satisfactory	Satisfactory	0.91
6	10/11/2005	Satisfactory	Satisfactory	1.67
7	12/07/2005	Satisfactory	Satisfactory	1.86
8	06/14/2006	Satisfactory	Satisfactory	2.50

9	02/12/2007	Satisfactory	Satisfactory	3.50
10	06/01/2007	Satisfactory	Satisfactory	3.75
11	01/24/2008	Satisfactory	Satisfactory	4.39
12	05/01/2008	Highly Satisfactory	Highly Satisfactory	4.51
13	12/18/2008	Highly Satisfactory	Satisfactory	4.78
14	07/11/2009	Highly Satisfactory	Satisfactory	4.95

H. Restructuring (if any)

Not Applicable

I. Disbursement Profile



1. Project Context, Global Environment Objectives and Design

1.1 Context at Appraisal

Thanks to favorable climatic and soil conditions, agriculture plays an important role in Moldova's economy. 85 percent of the territory is agricultural land. During the early 2000s, the sector contributed about 33 percent to the gross domestic product, accounted for 65 percent of exports, employed 40 percent of the total estimated population of 4.3 million people, and 54 percent of the population lived in rural areas. However, the sector declined markedly following the loss of Soviet markets and the breakdown of the agricultural input supply system. As a result, rural poverty soared. To address these challenges, Moldova has explored new markets, especially among European Union (EU) countries, and new products, such as higher-value organic produce.

Agriculture has also been the major source of pollution for Moldovan water bodies that drain into the Danube River and the Black Sea. During the 1980s, significant ecosystem decline was observed in the Black Sea, in part caused by excessive nutrient loads in rivers (nitrogen and phosphorus). In Moldova, illegal dumping of livestock manure on roadsides and riversides was a major source of heightened nutrient loads. During 1960s-1980s, excessive application of heavily subsidized mineral fertilizers also contributed to river pollution until the 1990s when access to cheap fertilizers became restricted. However, it was expected that mineral fertilizers would be used intensively again as the economy recovered. In addition, widespread wind erosion caused large quantities of nutrient-rich topsoil to be washed into watercourses, adding to nutrient loads.

As a signatory to the Convention on Cooperation for the Protection and Sustainable Use of the Danube River (Danube Convention), Moldova qualified for support for nutrient-reduction measures under the GEF-led Partnership for Nutrient Reduction in the Black Sea Danube Basin, established in 2000, to implement the Danube Convention.

The Project supported the 1999 Moldova Country Assistance Strategy (CAS), which aimed to improve economic growth and thereby the prospects for reducing poverty and social hardship. The CAS envisaged "support for reforms in agriculture and enterprise to stimulate a supply response and promote private sector-led growth." Moldova was already implementing the Bank-funded Rural Investment and Services Project, "...designed to foster post-privatization growth in the agricultural sector by improving the access of new private farmers and rural businesses to what they need to succeed—legal ownership status, knowledge, know-how, and finance." The Project would complement RISP by promoting environment-friendly agricultural production technologies that would also help boost agricultural exports, regain traditional export markets, and tap into lucrative new markets in Western Europe. Reducing nutrient pollution in the Black Sea Basin would yield regional and global environmental benefits—enhanced conservation of marine biodiversity, recovery of Black Sea fisheries, and tourism and recreational benefits.

1.2 Original Global Environment Objectives (GEO) and Key Indicators (as approved)

The Project development objective (PDO) was to significantly increase the use of mitigation measures by agro-industry and farmers to reduce nutrient discharge into the surface and ground water bodies in Moldova. The global environmental objective (GEO) was to reduce, over the long-term¹ the discharge of nutrients and other agricultural pollutants into the Danube River and Black Sea. The Supplemental Letter No. 1 attached to the GEF Grant Agreement specified ten key performance indicators, agreed during negotiations:

1. Increased awareness of environmental issues in agro-industry and among farmers.

¹ The phrase "over the long term" is not included in the Grant Agreement or the main text of PAD, but only in PAD Annex 1.

2. Increased number of agro-processors adopting mitigation measures and increased area of agricultural land with resource conservative technologies and increased production of organically-certified products.
3. Demand for Project interventions by farmers outside the pilot watershed area and from other riparian countries.
4. Eight commune/village stores constructed together with 1,200 household manure storage facilities.
5. Equipment provided for manure handling and field application.
6. Two embankments reinforced in wetland area; 3 concrete and 10 wooden bridges installed to provide access.
7. A monitoring system to determine the impact of Project interventions on soil quality installed. Relevant laboratory staff trained.
8. Policy framework for non-source pollution meeting EU criteria in place.
9. Adoption of Code of Good Agricultural Practices.
10. Public and farmers aware of the potential to improve income while protecting the environment.²

1.3 Revised GEO (as approved by original approving authority) and Key Indicators, and reasons/justification

The GEO was not revised.

During the Mid-Term Review, the “Manure Management Practices” activity under Sub-component 1b was revised, reducing eight commune platforms to three; and 1,200 household platforms to 450, due to difficulties establishing sustainable operating arrangements in two of three communal platforms installed in the first two years of the Project, and declining livestock numbers in the pilot Project area. These factors raised concern about the viability of additional communal platforms. The remaining funds were reallocated, with Country Director approval, to Sub-component (1a) “Activities under RISP” which was disbursing well, and had a healthy pipeline of candidate sub-projects. The amendment was justified and contributed to achieving the GEO and PDO since the nutrient-reducing investments under this sub-component appeared to be operated sustainably by the private farmers and agro-industries that received them. The amendment did not change the scope of the Project as it was one of several activities designed to achieving the GEO and PDO. It was discussed in detail with the Government as documented in the mission aide memoire and correspondence on funds reallocation.

Main Beneficiaries

The primary beneficiaries identified at appraisal were:

- a) Nine communes in the Hincesti raion and two communes in the Leova raion, comprising more than 43,200 people in 14,413 households who would benefit from a cleaner local environment and improved drinking water quality
- b) Enterprises with RISP loans across the country who would receive grants to fund part of their nutrient reduction investments
- c) Government of Moldova, through the Ministry of Ecology, Construction and Territorial Development (MECTD)³ and the Ministry of Agriculture and Food Industry (MAFI),

² The PAD Section A was not updated to incorporate these indicators. However, the indicators were largely in line with PAD Annex 1.

³ This Ministry’s name was later changed to Ministry of Environment. For consistency, this ICR refers to the Ministry as “Ministry of Environment, Construction, and Territorial Development (MECTD)”.

which would receive support for honoring its international commitments to reduce pollution to the Danube River and Black Sea

Other Project beneficiaries included rural communities, local NGOs, advisory and extension agencies, agricultural service providers, and rural entrepreneurs, who could access information on low-cost environmentally sound technologies.

1.5 Original Components (as approved)

Component 1. Promotion of mitigation measures for reducing nutrient loads in water bodies (US\$9.66m with US\$4.19m GEF, US\$ 3.93m RISP, and US\$1.53m recipient financing). This component would contribute directly to the PDO and GEO by encouraging farmers and agro-processors to adopt nutrient-reducing technologies through two sub-components:

(a) Collaboration with business development, rural support services, and rural finance activities under RISP (US\$6.29m with US\$2.30m GEF, US\$ 3.93m RISP, and US\$0.06m recipient financing), including:

(i) *Providing grants* totaling up to US\$2.0 million to mitigate nutrient discharge from RISP-borrowers, including individual farmers, farmers' organizations, co-operatives and agricultural processors, to offset the incremental cost of nutrient reduction investments. Eligible business lines would include livestock rearing; slaughtering and meat processing; crop production with large nutrient discharge potential; juice and vegetable oil extraction; wine production vinery; and other agro-processing that produces biomass waste.

(ii) *Training rural advisory service providers and RISP credit officers* in nutrient-reduction practices and grant-provision mechanisms so they could inform credit recipients of grant availability, eligibility criteria, and application procedures.

(b) Promotion of improved watershed management practices in the Lapusna basin (US\$3.36m with US\$1.89m GEF and US\$1.47m recipient financing) comprising 11 communes in Hincesti and Leova raions, part of the Lapusna tributary of the Prut River ("Project pilot area"). The sub-component would fund the following activities to reduce nutrient loads flowing into Prut River.

(i) *Manure management* through 1,200 individual household and eight community manure platforms and equipment for manure collection and application to land. Community training and awareness on composting, testing, and field application of manure would also be provided.

(ii) *Promotion of environment-friendly agricultural practices* through technical assistance and funding of incremental operating costs that would improve agricultural production and reduce nutrient discharge into water bodies, including: (a) nutrient management; (b) conservation tillage; (c) integrated cropping management; (d) vegetated buffer areas; and (e) organic farming.

(iii) *Shrub and tree planting* including (a) forest belts to protect water bodies; (b) forest belts to prevent soil erosion; (c) ecological reconstruction of forests; and (d) agro-forestry. The APCP would provide planting material, equipment, and technical assistance. The State Forestry Service "Moldsilva" would implement the program, with significant contributions from local communities.

(iv) *Wetland restoration* and promotion of sustainable management practices to enhance the nutrient filtration capacity of the wetland at the intersection of the Lapusna and Prut Rivers (near the Sarata-Razesii community) and help restore degraded wetland to its former natural state. Activities under the sub-component included: (a) planting forest vegetation with species that have high capacity for nitrate uptake and retention in floodplain areas and terraces exposed to erosion; (b) hydrologic enhancement practices, such as embankment reinforcements to stabilize water levels, and small bridges for wetland access; (c) sanitation activities; and (d) raising awareness among local people about the importance and fragility of wetland ecosystems.

(v) *Monitoring soil, water quality and environmental impacts.* An extensive soil and water quality testing program would be established for the pilot area to monitor changes in surface and groundwater quality in response to piloting improved agricultural and livestock practices. The Project would strengthen the capacity of MECTD Water Quality Laboratory and Hydrology Department of the Hydrometeorology State Service and the central and regional laboratories of the State Environmental Inspectorate and Institute for Pedology and Soil Science to carry out comprehensive soil and water quality testing. Internationally approved monitoring procedures, including paired-watershed and upstream-downstream hydrologic and soil and water quality monitoring designs would be used. A modeling activity would extend lessons learned from Lapusna Basin to other watersheds in the country.

Component 2. Strengthening National Policy, Regulatory and Enforcement Capacity (US\$0.09m with US\$0.07m GEF; US\$0.02m recipient financing) would strengthen Government legislative, regulatory, and institutional capacity in agricultural pollution control by assisting MECTD and MAFI to develop a Code of Good Agricultural Practices (CGAP), to apply EU Nitrate Directive (ND) principles to national legislation, to promote scientifically grounded organic farming and land use management, and to develop certification procedures for domestic and international marketing of organic products. CGAP and promotion of organic farming would support the achievement of the PDO and GEO by helping farmers implement practices that reduce nutrient loss while incorporating ND principles in national legislation would provide the Government with incentives to encourage farmers to reduce agricultural pollution.

Component 3. Public Awareness and Replication Strategy (US\$0.37m with US\$0.28m GEF and US\$ 0.09m Recipient financing). Raising awareness of Project activities would support the GEO and PDO by increasing the number of farmers and agro-processors using nutrient-reduction technologies, and creating support for environmental protection; a replication strategy would ensure long-term application. Public information campaigns would familiarize the public with Project and its benefits and raise interest among RISP clients in undertaking nutrient-reducing investments with project grant support. At the pilot Project area level, the Agency for Consultancy and Training in Agriculture (ACSA), entrusted with RISP extension activities, would target local officials, farmers, community groups, and NGOs. National efforts would concentrate on Government agencies, national environmental or professional associations, academia, NGOs, and the public. The Project would also fund national and regional workshops, field trips, visits, training, international agricultural and environmental journal articles, and promotion to replication of Project activities in Moldova and other Black Sea Basin countries.

Component 4. Project Management and Evaluation (US\$0.62 m with US\$0.42 m GEF and US\$ 0.20m recipient financing). The Project would support a Project Implementation Unit (PIU) responsible for timely implementation of Project activities, achieving the PDO and GEO by coordinating implementing agencies, procurement, financial management, and monitoring and evaluation. The Consolidated Agricultural Projects Management Unit (CAPMU) based in MAFI would provide fiduciary support including procurement and financial management.

1.6 Revised Components. Please refer to Section 1.3.

1.7 Other significant changes. No other significant changes occurred.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

Project background analysis was generally adequate. The Trans-boundary Diagnostic Analysis prepared under the precursor Black Sea Environmental Program provided rationale for Project interventions; it revealed that 90 percent of nutrients discharged into the Moldovan Danube system originated from agriculture including nutrients in eroded top soils from hilly land and poor soil conservation techniques. A stakeholder survey indicated that residents ranked unauthorized dumping of household and livestock waste as the primary environmental problem, followed by polluted drinking water. Additional survey findings from wetland area stakeholders indicated reliance on wetland resources and misperception about planned Project outcomes (that existing resource use would be enhanced), but these were not fully integrated in Project design. Project preparation benefitted from lessons learned during the Agricultural Pollution Control Project in neighboring Romania, begun two years earlier, supporting similar interventions.

The Project reflected the following ***key lessons learned*** from rural environmental and agricultural operations in the region:

- a) *Early involvement of local administrations, communities, and key decision makers in Project preparation is essential in order to ensure ownership and successful implementation.* Project preparation identified key stakeholders and their priorities to help secure their commitment and ownership. The Project preparation team held consultations with local Hincesti and Leova raion officials, including Prefects and mayors of the eleven Project communes, who indicated their full commitment. A Local Consultative Committee was established to coordinate local agencies, but the Project could have done more to help local wetland area stakeholders fully understand and support Project activities and intended outcomes.
- b) *Local communities need to see tangible benefits to adopting measures to reduce nutrient loads.* Improved agricultural practices selected for testing and demonstration were cost-effective, low-input, and readily transferable, demonstrating potential to increase farmers' incomes.
- c) *Build local ownership and sustainability by decentralizing responsibility for financial and project management (e.g., Romania Danube Delta Biodiversity Project).* During Project preparation and implementation, the PIU worked closely with raion and commune administrations in the pilot area, although the Project was designed to be managed by a Chisinau-based PIU.
- d) *Disseminate information through credible and well-established local institutions to encourage widespread adoption of new technologies and practices.* The Project included a public awareness campaign, training, and local and national demonstration programs delivered by ACSA, with support from local soil and forest institutes, to disseminate information on site-appropriate environment-friendly agricultural practices.

The rationale for Bank intervention was sound. The Bank was a founding member of the GEF Partnership for the Danube and the Black Sea and the Implementing Agency for the GEF Fund for Nutrient Reduction in the Danube and Black Sea. During preparation of the Moldova APCP, the Bank was supporting preparation and implementation of similar operations in Bulgaria, Georgia, Romania, Russia, and Turkey. This region-wide involvement enabled the Bank to transfer experiences and best practices to Moldova, and build a regional support and peer network for knowledge exchange among practitioners. Ongoing Bank support to Moldovan agriculture, mainly through RISP, also put it in a good position to mainstream environmental concerns into the sector.

The PDO was appropriate, but the GEO was very broad and difficult to measurable. The Project performance indicators agreed during Negotiations correctly excluded an indicator of nutrient reduction given that these may not be reliably measured during the Project's time frame. It would have been appropriate for the GEO to be the same as the PDO.

Project design was generally sound. It incorporated experience from similar projects in the region concerning agricultural pollution, tailoring them to Moldovan conditions. Design complexity was appropriate: Pilot manure storage investments and other watershed management activities were concentrated in a well-defined geographical area of about 50,000ha, which allowed quantitative assessments of long-run nutrient reduction from Project interventions. The communal manure management sub-component was technically straightforward, but posed some organizational and financial challenges. The “Collaboration with RISP” sub-component built on existing financial and business support networks. Organic farming activities built on EU TACIS study recommendations that the Government owned, and corresponded to MAFI strategy to expand Moldova’s market reach in organic products. Project-promoted environment friendly practices were simple and had been tested in neighboring Romania.

Project design overestimated financial and institutional capacities of some communes selected for communal manure platforms. Realistic targets for communal manure platforms might have been determined early on through more in-depth assessments of commune ability to maintain and operate the platforms (manure collection, platform operation, and manure application).

Wetland restoration sub-component activities were straightforward and simple. The site was a legally protected area under the Ramsar Convention. However, enforcement of protected area access restrictions had been lax prior to the Project and a 2003 survey indicated that local inhabitants had come to depend on wetlands to graze animals, raise fodder, collect firewood, and pursue recreational activities, and they mistakenly thought that wetland restoration aimed to enhance these benefits. If Project design had taken these survey findings into account, livestock owners’ opposition to reforestation activities may have been avoided during early implementation. Furthermore, closer communication between the PIU and the local community could have avoided later problems that arose when the community rehabilitated drainage systems in an adjacent agricultural polder that deprived wetlands of water. This problem was resolved through additional works.

Government prioritized agricultural pollution control and wetland ecosystem protection by ratifying the Danube Convention. Government commitment was also evidenced by MECTD and MAFI support to the Project design unit, and timely release of counterpart funds by the Ministry of Finance during Project preparation. Local governments, including Hincesti and Leova Prefects and their staffs, and the Mayors and Vice Mayors of the eleven pilot-area communes, understood and supported Project interventions to improve local environmental conditions.

Most critical risks were adequately identified and rated; mitigation measures were adequate. Notably, the critical risk, “Beneficiaries cannot develop new manure storage and handling systems that are financially attractive,” was assessed correctly as “substantial.” Inadequate financial resources for operational expenses plagued the first three communal platforms, triggering a decision to cancel construction of any others. The mitigation measure, “...early designs and pilots to develop low-cost manure-handling and storage systems that are financially attractive to farmers,” was partially effective. Deeper analysis of communes’ financial and administrative capacities could have revealed this situation earlier. However, the risk of conflicts over restricted resource use in wetlands was not identified despite social survey finding of high level of dependence on wetlands for livelihoods.

2.2 Implementation

The Project became effective on schedule. Thanks to prepared detailed designs and specifications, the first batch of platforms was built in the first year. Disbursements were ahead of schedule throughout implementation; the Project closed nearly six months ahead of schedule; no major Project restructuring was necessary; the Project was never at risk. Some challenges during

implementation were overcome by timely interventions from the implementing agency, supported by the Bank team. For example, during early implementation, manure transfer from household platforms to communal platforms was slow and irregular, eroding waste management system effectiveness, but the situation improved when public awareness campaigns were launched and transportation equipment was provided to beneficiary communes. At the Mid-term Review (MTR), Government and the Bank team agreed to reduce the number of Project-supported commune and household platforms after observing slow progress among initial communes to establish operationally and financially viable waste management. Funds were reallocated to the RISP grant co-financing component, under which Project-supported nutrient-reducing facilities were operated effectively. This was a prudent decision.

Wetland rehabilitation was affected by resource-use conflicts due to stricter enforcement of access restriction by Government as a result of the emergence of a common border with the EU and weak administrative coordination. Conflicts over access to wetlands delayed reforestation; community activities to rehabilitate drainage works in the adjacent agricultural land limited water flow to the wetlands; and the local environmental authority erred in providing permits for these works. The Project responded adequately to the water flow issue by funding corrective works. Improved communications between the PIU, Molsilva (which is entrusted with the management of the Ramsar site) and the community focusing on correcting the stakeholders' expectation of enhanced resource use possibilities would have been helpful. Development of an Access Restriction Process Framework during Project preparation in anticipation of such conflicts would have mitigated them by creating alternatives even though it was not the Project per se but the Government's stricter enforcement of the protected area regulation which limited stakeholder access to the wetlands.

Except for the above issues, Project implementation was smooth due to: (i) continuous support and close supervision by Government authorities (MECFD and MAFI) and the Bank team; (ii) substantial involvement of the Hincesti and Leova raion authorities in implementation; (iii) timely availability of GEF, Government, and local funds; and (iv) a dedicated PIU.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

The key performance indicators in PAD Section A differed from the key performance indicators listed in the Supplemental Letter (SL) to the GEF Project Grant Agreement (see Section 1.2 above) in that of the 10 SL indicators two overlapped with PAD Section A indicators, two were modified, and the rest were new (See Annex 2 for a table comparing the two sets of indicators). The SL indicators improved PAD Section A indicators: (i) given the short Project life, they excluded indicators specifying water and soil quality improvements due to Project interventions; and (ii) included key Project outputs that helped achieve the PDO and GEO. This section reviews the SL indicators in conjunction with the Project Design Summary in Annex 1 of PAD. Indicators monitored in Bank implementation status reports (ISRs) were a subset of the 10 key performance indicators in the SL.

Design. About 7 of the 10 indicators were appropriate to measure progress towards the PDO and the GEO. The others were either too complex (No. 2), attributed too much to the Project (No. 3), or lacked realism (No. 8). Measurability was a problem with No.s 1, 2, 3, 8 and 10, due to lack of specificity. PAD Annex 1 did not specify baseline values, targets, or a time frame to achieve the targets, which was common before the Bank introduced the Result Framework Matrix in the PAD format. Nevertheless, the binary nature of some of indicators made it clear that the baseline was either "zero" (No. 4, 6) or "nonexistent" (No. 5, 7, 8, 9). Some indicators had embedded target values (No. 4, 6 and 9); no time frame was provided.

Implementation. One of the PIU members was tasked to manage Project M&E. Substantial progress data were collected during Project implementation through household surveys, RISP APCP recipient questionnaires, Project-funded soil and water quality monitoring programs, status reports provided by government and local agencies implementing individual Project activities, and on-site PIU inspection. Data collected were reported in Project Progress Reports by CAPMU. A significant effort was also made to measure the impact of the Project, including through an Impact Assessment Review during the final year of implementation.

Utilization. Most data collected were evaluated and used to gauge Project progress towards the GEO and PDO and refine implementation. For example, when the PIU noted that household use of communal manure management systems was lower than targeted, it responded with a stronger public awareness campaign. While not an indicator specified by the M&E plan, low commune capacity to sustainably operate the three existing platforms led to the decision not to invest in more platforms. However, it is unclear whether the public awareness campaign was adjusted to reflect household survey results. Most monitoring activities ended at Project closure, because most were related to Project outputs. However, the Soil and Forestry Institutes and Hydromet received equipment and training to establish and maintain monitoring capacity beyond the Project. Actual utilization will depend on the institutes' budget availability.

2.4 Safeguard and Fiduciary Compliance

Financial Management. Regular Bank team financial management reviews confirmed a satisfactory financial management system during the Project life. No internal control issues were raised. Satisfactory internal controls and procedures ensured reliable accounting records and safeguarded Project resources and assets. The Project benefited from CAPMU's experience in financial management of Bank-financed projects; CAPMU respected the financial covenants included in the Grant Agreement and prepared and submitted financial reports punctually in the agreed content and format. All audit reports contained unqualified (clean) opinions. The final Project audit was submitted on June 23, 2009, with an unqualified opinion and no accountability or internal control issues. Counterpart financing was satisfactory during the Project life.

Procurement. The CAPMU procurement expert supported the PIU on all procurement activities. The Bank team conducted prior review of contracts and regularly supervised smaller contracts subject to post review. The CAPMU procurement officer maintained a fully functional filing system. Procurement supervision missions concluded that Project procurement was conducted in accordance with World Bank rules and procedures, and in line with Grant Agreement provisions.

Disbursement. The Project disbursed ahead of schedule without deviations or waivers from Bank disbursement policies and procedures.

Environmental Assessment. The Project was rated "category B." An Environmental Assessment (EA) carried out during preparation concluded that Project impact would be overwhelmingly positive—reducing illegal manure dumps on roadsides and riverbanks, and leaching of nutrients and other pollutants into water bodies. Only Component 1, which involved construction, had potential risks, such as manure leakage from communal storage facilities (in case of defective construction), inappropriate manure spreading in the fields, or improper cleaning of individual and communal platforms. The EA also pointed out that the wetland restoration subcomponent would enhance wetland nutrient-filtration capacity and biodiversity. The EA noted that subcomponent environmental concerns included potential introduction of invasive species that could dominate the wetlands, or human overexploitation of wetland

resources. However, the EA failed to mention that the wetlands were a Ramsar site and to highlight lax enforcement as a potential threat to the sustainability of project interventions. These factors would have warranted the triggering of the Natural Habitats Operational Policy. In the light of the social survey finding on local stakeholder dependence on wetland resources preparation of an Access Restriction Process Framework would have been beneficial.

An Environmental Management Plan (EMP) laid out mitigation measures for these risks. Notably, a comprehensive soil and water quality monitoring system included 32 piezometers to detect pollution from platforms. The Project strengthened local laboratory capacity to carry out related analyses. The EMP recommended monitoring wetlands flora, fauna, and water quality—which discovered a healthy resurgence of some endangered species.

Compliance with OP 4.01 on EA was rated satisfactory throughout Project implementation. The Bank team’s comprehensive final safeguards review found compliance with all provisions laid out in the EMP, and confirmed that: (a) the large and individual manure storage facility designs were prepared under PIU engineering staff supervision; (b) the State Ecological Inspectorate and/or Territorial Ecological Agency ensured that manure storage facilities construction met environmental guidelines to prevent manure contamination of surface and ground water sources; (c) facilities were built away from any surface water body; (d) the hydro-technical works and site modifications in the wetland restoration area were properly implemented; (e) an extensive soil and water monitoring program was implemented to prevent manure seepage to ground water; and (f) a public awareness campaign promoted adoption of environment-friendly manure management to reduce nutrient loads in water bodies.

With regard to (d), after Project-supported wetland rehabilitation works were completed, local government carried out drainage works on communal agricultural land adjacent to the wetlands, which put Project achievements at risk by reducing water flow to the restored wetland area. Therefore, the APCP funded additional hydro-technical works to maintain water flow and prevent flooding. The review concluded that these interventions were justified.

While the team carried out an in-depth safeguards review in the final semester of the Project, periodic reporting in ISRs and mission aide memoires should have been used to justify the safeguards compliance rating of the Project.

Social safeguards. No social safeguards were triggered. The final safeguards review and the social survey revealed two concerns that relate to local people’s misperceptions: first, that their access to wetland resources such as pastures, fishing, and hunting was reduced; and second, that the wetlands could flood or pose health risks due to excessive humidity. However, discussions with local people, community representatives, Moldsilva representatives, and the APCP team revealed that access to wetland resources was not limited by APCP activities; rather, it was a consequence of Moldsilva’s stricter enforcement of existing access regulations. These misperceptions could have been avoided through better communication between Project implementers and local communities, and stronger coordination with other agencies, which also could have prevented the Sarata-Razesi community drainage system works that reduced water flows to Project-rehabilitated wetlands.

2.5 Post-completion Operation/Next Phase

This section discusses sustainability and replicability of Project interventions.

Sustainability: All Project-supported goods and works were transferred to beneficiaries during implementation:

- One hundred RISP borrowers received APCP grants for environmental investments, and 450 households received small platforms. It is anticipated that the platforms will be

maintained in good operating order: first, because the fine for illegal dumping, including animal waste, is sufficient to deter such behavior; second, because farmers understand the environmental benefits of platforms to their backyards and farms (Annex 5); and third, farmers save money by using less mineral fertilizer and substituting composted manure. Some 18 farmers received drip irrigation equipment that appear to have improved yields sufficiently to provide incentives for maintenance. Seven agro-processors received grants for wastewater treatment plants; enterprises must meet specified standards to receive operating licenses, which is sufficient incentive to operate and maintain this equipment.

- The mayoralties of Lapusna, Carpineni, and Negrea steward communal platforms. Private concessionaires operate the Lapusna and Carpineni platforms—collect manure from household platforms, compost it on communal platforms, apply some to their fields and sell the rest to cover costs. In Negrea, the mayoralty operates the platform in partnership with a local farmers' association that covers operational costs to collect and transport manure from household platforms to the communal platform; the commune pays for electricity and guards.
- The Soils and Hydro-meteorological Institutes' capacity is adequate to operate and maintain Project-provided equipment for water and soil quality. The Project established a water and soil quality program, but implementation will require institute budget allocations. Moldova being an EU neighborhood country and riparian to a common river will likely qualify it for support for water quality monitoring programs.

Replicability

Several factors point to good replication potential. First, villages and households have come to appreciate the communal manure management system piloted by the Project in three villages. 218 households in these villages have already built individual manure platforms using their own resources. Increased awareness of the importance of proper manure management, low cost of individual platforms and fines for illegal dumping of manure bode well for more wide-spread construction of individual platforms in villages that have communal platforms. Construction and operation of communal platforms will require public financial resources, including from local authorities, and institutional capacity. Ongoing initiatives by four villages in the Glodeni, Telenesti and Orhei raions to build communal platforms and MECTD pledge to support them are promising developments.

Second, the requirement that industrial enterprises meet effluent concentration limits with regard to nutrients and other pollutants is a significant driver for agro-enterprises to install wastewater treatment stations. In fact already during Project implementation two agro-processors financed installation of wastewater treatment stations using Project designs and Project-trained consultants. Environmental inspectors now conduct tours of recipient enterprises so entrepreneurs can see facilities that comply with licensing requirements. Financial benefits associated with other nutrient-reducing investments on RISP ACP farms will encourage other farmers to adopt such benefits. RISP officials report that since project closure one loan recipient under RISP II has built a manure platform using his resources. Training provided to loan officers in financial institutions under the RISP will allow credit financing of nutrient-reducing investments in agro-processors and farms under RISP II and other credit programs.

Third, with regard to good agricultural practices, capacity built among agricultural advisors nationwide and the adoption of a Code of Good Agricultural Practices will ensure their dissemination for years to come. Organic farming will also be encouraged by Moldova's close proximity to European markets.

Finally, central and local Governments have strong interest in building on Project achievements in manure management through a follow-up operation focusing on biogas digestion; they have

approached the Bank for support. The Bank and Moldovan counterparts are cooperating to explore funding sources for this operation, including GEF and carbon finance.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

The Project objectives, design, and implementation remain highly relevant to Moldova's development and environmental priorities. The Country Partnership Strategy (CPS) for 2009-12 highlights environmental concerns about soil degradation, surface water pollution from run-off and agro-chemicals, and increased ground water pollution from poor manure management in rural communities. The Project demonstrated effective and affordable measures to address these problems; the next step is replicating these measures across the country. Furthermore, as the CPS underlines, climate change and environmental degradation pose significant challenges. Government has expressed intention to support adoption of biogas manure digestion to help mitigate climate change, reduce pollution, and generate energy—goals that align with the Project PDO and GEO. Furthermore, the Project contributed to Moldova's afforestation and biodiversity conservation targets for the Millennium Development Goals. Finally, the National Strategy for Sustainable Development of Agro-Industrial Complex (2008-15) includes environment-friendly agricultural practices, confirming their relevance. Specifically, the Strategy highlights ecological agriculture, reconstructing degraded soils, rehabilitating meadow vegetation, expanding afforestation and shelterbelts, and restoring wetlands, as means to preserve soil quality, which is key to agricultural productivity in Moldova.

3.2 Achievement of Global Environmental Objectives

A review of Project achievements against key performance indicators reveal that the GEO was achieved. Specifically, awareness among farmers and the general public was increased from the baseline of 4 percent to 58 percent in the Project pilot area; 100 RISP borrowers—private farms and agro-processors have adopted nutrient-reducing technologies; three villages are operating communal manure platforms in cooperation with more than 668 households, 218 of which built platforms using their own funds. Three villages outside the Project pilot area built communal platforms using their own funds and Project-promoted designs. The Project-end social survey indicated that manure-disposal behavior changed significantly. Taken together, these indicators suggest sustainable reduction of nutrient discharges from farms and agro-processors.

3.3 Efficiency

An incremental cost analysis (ICA) was carried out at appraisal. At ICR stage, an ex-post ICA and a cost-effectiveness analysis were conducted (Annex 3).

At appraisal, the Baseline Scenario included US\$3.93 million from the RISP, which provided sub-loans to farms and agro-processors for investments that aimed to boost productivity, but not directly aimed at environmental improvements. The GEF Alternative Scenario included the RISP and the GEF Project for US\$10.74 million. Under the GEF Alternative, improved farming practices would reduce annual nutrient leakage by an estimated 280 tons N and 70 tons P; and the reconstructed wetland area would retain/absorb 100 kg N and 10 kg P per hectare/year.

Ex-post analysis indicates that the GEF Alternative cost US\$8.17 million, including RISP co-financing of US\$1.52 million, Government and recipient contributions of US\$1.70 million, and the US\$4.95 million GEF grant. Average annual nutrient reduction estimates from the three Project-supported communal platforms are 60 tons N and 40 tons P. However, these figures underestimate Project impact, since they exclude nutrient reductions achieved by two additional

communes that built platforms with Project technical support, using their own funds. Furthermore, platforms on the 59 RISP APCP farm reduce an annual estimated 134 tons N and 80 tons P. Hence, estimated annual nutrient reduction due to manure management is lower than the appraisal estimate for N, but higher for P. The rehabilitated wetland annual nutrient retention estimate is 17 tons N and 3 tons P, close to appraisal estimates. Finally, wastewater treatment plants, built by the RISP APCP grant recipient agro-processors, reduce 1.5 tons N/year and 0.1 tons P/year.

Cost effectiveness analysis found that reducing one kg of N costs US\$3.79 and P, US\$3.36, for communal manure management; and US\$5.96 and US\$5.69 for farm manure management on RISP APCP farms. These values compare favorably with values in other countries in the region and in the Chesapeake Bay, in the United States.

3.4 Justification of Overall Outcome Rating

Rating: Satisfactory

The GEO and PDO remain highly relevant for global environmental protection and local agricultural development (value of manure as fertilizer, increased productivity from good agricultural practices). The PDO was achieved; estimates of nutrient load reduction indicate that the GEO will also be achieved in a highly cost effective manner.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

Not applicable.

(b) Institutional Change/Strengthening

The Project built capacity in several institutions to mitigate agricultural pollution: First, lending institution staff are now aware of sectoral environmental issues that affect farmers and agro-processors and can handle commercial loans for their investments; credit demand may be expected to grow now that operating licenses are required; financial benefits accrue from avoided fines, and increased yields and export opportunities. Second, the three recipient commune mayoralties can provide lessons learned to other communes about implementing successful manure and waste management systems.

(c) Other Unintended Outcomes and Impacts (*positive or negative, if any*). None.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

A national conference, “The Agricultural Pollution Control Project of Moldova: Results and Perspectives,” was held in May 2009, at the World Bank country office, attended by about 35 representatives of Environment and Agriculture Ministries, other implementing agencies, Project-area mayors, and many beneficiaries. All workshop participants expressed satisfaction with Project benefits related to the environment, economy, social sector, and climate change mitigation; the replicability of pilot Project activities; and enhanced country capacity to maintain them. Project-generated experience and knowledge is now used in the public and private sectors, and participants indicated considerable national demand for scaling-up activities.

4. Assessment of Risk to Development Outcome

Rating: Moderate

Prospects are good for sustainable Project outcomes. Communal manure management sustainability is evidenced by two communes in the Glodeni and Orhei raions, and 218 households that built manure platforms at their own expense, based on Project-supported designs.

Similarly, two agro-processors financed installation of wastewater treatment stations using Project designs and Project-trained consultants.

The Hydrometeorological Service continues to monitor the three Project-installed water flow stations and sample the 17 APCP village wells to gauge shallow water quality. Project-provided equipment, including three mobile labs, and training, facilitate continued monitoring, but State budget allocations are required for operating costs. The same is true for the Soil Institute.

Stronger enforcement of access restrictions will ensure sustainable Project outcomes in the restored wetlands. The rehabilitated drainage infrastructure in the adjacent agricultural polder will help local people increase crop revenues, thereby reducing some livelihood-seeking pressure on wetland resources. (Project-funded corrective works now mitigate wetland risks from drainage.) However, local communities may continue to challenge wetland access restrictions on recreation, livestock grazing, and fodder raising, which means that a targeted public information campaign and close cooperation with the community would be useful to identify alternatives, reduce conflicts, and increase reserve sustainability.

5. Assessment of Bank and Borrower Performance

5.1 Bank

(a) Bank Performance in Ensuring Quality at Entry

Rating: Moderately satisfactory

The Bank identified an area of support that was and remains relevant to Moldovan priorities in environment, public health, and agriculture. Linking Project-supported agricultural pollution-control activities and the ongoing RISP was innovative and integrated environmental and agricultural sector goals. The Bank team helped transfer a simple-but-effective communal manure management system from Romania to Moldova and establish regional cooperation to exchange information and experiences.

The Bank team supporting Project preparation should have examined Project-selected communes' financial and operational capacity to run manure management systems since this is of key importance for the sustainability of Project investments. The team could have also paid more attention to community expectations from Project-supported activities in the wetland area; and a monitoring and evaluation system that included baselines and targets.

(b) Quality of Supervision

(including fiduciary and safeguards policies)

Rating: Satisfactory

The Bank team closely supervised Project implementation (using monthly video conferences in addition to semi-annual missions), and maintained intensive and constructive dialogue with the PIU, central and local government agencies, and other stakeholders identifying problems and adopting corrective measures in a timely manner. For example, at MTR, the Bank team indicated the need to strengthen the public awareness campaign to improve household manure transfer frequency to the communal platform; and the team recommended actions to smooth cooperation between the PIU and CAPMU, addressing implementation delays. The team reported issues candidly and adjusted Project ratings accordingly. The team emphasized sustainability of Project outcomes, as evidenced by its close review of operational arrangements, business plans, and adequate financial commitments for communal manure management systems. The team maintained a strong focus on measuring and documenting Project results, and supported Government to carry out corrective works in the wetland to mitigate risks posed by drainage works in adjacent agricultural land.

However, the team could have performed better (i) in detecting early stakeholder conflicts over resource use in the wetlands and encouraging the PIU to strengthen dialogue about Project-supported activities; and (ii) in reporting on safeguards compliance.

(c) Justification of Rating for Overall Bank Performance

Rating: Moderately satisfactory

Bank support to the Government of Moldova in preparing and implementing the Project was a significant factor in Project success. During Project preparation, closer attention to sustainability and community perceptions could have prevented some problems during implementation. During implementation, team performance was satisfactory despite a few areas that could have been improved. However, overall rating is moderately satisfactory, as per the ICR guidelines that the overall rating will be equal to the lower of two ratings.

5.2 Borrower

(a) Government Performance

Rating: Satisfactory

Government strongly supported the Project, and as it progressed, Steering Committee support increased and cooperation among agencies improved, contributing to timely implementation of Project activities. Timely counterpart financing availability throughout the Project contributed to excellent disbursement performance. Local government agencies contributed significantly to Project implementation; in the pilot area, the County Coordination Committee, led by the Head of the Hincesti County Executive Council and comprising county department chiefs and mayors of all area communes, was delegated significant responsibility. Based on pre-established selection criteria, the Council selected communes for platform construction, and commune Mayoralties chose households to receive small individual platforms. The Hincesti County Ecological Agency was an important local stakeholder.

(b) Implementing Agency or Agencies Performance

Rating: Satisfactory

The highly supportive implementing agency, MECTD, enabled timely completion of Project activities, supported the PIU on daily implementation issues, and helped resolve problems. For example, MECTD was willing to help finance the corrective wetland civil works, assistance that was not needed because the financial crisis resulted in unexpectedly low bids from local contractors. MECTD made counterpart financing available on a timely basis, and through the PIU, contributed to replicating Project activities through technical assistance to communes, individual households, and agro-processors who were willing to use their own funds to install manure platforms and wastewater treatment plants. Assistance included preparation of technical designs, materials and technical specifications, and on-site consultation. The PIU's dedication to achieving the PDO and GEO was an important factor in the Project's success.

While MECTD and in particular PIU performance was a key factor in ensuring the satisfactory outcome of the project, the MECTD could have performed better in coordinating and communicating with other agencies to protect the Lapusna wetland. The MECTD's Ecological Inspectorate issued a permit to the Sarata-Razesi community for drainage rehabilitation works on the agricultural polder adjacent to Lapusna wetland, financed by the Ecological Fund, and the works reduced water flow to the protected wetlands.

The MAFI was highly supportive of Project implementation through CAPMU and its representatives in the Project Steering Committee. The Minister of MAFI chairs the CAPMU Board, which ensured that due diligence was efficient and effective, but some Project activities

that are within MAFI institutional mandate, such as promoting scientific organic farming, were implemented with some delays.

(c) Justification of Rating for Overall Borrower Performance

Rating: Satisfactory

Central and local Government agencies were highly supportive of the project, which contributed to timely implementation and achievement of PDO and GEO.

6. Lessons Learned

- a) Implementing a communal animal waste management system:
 - i. During selection and planning, verify sufficient finances, and that financially and technically sound business plans exist for platform operations.
 - ii. Increase fines before manure and waste management system are established to discourage illegal dumping.
 - iii. Raise required financial contributions to a minimum of 30 percent for commune and households participants, to increase commitment and system sustainability.
- b) Sustainability and replicability of communal waste management depends on local authorities' commitment.
- c) Train a PIU member in procurement procedures to aid understanding of fiduciary unit requests and improve cooperation. If a PIU under a sectoral ministry is in charge of technical aspects, and a fiduciary unit under another Ministry is in charge of procurement and financial management, miscommunication/confusion about responsibilities will delay implementation.
- d) Timely fund allocation, irrespective of financing source, maintains implementation pace and Project credibility among grant recipients and contractors.
- e) Plan for mitigating possible resource use conflicts and access restrictions when restoring wetlands as a small component in a large nutrient reduction project. Be prepared to allocate more time to social issues than the share of the activity in the overall project costs.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

The following comments were provided by the Ministry of Environment of the Republic of Moldova on January 13, 2010 in a letter signed by Gheorghe Țalaru, Minister:

“The Ministry of Environment of the Republic of Moldova (ME) has reviewed the initial version of the Agricultural Pollution Control Project Implementation Completion Report (APCP ICR) prepared by the World Bank team and informs you on the following:

The ME accepts the APCP ICR with the following observation:

- 1. The APCP provided an innovative solution for the Republic of Moldova in achieving its objective to reduce the discharge of nutrients in the underground and surface waters of Moldova. Nevertheless the ME considers that the achievement of the Global Environment Objective of the Project, i.e. “long term reduction of discharge of nutrients and other agricultural pollutants in the waters of Danube River and Black Sea” is jeopardized by the insufficient interest of the local public authorities in promoting the technologies proposed by the Project.
- 2. The ME considers that ensuring the sustainability of APCP activities is related to the competence of the local public authorities and private farms selected as pilot areas for constructing the platforms storing and collecting animal wastes as well as the farms and

farmers trained in the good agricultural practices. At the same time, replicating Project activities will be possible only with the support and acceptance of local public authorities.

3. The ME highly appreciates the synergy of APCP activities with the activities of the Rural Investment and Services Project in implementing good agricultural practices.

In this context, the ME summarizes that the Agricultural Pollution Control Project has achieved its main objectives and generally contributed to promoting the mitigation measures of underground and surface waters pollution with nutrients by the agro-industrial sector and farmers of the Republic of Moldova.”

(b) Cofinanciers

Not applicable.

(c) Other partners and stakeholders

Not applicable.

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in US\$ Millions equivalent)

Components	Appraisal Estimate (US\$ millions)	Actual (US\$ millions)	Percentage of Appraisal
Promotion of Mitigation Measures for Reducing Nutrient Loads in Water Bodies - Grant for Agro-Industries Supported by RISP - Training	8.80	6.85	77.8
National Level Strengthening of Policy and Regulatory Capacity	0.08	0.23	287.5
Public Awareness, Capacity Building & Replication Strategy	0.32	0.41	128.1
Project Management Unit	0.55	0.69	125.5
Total Baseline Cost	9.75	8.17	83.8
Physical Contingencies	0.19	0.00	
Price Contingencies	0.80	0.00	
Total Project Costs	10.74	8.17	76.1
Project Preparation Facility (PPF)	0.00	0.00	
Front-end fee IBRD	0.00	0.00	
Total Financing Required	10.74	8.17	76.1

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (US\$ millions)	Actual/Latest Estimate (US\$ millions)	Percentage of Appraisal
Borrower		1.04	0.89	85.6
Local Communities		0.72	0.81	112.5
GLOBAL ENVIRONMENT - Associated IDA Fund (RISP)		3.93	1.52	38.7
Global Environment Facility (GEF)		4.95	4.95	100.0
Local Govts. (Prov., District, City)		0.10	0.00	0.0
TOTAL		10.74	8.17	76.1

Annex 2. Outputs by Component

Component 1 – Promotion of mitigation measures for reducing nutrient loads in water bodies

Component 1(a): Activities under RISP.

This sub-component was implemented in compliance with the Program Guidelines for “Environmental Mitigation Grants” approved in 2003. 100 RISP borrowers received APCP grants totaling US\$2,540,490 equivalent, for nutrient pollution mitigation investments, including:

- US\$1.7 million (67 percent) to 59 livestock farms to construct manure storage facilities for a total annual storage capacity of 29,300m³. In 2006-08, this capacity allowed proper management of 83,000 tons of manure, including use as fertilizer on 2,718 ha of agricultural land. Consequently, leakage into water streams of about 280 tons of N and 225 tons of P was avoided.
- US\$0.28 million (11 percent) to seven agro-processing enterprises to construct wastewater treatment facilities with a total capacity of 290m³/day. Water quality tests conducted at treatment facility entries and exits averaged a reduction of Ammonia Nitrogen N(NH₄⁺) of about 13-14 kg/day, when working at full capacity.
- US\$0.30 million (12 percent) to 25 crop farms to install efficient irrigation technology on an erosion-prone land area of 720 ha. Early evidence suggests that yields increased and farm profits rose due to efficient irrigation technology combined with environment-friendly practices such as nutrient management, crop rotation, and selected seed use.
- US\$25,400 (1.0 percent) to nine crop farms to introduce grassed water ways, forest vegetation, forest plantation, and buffer strips on 253 ha of agricultural land. These economically viable resource conservation technologies are a model for replication by neighboring farms.

Component 1(b): Promotion of improved watershed management practices

This component was implemented in the Lapusnita Project pilot area (Hincesti and Leova raions) and funded investments in: (i) manure management practices; (ii) environment-friendly agricultural practices; (iii) shrub/tree planting; (iv) restoring wetlands and promoting sustainable management practices; and (v) monitoring soil and water quality and environmental impacts.

(i) Manure Management Practices. The Project funded platform construction in Negrea, Carpineni, and Lapusna communes with total storage capacity of 7,600 m³ (2,800 m³, 2,400 m³, and 2,400 m³, respectively). Each communal platform has a shredder, a vacuum tank, a tractor with trailer, and a manure spreader. The APCP also financed construction of 450 household platforms in these communes; farmers used their own funds to construct 218 additional individual platforms. After a slow start, communes improved platform management so that all platforms were well managed by Project-end. During 2006-08, 18,000 tons of manure was collected and stored on village platforms. In 2008, Project interventions resulted in manure storage for 46 percent of cattle, 16 percent of pigs, and 14 percent of sheep and goats that were raised in the watershed.

(ii) Promoting Environment-Friendly Agricultural Practices

In 2004, the Soil Institute initiated a program to test and demonstrate environment-friendly agricultural practices, and maintained the program throughout the Project. The Project supported the program by providing planting materials and specialized soil-loss measuring equipment. Twelve testing/demo sites were established on 146 ha of Lapusnita watershed land —eight in commune Negrea, and four in commune Pascani. Demonstrations included nutrient management,

conservation tillage, strip cropping, crop rotation, grassed waterways, and anti-erosion measures in vineyards, orchards, and buffer strips. The program carried out twelve national training sessions and field visits for about 300 local farmers and specialists.

The program resulted in some 3,000 farmers applying at least one environment-friendly agricultural practice over a total area of 6,600 ha. A 2008 stakeholder survey found pilot-area farmer adoption rates are higher than in other communities; and have increased over 2003. Farmers apply more organic fertilizers (by 13 percent), forest belts (10 percent), strip cropping (9.0 percent) and less mineral fertilizers (17 percent). Environment-friendly agricultural practices are used on larger areas in the pilot watershed than in other locales in the country.

Training and replication: In addition to pilot-area activities, the Agency for Rural Development (ACSA) established three demonstration sites in three regions of Moldova (South, Center, and North) to provide on-farm training for farmers and leaders of farmers' associations. Some 2,700 participants completed training sessions and field visits, and the Soil Institute and ACSA intend to continue demonstration activities on these sites after Project closing.

(iii) Shrub and Tree Planting

Some 680 hectares were planted, including: 156 ha of commune lands, 26 ha of wetlands, and 498 ha of degraded lands, in collaboration with the State Forestry Service, "Moldsilva." Degraded lands were planted with acacia; forest belts along the Lapusnita River were planted with poplar and willows; as was the ecological restoration of the wetland area. Walnut was planted in shelterbelts on arable land. Total area of reconstructed forest is 424 ha, compared to 255 ha envisaged. Satisfaction with these plantations motivated farmers to plant windbreaks using their own funds. The increased demand for saplings led to development of tree nurseries.

(iv) Wetland restoration and promotion of sustainable management practices

The envisaged integrated management program for the wetland area was successfully implemented, including: (a) zone delineated with marks and landmarks; (b) ecological reconstruction of the forest on 26 ha, using tall saplings; (c) two concrete bridges with outflow systems; and (d) ten wooden bridges to improve public access.

Moldsilva administers the wetland under conditions established in the Forestry Code and Law on Natural Resources, Ramsar Convention, and national border rules. A Project-supported biodiversity inventory by the Institute for Research and Forestry Management found that flora and fauna began to regenerate after Project activities restored the wetland.

(v) Monitoring soil and water quality and environmental impacts.

The Project strengthened the capacity of the State Hydro-meteorological Center (SHC) and of the Soil Institute to monitor water and soil quality, and nutrient reduction impacts of Project activities such as manure management, tree planting, and applying the Code of Good Agricultural Practices. The Project funded incremental costs to purchase equipment, and select and maintain monitoring sites. To monitor water quality, the SHC applied the Project designed monitoring strategy of "paired watersheds" and "upstream-downstream," installing eight monitoring stations along the river and main tributaries, and selecting 17 shallow wells for surface water monitoring. The SHC monitored nine chemical and two biological parameters; chemical testing revealed that ammonium and nitrates concentrations have decreased at most monitored sections in the last two years, because of Project interventions. The Balceana and Negrea tributaries continue to register high nitrate concentrations, but levels of discharged nutrients are declining on the monitored paired watersheds. The SHC is using the integrated water quality-monitoring program, the Project approach used to train students, technical staff, and the local people.

Under the soil-monitoring program, the Soil Institute (IPA) measured soil loss at monitoring points in the demonstration plots, using 15 units of specialized equipment provided by the Project. Measurements show that soil erosion can be reduced by 35-64 percent, depending on the practice. The Project also increased IPA capacity to test soils and provide farmers with nutrient management advice using laboratory equipment such as spectrometer, flame-photometer, colorimeter, soil mills, bi-distiller, pH-meter, electronic balances; and supplied a vehicle and training to use the new equipment.

Component II - Strengthening the National Policy and Regulatory Capacity

The Project (i) contributed to drafting the Law on Ecological Farming and the Law on Soil Conservation, in particular to harmonize with the EU Nitrate Directive; and (ii) provided finances to develop, publish, and disseminate 500 copies of the Code of Good Agricultural Practices. The ACSA used Project funding to promote organic farming using training seminars for farmers and leaders of farmer associations; and to support MAFI in capacity building to certify organic farms, and publish and disseminate brochures.

The Project provided considerable support to the Government of Moldova to develop a new Project based on experience gained—the Project on Biogas Digesters from animal waste, which is designed to replicate APCP experiences throughout the country and assist the Republic of Moldova to its reduce greenhouse gas emissions in line with the Kyoto Protocol.

Component III - Public Awareness and Replication Strategy

The Project supported a broad public awareness campaign at the local, regional, national levels on Project activities and benefits to help sustain and replicate Project activities. Public awareness campaigns helped achieve behavioral changes necessary for Project success—among farmers in Project demonstration areas, some 36 percent adopted the environment-friendly practices that increased their incomes.

In October 2006, the PIU organized a Black Sea / Danube regional conference, and hosted staff from similar projects in the region, to disseminate Project experiences and methodology for measuring nutrient reduction. The PIU organized field trips and training for institutions involved in replication, and for mayors and farmers from other regions in the country, and promoted environment-friendly agricultural practices using publications, exhibitions, community activities, and working with schoolchildren. These activities generated good will and interest in the Project objectives among government officials and civil society. The December 2008 stakeholder survey found that awareness of environmental issues had increased in the pilot area and nation-wide.

Component IV - Project Management

Project Administration: The PIU was fully staffed before Project effectiveness and the staff composition remained unchanged during Project implementation. The PIU provided effective technical leadership and efficient Project administration resulting in full achievement of Project objectives and ahead-of-schedule disbursement of Project funds.

Comparison of Indicators in PAD Section A and the Supplemental Letter

	PAD Section A		Supplemental Letter
1	Increased awareness of environmental issues in agriculture and agro-industry;	1	Increased awareness of environmental issues in agro-industry and among farmers.
2	Increased percentage of farmers and agro-processors / industries implementing environment-friendly practices;	2	Increased number of agro-processors adopting mitigation measures and increased area of agricultural land with resource conservation technologies and increased production of organically-certified products.
3	Improved soil and water quality in the pilot watershed area;	3	Demand for project interventions by farmers outside pilot watershed area and from other riparian countries.
4	Adoption of a Code of Good Agricultural Practices;	4	Eight commune/village stores constructed together with 1,200 household manure storage facilities.
5	Implementation of policy framework for non-point source pollution commensurate with EU criteria;	5	Equipment provided for manure handling and field application.
6	Improved quality of rural drinking water.	6	Two embankments reinforced in wetland area; 3 concrete and 10 wooden bridges installed to provide access.
7		7	A monitoring system to determine the impact of project interventions on soil quality installed. Relevant laboratory staff trained.
8		8	Policy framework for non-source pollution meeting EU criteria in place.
9		9	Adoption of Code of Good Agricultural Practices.
10		10	Public and farmers aware of the potential to improve income while protecting the environment.

Supplemental Letter (SL) Indicator No. 1 is the same as No. 1 in PAD Section A.

SL Indicator No. 9 is the same as No.4 in PAD Section A.

SL Indicators 2 and 8 are modified versions of PAD Indicators No. 2 and 5, respectively.

Annex 3. Economic and Financial Analysis An incremental cost analysis (ICA) was conducted at appraisal as per GEF requirements. This Annex reviews the ICA against Project implementation results. The Annex also reviews the cost effectiveness of nutrient reduction impact of the Project in comparison with similar initiatives in the region and in the world.

Incremental Cost Analysis

a) ICA at Appraisal

ICA compared the baseline scenario with the GEF-Alternative scenario. The baseline scenario included activities to promote Moldova’s agricultural sector without GEF support. ICA noted the IDA-funded Rural Investment Services Project (RISP), which aimed to address farmers’ lack of access to capital and advice on modern agricultural technologies, including practices that promote conservation and sustainable natural resource use and increase productivity. Baseline scenario cost was estimated at US\$5.79 million, of which US\$3.93 million would be the cost of RISP loans to farms and agro-processors, complemented by APCP nutrient reduction grants and Central and local governments and sub-grant recipients contributions (Table 1).

Table 1. Incremental cost matrix as of Project Appraisal and Completion (US\$ million)*

Component	At Appraisal				At Completion			
	Baseline Cost**	Incremental Cost		Total	Baseline Cost	Incremental Cost		Total
		GEF grant	Other			GEF grant	Other	
1. Promotion of mitigation measures for reducing nutrient loads in water bodies	5.47	4.19	0	9.66	1.52	4.04	1.29	6.85
2. Strengthening national policy and regulatory capacity	0.02	0.07	0	0.09	0.00	0.05	0.18	0.23
3. Public awareness and replication strategy	0.09	0.28	0	0.37	0.00	0.29	0.12	0.41
4. Project management	0.20	0.42	0	0.62	0.00	0.58	0.11	0.69
Total	5.79	4.95	0	10.74	1.52	4.95	1.70	8.17

Source: PAD, Annex 4 and CAPMU.

*Including physical and price contingencies;

**This column includes contributions by Government, local communities, and local governments (Annex 1) to complement GEF resources and should have been accounted for under “incremental costs.”

The GEF-alternative scenario, at an incremental cost of US\$4.95 million⁴ would promote environment-friendly agricultural practices to reduce nutrient flows into surface and ground waters and barriers to adopt these practices. This scenario included wetland rejuvenation, and better-managed and protected fragile riparian systems, pastures, and forests. ICA estimated that in the Project better manure and farm nutrient-management practices would allow plants to take up 280tons of N and 70tons of P each year, preventing contamination of water bodies connected to the Danube and the Black Sea. This estimate assumed that about 50,000 tons of wet manure out of a total of 86,000 tons/year in the pilot area, would be collected on platforms (rather than dumped illegally) and used as organic fertilizer. Also, the rehabilitated wetland would be expected to absorb an additional 100kg N and 10kg P per hectare per year.

ICA at Completion

⁴It would have been more accurate to define the GEF Alternative Scenario as including activities funded by the GEF and other financiers (central and local governments, grant recipients) since all these activities are incremental. Funds from other financiers were made available to complement GEF-grant financing for water-borne nutrient reduction. Hence, the incremental cost estimate should have been US\$6.81m rather than US\$4.95m (Table 1).

The RISP loans, which were complemented by APCP grants, amounted to US\$1.53 million, not US\$ 3.93 million, as in the original estimate. The incremental cost at completion was US\$6.65 million (including GEF grant of US\$ 4.95million) (Table 1).

Nutrient Reduction due to Proper Manure Management

During Project implementation, the PMU monitored amounts of manure collected on municipal platforms and individual platforms of RISP APCP grant-recipient farms. Table 2 summarizes annual totals and the level of nutrient leakage avoided. The three Project-supported municipal platforms were fully operational in 2009, when about 12,000 tons of manure were collected. About 15,000 tons may be expected in a normal year, given platform capacity, but the 2007 drought reduced livestock holdings thereby significantly reducing the amount of manure collected in 2009. The RISP APCP farm platforms, completed by 2008, collected nearly 35,000tons of manure that year, and about 25,000 tons in 2009; 30,000tons per year is the expected annual average.

Table 2 presents the quantities of nutrient leakage avoided. Normal annual N reduction due to the three municipal platforms is expected to be about 60 tons and P reduction, 40 tons. In RISP APCP farms, annual N reduction is 134 tons and P reduction, 80 tons. Calculations use nutrient content values from the Institute for Pedology and Soil Science of Moldova (Table 3). Estimates assume that (i) annual manure accumulation is applied to land as fertilizer eventually; (ii) without platforms (no-Project scenario), *all* manure collected would be dumped on inappropriate sites, including riverbanks and roadsides; and (iii) plant nutrient-uptake efficiency from broadcast manure is 80 percent. Total estimated annual nutrient reductions due to the Project are about 200 tons of N and 110 tons of P.

Table 2. Manure collected and nutrient leakage avoided

Year	Municipal Platforms			RISP APCP Recipient Farms		
	Manure collected	Nutrient leakage avoided		Manure collected	Nutrient leakage avoided	
		N (tons)	P (tons)		N (tons)	P (tons)
2005	3,000	13.44	7.92			-
2006	3,700	16.58	9.77	21,451	96.10	56.63
2007	5,900	26.43	15.58	26,467	118.57	69.87
2008	5,770	25.85	15.23	34,530	154.69	91.16
2009	12,000*	53.76	31.68	25,000*	112.00	66.00
Normal year	15,000	62.20	39.60	30,000	134.40	79.20

Source: APCP PIU

Table 3: Nutrient content in fresh manure (kg of nutrient / ton of manure)

Nutrient	N (kg/t)	P (kg/t)
	5.6	3.3

Source: Moldova Institute for Pedology and Soil Science

Nutrient Reduction due to Wetland Rehabilitation

Estimated annual nutrient retention of rehabilitated land in the Lapusna wetland is about 17 tons N and 3.0 tons P, which assumes an average annual flow through of 10,600,000m³ (Table 4).

Table 4: Calculation of annual N and P retention in the rehabilitated wetland area

Quality indexes*	Sampling	Average	Retention	Yearly Nutrient	Total retention	Retention capacity

mg/dm ³	place	content mg/dm ³	Capacity mg/dm ³	Retention for Q _m = 10.6 mil. m ³ (tons)	capacity expressed in active substance N or P (tons/year)	expressed in active substance N or P (kg/ha and year) [Wetland area = 166 ha]
Ammonia: NH ₄	Water entrance	0.9	0.1	1.3	1.0	6.0
	Water exit	0.8				
Nitrate: NO ₃	Water entrance	22.3	6.5	68.5	15.8	94.9
	Water exit	15.8				
TOTAL N:					16.8	100.9
Phosphate: PO ₄	Water entrance	2.1	0.8	8.9	2.9	17.7
	Water exit	1.3				
TOTAL P:					2.9	17.7

- Notes: 1) 1g of NH₄ contains 0.78 g N, 1g of NO₃ contains 0.23 g N, 1g of PO₄ contains 0.33 g P
2) The average annual flow of Lapusnita river Q_m = 10,600,000m³ (APCP - Monitoring program on water quality in 2007, Technical Report. State Hydro-metereological Service, Monitoring Department on Environmental Quality, Surface Water Quality Center)
3) Wetland area: 166ha
4) *: Agricultural Pollution Control Project - Tree and shrubs planting program and management of the wetland area, February-December 2007

Source: APCP PIU

Nutrient Reduction due to Agro-processing Wastewater Treatment

Wastewater treatment plants built by the RISP APCP grant recipient agro-processors contribute an estimated 1.5 t N/year and 0.1 t P/year to nutrient reduction, assuming annual operation of 200 days.

Cost Effectiveness Analysis

Cost effectiveness (CE) ratios were estimated for reductions in nutrient leakage (to ground and surface waters) associated with (i) communal manure management systems in three beneficiary communes and (ii) farm manure platforms built for APCP RISP beneficiary farmers.

The CE ratio for nutrient reduction is defined as the ratio of the *annualized* cost of constructing and managing manure platforms over *annual* nutrient reductions achieved. Hence the CE ratio is measured in terms of (US\$/ kg of nutrient reduced). CE ratios are calculated for N and P.

Estimation of costs. Included are (i) initial investment costs (including those covered by the GEF grant and recipient contributions, and Project management costs for this activity); and (ii) operations and maintenance (O&M) costs. For communal manure management systems, costs pertain to the entire system, i.e., communal platforms and household platforms. Data are available for initial investment costs (i); for (ii), it was assumed that annual O&M costs equal 10 percent of investment costs (including costs associated with transportation, safeguarding the communal platforms, and maintenance of both types of platforms). Platform lifespan is assumed to be 20 years so costs are annualized over this period (Table 5.)

Table 5. Costs of manure management systems (US\$ million)

	Communal manure management	RISP APCP farms
Investment costs		
GEF grant	0.67	1.69
Recipient contributions	0.33	0.22
Share of Project management costs	0.08	0.16
Total investment costs	1.08	2.07
Annualized investment cost (r=0.1, 20 years)	0.13	0.24
Annual O&P costs	0.11	0.21
Total annual costs	0.24	0.45

Cost Effectiveness Ratios

Table 6 presents CE ratios calculated using above estimated annual costs and nutrient reductions.

Table 6. Cost effectiveness ratios

	Cost of N reduction (US\$ / kg N)	Cost of P reduction (US\$ / kg P)
Communal manure management	3.79	3.36
APCP RISP farms	5.96	5.69

Comparison of CE ratios with those achieved in other parts of the world

These CE ratios indicate that nutrient reduction was achieved at significantly lower cost in Moldova than in other countries in the region and the world. Notably, in Romania, communal manure management cost US\$30 – 40 / kg. In Poland, the CE ratios achieved by the Bank-funded Rural Environmental Protection Project in four regions ranged from US\$18.5/ kg N to US\$24.8/ kg N. In the United States Chesapeake Basin, the estimated median CE ratio for animal waste systems was US\$39/ kg N removed for animal waste systems and US\$19.5/kg N removed for combined nutrient management and animal waste systems (2003 values.) Lower CE ratios in Moldova may be due to lower investment costs for platforms and equipment.

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit
Lending		
Alexandre Nacev	Task Team Leader	ECSSD
Bogdan Contantinescu	Financial Management	ECSSD
David Freese	Finance Officer	CTRFC
Doina Petrescu	Sr. Agricultural Specialist	ECSSD
Elmas Arisoy	Procurement Specialist	ECSSD
Jitendra Srivastava	Consultant	ECSSD
Marjory-Anne Bromhead	Sector Manager	ECSSD
Meehta Sehgal	Consultant	ECSSD
Nora Dudwick	Social Scientist	ECSSD
Rohan Selvaratnam	Senior Program Assistant	ECSSD
Vitalay Kazakov	Financial Management	
Zoe Kolovou	Lead Counsel	LEGOP
Supervision/ICR		
Cora Melania Shaw	Sr. Agricultural Econ. / TTL	ECSSD
Aleksandar Nacev	Sr. Agriculturist / TTL	ECSSD
Anatol Gobjila	Sr. Operations Officer	ECSSD
Arben Maho	Procurement Analyst	ECSPS
Cesar Niculescu	Environmental Specialist	ECSSD
Elena Corman	Executive Assistant	ECCMD
Iwona Warzecha	Financial Management Spec.	ECSC3
John C. Cole	Consultant	ECSSD
John Kellenberg	Sector Manager	ECSSD
Jitendra P. Srivastava	Consultant	ECSSD
Lucian Bucur Pop	Sr. Social Development Spec.	ECSSD
Oksana Martsenyuk-Kukharuk	Operations Assistant	ECCU2
Sharifa Kalala	Program Assistant	ECSSD
Solvita Klapare	Environmental Econ.	ECSSD
Stefan Nicolau	Consultant	ECSSD
Suzy Yoon-Yildiz	Sr. Operations Officer	ECCU2
Tijen Arin	Sr Environmental Econ.	ECSSD
Yulia Snizhko	Operations Analyst	ECCU2

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	US\$ Thousands (including travel and consultant costs)
Lending		
FY02	9.06	60.28
FY03	17.30	75.72
FY04	12.13	53.59
Total:	38.49	189.59
Supervision/ICR		
FY04	3.42	13.44
FY05	9.81	58.57
FY06	9.97	60.17
FY07	90.91	64.44
FY08	9.14	60.81
FY09	19.34	100.13
Total:	142.59	357.56

Annex 5. Beneficiary Survey Results

A December 2008 study elicited public opinion of Project impact in rural areas across Moldova and in Lapustina, the Project pilot area. The study included two household surveys: Lapustina with a sample size of 300; and rural areas outside Lapustina with a sample size of 506. Seven focus group meetings were also carried out with local authorities, individual farmers, farmers with parcels in associations, members of local agricultural associations, ACSA agents, APCP grant recipients, and NGOs. Key study findings are summarized below, and where feasible, are compared with similar studies from 2007 and 2002.

- About 42 percent of pilot-area *survey* participants characterized the state of environment in the locality with *very good* and *good* ratings, compared to 22.1 percent from rural areas of the Republic. Pilot-area *focus group* participants reported that many waste piles along riverbanks and cliffs had been removed, fewer unauthorized dumpsites exist, and illegal dumping is in decline. Reported environmental and behavioral improvements were more pronounced in the pilot area than in other rural areas of the country.
- Unauthorized waste dumps were deemed the most acute environmental problem by 40 percent of respondents in the Project area, and 52.6 percent in other rural areas of Moldova, lower numbers than in 2007 and 2002. Water pollution is perceived as less of a problem in the pilot area than it is in other rural areas (Figure 1).
- In comparison with 2002, fewer Project-region respondents considered soil erosion, water pollution, and drinking water pollution as acute environmental problems.
- Pilot-area respondents said crop residues and manure were the main water pollutants; respondents from other rural areas of Moldova agreed but ranked household refuse slightly higher on the list of pollutants (Table 1).

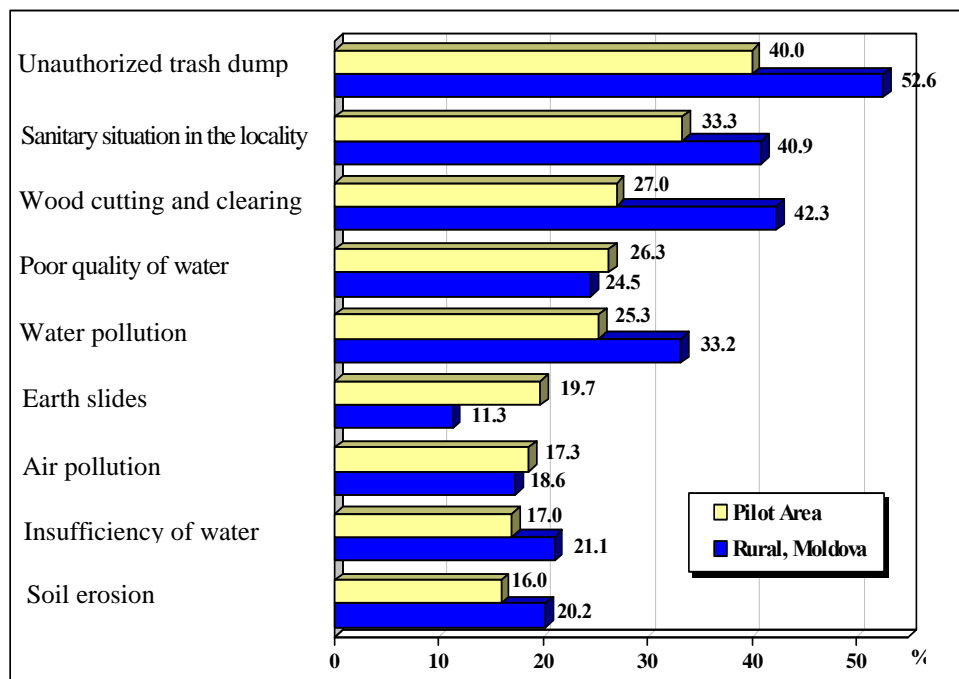


Figure 1. Priority environmental problem perceived by respondents

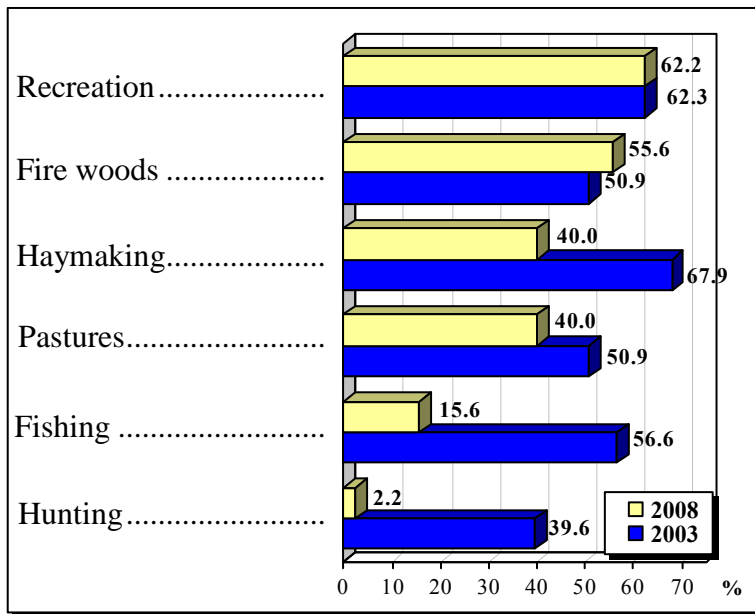
Table 1. To what extent do the factors below lead to pollution of waters in your locality? (%)

Factors of pollution	To a very great extent		To a great extent		To a small extent		To a very small extent		Not at all	
	Pilot Area	Rural, Moldova	Pilot Area	Rural, Moldova	Pilot Area	Rural, Moldova	Pilot Area	Rural, Moldova	Pilot Area	Rural, Moldova
Crop residue, animal waste, especially manure	24,7	24,3	40,7	44,9	9,3	21,5	12,3	4,0	10,0	3,6
Refuse (glass, plastic and metal)	13,0	22,9	35,7	49,0	13,7	20,4	15,7	4,9	17,3	0,6
Residual waters from enterprises of agricultural raw material processing, live-stock farms	10,7	15,8	26,7	19,8	20,0	23,1	7,3	17,2	27,0	18,0
Chemical fertilizers used in agriculture especially on eroded soils unprotected from erosion	17,3	18,6	21,3	31,8	25,7	19,4	12,0	16,2	17,7	5,3
Soil erosion	8,7	11,1	31,3	32,0	26,7	26,1	18,0	18,0	7,3	3,4

* The difference up to 100 percent represents not know/no answer

- Lack of transport is the main waste management problem that local authorities face in rural communities because Mayoralities lack resources to procure transportation.
- Some 51 percent of Pilot-area respondents say they accumulate discarded household glass, plastic, and metal to send to the village waste platform.
- Some 62.7 percent of Pilot-area respondents say they always separate organic waste and manure from household waste; in other rural areas, it is 53 percent.
- In 2008, 17.3 percent of Pilot-area respondents store crop residue and animal waste in household platforms, up from 7.4 percent in 2007; and 20 percent transport waste to a communal platform, up from 8.7 percent in 2007. However more people now report burning their waste—11.3, up from 3.7 percent in 2007; and those who admit to illegal dumping increased from 8.4 percent in 2007 to 9.7 percent in 2008.
- APCP objectives remain a priority for households in rural Moldova, and in the pilot area in particular, with 70.9 percent and 75 percent respectively stating that accumulation of livestock waste represents a priority problem.
- In 2008, 29.3 percent of pilot-area respondents, and 9.7 percent in other rural areas had household manure platforms; 77.3 percent of pilot-area platform owners received Project assistance and the rest built their own, as did all platform owners in other rural areas.
- Half of pilot-area respondents without a platform would like to build one; in other rural areas, about 68 percent of those without platforms would like to have them.
- About 48 percent of pilot-area communities had communal platforms; 20 percent of other rural communities had them; 90 percent of those without communal platforms in the pilot area, and 87 percent in other rural areas, considered communal platforms a necessity.
- Most respondents (pilot area: 88.7 percent; other rural areas: 93.5 percent) were unfamiliar with the Code of Good Agricultural Practices (GAP). In the pilot area, Lapusna, Negrea and Sarat-Razesii village respondents were somewhat familiar with GAP, but in Pascani, Secarani and Tochile-Raducani, no respondents had heard of GAP. Half of the respondents who had heard of GAP could not elaborate what they knew about it.

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- Most respondents knew about good agricultural practices including composting, managing organic wastes, nutrients, and organic fertilizers, and crop rotation.
- Since 2007, pilot-area and other rural area residents had increased their knowledge of wind breaks, and using organic wastes and compost as fertilizers.
- Respondents reported progress during the past two years in applying good agricultural practices.
- 77.8 percent of the respondents were satisfied with Project-supported activities in the wetlands.
- Most types of wetland resources uses decreased since 2003 as a result of restrictions imposed by border guards and the Forest agency (Figure 2).
- Respondents expressed frustration with access restrictions even in areas that are not included in the formally protected area.



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Annex 6. Stakeholder Workshop Report and Results

(if any)

Annex 7. Summary of Borrower’s ICR and/or Comments on Draft ICR

This Annex includes: (a) An extract from the “Republic of Moldova, Agricultural Pollution Control Project, Project Final Report, Chisinau, May 2009”, and (b) Government of Moldova comments on the draft ICR.

a) An extract from the “Republic of Moldova, Agricultural Pollution Control Project, Project Final Report, Chisinau, May 2009.”

PROJECT ACHIEVEMENTS AND OUTPUTS

The Agricultural Pollution Control Project includes four main components:

1. Promotion of mitigation measures for reducing nutrient loads in water bodies, including activities under RISP, including (a) Activities under RISP; (b) Promotion of improved watershed management practices; (c) Manure management practices; (d) Promotion of environment-friendly agricultural practices; (e) Shrub and tree planting; (f) Wetland restoration and promotion of sustainable management practices; (g) Monitoring of soil and water quality and environmental impacts.
2. Strengthening of the National Policy and Regulatory Capacity, which has supported the Government in two main areas: (a) strengthening institutional and regulatory capacity for agricultural nutrient pollution control promotion in the line with EU Nitrates Directive; and (b) development of the Code of Good Agricultural Practices
3. Public Awareness and Replication Strategy, including activities developed at the national and Project-pilot area level.
4. Project Management.

Component 1 – Promotion of mitigation measures for reducing nutrient loads in water bodies

Component 1(a): Activities under RISP.

This sub-component was implemented according to Program Guidelines, “Environmental Mitigation Grant” approved in 2003, within the Project preparation stage. The Program was prepared by team comprising Mr. Ion Raileanu, local civil engineer; Dr. Adel Shirmohammadi and Dr. Robert L. Hill, University of Maryland, USA. This document sets criteria and indicators for grant approval and implementation. Major amendments to the program are documented and registered. According to Program Guidelines, five categories of agro-business developed in rural areas were eligible for APCP Grant: (i) livestock farming; (ii) crop production, including individual farms and farm associations; (iii) agro-processing industry; (iv) irrigation systems; and (v) greenhouse farming.

Since the Project began, 100 RISP borrowers have benefited from APCP Grants, including: (a) 59 livestock farms for manure storage facilities; (b) seven agro-processing enterprises for wastewater treatment facilities; (c) 25 crop farms for irrigation and soil protection; and (d) nine crop farms for measures to reduce soil erosion and water pollution. Total invested APCP funds under this sub-component: 31,025,112 MDL (\$US2,540,490 equivalent).

Table 1: Investment by Category

Category	Committed Grant (MDL)	Disbursed Grant (MDL)	Beneficiary Contribution (MDL)	Total Project Cost (MDL)
Livestock farms	20,676,429	20,676,429	2,667,067	23,343,496
Crop production (tree/grass planting)	299,038	299,038	56,6	355,638
Irrigation	6,583,217	6,583,217	3,023,477	9,606,694
Agro-industry	3,466,428	3,466,428	3,082,678	6,549,106
Total:	31,025,112	31,025,112	8,829,822	39,854,934

1 US\$ = 12.21 MDL

Up to 67 percent of APCP funds were granted for the mitigation facilities developed at the livestock farms: 57 surface concrete storage platforms for solid manure (capacity ranges from 84 m³ to 1,750 m³) and two in-ground concrete basins for farms with manure washing systems. The APCP/RISP beneficiaries contributed 9.0m MDL (22 percent) to total investment costs, primarily for power and water supply, labor, platform road access, and increased costs for construction materials and services. The cost per m³ of platforms construction increased 70 percent (from 540 Lei in 2004 to 801 Lei in 2008); the cost of construction materials such as cement, steel, insulation, and construction services, increased 100 percent. According to the Grant Agreement, the bill of quantities was not changed, therefore the beneficiary was to cover price fluctuations and any additional costs.

The largest share of beneficiary contribution (47 percent) is for wastewater treatment stations and 31 percent for irrigation systems, due to the high cost of facilities and fixed Grant threshold (not to exceed US\$50,000). For example, in 2007, total investment costs for the drip irrigation system for 100 ha of orchards procured by “Terra Tiana” company was 1,474,897 MDL. The APCP grant was 632,765 MDL (41 percent) and beneficiary contribution, 871,132 MDL (59 percent).

Table 2: Committed Funds by Year

Category	APCP Grant (MDL)					
	2004	2005	2006	2007	2008	Total
Livestock farms	2,474,517	4,704,688	10,818,499	2,680,725	-	20,678,429
Crop production (tree/grass planting)	-	299,038	-	-	-	299,038
Irrigation	-	-	1,648,618	4,044,388	890,211	6,583,217
Agro-industry	-	-	3,466,428	-	-	3,466,428
Total:	2,474,517	5,003,726	15,933,545	6,725,113	890,211	31,027,112

In 2004, RISP activities were launched with nine livestock farms (Attachment 4). Platform capacity ranges from 84 m³ installed at an individual sheep farm, “Dumitru Axenti” in Rion Falesti and 1,750 m³ at a dairy cattle farm, “Vitagroteh” in Rion Telenesti. Approved grants increased to 15 farms in 2005, and 28 in 2007, due to the transparency of the grant approval process, good management, PIU replication activities, and public awareness campaigns. A 2006 deadline was anticipated for APCP funds for RISP activities, but the last grant was approved in 2007, because funds had been reallocated from the manure management system at commune level.

Table 3: Manure Stored

Livestock	Total Animals	Manure Stored (tn.)			
		2006	2007	2008	Total
<i>Cattle, including:</i>	<i>1,654</i>	<i>11,715</i>	<i>12,145</i>	<i>19,579</i>	<i>43,439</i>
Dairy	454				
Beef	994				
Calves	202				
<i>Pigs, including:</i>	<i>6,197</i>	<i>3,145</i>	<i>6,777</i>	<i>6,595</i>	<i>16,517</i>
Sows	624				
Fattening	4033				
Piglets	1540				
<i>Poultry</i>	<i>1,001,483</i>	<i>4,870</i>	<i>4,530</i>	<i>6,340</i>	<i>15,740</i>
<i>Sheep</i>	<i>4,129</i>	<i>1,661</i>	<i>2,325</i>	<i>1,204</i>	<i>5,190</i>
<i>Horses</i>	<i>26</i>				
<i>Other</i>	<i>6,220</i>	<i>60</i>	<i>690</i>	<i>894</i>	<i>1,644</i>
Total:	1,019,709	21,451	26,467	34,612	82,530

Total manure stored at platforms is 82,530 ton representing 794 tons of nutrients reduced. Cattle farms produce the highest share (53 percent); manure from sheep and poultry has higher nutrient content therefore its share of the total nutrient reduction is 47 percent.

Table 4: Use of Manure

Livestock	Total Animals	Manure Used (tn)			
		2006	2007	2008	Total
<i>Cows, including:</i>	<i>1,654</i>	<i>10,515</i>	<i>11,915</i>	<i>16,626</i>	<i>30,056</i>
Dairy	454				
Beef	994				
Calf	202				
<i>Pigs, including:</i>	<i>6,197</i>	<i>2,505</i>	<i>6,346</i>	<i>4,703</i>	<i>13,554</i>
Sows	624				
Fattening	4033				
Piglet	1540				
<i>Poultry</i>	<i>1,001,483</i>	<i>4,210</i>	<i>4,935</i>	<i>5,700</i>	<i>14,845</i>
<i>Sheep</i>	<i>4,129</i>	<i>1,396</i>	<i>2,125</i>	<i>768</i>	<i>4,289</i>
<i>Horses</i>	<i>26</i>				
<i>Other</i>	<i>6,220</i>	<i>20</i>	<i>700</i>	<i>670</i>	<i>1,390</i>
Total:	1,019,709	18,646	26,021	28,467	73,134

Up to 91 percent of manure stored at platforms was composted and applied as organic fertilizer over 2,718 ha cultivated land. The ratio of quantity stored/ used differs by manure type: poultry, 89 percent; cattle, 84 percent; and pigs, 71 percent, depending on storage or composting periods, application practices, and equipment for solids or liquids.

Table 5: Manure Use by Crop

Crops	2006-07		2008		Total	
	Area (ha)	Quantity (tn.)	Area (ha)	Quantity (tn.)	Area (ha)	Quantity (tn.)
Technical/Industrial, incl:	409	12,893	298	12,088	884	24,981
Corn	409	12,893	298	12,088	884	24,981
Sunflower						
Sugar beet						
Cereals, incl:	963	30,259	353	13,929	1,727	44,188
Wheat	753	23,254	322	12,539	1,426	35,793
Barley	210	7,005	31	1,390	301	8,395
Rye	10	300			20	300
Alfalfa	15	295	30	1,825	45	2,120
Vegetables	19	695			22	695
Orchard	8	225	12	625	20	850
Vineyard						
Other						
Total:	1419	44,667	693	28,467	2,718	73,134

Most compost was applied to cereal crops: 44,188 tons; and corn: 24,981 tons. The Independent Project Impact Assessment, reports that the Benefit/Cost Ratio (B/C Ratio) for manure (nutrient) management practices without irrigation was 1.14-5.34; the internal rate of return (IRR) was 16-33 percent. The cost/benefit ratio for manure management practices under irrigation was 1.57-4.08; the internal rate of return was 52-124 percent. The 25 irrigation systems procured with APCP support irrigated 718 ha. For example, the “Cibotari Feodor Farm: the B/C Ratio was 2.49 and IRR 73.39 percent.

Component 1(b): Promotion of improved watershed management practices

This component was developed in the watershed Project pilot area (Raion Hincesti and Leova), comprising some 46,603 hectares of agricultural land, home to 43,238 people and 14,413 households. The APCP provided investments in: (i) manure management practices; (ii) promotion of environment-friendly agricultural practices; (iii) shrub and tree planting; (iv) wetlands restoration and promotion of sustainable management practices; (v) monitoring of soil and water quality and environmental impacts.

(i) Manure Management Practices. This program provided funds for the installation of improved manure storage facilities and equipment for manure collection and handling in three communes of the Lapusnita Project pilot area. The investment program for the commune /village level manure management consisted of construction of three platforms with total capacity of 7,600 m³, including: 2,800 t in Negrea commune; 2,400 t in Carpineni; and 2,400 t in Lapusna.. Each village-level platform was equipped with a shredder, vacuum tank, tractor, trailer and spreader. The APCP also supported construction of 450 individual household platforms in these three villages. Total investments under this program: \$US 686,300.

Table 6: Investment by Commune Platform

Commune	Capacity, m ³	Civil Works, MDL	Equipment, \$USA	Plastic Basket, MDL
Negrea	2,800	2,098,835	41,000	14,760
Carpineni	2,400	2,658,450	45,390	-
Lapusna	2,400	1,878,534	45,390	-
Total:	7,600	6,635,819	131,780	14,760

Civil works were carried out by local construction firms tendered in compliance with the World Bank and national regulations. Grants were provided on a cost-sharing basis, including the contribution of local authorities (commune Mayoralty): electricity and water supply; operating costs (transport and fuel to collect, store, and handle manure; accommodation and remuneration for personnel; improved platform access, among others.).

Total manure collected and stored on village platforms was 18,000 t; 67 percent was sold (partially in Negrea commune) and applied as organic fertilizer on individual and farmer associations land in the area. Half of 6,700 t of manure stored on household platforms was transported to village platforms; the other half was applied as organic fertilizer on farmers' land.

(ii) Promotion of Environment-Friendly Agricultural Practices

The Soil Institute was contracted to implement testing and demonstrations of environment-friendly agricultural practices; during the Project lifetime, the program established and maintained 12 testing/demo sites on 146 ha of land in two communes in the Lapusnita watershed (eight in commune Negrea and four in commune Pascani). Practices included nutrient management, conservation tillage, strip cropping, crop rotation, grassed waterways, anti-erosion measures in vineyards, orchards, and buffer strips. To support the demonstrations, the Project provided planting materials and specialized equipment for soil loss measurements.

The program also sponsored 12 training sessions and field visits nation-wide for 291 local farmers and specialists. As a result, up to 3,000 farmers have applied at least one environment-friendly agricultural practice on a total area of 6,600 ha. The December 2008 study, by "OPINIA" showed a high level of adoption of these agricultural practices among farmers, especially among pilot-area farmers, increasing from 2003 levels. Farmers now use more organic fertilizers (13 percent), forest belts (10 percent), strip cropping (9.0 percent) and less mineral fertilizer (17 percent); the practices are used on larger areas of LPA, compared to other parts of the country, clearly reflecting Project impact.

Training and replication: The Soil Institute the Agency for Rural Development (ACSA) also established three demonstration sites in south, center, and north regions of Moldova to organize seminars for farmers, and farmers' association leaders who were then expected to adopt the good agricultural practices on their land. Some 2,700 people participated in the training sessions and field visits and about 12,000 farmers adopted at least one practice. (total area: 21,600 ha) The two agencies have signed contracts that should ensure Project interventions are continued, using the training established with APCP support during five years of Project implementation.

(iii) Shrub and Tree Planting

Under the agro-forestry program, 680 hectares were planted, including: 156 ha of commune land; 26 ha of wetland; and 498 ha of degraded land, in collaboration with the State Forestry Service "Moldsilva." Degraded lands were planted with acacia; poplar and willow species were used for forest belts along the Lapusnita river and the ecological restoration of the wetland area; walnut was planted in shelterbelts on arable land. Total area of reconstructed forest is 424 ha, slightly less than the 255 ha envisaged. Communes are extremely happy with these plantations; farmers now plant windbreaks; and seedling nurseries provide saplings.

(iv) Wetland restoration and promotion of sustainable management practices

The integrated management program for the wetland area was successfully implemented, including: (a) zone delineation using marks and landmarks; (b) ecological reconstruction of forest on 26 ha, using tall saplings; (b) two concrete bridges with outflow system; (b) ten wood bridges to improve public access.

The Leova Forestry Enterprise administers the wetlands under terms established in the Forestry Code and Law on Natural Resources. However, the PIU supported the forestry agency and local authorities to develop an integrated action plan so the local population can ensure biodiversity conservation and sustainable use of natural resources. In this context, the APCP played a decisive role in resolving conflicts between landowners and the forestry agency that emerged when a drainage system was reconstructed on 200 ha of arable land close to the wetlands. The PIU conducted frequent consultations with the Ministry of Ecology and Natural Resources (MENR), forestry agency, Mayorality of Sarata Razes, and villagers, seeking a common solution to prevent damage to the wetland area. The last two Bank missions aided in this process. Consequently, it was agreed to reallocate US\$40,000 from the APCP fund for hydro-technical works were commonly approved. These include: (a) partial redirection of water flow from Lopusna River through the wetland through an underground pipe system; and (b) consolidation of the dam, which would control water regime inside the area. These works have will maintain hydrological regime balance, but additional interventions are required to ensure proper wetland functioning, particularly in dry season.

(v) Monitoring of soil and water quality and environmental impacts.

The Project strengthened capacity in the State Hydrometeorological Center (SHC) and Soil Institute to monitor water and soil quality, and nutrient reduction impacts of the Project (manure management, tree planting, applying the Code of Good Agricultural Practices), by supporting incremental costs to select and maintain monitoring sites and upgrade equipment.

The Hydrometeo selected the integrated *water quality monitoring program*, which was a training tool for students, scientists, and local people, using the “paired watersheds” and “upstream-downstream” monitoring strategy. Eight monitoring stations were installed: six along the river and two on the main tributaries; 17 shallow wells were selected for monitoring underground water. All samples were analyzed against nine chemical and two microbiological parameters.

Analyses have shown that Project interventions reduced ammonium and nitrate concentrations at most of the monitoring sections over the last two years. Ammonium pollution is due to random manure dumping which has been reduced in the pilot area. High ammonium and nitrate concentrations are still recorded at the Balceana and Negrea tributaries. As for underground water, four shallow wells of the Lopusnita watershed show nitrate pollution, and three show ammonium pollution. Livestock have access to shallow wells and their feces and urine percolate into the soil and reach underground water.

The soil monitoring program was carried out by the Soil Institute. As reported, strip cropping has reduced soil loss by seven times while crop rotation (including alfalfa) by 90 percent. Nitrogen and phosphorus was lost by 6.7-8.6 and 7.8-10.1 times less than on the control sites. In vineyards, alternative seeding of forage crops has decreased the nitrogen and phosphorus loss by 24 % and 23% respectively.

In conclusion, agricultural farming is to be conducted in an integrated manner, including the whole package of conservation practices (minimum tillage; fissing; strip cropping; crop rotation; grassed waterways; etc.). Thus conservation farming records both environmental and economic benefits: significant reduction of soil and, consequently, nitrogen and

phosphorus loss (as reported, the APCP interventions have contributed with 1,024 t of to nutrient discharge reduction during the period of 2004-2008); higher production (ex: yield increase for cover crops is of 83-121 % in comparison with conventional farming); higher quality of agricultural products.

Component II - Strengthening of the National Policy and Regulatory Capacity

The Project supported the MAFI and the MENR in two main areas: (i) promotion of the Law on Ecological Farming and the Law on Soil Conservation, particularly harmonizing with EU Nitrates Directive; and (ii) development of the Code of Good Agricultural Practices, published and disseminated in 500 copies. The PIU contracted ACSA to promote organic farming, which includes: training seminars for farmers and leaders of farm associations; capacity-building support to MAFI for certification; publication and dissemination of brochures and information.

Component III - Public Awareness and Replication Strategy

The Component aimed to inform, transfer knowledge and know-how; increase awareness among local communities in the Lapusnita pilot area, and Moldovan farmers, and the public about environmental and economic benefits of using environment-friendly agricultural practices to reduce nutrient pollution.

The complex activities of the public awareness team were focused on meetings with Project beneficiaries (local authorities, farmers, priests, schools, local NGOs etc), involvement of the population in environmental, tree planting, and sanitation activities, preparation and distribution of materials written in a simple and accessible language, lessons and practices on nutrients reduction, environment-friendly agricultural practices and the impact of the water quality and environment on health. The issues of the supplement, "Lapusnita" distributed nation-wide (31 issues with a circulation of over 200,000 copies); and the TV and radio broadcasts at local and national level helped establish a favorable public opinion toward APCP, which generated an increased interest in APCP activities, leading to the pilot area visits by delegations of mayors (Orhei, Criuleni, Calarasi, Comrat, Cimisila, etc), to see the works and replicate them. Favorable public opinion caused the central stakeholder to increase attention to the Project, and declare 2007 "The Year of Sanitation."

The following activities were carried out to increase public awareness in *the pilot area*: meetings with the public, mayors, household platforms owners, landowners (69); instructions, lessons, and courses for farmers and mayors(31); study visits(36); working meetings with the local public administration (20); ecological expeditions, with young people from Lapusnita River Basin (2); Green Caravans, organization of ecological activities and schools contests in the Project area (24); photo exhibitions at the events in the pilot area (10); surveys on Project activities and identification of environmental issues(3); environmental lessons in educational institutions(15); local events, participation in the Village Holidays, general public meetings in villages (25); roundtables to present Project results, successes, and advantages (16); contests for farmers and students with the theme, "Cleanest locality", "Best taken care of", "Greenest street", etc.,(6); Lapusnita River Basin Forum (1); and installation of road signs to communal platforms.

The following *replication activities* took place: participation in national and international forums (6); national and regional meetings with mayors and farmers from other regions of Moldova (50); teaching farmers interested in APCP (18); working visits to the localities of Moldova (36); photo exhibits presenting Project results; joint meeting for implementation of the trans-boundary Project Romania-Moldova in the village of Branza, Cahul district; Environment NGOs' Forum; National Conference of EMM and other national for a (18); regional seminars in Stefan-Voda, Balti,

Edinet, Falesti, Comrat, Soroca, Chisinau (10); national-level environmental lessons on nutrient management and waste management (2); small Green Caravans of APCP in national schools (20); travels for Project promotion: organization of mayors' visit to Negrea and demo sites from Orhei, Glodeni, Stefan-Voda, Calarasi, Nisporeni, Cahul, etc., (4); regional fora (3); national forum (1); and Web-page updating. In addition, the documentary "Lapusnita, a Clean River" and the following video and radio spots were prepared and broadcast: Water—the Source of Life (Lapusnita model); "Waste management"; "Environment-friendly Agricultural Practices", "Love and care for the land of your village." Some 67 radio programs and 65 print articles were developed at the national level, and 107 radio programs and 80 articles at the Project area level.

While behavioral change is not easy to measure, its effects can be observed in improved rural ecological conditions in the pilot area, greater awareness about major national and local ecological problems, decreased tolerance towards pollution and polluting activities. These were observed by Project partners and by local people in the pilot zones.

The Project provided considerable support to the Government of Moldova in developing a new Project based on the experience gained - the Project on Biogas Catchments from the animal waste. The APCP provided local information, and significant technical assistance in developing this new Project to replicate its experience throughout the country and to assist the Republic of Moldova in meeting its obligations regarding the Kyoto Protocol on reduction of greenhouse gas emissions.

Component IV - Project Management

Project Administration: The Project Implementation Unit (PIU) was fully staffed before Project effectiveness and the structure of personnel and the specialists initially hired remained unchanged during the Project implementation. The PIU staff provided effective technical and CAPMU efficient Project administration, with the result that Project development objectives have been achieved, expected Project outputs in many cases exceeded, and funds fully disbursed.

b. Government of Moldova comments on the draft ICR⁵.

The Ministry of Environment of the Republic of Moldova (ME) has reviewed the initial version of the Agricultural Pollution Control Project Implementation Completion Report (APCP ICR) prepared by the World Bank team and informs you on the following:

TheME accepts the APCP ICR with the following observation:

1. The APCP has provided an innovative solution for the Republic of Moldova in achieving its objective to reduce the discharge of nutrients in the underground and surface waters of Moldova. Nevertheless the ME considers that the achievement the Global Environment Objective of the Project, i.e. “long term reduction of discharge of nutrients and other agricultural pollutants in the waters of Danube River and Black Sea” is jeopardized by the insufficient interest of the local public authorities in promoting the technologies proposed by the Project.
2. ME considers that ensuring the sustainability of APCP activities is related to the competence of the local public authorities and private farms selected as pilot areas for constructing the platforms storing and collecting animal wastes as well as the farms and farmers trained in the good agricultural practices. In the same time, replicating APCP activities will be possible only with the support and acceptance of local public authorities.
3. ME highly appreciates the synergy of APCP activities with the activities of the Rural Investment and Services Project in implementing the good agricultural practices.

In this context, ME summarizes that the Agricultural Pollution Control Project has achieved its main objectives and generally contributed to promoting the mitigation measures of underground and ground waters pollution with nutrients by the agro-industrial sector and farmers of the Republic of Moldova.

⁵ The signed Romanian original is dated January 13, 2010.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

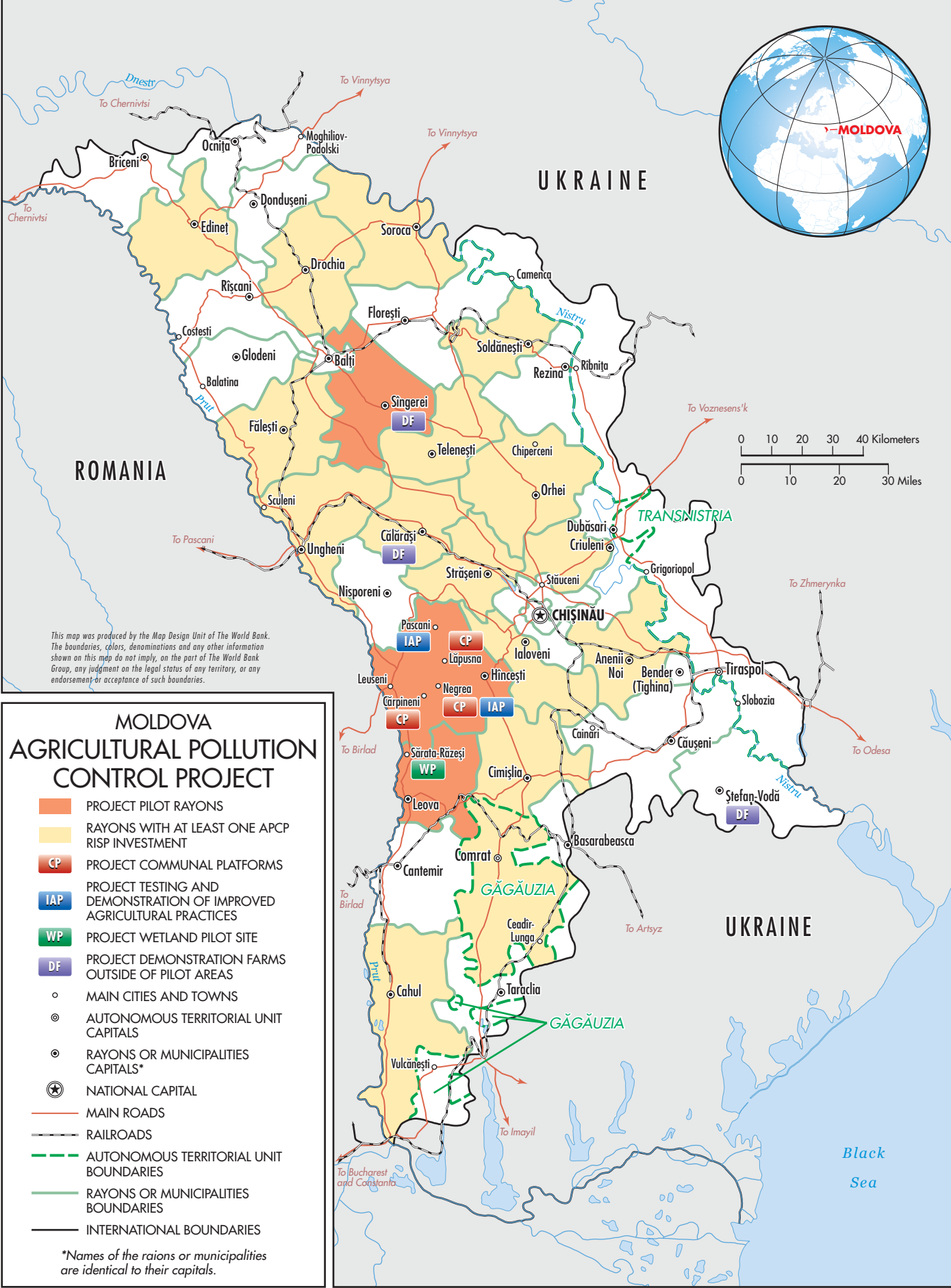
Not applicable.

Annex 9. List of Supporting Documents

Nicolae, Talpa 2003. "Sociological Survey in the Wetland Pilot Area (Commune Tochile-Raducani)". Commissioned by the Republic of Moldova Agricultural Pollution Reduction Project. Chisinau.

OPINIA, 2002. "Baseline study of Households from Lapusna region. Analytical-scientific report." Commissioned by the Republic of Moldova Agricultural Pollution Reduction Project. Chisinau.

OPINIA, 2009. "Impact Assessment of the Agricultural Pollution Control Project in the Lapusnita Pilot Area." Commissioned by the Republic of Moldova Agricultural Pollution Reduction Project. Chisinau.



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MOLDOVA AGRICULTURAL POLLUTION CONTROL PROJECT

- PROJECT PILOT RAYONS
- RAYONS WITH AT LEAST ONE APCP RISP INVESTMENT
- CP PROJECT COMMUNAL PLATFORMS
- IAP PROJECT TESTING AND DEMONSTRATION OF IMPROVED AGRICULTURAL PRACTICES
- WP PROJECT WETLAND PILOT SITE
- DF PROJECT DEMONSTRATION FARMS OUTSIDE OF PILOT AREAS
- MAIN CITIES AND TOWNS
- AUTONOMOUS TERRITORIAL UNIT CAPITALS
- RAYONS OR MUNICIPALITIES CAPITALS*
- NATIONAL CAPITAL
- MAIN ROADS
- RAILROADS
- AUTONOMOUS TERRITORIAL UNIT BOUNDARIES
- RAYONS OR MUNICIPALITIES BOUNDARIES
- INTERNATIONAL BOUNDARIES

*Names of the raions or municipalities are identical to their capitals.

