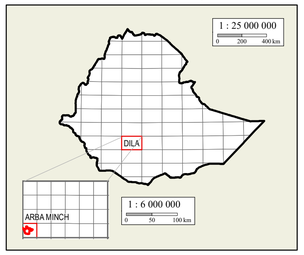
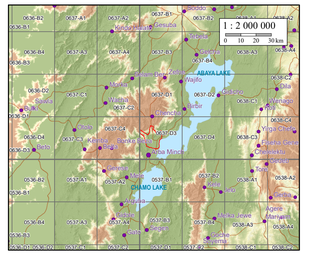
SUSTAINABLE LAND MANAGEMENT PLAN OF THE NATURAL RESOURCES
MAP OF LANDSCAPE MANAGEMENT PLAN

SUBSHEET: 0637-D3 ARBA MINCH
AREA ACROSS THE RIVER BASINS OF KURPAYO, BASO AND HARE RIVERS

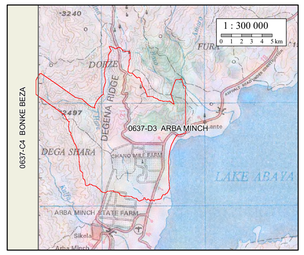
General Map of Ethiopia



Wider Surroundings of the Project Area

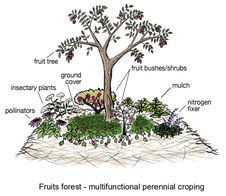


Detail of the Project Area



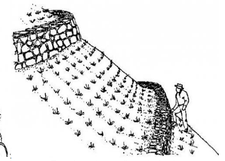
Examples of Recommended Anti-Erosion and Water-Harvesting Measures

Rainwater harvesting pits

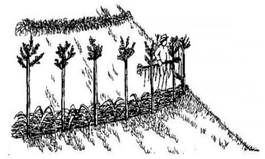


Fruits forest - multifunctional perennial croping

Rainwater harvesting pits



Terracing - stone wall counter barrier

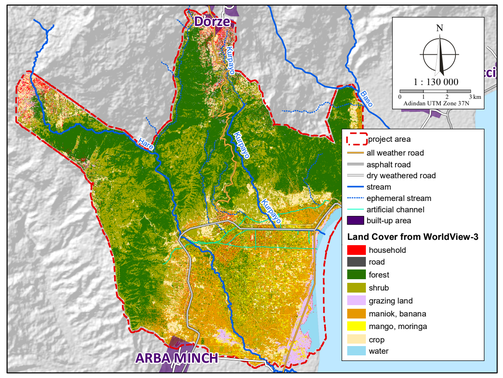


Terracing - live counter barrier

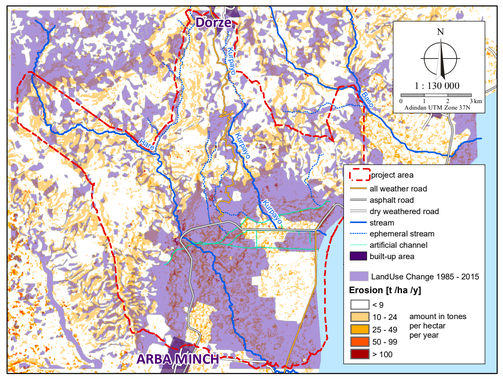
Weirs or small dams - gully erosion protection

Well shaped stone or wooden walls against rill erosion

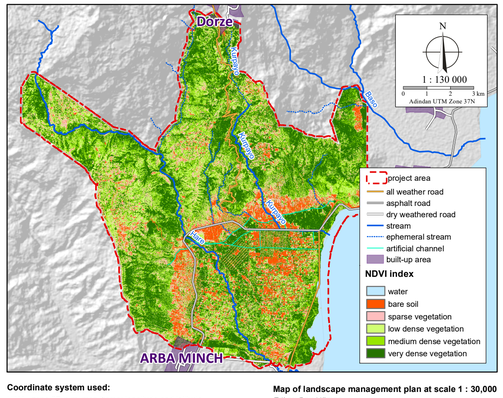
Land Cover in 2015 of the Project Area Based on Satellite Image WorldView-3



Land Cover Change in the Project Area between Years 1985 and 2015 with Quantification of Yearly Eroded Soil



Project Area with Depicted NDVI Vegetation Index (23. 2. 2016)



LEGEND:

- watercourse - ephemeral
- watercourse - pernament
- trigonometric point
- contour - interval 50 meters
- road - asphalt
- road - paved
- road - unpaved
- project area - across the river basins of Kurpayo, Baso and Hare
- rehabilitated exemplary area - with realized anti-erosion measures
- floodplain - risk of inundation and agradation of sediments
- gully - high risk of rapid water erosion, link for transferring runoff and sediment from uplands to valley

RECOMMENDATIONS FOR SUSTAINABLE MEASURES OF THE LANDSCAPE MANAGEMENT:

- border of the specific area with recommendations for sustainable measures
- **A** technical antierosion measure [build trenches, eyebrow structures, pits, fast growing shrubs and trees]
- **C** cultivation, plantation [suitable for larger scale fields and orchards, plant a fruit bushes between fields]
- **E** enclosured area [do not interfere, retain the natural development]
- **F** fruit trees, bananas [plant a mixture of a fruit species, keep soil covered by grass, trap the rainwater]
- **I** insulated area [close the area for animals, prohibit the entrance for inhabitants, guarding and fencing]
- **M** multifunctional perennial cropping [fruit bushes, plants under the fruit trees, small fields, beekeeping]
- **P** controlled pasture [periodically change the areas of pasturing, build fences, zoning the area]
- **R** reforestry [plant local tree species pre-cultivated in nursery, avoid logging trees and pasture]

CATEGORY OF ECOSYSTEM STABILITY AND EROSION VULNERABILITY:

Water
- water

Forests
- original dense forest
- original sparse forest
- renewed dense forest
- renewed sparse forest

Shrubs
- original dense shrub
- original sparse shrub
- new emerging shrub

Settlements
- household

Pastures
- original pasture since 1985
- new emerging pasture

Dominant multifunctional trees
mainly Moringa and Mango tree
- original since 1985
- new emerging tree

Cultivated land

original cultivated land since 1985	newly cultivated land since 1985
low risk, high erosion tolerance	low risk, high erosion tolerance
low risk, low erosion tolerance	low risk, low erosion tolerance
small risk high erosion tolerance	small risk high erosion tolerance
small risk, low erosion tolerance	small risk, low erosion tolerance
medium risk, high erosion tolerance	medium risk, high erosion tolerance
medium risk, low erosion tolerance	medium risk, low erosion tolerance
high risk, low erosion tolerance	high risk, low erosion tolerance
high risk, high erosion tolerance	high risk, high erosion tolerance
extreme risk, high erosion tolerance	extreme risk, high erosion tolerance
extreme risk, low erosion tolerance	extreme risk, low erosion tolerance

Background raster represents a synthetic layer composed of different land use categories with combination of its erosion vulnerability and ecosystem stability. Size of each pixel is 5 m.

Source of used pictures of the recommended measures:
http://earthworksfarmgarden.org/; http://www.ecologiadesign.com; http://teca.fao.org/

Coordinate system used:

UTM - zone 37 in m, map frame: longitude and latitude
Projection: Transverse Mercator
Ellipsoid, Datum: Clarke 1880, Adindan
Topography derived from Ethiopia 1 : 50,000 scale maps
Ministry of Land Reform and Administration
(Survey and Mapping Department)

Other used map sources:

- Geoscience maps of Ethiopia at scale 1 : 50,000, ČGS, EGS, 2017: Geohazards, Hydrogiological map, Geological map, Pedological map
- Digital Globe / WordView-3 MS scene from 23. 2. 2016 (ORS2a)
- LANDSAT(5, 7, 8) MS images from USGS (NASA), from 1985 to 2015
- Aster Digital Elevation Model Aster GDEM V2 from METI and NASA
- climatological data from Ethiopian Bureau of Agriculture 1960 - 2015
- topographic map of Ethiopia 1 : 50 000, sheet 0637-D3 Arba Minch

Map of landscape management plan at scale 1 : 30,000
Editor: Petr Němec
Collaborators: Shiferaw Alem, Jan Bartoň, Lenka Ehrenbergerová
Jiří Hladík, Cristina Medina Solano, Firew Tadesse
Digital cartography: Jan Oprchal

CZECH REPUBLIC DEVELOPMENT COOPERATION
GEOtest
Mendel University in Brno