Grassed waterway (Sergiu Magdil)

Integrated Land and Water Management (Moldova, Republic of)

Managementul integrat al solului și al apei

DESCRIPTION

Integrated land and water management was promoted in order to improve agricultural production while reducing soil loss and nutrient discharge into water bodies. Technical assistance and financial support was provided for sustainable agricultural practices, including: nutrient management, conservation agriculture, integrated cropping management, agroforestry and wetland management.

Integrated land and water management was promoted in order to improve agricultural production while reducing soil loss and nutrient discharge into water bodies. Technical assistance and financial support was provided for sustainable agricultural practices, including:

1. Manure Management Practices:
Organic manure was substituted for inorganic fertilizer, and eight commune/village stores were constructed together with 1200 household stores and equipment provided for manure handling and field application. A monitoring database was made available.

2. Promotion of Environment-Friendly Agricultural Practices:
A well-documented pilot was completed and evaluated for replication, and 300 farmers then trained in the application of environment-friendly agricultural practices. The capacity of extension staff significantly improved. A monitoring system to determine the impact of practices on soil quality was installed and data collected.

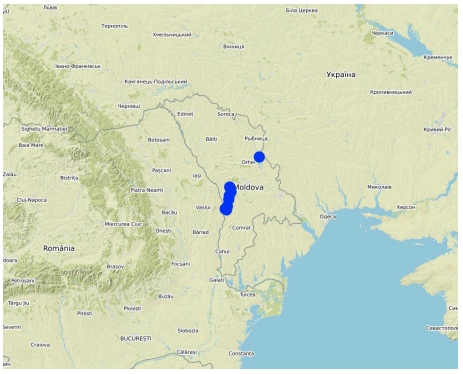
3. Shrub and Tree Planting:
• 132 hectares of shelterbelts for water protection established; 112 hectares of improved anti-erosion forest belts set up; 50 hectares of improved pasture established; 484 hectares of the existing forests rehabilitated and properly managed; forest monitoring was incorporated into the general monitoring scheme.

4.Wetland Restoration and Promotion of Sustainable Management Practices:
The existing ecosystems were rehabilitated and ecologically well balanced. In this context two dams were built with a sluice gate system for the stabilization of water levels; three concrete bridges with adequate culvert capacity were installed for accessibility to different portions of the wetland; and 10 small wood bridges with culverts were built for access.

5 .Monitoring Soil and Water Quality and Environmental Impacts
Availability of water for downstream users and fisheries was increased, drinking water supplies was improved, there was increased quality and availability of groundwater for human and animal consumption, and simultaneously better productive lands with increased organic matter and carbon sequestration, as well as increased biodiversity.

Key Elements of the Manure Management System:
a. Segregation of inert and recyclable materials from livestock waste through the provision of a separate household waste container.
b. Improved manure stores for storage of waste at a single impermeable store at the household with enough storage for up to one month's production.
c. Transfer of waste from the farm store to a central site, using transport units then unloading it at the commune platform, to aerate the waste, promoting continued bacterial activity.
d. At the commune/village store level, the segregated inert materials deposited in designated bunkers.
e. At the commune/village store level, management of the household manure at the main bunker involving stacking in shaped windrow heaps three metres high.
f. Store the waste deep so that the areas getting wet from rainfall is minimised. Provide impermeable walls and floor to eliminate leaching.
g. Provide storage capacity for over the winter so that matured manure will be available for use on the land.

LOCATION



Location: Negrea, Lapusna, Carpineni, Minjir communes, Hincesti district; Sarata Razesti commune, Leova district, and Jora de Mijloc, Orhei district, Hincesti and Orhei districts, Moldova, Republic of

No. of Technology sites analysed: 2-10 sites

Geo-reference of selected sites
- 28.36446, 46.9753
- 28.39688, 46.89446
- 28.35912, 46.82966
- 28.34058, 46.76762
- 28.31311, 46.65321
- 28.25509, 46.61407
- 28.29543, 46.59662
- 29.0835, 47.46431

Spread of the Technology: evenly spread over an area (approx. > 10,000 km2)

Date of implementation:

Type of introduction
- through land users' innovation
- as part of a traditional system (> 50 years)
- during experiments/ research
- through projects/ external interventions

Key Elements of facilities at the Village Platform are:
a. Concrete area for the management of the manure.
b. Bunkers for the segregated household manure.
c. Collecting channel for runoff from the platform.
d. Storage pits and tanks with impermeable base and walls.
e. Security fencing.
f. Office / Staff facilities and Landscaping. Monitoring wells to check for leakages.

Overall results show that 8,250 farmers from both the project pilot area and other regions of Moldova had adopted at least one environmentally-friendly agricultural practice promoted by the project, and had implemented these on 14,028 ha of land.

Crop rotation (Sergiu Magdil)

Manure Storage Platform (Sergiu Magdil)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [x] improve production
- [x] reduce, prevent, restore land degradation
- [x] conserve ecosystem
- [x] protect a watershed/ downstream areas – in combination with other Technologies
- [x] preserve/ improve biodiversity
- [x] reduce risk of disasters
- [ ] adapt to climate change/ extremes and its impacts
- [ ] mitigate climate change and its impacts
- [x] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Cropland - Annual cropping, Perennial (non-woody) cropping, Tree and shrub cropping
Main crops (cash and food crops): Wheat, corn, sunflower, alfalfa (lucerne), vineyards, orchards, vegetables

Waterways, waterbodies, wetlands - Drainage lines, waterways, Swamps, wetlands
Main products/ services: The existing ecosystems rehabilitated and ecologically well balanced; dams with a sluice gate system for the stabilization of water levels; concrete bridges with adequate culvert capacity for access to different portions of the wetland; and wooden bridges with culvert capacity for access through the zone constructed

Water supply

- [ ] rainfed
- [x] mixed rainfed-irrigated
- [ ] full irrigation

Number of growing seasons per year: 1
Land use before implementation of the Technology: n.a.
Livestock density: n.a.

Purpose related to land degradation

- [x] prevent land degradation
- [ ] reduce land degradation
- [x] restore/ rehabilitate severely degraded land
- [ ] adapt to land degradation
- [ ] not applicable

Degradation addressed

soil erosion by water - Wt: loss of topsoil/ surface erosion, Wg: gully erosion/ gullying, Wm: mass movements/ landslides, Wr: riverbank erosion, Wo: offsite degradation effects

chemical soil deterioration - Cn: fertility decline and reduced organic matter content (not caused by erosion), Cp: soil pollution, Cs: salinization/ alkalinization

physical soil deterioration - Pc: compaction, Pk: slaking and crusting, Ps: subsidence of organic soils, settling of soil

biological degradation - Bc: reduction of vegetation cover, Bh: loss of habitats, Bq: quantity/ biomass decline, Bs: quality and species composition/ diversity decline, Bl: loss of soil life

water degradation - Ha: aridification, Hp: decline of surface water quality, Hq: decline of groundwater quality, Hw: reduction of the buffering capacity of wetland areas

SLM group

- forest plantation management
- rotational systems (crop rotation, fallows, shifting cultivation)
- integrated crop-livestock management

SLM measures

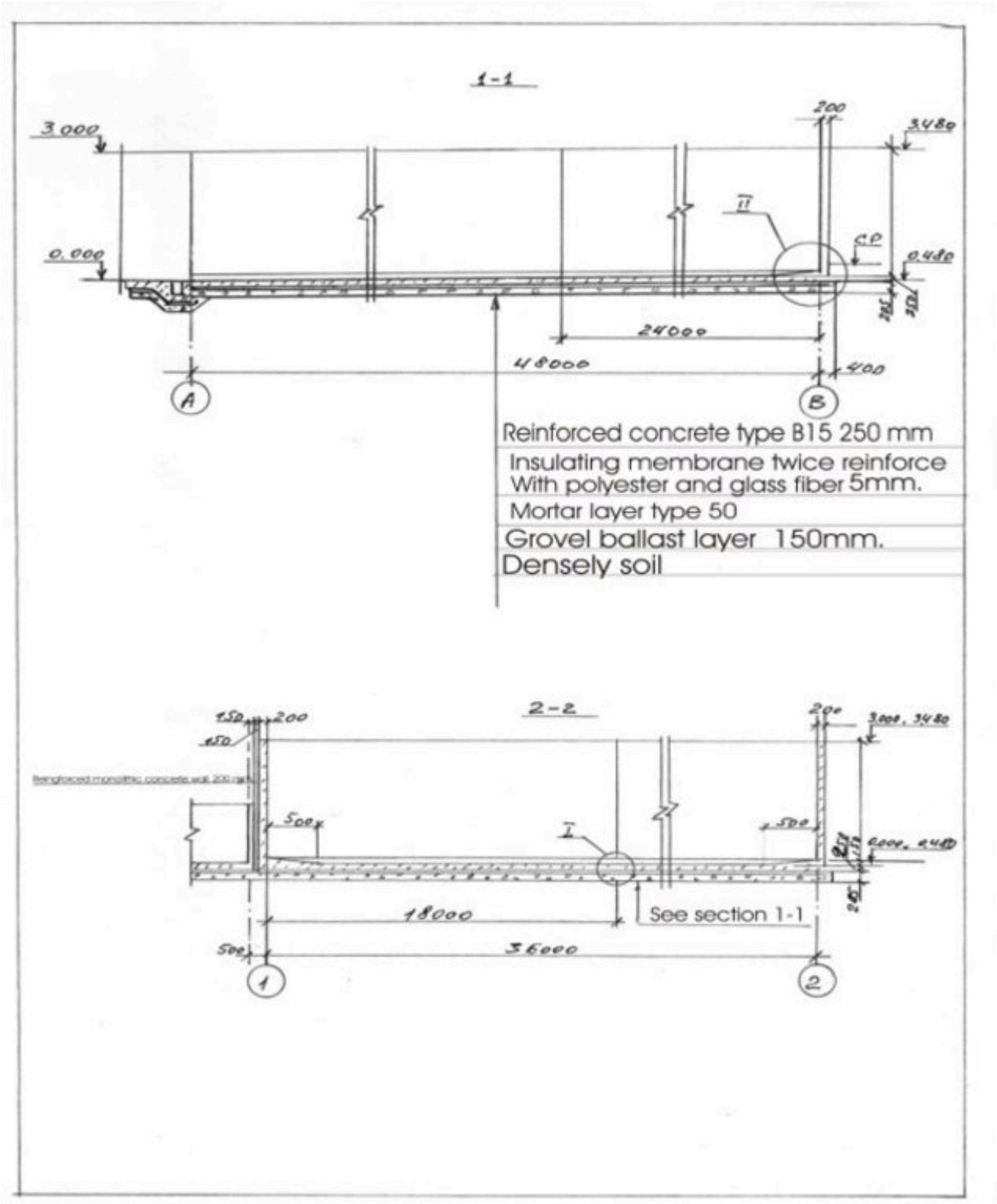
agronomic measures - A1: Vegetation/ soil cover, A2: Organic matter/ soil fertility

vegetative measures - V1: Tree and shrub cover, V2: Grasses and perennial herbaceous plants, V4: Replacement or removal of alien/ invasive species

management measures - M2: Change of management/ intensity level, M3: Layout according to natural and human environment, M5: Control/ change of species composition, M6: Waste management (recycling, re-use or reduce)

TECHNICAL DRAWING

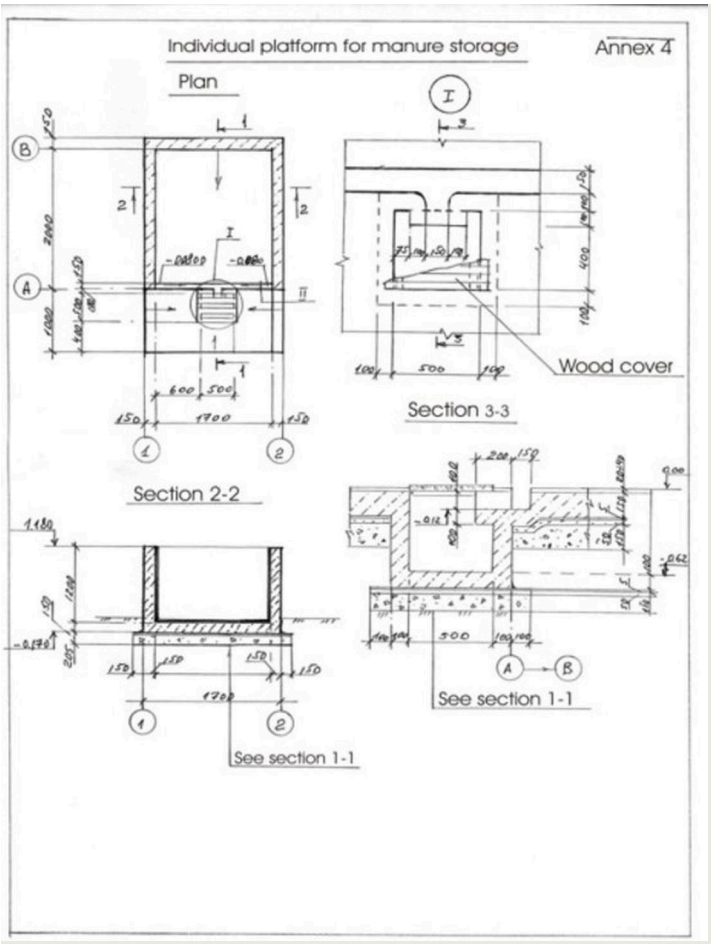
Technical specifications



Author: Ion Raileanu
Schematic structure of village platform: Length - 48 m, Width - 36 m, Height - 3 m, Capacity - 3400 tons, Storage period - 5 months

Schematic structure of household platform: Length - 2.2 m, Height - 1.2 m, Capacity - 4.8 c.m., Storage period - 1 month.

At village level, the project supported the construction of waste storage platforms of 3400 tonnes capacity and a storage period of 5 months. The platform has 48 m length and 36 m width. It is surrounded by a concrete 3 m high wall and bedded by a concrete floor with an impermeable insolating membrane. The platform is equipped with a bunker for inert material and a basin for collection of liquid fraction. The platform is built on the commune land (administrated by the Mayoralty) in full compliance with the environmental protection requirements.
At the household-level 150 platforms were built. The platforms have 2.55 m3 and a storage period of one month. The platform capacity was calculated based on estimated quantity of manure for an average household with at least two cattle, two-three pigs and a certain number of poultry. The designed platform consists of a simple open fronted store with a concrete floor and 1.5 m height walls. In front of the platform, a concrete below ground tank (125 dcm3 volume) covered by a wood lid with a plastic basket inside of 50 liters capacity for collection of liquid fraction would be equipped. A separate small capacity container (about 90 liters) for the collection of recyclable and non-recyclable household wastes was also provided.



Author: Ion Raileanu

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated:
- Currency used for cost calculation: **n.a.**
- Exchange rate (to USD): 1 USD = n.a
- Average wage cost of hired labour per day: n.a

Most important factors affecting the costs

n.a.

Establishment activities

1. Packages developed for manure management at village and household level and evaluated for replication (Timing/ frequency: None)
2. Public awareness & education (Timing/ frequency: None)
3. Use of good agricultural practices by farmer associations, family farms and individual farmers on cropland. (Timing/ frequency: None)
4. Monitoring & evaluation. (Timing/ frequency: None)

Maintenance activities

n.a.

NATURAL ENVIRONMENT

Average annual rainfall

- [ ] < 250 mm
- [x] 251-500 mm
- [x] 501-750 mm
- [ ] 751-1,000 mm
- [ ] 1,001-1,500 mm
- [ ] 1,501-2,000 mm
- [ ] 2,001-3,000 mm
- [ ] 3,001-4,000 mm
- [ ] > 4,000 mm

Agro-climatic zone

- [ ] humid
- [x] sub-humid
- [ ] semi-arid
- [ ] arid

Specifications on climate

Average annual rainfall in mm: 500.0
Name of the meteorological station: Hincesti
Climate is moderately continental: the summers are warm and long, with temperatures averaging about 20°C, and the winters are relatively mild and dry, with January temperatures averaging -4°C. Annual rainfall, which ranges from around 500 millimeters; long dry spells are not unusual. The heaviest rainfall occurs in summer; heavy showers and thunderstorms are common.

Slope

- [ ] flat (0-2%)
- [ ] gentle (3-5%)
- [x] moderate (6-10%)
- [ ] rolling (11-15%)
- [x] hilly (16-30%)
- [ ] steep (31-60%)
- [ ] very steep (>60%)

Landforms

- [ ] plateau/plains
- [ ] ridges
- [ ] mountain slopes
- [x] hill slopes
- [ ] footslopes
- [x] valley floors

Altitude

- [x] 0-100 m a.s.l.
- [ ] 101-500 m a.s.l.
- [ ] 501-1,000 m a.s.l.
- [ ] 1,001-1,500 m a.s.l.
- [ ] 1,501-2,000 m a.s.l.
- [ ] 2,001-2,500 m a.s.l.
- [ ] 2,501-3,000 m a.s.l.
- [ ] 3,001-4,000 m a.s.l.
- [ ] > 4,000 m a.s.l.

Technology is applied in

- [ ] convex situations
- [ ] concave situations
- [x] not relevant

Soil depth
- very shallow (0-20 cm)
- shallow (21-50 cm)
- moderately deep (51-80 cm)
- deep (81-120 cm)
- very deep (> 120 cm)

Soil texture (topsoil)
- coarse/ light (sandy)
- medium (loamy, silty)
- fine/ heavy (clay)

Soil texture (> 20 cm below surface)
- coarse/ light (sandy)
- medium (loamy, silty)
- fine/ heavy (clay)

Topsoil organic matter content
- high (>3%)
- medium (1-3%)
- low (<1%)

Groundwater table
- on surface
- < 5 m
- 5-50 m
- > 50 m

Availability of surface water
- excess
- good
- medium
- poor/ none

Water quality (untreated)
- good drinking water
- poor drinking water (treatment required)
- for agricultural use only (irrigation)
- unusable

Is salinity a problem?
- Ja
- Nee

Occurrence of flooding
- Ja
- Nee

Species diversity
- high
- medium
- low

Habitat diversity
- high
- medium
- low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- subsistence (self-supply)
- mixed (subsistence/ commercial
- commercial/ market

Off-farm income
- less than 10% of all income
- 10-50% of all income
- > 50% of all income

Relative level of wealth
- very poor
- poor
- average
- rich
- very rich

Level of mechanization
- manual work
- animal traction
- mechanized/ motorized

Sedentary or nomadic
- Sedentary
- Semi-nomadic
- Nomadic

Individuals or groups
- individual/ household
- groups/ community
- cooperative
- employee (company, government)

Gender
- women
- men

Age
- children
- youth
- middle-aged
- elderly

Area used per household
- < 0.5 ha
- 0.5-1 ha
- 1-2 ha
- 2-5 ha
- 5-15 ha
- 15-50 ha
- 50-100 ha
- 100-500 ha
- 500-1,000 ha
- 1,000-10,000 ha
- > 10,000 ha

Scale
- small-scale
- medium-scale
- large-scale

Land ownership
- state
- company
- communal/ village
- group
- individual, not titled
- individual, titled

Land use rights
- open access (unorganized)
- communal (organized)
- leased
- individual

Water use rights
- open access (unorganized)
- communal (organized)
- leased
- individual

Access to services and infrastructure

	poor			good
health	✓			
education		✓		
technical assistance	✓			
employment (e.g. off-farm)	✓			
markets	✓			
energy		✓		
roads and transport	✓			
drinking water and sanitation	✓			
financial services	✓			

IMPACTS

Socio-economic impacts

Crop production

	decreased				increased
			✓		

According to elevator (NGO BIOS), •The SROI (Social Return on Investment) ratio for the period of 2004-2009 was 3,34, or, every $US1 invested by the Project $US 3,34 worth of value (economic, social and/or environmental) was delivered to society.

	decreased				increased
animal production			✓		
wood production				✓	
non-wood forest production				✓	
risk of production failure	increased			✓	decreased
land management	hindered			✓	simplified
drinking water quality				✓	
water quality for livestock				✓	

irrigation water quality	decreased	increased

Socio-cultural impacts

Ecological impacts

surface runoff	increased	decreased
soil loss	increased	decreased
soil compaction	increased	reduced
nutrient cycling/ recharge	decreased	increased
soil organic matter/ below ground C	decreased	increased
vegetation cover	decreased	increased
plant diversity	decreased	increased
invasive alien species	increased	reduced
habitat diversity	decreased	increased

Off-site impacts

downstream siltation	increased	decreased
groundwater/ river pollution	increased	reduced
buffering/ filtering capacity (by soil, vegetation, wetlands)	reduced	improved
damage on neighbours' fields	increased	reduced
damage on public/ private infrastructure	increased	reduced

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Short-term returns	very negative	very positive
Long-term returns	very negative	very positive

Benefits compared with maintenance costs

Short-term returns	very negative	very positive
Long-term returns	very negative	very positive

CLIMATE CHANGE

-

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology

- single cases/ experimental
- 1-10%
- 10-50%
- more than 50%

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- 0-10%
- 10-50%
- 50-90%
- 90-100%

Number of households and/ or area covered

8,250 farmers from both project pilot area and other regions of Moldova

Has the Technology been modified recently to adapt to changing conditions?

- Ja
- Nee

To which changing conditions?

- climatic change/ extremes
- changing markets
- labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

Strengths: compiler's or other key resource person's view

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

- Farmers did not calculate properly expenses and benefits. They should be provided simple instruments to calculate their inputs and to plan for future activity.
- Agricultural literature is too difficult for rural people to understand. Knowledge should be provided in an accessible manner. Small guides should exist for separate crops with drawings and schemes.

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

REFERENCES

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Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_1817/

Linked SLM data
n.a.

Documentation was faciliated by

Institution
- NGO BIOS (.) - Moldova, Republic of

Project
- n.a.

Key references
- Guidelines for Good Agricultural Practices (Practici agricole prietenoase mediului). Îndrumar: /Ungureanu V., Cerbari V., Magdîl A., Gherman E.- Chişinău: Tipografia Centrală, 2006. – 96 p.: http://www.acsa.md/album.php?l=ro&idc=152&t=/GALERIE-FOTO/Practici-agricole-prietenoase-mediului

Links to relevant information which is available online
- Moldova - Agricultural Pollution Control Project (English): http://documents.worldbank.org/curated/en/117701468287732017/Moldova-Agricultural-Pollution-Control-Project