Potentials and Limitations for Improved Natural Resource Management in Mountain Communities in the Rustaq District (Rustaq NRM Study)

Final Report

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List of Abbreviations

ADB	Asian Development Bank
AE	Agro-ecological (component)
AREU	Afghanistan Research and Evaluation Unit
CDC	Community Development Council
CDE	University of Bern, Centre for Development and Environment
CFSR	Climate Forecast System Reanalysis
CN	Curve Number
CWS	Chokar watershed
DEM	Dasht-e-Mirzayi
DoC	Director of Cooperation
FGD	Focus group discussion
GIAA	Green Initiative for Afghanistan's Agriculture
GIS	Geographic Information System
HAFL	Bern University of Applied Sciences, School of Agricultural, Forest and Food Sciences
JWK	Jawaz Khana
LBRC	Labour-based Road Construction Project
LGP	Length of growing period

LIPT	Livelihood Improvement Project Takhar
LUP	Land user protocol
M+E	Monitoring and Evaluation
NGO	Non-governmental organization
NRM	Natural resource management
NRMC	Natural Resource Management Committee
NSP	Afghan National Solidarity Programme
OM	Outcome mapping
OSAVI	Optimized Soil-Adjusted Vegetation Index
QGIS	Quantum GIS open source software
SCS-CN	Soil Conservation Service curve number
SCO	Swiss Cooperation Office
SDC	Swiss Agency for Development and Cooperation
SE	Socio-economic (component)
SEJ	Sar-e-Joy
SLM	Sustainable land management
Tdh	Terre des Hommes Foundation
WFGD	Women focus-group discussion
WOCAT	World Overview of Conservation Approaches and Technologies
WSA	Watershed Association
WV	World View satellite imagery

Glossary

This brief glossary contains Dari terms that are most frequently used in this report. Additional terms can be found in the LIPT III Glossary in the Digital Annex 1.

Abi	Irrigated land
Arbab	Village head
Arbaki	Armed local militia
Hayoti	Traditional fenced plot for wheat cultivation
Jerib	0.2 ha; 5 jerib = 1 ha
Kunda	Clan, lineage
Lalmi	Rainfed land
Mirob	Community worker in charge of water
Muzdur	Daily labour, also used for seasonal labour
Qarluq	Distinct ethnic group, Uzbek speaking
Shura	Traditional council, at times also CDC

Executive Summary

In a context of fragility and poverty in the mountainous North of Afghanistan questions to do with food security and making ends meet figure prominently from a local perspective. While crop farming and livestock keeping form a mainstay of livelihoods of many people in the Chokar watershed, the resource base is threatened by substantial land degradation and erosion processes that result in the loss of valuable soils and the depletion of the nutrients base. Since 2011, Terre des hommes (Tdh) is implementing an SDC project in this area focusing its activities in natural resource management (NRM) on introducing sustainable land management (SLM) practices.

The overall goal of the Rustaq NRM Study is to inform future context-sensitive natural resource management strategies that contribute to more sustainable livelihoods in Rustaq district and other mountainous regions of Central Asia. Three research components address the topic from their respective angle: (1) the agro-ecological component aims for a better understanding of potentials and limitations for improved NRM based on the participatory assessment of implemented SLM technologies in focus-group discussions, as well as the assessment of the land resources potential by means of scenario modelling; (2) the socio-economic component focuses on local people's livelihoods, their experiences with innovations in agriculture and land management, and the village context using a mixed-methods approach with a quantitative household survey, key informant interviews and focus group discussions; (3) and the interface component aims to benefit stakeholders active in the development and implementation of NRM interventions by means of trainings, feedback and learning sessions and bilateral meetings and restitution events.

SLM has the potential to reduce erosive processes and to increase the productivity of land on a longer term, as shown in the scenario modelling and reflected in local people's observations and expectations. It however requires substantial investments in terms of money, land, labour and process facilitation. Some SLM practices such as terraces and orchards seem to be attractive for local people having the means to implement them. For several of the SLM practices, however, it is questionable whether local people will be able and/or ready to mobilize the necessary resources. Many households lack the financial and physical capital (e.g. landless households) or seem to assign priorities differently: other agricultural practices and livelihood activities as well as health issues, debts and family duties absorb money, land, labour and attention. It is such everyday trade-offs - which are most pronounced among the very poor people - that constitute the major hindering factors in the implementation of SLM practices on people's own initiative. This is important to keep in mind especially when striving for pro-poor project interventions.

Research results further show that external support for individual households in the form of money or inputs can have positive effects but at the same time bears the risk of favouring some over the many, the risk of unjust benefit sharing and more conflicts, and that not all SLM interventions are appreciated equally by everyone (e.g. trees planted on pasture land). SLM/NRM strategies should therefore be developed and implemented in a genuinely participatory manner taking into account the divergent interests of different groups within an intervention region. For this, continuity, patience as well as communication and facilitation rather than technical skills are key. External support may further be placed best focusing on common rather than private land, as such initiatives seem to lack catalysts yet have the potential to benefit the village more inclusively. This holds true not only in ecological and economic but also in social and institutional terms. Pastures constitute a backbone of many households' livelihoods, are at the roots of some of the more prominent conflicts in the villages – and at the same time have the potential to substantially reduce the risk of natural disasters. Using participatory approaches in the management of common pool resources as a peace-building strategy at the very local level is all the more important and promising in a fragile context such as Afghanistan.

Key words: sustainable land management practices, adoption of innovation, livelihoods, rain-fed agriculture, pastures, fragile context, natural resource management, rural development, research for development, Afghanistan.

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1 Introduction

This chapter outlines the broader context (1.1), the overall goal and components (1.2), the project embedment (1.3), the timeframe (1.4) and the final report structure (1.5) of the Rustaq NRM Study.

1.1 Context

The year 2015 was hailed as the beginning of the 'decade of transformation' – and with it the dawn of a new era of reforms to revitalize Afghanistan's economy. In terms of growth, agriculture as an economic key sector was expected to be among the significant forces driving change, and highly relevant to poverty reduction and job creation (World Bank 2014; 2016). The reinvigorated thrust to push agriculture to new limits places strong emphasis on production and productivity, expansion as well as intensification and extensification. This may be positive and worthy in its own right – if working – in terms of local livelihoods and economic development, coupled with attempted social cohesion and stability. However, looking at the overall developments with security deteriorating, the two years since were unable to confirm the vague sense of hope there was with some observers in the government and the international community alike. Rather, the idea of agriculture driving Afghanistan's economic transformation is questionable, as Adam Pain (2015) highlights. Pro-growth policies are not attentive to distributional outcomes and the heavy focus on market-led growth in reconstruction policy may be misled, especially if weighted against issues of food security and (largely missing) state interventions in Afghan agriculture (Pain 2015; Pain and Kantor 2012). In fact, "[…] in spite of a persistent policy narrative that agriculture would be the engine of transformation for Afghanistan, many people in rural areas are trapped in a failing rural economy" (Pain et al 2017:1).

Even if this reinvigorated focus on agriculture never reaches the local level or only partly works as a driver for growth, there is little doubt that issues to do with sustainability and the environment, with (more) sustainable agriculture and the management of natural resources become more urgent in the years to come. This includes vulnerability to natural calamities; the exposure of soils to wind and rainwater erosion; the destruction of forests leading to erosion and desertification; overgrazing in rangelands; the conversion of rangeland into crop land; loss of biodiversity; mismanagement of natural resources – to name but the most prominent challenges (see FAO 2012).

At this point in time it seems unclear where things are heading, with a local reality that apparently does not match easily with policy papers. The Rustaq NRM study provides close-to-reality and detailed insights into this larger context. Thus, this research needs to be understood as an in-depth case study situated in today's Afghanistan where issues to do with sustainable land and natural resource management are becoming increasingly relevant.

1.2 Overall Goal and Components of the Rustaq NRM Study

The overall goal of the Rustaq NRM Study is to better understand the social-ecological systems and innovative sustainable land management (SLM) practices in Chokar watershed in order to inform future context-sensitive natural resource management (NRM) strategies that contribute to more sustainable livelihoods in Rustaq district and other mountainous regions of Central Asia.

The study activities were organized in three interlinked components which were under the lead of different principal investigators and institutions:

1. Agro-ecological component (Bettina Wolfgramm, CDE)
2. Socio-economic component (Dominic Blaettler, HAFL)
3. Interface component (Reto Zehnder, ee)

Specific objectives and research questions of the individual components are provided in the Methodology (Chapter 2) as well as in the Tabular Project Overview (Annex 1). The overall lead of project was with Bettina Wolfgramm during the first year of implementation and was then handed over to Dominic Blaettler until the end of the project.

An inter- and transdisciplinary approach was used. Participatory identification of knowledge gaps, conducting field research in close coordination and reviewing research results together aimed at a joint learning process. The study took a pro-poor, gender-sensitive approach.

1.3 Project Embedment

The Rustaq NRM Study is strongly interlinked with the SDC-funded Livelihood Improvement Project Takhar (LIPT) of the Swiss NGO Terre des hommes (Tdh). The presence of Tdh in Rustaq district, Takhar province, dates back to 1999 when it became involved in reconstruction work after the 1998 earthquake. From 2006 to 2011, Tdh focused on rural income generation, health and youth projects (LIPT I and LIPT II). For its third phase (2012-2017), LIPT is focusing on NRM and rural economic development, conducting numerous interventions in the field of SLM practices. In order to work with and through local partners in the villages, Tdh established a new institution on the village level, the so-called Natural Resource Management Committees (NRMCs), and on the watershed level, the so-called Watershed Associations (WSAs). Despite the extensive knowledge acquired during the years of project intervention in Rustaq it became apparent that a more in-depth understanding was necessary to move fully into the new thematic areas.

This is why Tdh and SDC indicated interest in a research project on NRM already in 2011. It was not until 2014 that the researchers developed a concept note for consultation and feedback which was then developed into the "Rustaq NRM Study". Research took place in the project area of LIPT in the Chokar watershed, Rustaq district, closely collaborating with the Tdh / LIPT staff and focusing its analysis on the SLM practices implemented in the frame of the 3rd phase of the LIPT project.

The Rustaq NRM Study is in line with SDC's current cooperation strategy for Afghanistan 2015-18 (SDC 2015). Under the title "Staying Engaged" this strategy highlights that in "[…] a fragile context such as Afghanistan, an in-depth knowledge and understanding of the context is especially crucial." SDC takes a long term approach to development, targeting "Sustainable management of assets such as land and water to reduce the exposure to natural hazards and improve the livelihood and opportunities of the Afghan women, men and children, particularly in rural areas." The Rustaq NRM Study contributes to this context-sensitive approach and reflects and informs SDC's understanding of interventions. Among the three thematic orientations of the SDC strategy, the study fits into the priority theme "Agriculture and Food Security". Regarding the domains of intervention, the study lies within Domain 2, namely "Sustainable and inclusive socio-economic development".

1.4 Timeframe

The contract for the Rustaq NRM study covered the period from 1 May 2015 until 30 June 2017. Table 1 summarizes the different research phases and most important activities and milestones.

Table 1: Overview of research phases, activities and milestones

Time	Phase	Activities and Milestones
May 2015	Inception	Inception meeting with Tdh in Berne (27.03.2015), MoU with Tdh Inception mission (04.-16.05.2015) Inception Report (30.06.2015)
Nov 2015	Contingency planning	Progress Reporting and Adapted Planning Rustaq NRM study (30.11.2015)
Autumn 2016	Preparatory work	Preparatory meeting with Tdh in Lausanne (20.06.2016) AE team meeting in Dushanbe (03.-07.10.2016) SE team meeting for Block A in Rustaq (19.-30.09.2016) SE team meeting for Block B in Kabul (12.-20.11.2016)
Autumn / Winter 2016	Data collection	AE field research (15.10.-03.11.2016) SE field research Block A (19.09.-21.10.2016) SE field research Block B (12.-19.11. and 05.-31.12.2016) Joint operational report to SDC (30.11.2016)
Spring 2017	Data analysis and integration	Steering committee meeting at SDC headquarters in Bern (02.03.2017) AE and SE integration workshops: 08./09.04., 09.05. and 12.06.2017
Jun 2017	Reporting incl. feedback rounds	Video conference with Tdh, LIPT III team Rustaq (20.06.2017) Draft final report (23.06.2017), feedback from SDC & Tdh (27.06.2017) Final report (30.06.2017)
Aug 2017	Dissemination of results	Planned dissemination event in Kabul (20.-26.08.2017) Planned restitution event Rustaq (28.-30.08.2017) Potentially presentations at various events in Switzerland

1.5 Report Structure

Instead of separating the individual research components it was decided to report the results in an integrated manner. Table 2 shows how the individual sections of the final report of the Rustaq NRM Study link to both the Annex (at the end of this report) as well as the Digital Annex.

Table 2: Report structure and corresponding annexes

Section	Annexes
1 Introduction	Tabular project overview (Annex 1) Factsheet Rustaq NRM Study (Annex 4) Glossary (Digital Annex 1)
2 Research Methodology	FGD guidelines, AE (Digital Annex 2) FGD plenary notes (Digital Annex 2) GIS protocol, AE (Digital Annex 2) Data collection for WOCAT, AE (Digital Annex 2) 3.1_Protocol Household Survey Block A (Digital Annex 3) 3.2_Questionnaire ENG (Digital Annex 3) 3.3_Questionnaire DARI (Digital Annex 3) 3.4_Protocol Block B (Digital Annex 3)
3 Chokar Watershed – Agro-ecological System Vulnerability	GIS database Land Use Types in Chokar watershed (Annex 2)
4 Chokar Watershed – Three Village Profiles	
5 Assessment of SLM Practices from Different Perspectives	Legend SLM Table (Annex 6) WOCAT Factsheets (Annex 7) Assessment SLM Practices by Survey Respondents (Annex 8)
6 Outlook using Scenario Modelling	
7 Discussion	
8 Conclusion	
9 Recommendations	Interface with Development Interventions (Annex 3) Draft Concept Strategy Game (Annex 5)
. 10 References	

2 Research Methodology

This chapter provides an overview of the research methodology used in the Rustaq NRM Study. It is organised along seven subchapters, namely general remarks focusing on the commonalities in research methodology between the study's components (2.1), the study area (2.2), a subchapter each on the methodology of the agro-ecological (2.3), the socio-economic (2.4) and the interface component (2.5) and a reflection on the limitations and challenges of the research (2.6).

2.1 Commonalities in Research Methodology

The three components of the Rustaq NRM Study are different in their specific research approach, their methods and outlook, and were organised under separate contracts and implemented by separate teams. The AE component focused on SLM practices as case studies and combining them with spatial data for parametrizing existing methods for runoff modelling. The SE component followed an empirical research approach. Yet at the same time a great effort went into collaborating across components in research preparation, field work and data analysis – aimed at generating complementary perspectives in order to integrate research results into one single report. Some of the key elements common to both the AE and the SE components are the following:

- The entire field research was conducted in three jointly selected villages of the Chokar watershed (see subchapter 2.2).
- The NRMCs constituted an important entry point for both teams for working in the three villages.
- The wealth ranking established by the SE component was also used to characterize the participants of the FGDs in the AE component.
- The list of SLM practices implemented in the three villages within LIPT, as prepared by the LIPT land management experts (see Table 3), was used by both the AE and SE component.
- Both components took an interest in women in agriculture in general (see Grace 2004, 2005) and in women in NRM in particular (see UNEP 2009b).
- Strong emphasis was placed on integrating the different data sets both for AE and SE. Clearly, the data collected regarding the individual SLM practices constitutes the most important commonality of the two components. The joint Table 4: Assessment of SLM practices from different perspectives (Chapter 5) is a concrete result of this integration process.

Table 3: SLM practices considered in the research

Land use types	Short form	SLM practices implemented by LIPT
Cropland	Terraces (Terracing) Hedgerows Ferula cultivation Gully treatment	Terraces with improved seed and fertilizer application Contour lines of alfalfa on annual cropland (Hedgerows) Ferula cultivation on degraded slopes Gully treatment (mainly on cropland but also on grazing and mixed land)
Mixed land (Orchards/Forest)	Orchards – Vineyards Nursery Afforestation	Establishment of improved orchards and vineyards Nursery for the production of fruit and non-fruit saplings Afforestation for firewood production
Grazing land	Pasture rehabilitation Grazing plan Fodder bank Livestock shed	Rehabilitation of degraded pastures with alfalfa Rotational grazing plan implemented on improved pastures Community fodder bank Livestock shed

2.2 Study Area

The study area of the Rustaq NRM Study is located in Rustaq district, Takhar province, of Northern Afghanistan. The Southern and Eastern part of Rustaq district are limited by the Kokcha river, a tributary to the Amu Daria. A number of tributaries flow towards the Kokcha river. In 2012, Tdh's LIPT project chose two of these watersheds, namely Chokar and Nooristan, to implement their SLM component. Together, these two watersheds cover an approximate area of 270 km^2. Except for three villages in the Nooristan watershed the area is inhabited by Qarluq people (see box below). The overall population of the two watersheds is estimated at 27'000. The Northern border of the watersheds is close to Rustaq (10-15 km) and relatively easy to access, while the villages along the Kokcha river are further away from Rustaq (30-40 km). Road conditions are difficult and villages may not be reached by car in winter or after heavy rains.

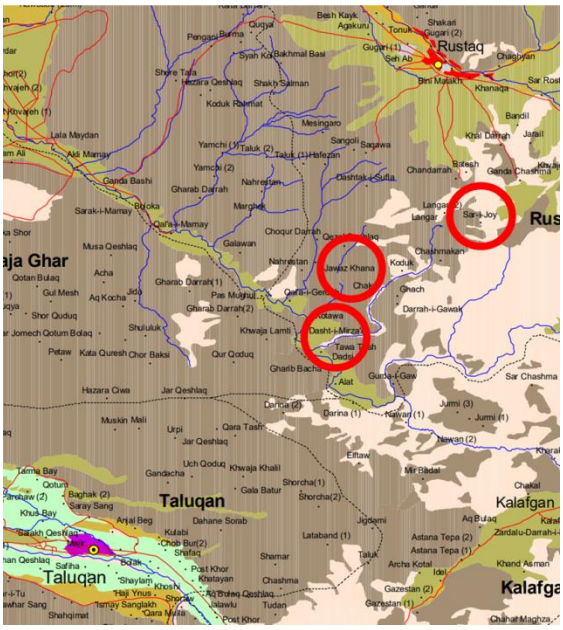


Figure 1: Map of study area (AIMS 2002)

In-depth research was done in three villages of Chokar watershed (CWS), namely Sar-e-Joy, Jawaz Khana and Dasht-e-Mirzayi (see Figure 1). These villages represent the upper, the middle and the lower zone of the watershed.

Figure 2 and Figure 3 provide insights on the topographic characteristics of the Chokar watershed.

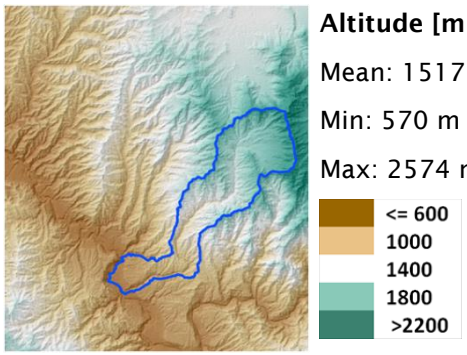


Figure 2: Altitudes in Chokar watershed

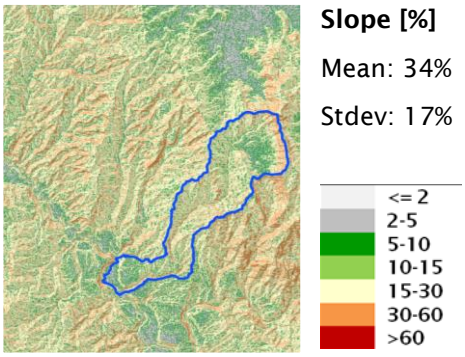


Figure 3: Slopes in Chokar watershed

The ***Qarluks*** are considered a branch of the Turgesh or aboriginal Altaians. The first Chinese reference to the Qarluks dates from 644 AD. The Qarluks were hunters, nomadic herdsmen and agriculturalists. Over time several Qarluq 'states' played an essential role in in the area between Samarkand, the Altai, Mongolia and Western China. The first mention on Qarluks (Karlogh Turks) in Rustaq is found in *A Journey to the Source of the River Oxus* by captain John Wood in 1836/38. Later the Afghanistan Gazetter describes the Qarluks as "a very industrious race, they rear flocks and cattle, cultivate land and are great traders." In 1872 a British envoy described the Qarluks as "a very turbulent race who acknowledge allegiance to no one. The people of Roostakh and Kurloogh are constantly plundering each other" (Grötzbach 1972).

No specific research has been undertaken in the Rustaq area, the rare information is found in publications referring to the much larger group of the Chechka-Uzbeks and their tribal confederation the Qataghan-Uzbeks. The Chechka-Uzbeks settled in the fertile lands along the Amu Daria river in the early 16th century but were driven away due to large numbers of Pashtuns transferred North of the Hindukush, primarily in two waves (1888, 1930s). They moved to an area including Rustaq district which was already populated by pre-Uzbek Turkic tribes such as the Qarluqs. The Qarluks have been driven off by Qataqhan-Uzbeks to the hilly and less fertile land North of Kokcha river. They settled down in former *ailoqs* (summer camps) and started to convert pasture land into cropland.

A major population increase happened since mid 20st century. Comparing households mentioned by Koshkaki (1922) with recent data we find the following increase: Sar-e-Joy 34 – 206; Jawaz Khana 32 – 149 and Dasht-e-Mirzayi 70 - 139.

2.3 Methodology Agro-ecological Component

This subchapter provides an overview of the research methodology used in the agro-ecological (AE) component. It consists of a section with general remarks, including the objective, and a section each on the different concepts and methodologies applied. All relevant materials about the AE methodology can be found in the Digital Annex 2.

2.3.1 General Remarks

The **aim of the AE component** is to better understand potentials and limitations for improved NRM in CWS based on the participatory assessment of SLM technologies implemented, families' agricultural strategies with regard to land management costs and benefits, and the land resources potential in CWS.

A mix of methods used in SLM evaluation and planning was applied. The SLM practices implemented by LIPT were documented as case studies, which serve when parametrizing scenario models.

The AE research team consisted of Bettina Wolfgramm (lead AE component); Roziya Kirgizbekova (senior research counterpart in 2016/17); Mr. Mia Jan Maroofi and Mr. Hekmatullah Sharifzai of the LIPT team providing support during the FGDs, Farrukh Nazarmavloev (Tajik senior research counterpart in 2015/16) Mirzokurbon Pochoev (Tajik FGD moderator), Aslam Qadamov (Tajik GIS specialist), Sebastian Ruppen (former MSc student at CDE) and Sandra Eckert (CDE geoprocessing senior scientist), Elias Hodel (junior CDE geoprocessing scientist) and colleagues from the WOCAT secretariat hosted at CDE.

2.3.2 Focus Group Discussions (FGDs)

The purpose of the FGDs was to discuss to evaluate the costs and benefits of SLM practices together with land users. In each village, first a FGD with the NRMC was conducted, covering all land use types and SLM practices (number of participants SEJ=11, JWK=11, and DEM=11). This was followed by 3 FGDs with male SLM implementers for each land use type; cropland (SEJ=16, JWK=16, and DEM=16), grazing land (SEJ=12, JWK=10, and DEM=5) and mixed lands (forest/orchard) (SEJ=14, JWK=10, and DEM=9). Additionally a Women's FGD (WFGD) mainly with the women of SLM implementing households was conducted (number of participants SEJ=29, JWK=19, DEM=24). Different datasets resulted from these FGDs: (a) 107 land users protocols (LUP), one of each male participant; (b) 18 multi criteria matrices rating SLM practices from different land use types against each other for specified criteria; (c) 3 village maps indicating the SLM plots of FGD participants, as well as land use and soil types; (d) notes of the plenary discussion held during each of the 15 FGDs conducted (no digital recording took place). The design of the FGDs is based on the "Learning for Sustainability" approach (Gabathuler et al. 2011; Schwilch et al. 2012). The guidelines for FGD moderators for the three types of FGDs are attached in the Digital Annex 2.

Two LIPT staff was trained by the AE component to moderate FGDs. The two male experts were familiarized with the WOCAT methodology and involved in the elaboration of the FGD guidelines. While the first FGDs were moderated by a very experienced Tajik moderator of the AE team, the LIPT experts were present, did support, and partly moderated the 12 FGDs conducted with male participants. The FGDs conducted with women of SLM implementing households were moderated by a Tajik femaile researcher, and translated into Uzbek by a female staff from the LIPT. The presence of LIPT staff was highly valuable for their knowledge of study villages, SLM implementers and LIPT SLM implementation. However, LIPT involvement precluded rising of critical issues concerning the SLM practices during FGDs.

2.3.3 Geoprocessing (geographic information system and remote sensing)

World View 2 (WV2) high resolution satellite imagery, with a spatial resolution of 0.46x0.46 m recorded on 15 June 2015, served as the baseline for digitizing land use types. During the FGDs a basic participatory land resources assessment was conducted. This included confirming the extent of land use types, indicating local soil categories and SLM plots of FGD participants. A GIS protocol was elaborated for guiding (GIS inexperienced) persons interested in viewing or adapting spatial data prepared for this study using the QGIS open source software (Digital Annex 2).

Topographic statistical data was derived from openly accessible Aster digital elevation model (DEM), with a resolution of 30x30m (ASTGTM). Vegetation cover data was derived from the WV2 and Landsat imagery by calculating the Optimized Soil-Adjusted Vegetation Index (OSAVI). For a historical

comparison of tree cover, cropland and settlement extent a Corona image recorded on 30 May 1970 and the WV2 imagery were visually compared.

2.3.4 WOCAT Standardized Documentation in Online Database

WOCAT standard questionnaires on SLM technologies were used to document LIPT SLM practices implemented in the three study villages in Chokar watershed. Data collected during the FGDs, geoprocessing data, LIPT reports and information from LIPT staff were compiled by the AE team. The documentations were reviewed and complemented by Reto Zehnder and the SE component.

One SLM practice of each land use type was fully documented using the standardized WOCAT Technology Questionnaires, and are available as Digital Annex 2 and online in the WOCAT database:

- Cropland: Terraces with improved seed and fertilizer application
- Grazing land: Rehabilitation of degraded pasture with alfalfa
- Mixed land: Establishment of improved orchards and vineyards

2.3.5 Scenario Modelling: Runoff Scenarios Using the SCS-Curve-Number-Model

The Soil Conservation Service curve number (SCS-CN) method for runoff estimation was applied to Chokar watershed. Runoff is a proxy indicator for all water related processes, such as water retention in the soil, soil erosion processes, which itself affects soil nutrient loss. In turn these processes impact on crop production. Runoff during storm rainfall events links to disaster risk of flash floods. The 4 variables influencing runoff and taken into account by the SCS-CN model are (1) rainfall, (2) soil condition, (3) slope steepness, and (4) land management in the study watershed as represented by land management types with known runoff characteristics, in the form of Curve Numbers (CN). Higher CN correspond to higher runoff. Runoff contribution from steep slopes is higher than from moderate (or flat) slopes.

The model input data was derived as follows: **(1) Precipitation**: In the absence of weather stations, climate data available from "Climate Forecast System Reanalysis (CFSR)" were used. This global dataset is based on weather prediction models, which were verified and improved using actual measurements from weather stations. The spatial resolution is 10km x 10km and the temporal resolution provided is daily weather data for the years 1979 to 2013. Seasonal rainfall distribution and types of erosive rainfall events were analysed. To distinguish precipitation in the form of snow and rainfall, temperature data from the same dataset were analysed. Only rainfall was analysed for this study, runoff and erosivity of snow melt was not considered. **(2) Soil condition**: The loess soils in the study area are best represented by the hydrological soil group "B, silt loam or loam" as defined by the SCS-CN. **(3) Slope steepness**: Average slope steepness for the different land use types was extracted using the GIS. For cropland a mean slope steepness of 26% with a standard deviation of 13% was calculated, for grazing land the mean slope steepness is 29% and the standard deviation 16%. For an overview see table 6-1. **(4) Land management**: The area digitized in the vicinity of the study villages covers 40% of the total area of Chokar watershed. While the villages have access to pasture areas outside of Chokar watershed, these areas were not included in the mapping, as they are not relevant for the runoff modelling. Land use categories based on the WOCAT land use types (WOCAT section 3.2) were applied. Nine land use types were distinguished: cropland, grazing land, mixed lands (orchards/forest intercropped with fodder crops), settlement, unproductive land, waterways, wood lots. Illustrations on these land use types are provided in Annex 2.

Limitations: The model is considering only uniform slopes and no spatial variability of runoff (e.g. channelled by roads, gullies, or absorbed in depressions). Thus, the modelling results cannot be interpreted with regard to actual flood risk. A general discussion on limitations of the SCS-CN method can be found in Bartlett et al. (2016). Furthermore, no local measurements are available of precipitation data or river flow measurements to calibrate actual runoff amounts. Thus, it should be stressed that absolute values presented in this study are mere estimations of runoff and that all conclusions drawn from scenario modelling arise from relative comparisons.

2.4 Methodology Socio-economic Component

This subchapter provides an overview of the research methodology used in the socio-economic (SE) component. It consists of a section with general remarks, including the objective, a section each on the two field research periods - one more quantitative (Block A) and one more qualitative (Block B) in nature - and a section on the Qarluq study. All relevant materials about the SE methodology can be found in the Digital Annex 3.

2.4.1 General Remarks

The **aim of the SE component** is to better understand potentials and limitations for improved natural resource management in the Chokar watershed (CWS) based on the analysis of local people's livelihoods, their experience with innovations in agriculture and SLM as well as the context they are embedded in. This was split up into **three subordinate objectives**:

1. Local people's livelihoods and the relative importance of land in CWS are better understood.
2. People's experiences with innovations in agriculture and land management in CWS are better understood.
3. The context (structures and processes) at village level in CWS and beyond is better understood regarding local people's livelihoods and NRM.

For the detailed research questions see Tabular Project Overview in Annex 1.

Conceptually, the socio-economic component is based on the Sustainable Livelihood Framework (DFID 1999), innovation and diffusion theories and concepts (e.g. Rogers 2003), and the village characterisation research of the Afghanistan Research and Evaluation Unit (e.g. Pain and Kantor 2010; AREU 2014; Pain and Sturge 2015; Pain 2016).

The research methodology used a mixed-methods approach which included a literature review on the relevant topics, a quantitative household survey, key informant interviews as well as focus group discussions. Field research for the socio-economic component was split into two blocks, namely Block A and Block B. Both blocks in the field were under the lead of Aqila Haidery, closely followed-up by Dominic Blaettler either in the field or by skype sessions on a daily basis.

The socio-economic component placed strong emphasis on team training in order to ensure the quality of data collection also under demanding circumstances. Thus, training for the field team was relevant on the one hand to better understand the research design, the questionnaire, different question formats, interview guides and the cornerstones of an interview more generally. Training, on the other hand, was especially important also in order to arrive at a shared understanding of the study's key terms and concepts. While this seems self-evident, it is not: often different people understand things differently. This is why the team spent several days discussing and sharing ideas and understandings of used concepts and terms. Team days throughout field research were used to consolidate knowledge and foster open exchange and mutual learning. The interviewers of the field team were mostly Uzbek native speakers, which is especially important in women interviews, in order to ensure the quality of data collection. The field team followed a Checklist and signed a Code of Conduct (both in Digital Annex 3).

The SE research team consisted of Dominic Blaettler (lead SE component); Aqila Haidary (national senior research counterpart); Mrs Parween, Mrs Rahmina, Mr Munir, and Mr Rahmani (local interviewers from Rustaq town); Mr Mirwais, Mr Shoaibullah (two data entry persons from Rustaq town); Mr Rajab, Mr Saidi and Mr Rahimi (text translators from Kabul); Tiphaine Leuzinger and Ata Davatgar (MSc students at HAFL); and Pia Fehle (research assistant at HAFL).

2.4.2 Field Research Block A

Block A focused on the perspective of individual women and men farmers in the three study villages, mainly concentrating on subordinate objectives 1 and 2. Data was collected by means of a quantitative household survey. The sampling used was a purposeful random sampling with a pro-poor and pro-scale approach (basically an over-representation of poor households), based on wealth ranking. The wealth ranking was done in all the three study villages during Block A, verified during Block B.

The questionnaire was a total of 16 pages in length and was pre-tested in another village of the same watershed. The final questionnaire consisted of seven sections, namely introduction, livelihood outcomes and strategies, livelihood activities, agricultural assets (land and livestock), changes in

agricultural practices and land (management), experience with specific SLM interventions, and demographic details (for the questionnaire in Dari and English, see Digital Annex 3).

The interview started with a series of open-ended questions aiming to capture short stories on people's livelihood outcomes and strategies. It meant looking back some years, looking ahead some years, and gaining a better understanding of how people intend to get there (strategy) by considering hindering and conducive factors. This worked well also thanks to the special effort and care on part of the field team. By this way, the team recorded 121 individual short stories of life, glimpses on people's needs, ambitions and preferences. Stories can be a powerful means to deepen our understanding, often implicitly, of complex issues, situations and contexts.

Block A took place from 19 September to 21 October 2016 including on-site preparation and training for 2 weeks and data collection accomplished in 5 days in each village, plus an additional team day for capitalization and learning. Each interviewer conducted two face-to-face interviews per day each of which lasted two hours, and wrote, in addition, a one-page observation report for each interview. The data entry person entered the data in excel and scanned the questionnaires (now fully available as a digital database). 40 interviews per village (20 men and 20 women) were carried out (plus one), thus a total of 121 interviews overall. The 5 weeks of field research were followed by 3 weeks of data entry, translation and data cleaning and producing both a graph book (in SPSS) and a text book (in excel). A preliminary data analysis in mid-November using SPSS prepared the follow-up for Block B. For more details on the methodology of Block A, see the 14-page Research Protocol in Digital Annex 3.

2.4.3 Field Research Block B

Block B focused on the perspective of individual women and men farmers as well as groups in the three study villages, on following-up information from Block A on subcomponents 1 and 2 and on exploring in-depth subcomponent 3. Thus, Block B consisted of a qualitative follow-up and the analysis of the village context along a modified form of AREU's (2014) 'village context' methodology (yet based on unpublished templates generously provided by Adam Pain) to make it suit the local realities in the study area. This involved expert interviews, key informant interviews and focus group discussions (FGDs). For Block B, a Protocol was used which allowed to produce interview guides from a list of 130 questions, as the base source, by matching questions with respondent groups centring around an 'operationalisation sheet' (see Protocol Block B, Digital Annex 3). The respondent groups for key informant interviews were predefined and the same for the three villages: head CDC, individual village elders, individual women and men, yet also the research team of Block A and LIPT staff. The respondent groups for focus group discussions were: CDC members, village elders, elderly women, young women, elderly men, young men, yet also the research team of Block A and LIPT staff.

Block B took place from 12 to 19 November and from 5 to 31 December 2016. This included the on-site preparation and training for 1 week, and data collection accomplished in 5 days per village, plus an additional team day for capitalization and learning. Each interviewer conducted two to three face-to-face interviews/FGDs per day each of which lasted around two hours. The interview notes were scanned and translated into English (now fully available as a digital database). In total, 24 key informant interviews and 26 FGDs were carried out. The 5 weeks of field research were followed by several weeks of translation.

2.4.4 Qarluq study

Field work: The relatively short time spend on Qarluq history, tribal structure, inter-ethnic relationships and specific Qarluq customs (marriage, heritage, etc), only allowed for a rudimentary analysis.

Visited resource persons:

- Mrs. Gabriele Rasuly-Paleczek. Associate Professor and Senior Lecturer at the Institute for Social and Cultural Anthropology of the University of Vienna.
- Centlivres Pierre et Micheline. Pierre Centlivres, former director (1974 – 1998) of Institut d'ethnologie de l'Université de Neuchâtel and founder of «Centre de recherches ethnologiques ». Together with Micheline Centlivres-Demont they did field work and research in northern Afghanistan, incl. Rustaq.
- Paul Bucherer. Founder and director of "Afghanistan Institut" and " Bibliotheca Afghanica" in Bubendorf (Switzerland).

Documentary research: see attached bibliography in Digital Annex 4.

2.4.5 Data Analysis

For the quantitative data analysis of Block A the statistical software SPSS as well as excel were used. For the qualitative data analysis in Block B yet also text data of Block A the software MaxQDA was used.

A word of warning: as the number of respondents (the 'N') of better-off households is small in all three villages, data interpretation of the better-off households needs to be handled with care. This is due to the purposeful pro-poor sampling.

The calculation of 'Livestock Units' uses standard conversion rates. Yet here it is not used in a comparative manner but as a proxy wealth indicator.

2.5 Methodology Interface Component

This subchapter provides an overview of the methodology used / activities conducted in the interface component. It consists of a section with general remarks, including the objective, a section each on the four subordinate objectives and a section on the interface within the research team itself.

2.5.1 General Remarks

The **aim of the interface component** of the Rustaq NRM Study is to benefit LIPT and other stakeholders active in the development and implementation of NRM interventions, thereby contributing to context-sensitive NRM strategies at different levels and locations. This objective is split up into **four subordinate objectives**, namely:

1. LIPT III staff benefits from the research activities in terms of research methodology.
2. Implications from the research contribute to the further development of LIPT interventions.
3. Research objectives, activities and results are discussed and evaluated jointly with multiple stakeholders.
4. Research results are communicated to the larger public by various means of dissemination.

The detailed expected results are outlined in Tabular Project Overview in Annex 1.

2.5.2 Interactions with LIPT III Staff

LIPT staff was involved in trainings of both the SE and the AE component. The SE team conducted a 3 days training at the Tdh office in Rustaq which was targeted towards the external interviewers but also benefitted Thd-internal staff. The focus of the training was on the elaboration of questionnaires and on conducting field interviews. The AE component provided "on-the-job" training for two LIPT staff before and during the AE field research. The focus was on conducting FGDs aiming at discussing the experiences and knowledge of implementing SLM practices. For further details see sections 2.3 and 2.4.

2.5.3 Contribution to Future LIPT Interventions

The Rustaq NRM study initiated at the beginning of LIPT III and inputs to the further development of LIPT interventions were thus foreseen. Meetings of the Rustaq NRM study steering committee were conducted with Tdh as the LIPT implementing organization and SDC as the funding agency during each research phase. Final results were shared and discussed with the LIPT staff via skype conference held in Dari on 20 June 2017. The draft version of the report was shared with Tdh management and feedback was received during a skype meeting in English on 27 June 2017. Recommendations for follow-up actions in the LIPT project area have been elaborated for this report (see Chapter 9).

2.5.4 Exchange with Multiple Stakeholders

Research results were shared and discussed with various stakeholders: Meetings were initiated and held regularly with SDC in Kabul, one for information exchange with SDC Dushanbe, at the Rustaq NRM study steering committee meeting at SDC in Berne, with the Tdh offices in Rustaq, Kabul, Dushanbe and Lausanne. Furthermore different research institutions were contacted and exchanges took place: key informant meetings were held with Prof Adam Pain (AREU, Swedish University of Agricultural Sciences in Uppsala); AREU in Kabul; eawag Dübendorf for biomass management; as well as regular exchange with the WOCAT team at CDE in Berne.

2.5.5 Dissemination of Results

An overview of the outputs available and of interest for different stakeholders is provided in the overview table "Interface with development interventions: Stakeholders and outputs" (Annex 3). Specifically, this includes the following documents:

- A **Factsheet** was produced in order to easily communicate the Rustaq NRM Study to stakeholders in Kabul and beyond (Annex 4).
- Documentation and evaluation on the implementation of three SLM practices is publically available through the **WOCAT online database**.
- A concept for a **SLM strategy game** was developed (Annex 5). The game aims at doing scenario development and assessment for land resource use improvements jointly with the different stakeholders (NGOs, local government) and communities. Existing strategy games and scientific literature was reviewed. The team made use of the long-term experiences in game development of other CDE researchers and the games that were developed for the Central Asia region. The concept for this game is tailored to the study region: data, information and knowledge from the two research components were used when designing the game. It is envisaged to play the strategy game with different stakeholder groups (NGO staff, men and women from the communities, possibly government officials) in the frame of awareness raising or planning workshops.
- A **Master's Thesis** by Tiphaine Leuzinger (HAFL) is currently being prepared under the title "Livelihoods and sustainable land management in a fragile context: case study, mountainous North of Afghanistan" and will be available in summer 2017.
- A **Term Paper** by Aqila Haidery (HAFL) is currently being prepared on the topic of "Customary and newly introduced Institutions in Chokar Watershed, Rustaq district, Afghanistan" and will be available in autumn 2017.
- A **dissemination event** is foreseen to take place under the lead of SDC in Kabul during the week of 20-26 August 2017.

2.5.6 Study-internal Interfaces

The interface between the different components of this study was at the core from the very beginning, but also proofed to be a considerable challenge. Besides regular skype meetings, very regular project internal meetings were conducted: between the inception report delivered in May 2015 an the project end June 2017 all in all 12 project internal half or full day meetings, as well as an integration weekend were jointly held.

The research report structure was designed to allow for integrating results at watershed and village level, as well as for each specific SLM practice. The two components produced datasets that are alone standing (e.g. spatial datasets), overlapping (questionnaires developed for different target groups), or complementary (questionnaires with SLM implementers and non-implementers). Ways were identified for how to integrate responses to open and closed questions in a joint rating system (e.g. table in Chapter 5). Results of both AE and SE research as well as insights provided from a LIPT perspective were integrated in three joint WOCAT documentations (see Annex 7).

2.6 Challenges and Limitations

Challenges and limitations were part of this study from the outset, some persisted throughout the project. Some of the most influential aspects are mentioned hereafter:

- Most notably, in given context, is the overarching **issue of security**. On the one hand, and based on security concerns, the timing of field research had to be pushed back by one year, to autumn 2016; no joint, simultaneous field work of the three research components was possible; the field work of the AE component was delayed to an extent where the team leader could no longer participate; and field work was delayed in December 2016 pushing SE field research into winter conditions. On the other hand, local staff faced additional risks through the presence of international researchers in the field for longer periods of time. In addition to the standard security screening this made backstopping and involvement in decision-making necessary of local staff in terms of their perception of the security situation.
- As mentioned above, the foundation of this research was laid in 2011 – much **time has passed** since. The long duration from first idea to project implementation meant that the study results were not available in the beginning of the phase and thus could no longer inform LIPT III. As SDC decided against a fourth phase, the aim of the research shifted from contributing to the planning of a next phase towards contributing to what comes next in terms of a new project to-be – and how the

research integrates with its wider evolving context, such as GIAA. The considerable time span also meant that **people in institutions changed** alongside priorities, needs and expectations.

- **SLM practices** assessed in the frame of the Rustaq NRM study were established only recently (1-4 years ago). In addition, SLM practices were externally supported with knowledge, training, tools, additional inputs and money. It is too early for a final judgment on the sustainability of these technologies within the human and natural environment of Chokar watershed.
- **Working closely with Tdh** was a great learning experience in many ways. Yet in terms of field research, the presence of LIPT staff influenced participants in agro-ecological FGDs with regard to raising critical issues concerning the SLM practices. Two men staff from LIPT were trained by the AE component to moderate focus group discussions (FGDs), and they were present, supported and partly moderated the 15 FGDs conducted with men participants in the three study villages. The AE FGDs conducted with women of SLM implementing households were moderated by a Tajik researcher, and translated into Uzbek by a woman staff from LIPT. Working in an Uzbek speaking part of Afghanistan language can become a challenge more generally, and so does **translation** – potentially with some information loss and room opening up for interpretation, also on part of a translator.
- There were quite a few **changes in team composition** both in the agro-ecological and the socio-economic components, and it took a considerable effort to find well qualified Afghan co-researchers and interviewers for this project.
- The research was **not put in place to monitor LIPT project implementation or progress**, and was never conceptualised as an evaluation – but as a learning for future NRM interventions. With a deliberate research focus on SLM practices implemented by LIPT and the passing of time more towards the end of phase, however, this boundary could easily be perceived ambiguous as several discussions showed. This was a challenge built in by time and focus, yet the research team emphasised the purpose of the research project time and again to forgo confusion.
- **Working together in a multi-disciplinary setting** is not always easy as different disciplines use different concepts, terminology and methods which might lead to misunderstandings. It can be a time- and energy intensive challenge yet also an inspirational and enriching experience.

3 Chokar Watershed – Agro-ecological System Vulnerability

Important aspects of agro-ecological system vulnerability have been identified following categories of the SLF (DFID 1999). The following figures and images highlight important aspects of agro-climatic seasonality, shocks and trends in Chokar watershed.

3.1 Chokar Watershed Agro-climatic Seasonality

Agro-climatic zone: The agro-climatic zone in the Chokar watershed is semi-arid, with a length of growing period (LGP) of 70-102 days per year (Fischer 2009 / IIASA-FAO). Calculations from the CFSR datasets show an average annual precipitation of 564 mm. The CFSR dataset shows an absolute maximum for annual rainfall for 1986, 1024 mm, and the absolute minimum for 2001, 269 mm. The data series covers the time from 1979 to 2013. The mean annual precipitation data corresponds with data provided by FEWS/USGS, which reports 530mm for all of Kokcha river basin. The amount of precipitation of Kokcha river basin is the highest for all river basins in Afghanistan (see https://earlywarning.usgs.gov/fews/product/114).

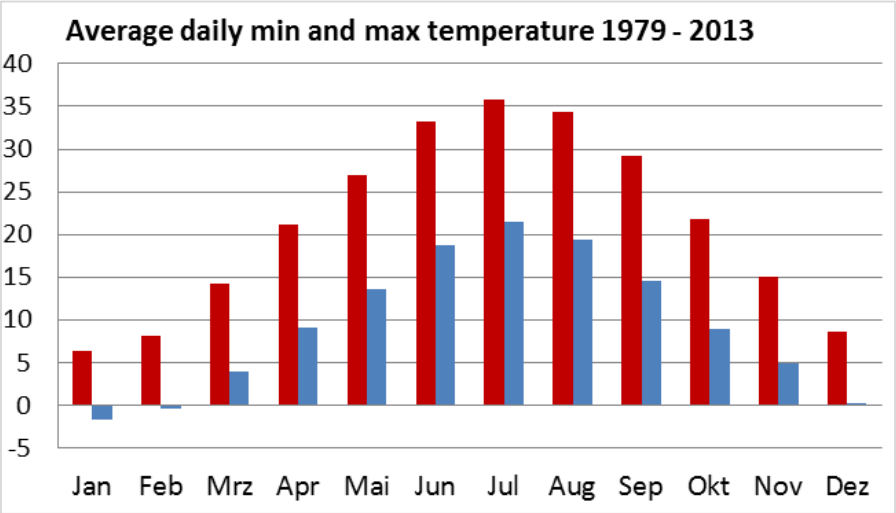


Figure 4: Average daily minimum and maximum temperature in Chokar watershed 1979-2013

Seasonal vegetation patterns: Representative Landsat satellite imagery from different years, visualizing vegetation cover for the months of March, April, May and September (Landsat: https://lta.cr.usgs.gov/L8)

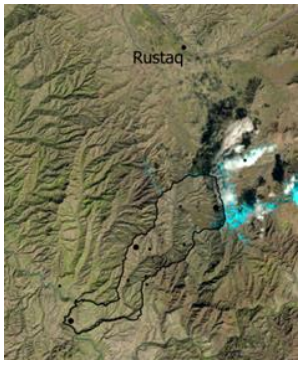
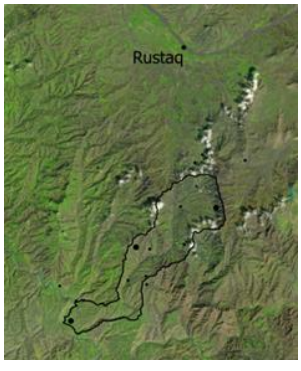
			
March (LC8 17.03.2017)	April (LC8 04.04.2016)	May (LC8 22.05.2016)	September (LC8 09.09.2015)
Green vegeration in the lower zone, low vegetation cover in the upper zone	Green vegetation cover across the watershed	Lower zone with dry vegetation. Upper zone with green vegetation.	Dry vegetation across the watershed, irrigated ares with green vegetation

Figure 5: Seasonal vegetation patterns in Chokar watershed

Seasonal precipitation patterns: In general, 57% of all precipitation events amount to >10 mm (see figure on the left). Of these around 8% are likely in the form of snow. Around 50% of the precipitation events are rainfall and are considered erosive rainfall events. Pre-vegetation and spring period each contribute around 30%, and together make up for 60% of the annual precipitation. Of these rains two-thirds are erosive. The analysis of frequency of erosive rainfall events shows that these are taking place mainly in the pre-vegetation and spring season, at similar frequency. Storm rainfalls of > 30mm are predicted to take place once per year, mostly in the spring season.

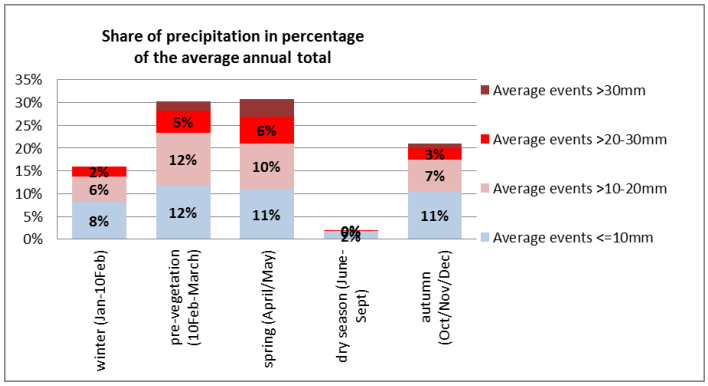


Figure 6: Share of precipitation in percentage of the average annual total in Chokar watershed

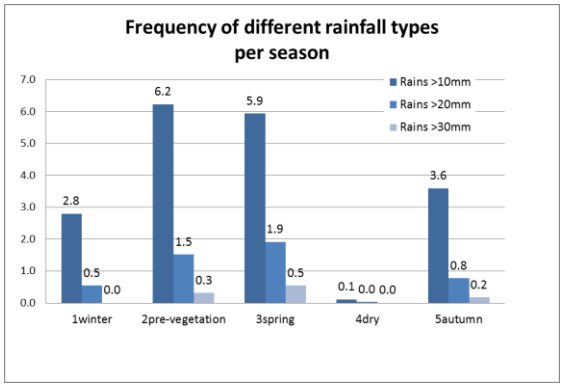


Figure 7: Frequency of different rainfall types per season in Chokar watershed

Winter (Jan-10Feb): precipitation is likely in the form of snow as we can conclude from the temperature curves available.

Pre-vegetation (10Feb-March): precipitation in the form of rain, adding up to 30% of the annual precipitation.

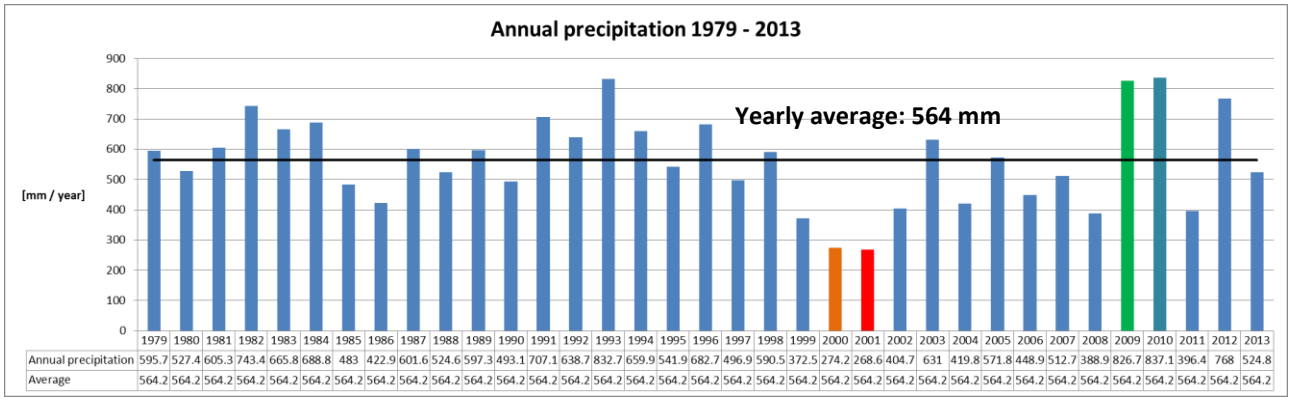
Spring (April/May): precipitation in the form of rain, adding up to 30% of the annual precipitation

Dry season (June-Sept): rainfall events are very scarce and contribute around 2% of the annual amount of precipitation, mostlynon-erosive rains.

Autumn (Oct/Nov/Dec): contribute around 20% to the annual rainfall, around half of these are erosive rainfall events.

3.2 Agro-climatic Shocks

Dry spells and heavy rainstorms are the most prevalent climatic shocks. The graph below shows the annual precipitation for the years 1979-2013. The extremly dry years (2001/2010) and the extremly wet years (2009/2010) are highlighted, and yearly average for the same period indicated.



	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Annual precipitation	595.7	527.4	605.3	743.4	665.8	688.8	483	422.9	601.6	524.6	597.3	493.1	707.1	638.7	832.7	659.9	541.9	682.7	496.9	590.5	372.5	274.2	268.6	404.7	631	419.8	571.8	448.9	512.7	388.9	826.7	837.1	396.4	768	524.8
Average	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2	564.2

Figure 8: Annual precipitation 1979-2013 in Chokar watershed

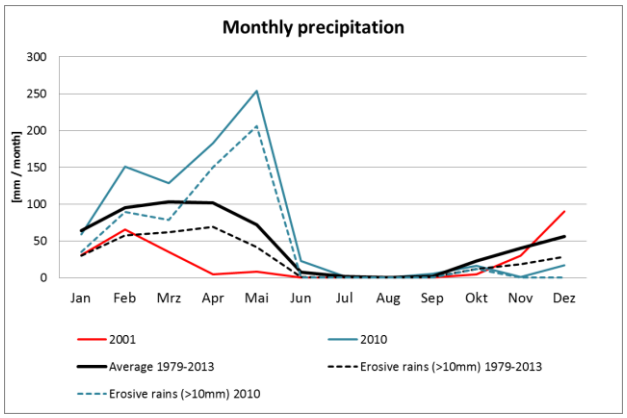


Figure 9: Monthly precipitation in Chokar watershed

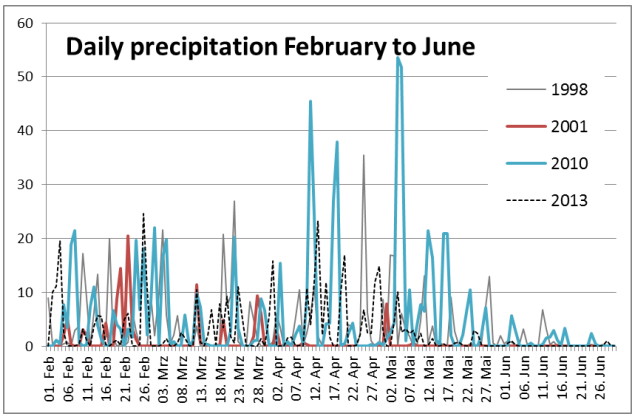


Figure 10: Daily precipitation Feb-June in Chokar watershed

Flash floods

Storm events lead to high amounts of runoff from these steep slopes, with very little vegetation cover. Flash floods were referred during interviews conducted by the SE team. Flashfloods are feared as they destroy roads and houses, as well as agricultural lands. Deep ravines can be observed in various locations within Chokar watershed.

3.3 Chokar Watershed Agro-climatic Trends

Climate trend

Before the drought of the years 2000/2001, rainfall during the pre-vegetation and the spring season varied but were above 100mm. After the drought, especially the spring rains show high irregularity: while in 2010, the year with the highest annual amount of rainfall in 35 years, there were extreme rainfall events that took place in the spring seasons, there have been a number of years with below 100 mm spring rainfall (2004 – 2006, and 2011). Additionally, the pre-vegetation rainfall shows slight downward trend, which would have to be further analysed with more recent data.

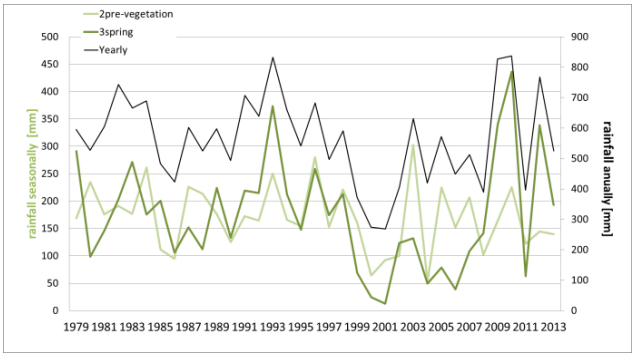


Figure 11: Rainfall during pre-vegetative season, in spring and annual

State of land and land degradation:

The photo on the left is recorded on 6 May 2015 at the top of the watershed neighbouring to Chokar watershed. It shows the different soil types locally distinguished:

- Dark soil (in the back, left corner): good quality soil, best for agriculture. This plot has just been ploughed and thus the soil is especially dark. Rills have been ploughed under.
- Light soil (middle): soil of average quality. Winter wheat is growing on these plots.
- Mixed soil (no example): a mixture of sand, small rocks or gravel, is considered having average soil quality.
- Red soil (front, right corner): bad quality soil, not good for agriculture, only as (degraded) grazing land.

Figure 12: Different soil types locally distinguished

Land use change: Comparison of Corona imagery from 30 May 1970 and WV imagery from 15 June 2015 show vegetation in darker shads and bare soil in light shades. A 1:1 comparison is not possible due to the limited quality of the georeferencing of the old image, but some information may be drawn from image comparison: (a) The extend of the village as digitized from the 2015 image and indicated in yellow lines shows the increase of area covered by the settlements since 1970. (b) There is very little permanent bush or tree cover, neither in 1970 nor in 2015. Alonestanding trees are visible as dark spots, and seem to have mostly remained since 1970. (c) There are few locations, where image comparison shows that grazing land might have been turned into cropland (see the brown squares).

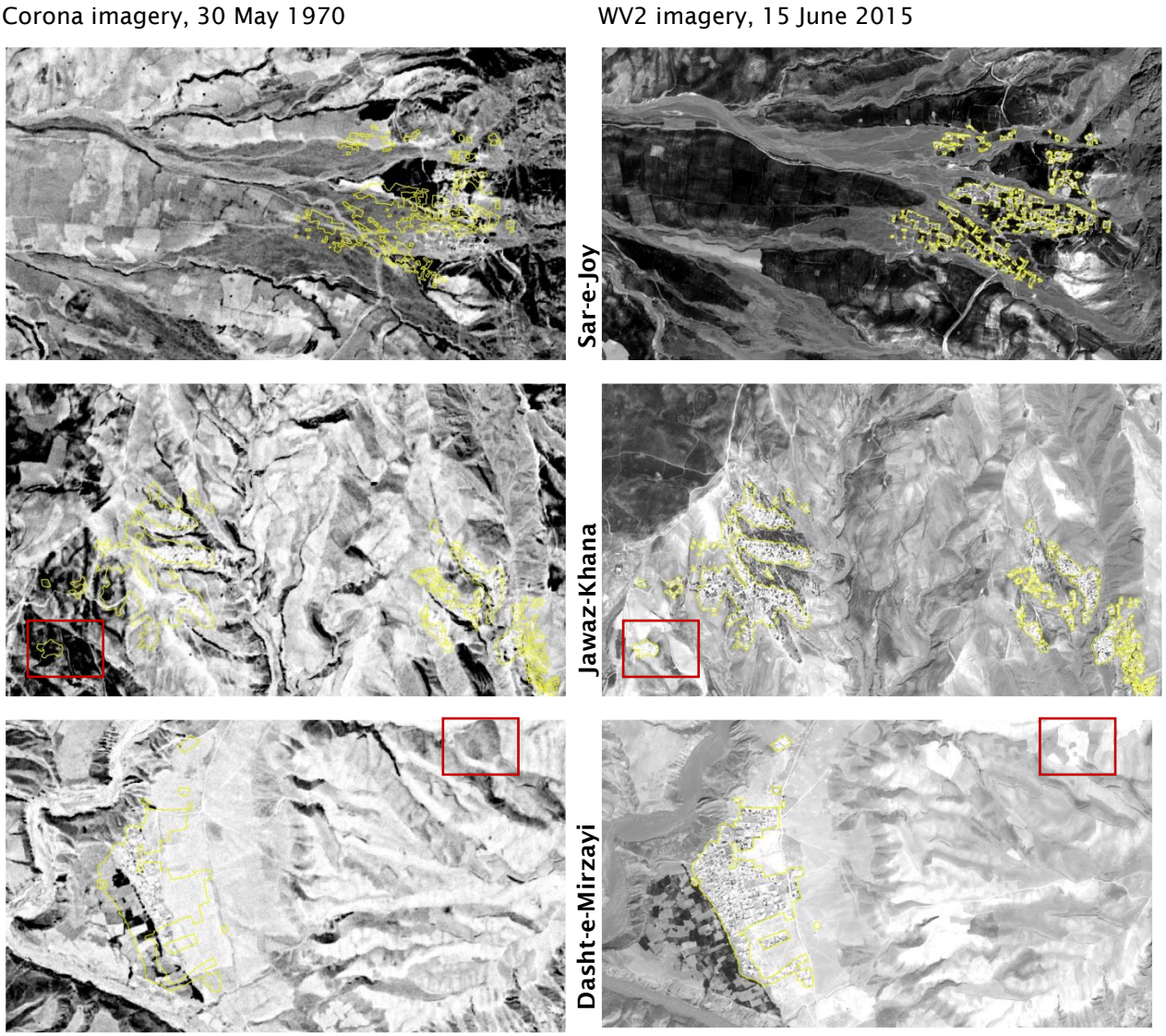


Figure 13: Corona imagery of the three study villages 1970 and 2015

4 Chokar Watershed – Three Village Profiles

This chapter starts with a brief overview of Chokar watershed (4.1) based on data collected during this research. It also highlights some commonalities and differences between the three study villages. In the following, the three study villages are presented separately to allow for a closer look village by village yet also for more in-depth comparison between the three villages. The village context is relevant, and the village is an important unit of analysis (Pain and Kantor 2010). The three study Villages Profiles are the following: Sar-e-Joy (4.2), Jawaz Khana (4.3) and Dasht-e-Mirzayi (4.4).

4.1 The Chokar Watershed

In Chokar Watershed four pronounced seasons structure crop production and livestock keeping as well as seasonal off-farm work. A topography of steep slopes linked to the climatic variability of Northern Afghanistan brings about a relatively short vegetation period especially due to the dry summer months in a setting of a combined rainfed farming system (Chapter 3). Agricultural conditions are aggravated by land degradation and erosion processes that result in the loss of valuable soils and the depletion of the nutrients base. Nonetheless, the main livelihood activities of many households in the watershed are animal husbandry and crop production, most notably wheat. Most of the land in the watershed is rainfed, namely crop land (lalmi land) and pastures. By contrast, there is only few irrigated land (abi land) available to villagers, especially in DEM. While crop land is held individually (yet may be sharecropped), most of the pasture area is held in common. Access to such common pool resources is especially important for the poorer households with more limited access to crop land. In the past 3-5 years it appears that agricultural practices have started to shift and that the use of chemical fertilizer (Urea, DAP) and tractors has become more commonplace in parts of the watershed. Yet grain self-sufficient remains low and, in addition, it is not likely that households will generate significant income from farm-based production in such context (see Pain 2007). Thus, for almost all households in the three study villages farming is not enough to make ends meet. This is the more so, of course, for the numerous landless households in the watershed.

Based on workforce availability as well as gender and age composition within a household, a range of income-generating activities make up for the insufficient level of agricultural production. Seasonality in agriculture brings about a pattern of day labour opportunities in farming – for instance as harvest helpers (both women and men) for larger land owners inside the village or in other parts of the North of Afghanistan (men only), including Kunduz. Yet labour opportunities extend beyond agriculture. Some of these non-farming activities are site-specific to the watershed, including gold washing at the Kokcha river and development projects active in the region both governmental and non-governmental. In this, labour linked to interventions by different Tdh components in the watershed figures prominently (LIPT, LBRC). Yet work also exists with customary and newly introduced institutions (e.g. head CDC, mullah, arbob), in services (transportation, threshing etc), small-scale trade, shop keeping, teaching, in the military for men and in handcrafts for women. And still, the relatively few work opportunities in the watershed pose a major challenge to local people and makes work beyond the village (and region) the more sought-after. This is closely linked to the topic of migration inside and outside Afghanistan. Longer term labour migration is a major livelihood strategy in the portfolio of household income for people in Chokar watershed, above all young men migrating to Iran. In this, Chokar watershed is no different from many other mountainous areas and economies inside and outside Afghanistan where seasonal and longer term migration and movement has long been a trend – and understood as more than a simple response to climatic variability (Pain 2007). Thus, it seems crucial to better understand the diversification of income sources more generally and the topic of migration more specifically. Looking at the agro-ecological setting of Chokar watershed, its infrastructure and partly lack of basic services (e.g. education, health, road access) as well as its natural resource base linked to the shortage of work opportunities it is not surprising that a part of the young generation aspires to new livelihoods and to a more urban life.

In Chokar watershed customary and newly introduced institutions coexist. Customary authority is embodied in the shura, the arbob, the commander, the mirab, the mullah, prominent and influential elders, and others. The National Solidarity Programme (NSP), a nationwide development initiative by the government of Afghanistan, has started in the three study villages in 2010 and is considered in this report as a newly introduced institution. In terms of the relationship between customary authority and CDC staff it is evident that there is strong overlap. It means that a high proportion of CDC members are

village elders from similar backgrounds (e.g. socio-economic). Thus, the boundaries between customary and newly introduced institutions are blurred, with many members 'wearing different hats'. In terms of development projects, as pointed out above, Chokar watershed has seen relatively recent change. Terre des hommes (Tdh) has started its activities in the watershed in 2012 more strongly focusing on agriculture, sustainable land management and rural economic development. As part of the current phase of LIPT III, Tdh had established a new institution on the village level, the so-called Natural Resource Management Committee (NRMC), as well as on the level of the watershed, the so-called Watershed Association (WSA). This, in order to work with and work through local partners in the villages in terms of natural resource management, and especially Sustainable Land Management.

Besides economic and environmental risks, many people in the villages also referred to political, health and security risks influencing their livelihoods by way of conflict, violence, instability, insecurity, risks to assets, physical and mental illnesses and disabilities. Risk and vulnerability is often subsumed under the notion of fragility, thus the combination of heightened exposure to risk and insufficient coping capacity to manage, absorb or mitigate those risks (OECD, 2016). Thus, and along the Sustainable Livelihoods Framework, an individual household is not only embedded in its natural context but also in its social and institutional environment – which can be both enabling and hindering.

In terms of security, and thinking back to the 'revolution period', many people in the three study villages see the current times as relatively safe. This, despite having arbaki (armed local militia) in the villages more recently which some people interpret as a sign that the past couple of years have seen deterioration. Overall, however, as one woman mentioned '…the security was not good in our village but is better now' [Q_1032]. In the three villages there are a number of sources of conflict that came up in numerous interviews and conversations, amongst which land (Chapter 7) is prominent, inheritance, employment opportunities and conflicts between borrowers and lenders. These are the kind of conflicts that are being taken care of mostly within individual villages. Thus, and while to different extents looking at the three study villages, much of the day to day conflict resolution is taking place locally: conflicts are solved by village elders, the mullah, the arbab or the arbaki commander. If there is no solution the conflict might be handed over to one powerful village elder with a more regional sphere of influence. If this does not solve the issue things would either be given back to the village level or, in serious cases, would be handed over to the government in Rustaq town. This is in line with the findings of the Land Governance Assessment Framework Afghanistan (AREU 2017:128) that states that although "…land disputes are the most common cause for conflict in Afghanistan in terms of all types of conflicts (42 percent), they seem to proceed infrequently to the formal justice system."

A note in terms of land ownership in the three study villages: when this report refers to a household owning assets – most notably land yet also livestock – then generally this refers to men within those households (see Grace 2004). Yet a number of women in the watershed also own some (if very little) property such as inherited rain-fed land and livestock.

In the following, three 'Village Profiles' are presented. The Profiles have a closer look at the study villages of Sar-e-Joy, Jawaz Khana and Dasht-e-Mirzayi in terms of infrastructure and institutions, agricultural assets and farming practices, local peoples' perception of quality of crop land and pasture, awareness of introduced SLM practices, grain self-sufficiency as well as aspired livelihood outcomes and strategies, and people's needs. Due to the identical layout of the three profiles, the villages can also easily be compared amongst each other. Parts of this information will be discussed in Chapter 7.

4.2 Sar-e-Joy (SEJ)

Village and People

Total number of households (HHs)	**206**
better-off farming HHs	20%
middle farming HHs	43%
poor farming HHs	20%
Non-farming HHs	17%
Landless households	~1/3 of total HHs

In Chokar watershed, Sar-e-Joy (SEJ) is the 'up-stream' village of the study area. SEJ is situated between 1'700 and 2'000 m.asl. at the bottom of the large mountain chain on the Eastern border of the catchment area. Most of the land is pasture, rain-fed land (*lalmi*) or unproductive land, with few irrigated land (*abi*). Moderate to steep slopes. Good access to market in Rustaq town, good access to drinking water.

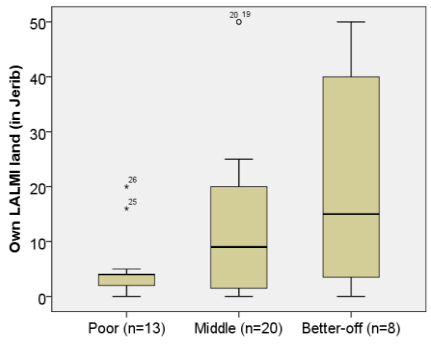
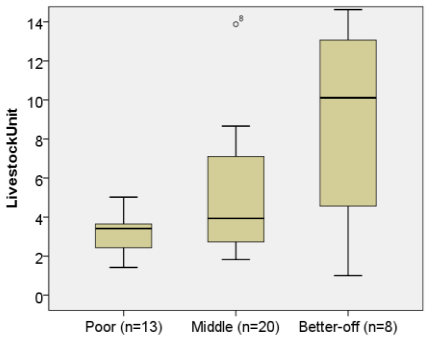
Satellite Image WorldView2 (CDE, 2015)

Infrastructure & Institutions

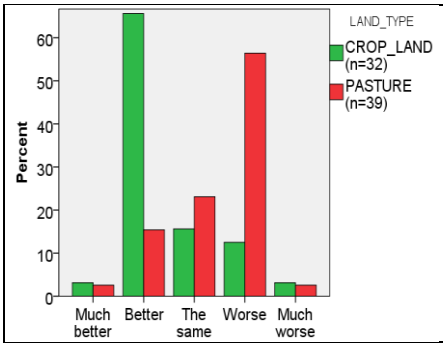
Distance Rustaq (hrs)	**Water access**	**Shops**	**Car**	**Tractor access**
on foot: 4.5; car: 1.5 donkey: 5; horse: 3	Sufficient	2-4 small HH-based shops	2-4 HHs in village own car	Yes, access to SEJ possible
Closest clinic	**Start Boys' school**	**Start Girls' school**	**Closest school 1st gr**	**Closest School 2st gr**
Rustaq town	2006	2006	Langar 2 km	Rustaq 20 km
NSP/CDC Starting year	2010; number of elections: 2			
CDC, NRMC	The CDC has 6 members, the NRMC 9 members. Currently, only 1 person is part of both committees, thus very little overlap. Within both committees unequal distribution of member participation and decision making authority (existence of 'core group' within each committee). Head NRMC is not head CDC. Both committees are headed by a strong, prominent person; the two heads have a relatively close working relationship. Some village elders who are not part of the CDC and NRMC can (strongly) influence matters – holding parallel role and acceptability in the village. No woman is part of the NRMC, 1 woman is part of the CDC, yet she has little to no role/authority. Number of elections in NRMC to date: 2.			
Customary authorities	High proportion of village elders in both CDC and NRMC, strong overlap; Arbab (customary head of village) is head of CDC at the same time; Powerful, influential village elder from wealthy background inside SEJ; good linkages to district level. Mirab exists.			
Kunda	3 Kundas: Reji Bayee, Qol Bayee, Baqi Bayee		Number of mosques	2

Agricultural Assets & Farming Practices

Lalmi Land, rainfed (% of survey respondents)		**Abi land, irrigated** (% of survey respondents)	
Own lalmi land:	80%	Own abi land:	7%
Share-cropping:	n.a.	Share-cropping:	0%
Main crops:	Wheat >> Pea, Gahmu	Main crops:	Tomato, onion, wheat, alfalfa
Orchard (% of survey respondents)		**Pasture** (% of survey respondents)	
Own orchard:	56% (median 0.5 jerib)	Own pasture:	12%
Share-cropping:	0%	Common:	98%
Main crops:	Apple > Peaches > apricots	Main crops:	Natural vegetation
Livestock (% of survey respondents)			
Own livestock:	100%		
Type livestock:	Donkey (98%); poultry (88%); goat (85%); cattle (68%); sheep (39%); oxen (24%); horse (0%)		
Remarks:	Some larger livestock herders with 200-300 animals in SEJ; goats > sheep		

Lalmi land (by wealth group)	**Livestock Units** (by wealth group)	**Interpretation & additional info**
		- Total landless HHs (est.): 32% - Landless non-farming HHs: 17% - Landless farming HHs (est.): 15% *(no own land but pasture access)* - Correlation between wealth group and ownership of land and livestock - Some fluctuation in land holdings over time, but for 2/3 of HHs size of land they use remains +/- same - 98% of respondents want to increase their livestock 'as much as possible' - 2-3 larger landowners in SEJ

Local peoples' perception of quality of crop land and pasture



Crop land (same/better): 82%
Crop land, reasons (why better)**:**
Mostly mentioned is use of fertilizer, terracing (linked to Tdh), tractor.

Pasture (worse): 56%
Pasture, reasons (why worse)**:**
Overgrazing, too many animals, pasture conversion, floods/erosion; feeling that 'people don't care'.

Crop land, measures (if worse):
Only few respondents (15%) perceive the quality of the crop land they use as worse; measures include fertilizer, terracing.

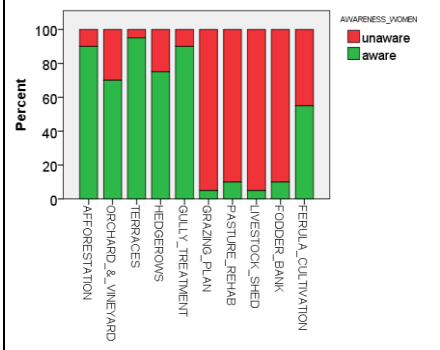
Pasture, measures (if worse):
Although 56% perceive the quality of pasture land as worse now than 10 years ago, most respondents (78%) do not take any measures.

Innovation in agriculture and SLM practices

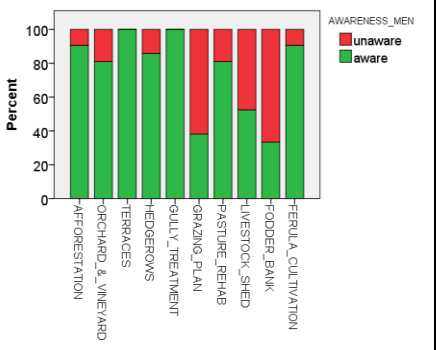
Innovation in agriculture (general)
Virtually all respondents (97%) indicate change in agricultural practices of some sort in the past few years
Top 5 changes in agri. practices (in order of frequency): Terracing > Mechanisation > Fertilizer > Vineyard > Hedgerow
Main source of information: From SEJ villagers & other farmers: 37%; Tdh: 37%; other village/region: 10%; resource person (specialist, arbab, chief, etc): 16%

Awareness of introduced SLM practices (by gender)

Awareness WOMEN (n=20)



Awareness MEN (n=21)

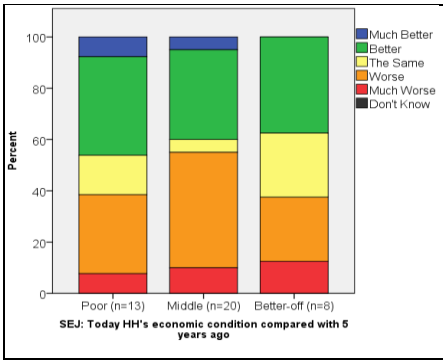


The 3 SLM practices of most interest to respondents

Overall:	TER >> GUL > AFF>FER
Men:	TER >> FER > GUL
Women:	TER > GUL > AFF
Youth:	TER > AFF = GUL
Poor HHs:	TER >> GUL > AFF
Middle HHs:	TER > GUL > AFF=FER
Better-off HHs:	TER > GUL = FER

Relatively low awareness (especially women) and interest in SLM practices to do with pasture management.

Livelihoods: economic condition of households



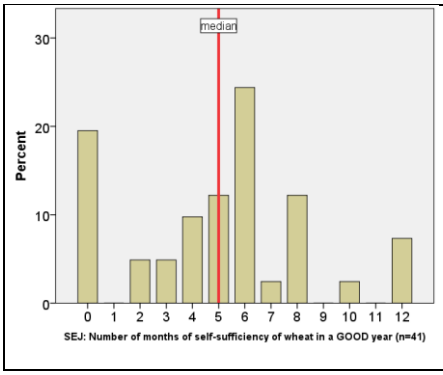
Many respondents in all 3 wealth groups (graph) yet also both women and men see their lives changed in the past 5 years; overall, 41% see their lives to have improved, 59% as the same or worse.

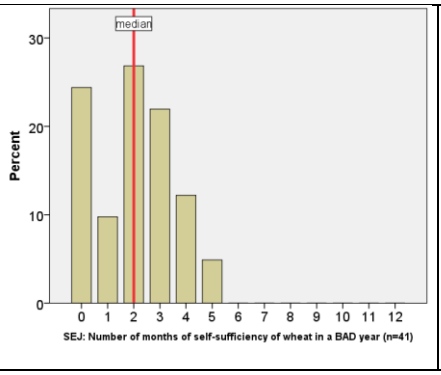
Reasons for *Life getting better*: separating from parents' HH, working & gaining money, work opportunities, improved agriculture.

Reasons for *Life getting worse*:
- often to do with some sort of shock: e.g. 'son in prison', law suit, less land now, lost work etc.
- often to do with some sort of event and/or process: e.g. getting married and borrowing money, funeral, illness and spending on treatment, increase in size HH.

Looking ahead 5 years, 71% expect their life to be better than it is now (15% expect life to be worse).

Wheat self-sufficiency in good (left) and bad (right) year & Household sources of income





- There are no subsistence-only households in SEJ
- Both the low level of wheat self-sufficiency and level of landlessness indicate that income in cash and kind is key to make ends meet
- All households need (and all respondents indicate, below) income from different sources
- Agriculture is important in SEJ but by far not the only livelihood activity

Main sources of household income, in order to make ends meet				
Farm labour: 38%	Farm sales: 16%	Non-farm labour: 16%	Livestock: 15%	Remittances: 15%
High level of uncertainty in terms of both changing sources and unstable amounts of cash income over the years; cope with uncertainty; 78% of respondents indicate credits and loans.				

Aspired Livelihood Outcomes, Strategies & Needs of local people

Aspired Livelihood Outcomes (along categories of SLF, DFID 1999)
increased wellbeing > more income > reduced vulnerability >>> improved food security = more sustainable use of NR base

Livelihood strategies

Work hard (incl women's work)	Farming activities (More LS or land, inno)	Labour migration (Iran, everywhere AFG)	Son support (workforce, money)	Non-farm labour
25%	17%	17%	12%	5%

Conducive factors to achieve strategy

NGO support	Government support	Favourable farming conditions	Work opportunity, good wage	Son support
20%	19%	17%	10%	6%

Hindering factors to achieve strategy

No work opportunity, workforce issue	Unfavourable farming conditions	Health issue	Insecurity	No migration, deportation
24%	14%	13%	12%	9%

Local people's Needs

Agriculture, access to…*	Health access	Education	Roads	Work Opportunity
33%	18%	17%	14%	5%
*Agriculture, access to: more livestock, land or pasture, SLM practices, fertilizer, livestock medicine, improved seeds				

Images Sar-e-Joy

SEJ: Cropland in August

SEJ: Hedgerows

SEJ: Cropland and village

SEJ: Gully rehabilitation

4.3 Jawaz Khana (JWK)

Village and People

Total number of households (HHs)	**149**
better-off farming HHs	13%
middle farming HHs	36%
poor farming HHs	46%
Non-farming HHs	5%
Landless households	~1/5 of total HHs

In Chokar watershed, Jawaz Khana (JWK) is the 'mid-stream' village of the study area. JWK is situated between 800 and 1'700 m.asl. Its geography is marked by steep slopes. Most of the land is pasture, rain-fed land (*lalmi*) or unproductive land, with no irrigated land (*abi*) at all. Due to the lack of access to drinking water all year round, people live in the pasture areas for almost 2 seasons. This makes the lives and livelihoods of people different from other villages.

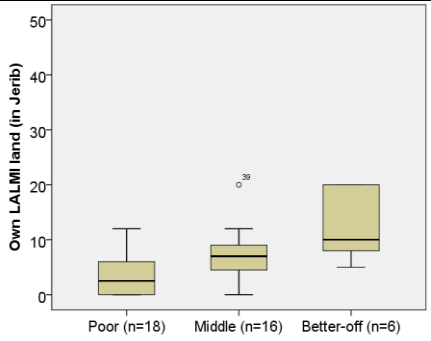
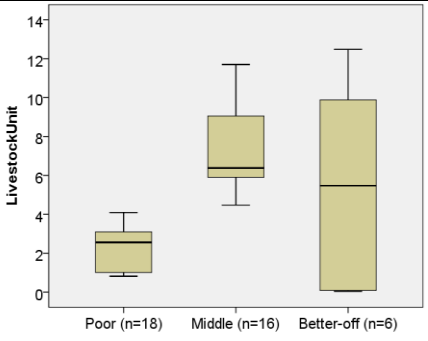
Satellite Image WorldView2 (CDE, 2015)

Infrastructure & Institutions

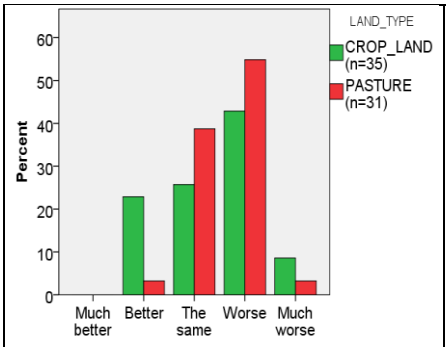
Distance Rustaq (hrs)	**Water access**	**Shops**	**Car**	**Tractor access**
on foot: 6; car: 2 donkey: 5; horse: 4	Insufficient	6 small HH-based shops	4 HHs in village own car	No
Closest clinic	**Start Boys' school**	**Start Girls' school**	**Closest school 1st gr**	**Closest School 2st gr**
Rustaq town	2007	2007	Qodoq 5 km	Qodoq 5 km
NSP/CDC Starting year	2010; number of elections: 2			
CDC, NRMC	The CDC has 9 members, the NRMC 7 members. Currently, only 1 person is part of both committees, namely the CDC secretary; thus very little overlap. Quite a few village elders in both CDC and NRMC, yet also some young men. The CDC members did not change much for the 2 elections. Head NRMC is not head CDC. Within both committees unequal distribution of member participation and decision making authority (existence of 'core group' within each committee). The CDC's secretary (not head) has important role in the village. To some extent, and in certain situations, competition between CDC and NRMC. No woman is part of the NRMC, 1 woman is part of the CDC – she is active, interested, supportive. Number of elections in NRMC to date: 2.			
Customary authorities	Quite a few village elders in both CDC and NRMC; Arbab (customary head of village) not very visible, and he is not the head of CDC; One powerful, influential village elder from outside the village with a lot of influence and control on decision making within JWK; not very good linkages to district level.			
Kunda	1 Kunda: Aruq (divided into 6 Gozar)		Number of mosques	3 (until recently 4)

Agricultural Assets & Farming Practices

Lalmi Land, rainfed (% of survey respondents)		**Abi land, irrigated** (% of survey respondents)	
Own lalmi land:	88%	Own abi land:	0%
Share-cropping:	38%	Share-cropping:	0%
Main crops:	Wheat >> Pea, Gahmu	Main crops:	n.a.
Orchard (% of survey respondents)		**Pasture** (% of survey respondents)	
Own orchard:	33% (median 1 jerib)	Own pasture:	10%
Share-cropping:	0%	Common:	88%
Main crops:	Poplar > apricots, mulberry, almond	Main crops:	Natural vegetation
Livestock (% of survey respondents)			
Own livestock:	100%		
Type livestock:	Donkey (93%); poultry (88%); goat (85%); cattle (47%); oxen (47%); sheep (45%); horse (0%)		
Remark:	Focus on livestock in JWK, in general		

Lalmi land (by wealth group)	**Livestock Units** (by wealth group)	**Interpretation & additional info**
		- Total landless HHs (est.): 20% - Landless non-farming HHs: 5% - Landless farming HHs (est.): 15% *(no own land but pasture access)* - Correlation between wealth group and ownership of land (livestock less clear; beware small 'n') - Fluctuation in land holdings over time, for less than half of HHs size of land they use remains +/- same - 95% of respondents want to increase livestock, 78% 'as much as possible', 18% 'moderate increase'

Local peoples' perception of quality of crop land and pasture



Crop land (same/better): 49%
Crop land, reasons (why better)**:**
Mostly mentioned is terracing (linked to Tdh), use of fertilizer, some manure.

Pasture (worse): 58%
Pasture, reasons (why worse)**:**
Overgrazing, too many animals, pasture conversion, floods/erosion; saplings/trees planted in pasture and thus pasture smaller now (link to Tdh); feeling 'people don't care'.

Crop land, measures (if worse):
Half of respondents (51%) perceive quality of crop land they use as worse; 72% did not do anything about it due to 'inability', lack of money and lack of labour force.

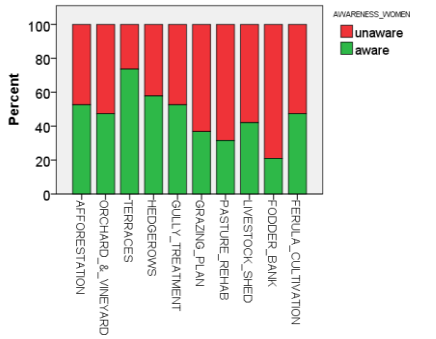
Pasture, measures (if worse):
Although 58% perceive the quality of pasture land as worse now, many respondents (61%) do not take any measures; the measures taken by respondents (39%) are almost all linked to LIPT interventions.

Innovation in agriculture and SLM practices

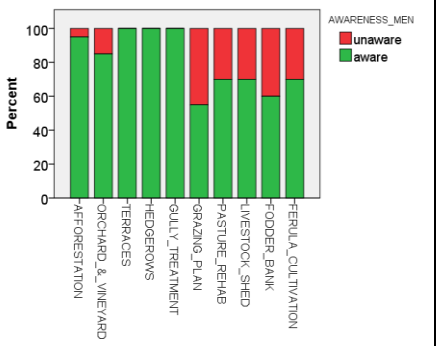
Innovation in agriculture (general)
Half of respondents (54%) indicate change in agricultural practices of some sort in the past few years
Top 5 changes in agri. practices (in order of frequency): Terracing >> Fertilizer = Manure/ash > Orchard
Main source of information: From JWK villagers & other farmers: 36%; Tdh: 41%; other village/region: 9%; resource person (specialist, arbab, chief, etc): 14%

Awareness of introduced SLM practices (by gender)

Awareness WOMEN (n=20)



Awareness MEN (n=20)

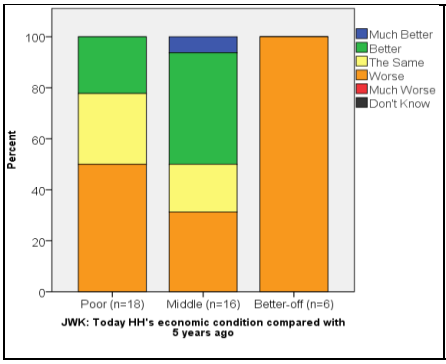


The 3 SLM practices of most interest to respondents

Overall:	TER	>>	GUL	> VIN
Men:	TER	>>	VIN	= GUL
Women:	TER	>	GUL	> AFF
Youth:	TER	=	GUL	= AFF
Poor HHs:	TER	>>	GUL	= VIN
Middle HHs:	TER	>>	FER	> GUL
Better-off HHs:	TER	=	GUL	> VIN

Overall lower awareness of SLM with women; generally lower awareness and interest by both women and men in SLM practices to do with pasture management.

Livelihoods: economic condition of households



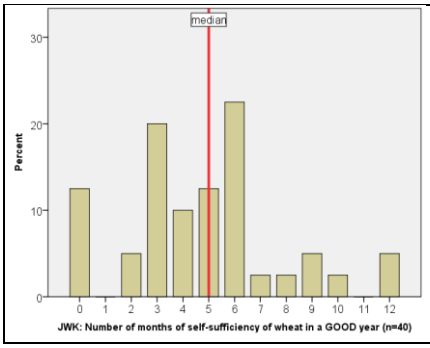
Many respondents in all 3 wealth groups (graph) yet also both women and men see their lives changed in the past 5 years; overall, 30% see their lives to have improved, 70% as the same or worse. All better-off HHs see their HH's economic situation as worse (beware small 'n').

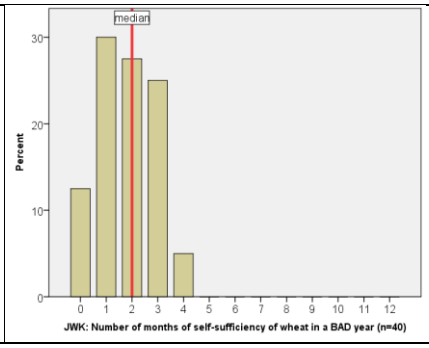
Reasons for *Life getting better*:
Good work opportunities, good yields/agriculture, work force within HH, support of son, help of relatives, security.

Reasons for *Life getting worse*:
Mostly to do with some sort of event and/or process: e.g. growing old, getting married and borrowing money, death/funeral, illness and spending on treatment, increase in size HH, loss of livestock, low yields; a few respondents mentioned loss of work.

Looking ahead 5 years, 78% expect their life to be better than it is now (3% expect life to be worse).

Wheat self-sufficiency in good (left) and bad (right) year & Household sources of income





- There are no subsistence-only households in JWK
- Low level of wheat self-sufficiency (and the level of landlessness) indicate that income in cash and kind is key to make ends meet
- All households need (and all respondents indicate, below) income from different sources
- Agriculture is important in JWK but by far not the only livelihood activity

Main sources of household income, in order to make ends meet				
Farm labour: 37%	Livestock: 25%	Farm sales: 16%	Non-farm labour: 13%	Remittances: 9%
High level of uncertainty in terms of both changing sources and unstable amounts of cash income over the years; cope with uncertainty; 83% of respondents indicate credits and loans.				

Aspired Livelihood Outcomes, Strategies & Needs of local people

Aspired Livelihood Outcomes (along categories of SLF, DFID 1999)
increased wellbeing > more income >> reduced vulnerability >>> more sustainable use of NR base > improved food sec

Livelihood strategies

Farming activities (More LS or land, inno)	Work hard (incl women's work)	Son support (Workforce, money)	Labour migration (Iran, everywhere AFG)	Get treated, stay healthy
24%	20%	19%	15%	7%

Conducive factors to achieve strategy

Favourable farming conditions	NGO support	Government support	Son support	Work opportunity, good wage
21%	17%	17%	10%	9%

Hindering factors to achieve strategy

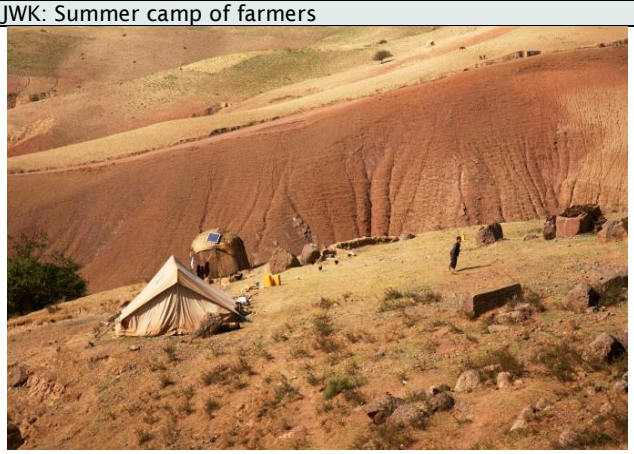
No work opportunity - Workforce issue	Unfavourable farming conditions	Health issue	Son stop support	No migration, deportation
30%	19%	19%	7%	6%

Local people's Needs

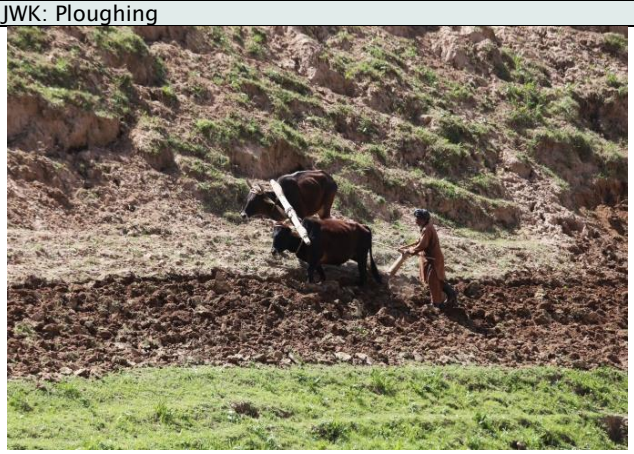
Drinking water	Agriculture, access to…*	Roads	Work Opportunity	Health access
26%	20%	20%	12%	9%
*Agriculture, access to: more livestock or land, SLM practices, flood prevention technics				

Images Jawaz Khana

JWK: Summer camp of farmers

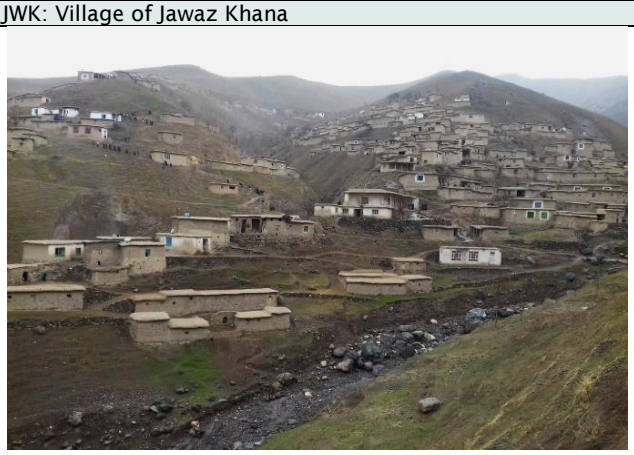


JWK: Ploughing



JWK: Landscape south of village (May)

JWK: Village of Jawaz Khana



4.4 Dasht-e-Mirzayi (DEM)

Village and People

Total number of households (HHs)	**139**
better-off farming HH	13%
middle farming HHs	38%
poor farming HHs	35%
Non-farming HHs	14%
Landless households	~1/3 of total HHs

In Chokar watershed, Dasht-e-Mirzayi (DEM) is the 'down-stream' village of the study area. DEM is situated between 600 and 800 m.asl. At the side of Kokcha river, with moderate slopes. Irrigated land (*abi*) available. Geographical situation with good road access to Rustaq town, Taloqan town and Tabataash. Good opportunities for non-farm work. Long tradition of village school. On-going road construction project (Tdh/SDC). Tree nursery in the village (LIPT).

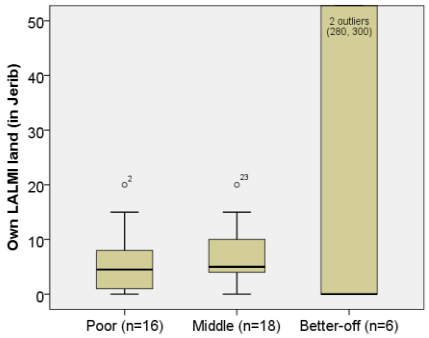
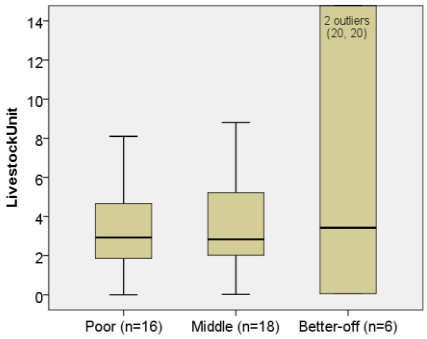
Satellite Image WorldView2 (CDE, 2015)

Infrastructure & Institutions

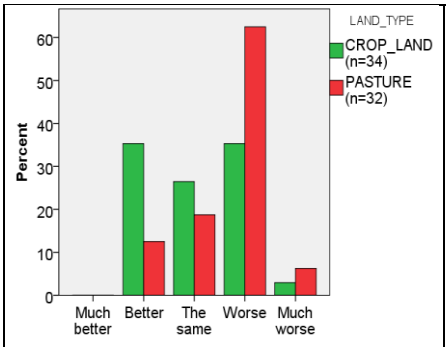
Distance Rustaq (hrs)	**Water access**	**Shops**	**Car**	**Tractor access**
on foot: 4; car: 1 donkey: 3; horse: 2.5	Sufficient	3-5 small HH-based shops	3-4 HHs in village own car	Yes, access to DEM possible
Closest clinic	**Start Boys' school**	**Start Girls' school**	**Closest school 1st gr**	**Closest School 2st gr**
Rustaq town	1973	2002	In the village (DEM)	In the village (DEM)
NSP/CDC Starting year	2010; number of elections: 2			
CDC, NRMC	The CDC has 10 members, the NRMC 10 members. In fact, almost all members are the same, thus a very strong overlap. Head NRMC and head CDC is the same person. Quite a few village elders in both CDC and NRMC, yet also some young men. The CDC members did not change much for the 2 elections. Within both committees unequal distribution of member participation and decision making authority (existence of 'core group' within each committee). No woman is part of the CDC or the NRMC. Number of elections in NRMC to date: 2.			
Customary authorities	High proportion of village elders in both CDC and NRMC; there is no Arbab (customary head of village) any longer in DEM; good linkages to district level.			
Kunda	3 Ks: Aaql, Qaragh, Qizil/Gosfandi, Aruq.		Number of mosques	1

Agricultural Assets & Farming Practices

Lalmi Land, rainfed (% of survey respondents)		**Abi land, irrigated** (% of survey respondents)	
Own lalmi land:	75%	Own abi land:	50%
Share-cropping:	20%	Share-cropping:	0%
Main crops:	Wheat >> Pea > Flax = Barley	Main crops:	Onion > Maize > Tomato
Orchard (% of survey respondents)		**Pasture** (% of survey respondents)	
Own orchard:	60% (median 0.5 jerib)	Own pasture:	5%
Share-cropping:	0%	Common:	95%
Main crops:	Apricots > almond = Poplar = Apple	Main crops:	natural vegetation
Livestock (% of survey respondents)			
Own livestock:	95%		
Type livestock:	Donkey (80%); cattle (73%); poultry (73%); goat (40%); oxen (38%); sheep (10%); horse (0%)		
Remarks:	3-4 larger livestock owners in DEM; generally less focus on livestock in DEM if compared to SEJ and JWK		

Lalmi land (by wealth group)	**Livestock Units** (by wealth group)	**Interpretation & additional info**
		- Total landless HHs (est.): 39% - Landless non-farming HHs: 14% - Landless farming HHs (est.): 25% *(no own land but pasture access)* - Relatively little difference in ownership of land and livestock between poor and middle HHs, yet presence of larger land & LS owners in village (beware small 'n') - Fluctuation in land holdings over time, for 2/3 of HHs size of land they use remains +/- same - 78% of respondents want to increase livestock, 48% 'as much as possible', 30% 'moderate increase'

Local peoples' perception of quality of crop land and pasture



Crop land (same/better): 62%
Crop land, reasons (why better)**:**
Terracing (link to Tdh), use of fertilizer, use of tractor, manure.

Pasture (worse): 69%
Pasture, reasons (why worse)**:**
too many animals, saplings/trees planted in pasture and thus pasture smaller now (link to Tdh), pasture conversion, floods/erosion; less rainfall.

Crop land, measures (if worse):
38% of respondents perceive quality of crop land they use as worse; 69% did not do anything about it due to 'inability', lack of money (often linked to fertilizer).

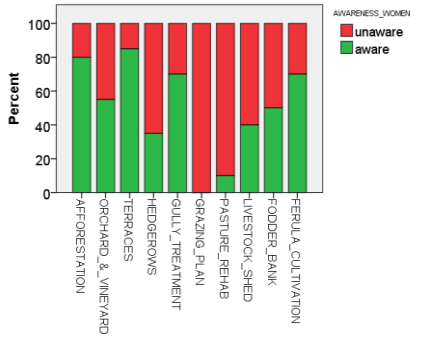
Pasture, measures (if worse):
Although 69% perceive the quality of pasture land as worse now, a large majority of respondents (86%) did not take any measures. Almost all feel (96%) that 'something should be done'.

Innovation in agriculture and SLM practices

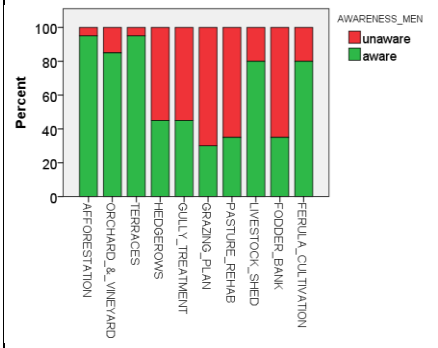
Innovation in agriculture (general)
Most respondents (88%) indicate change in agricultural practices of some sort in the past few years
Top 5 changes in agri. practices (in order of frequency): Mechanisation > Fertilizer > Terracing >> Orchard > Seedling
Main source of information: From DEM villagers & other farmers: 38%; Tdh: 32%; other village/region: 22%; resource person (specialist, arbab, chief, etc): 8%

Awareness of introduced SLM practices (by gender)

Awareness WOMEN (n=20)



Awareness MEN (n=20)

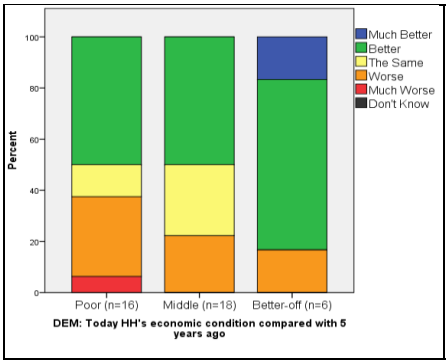


The 3 SLM practices of most interest to respondents

Overall:	ORC >>	TER >	NUR
Men:	ORC >	TER >	NUR
Women:	ORC >>	TER >	AFF
Youth:	ORC >>	NUR =	AFF
Poor HHs:	ORC >	TER >	VIN
Middle HHs:	ORC >>	TER =	NUR
Better-off HHs:	ORC =	TER =	FER

Generally lower awareness and interest in SLM practices to do with pasture management; strong interest in orchard.

Livelihoods: economic condition of households



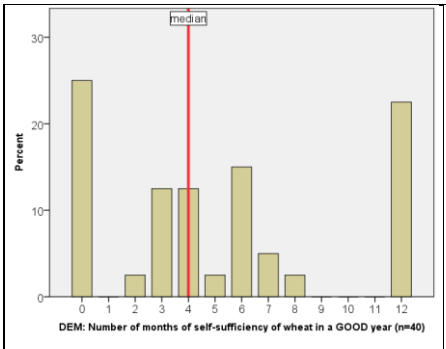
Many respondents in all 3 wealth groups (graph) yet also both women and men see their lives changed in the past 5 years; overall, 55% see their lives to have improved, 45% as the same or worse.

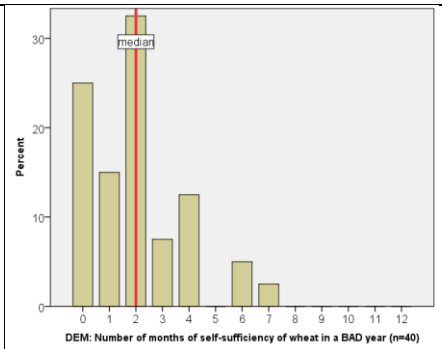
Reasons for *Life getting better*:
Many diverse reasons mentioned; working hard & gaining money, more work opportunities in village (link to Tdh), gold washing, improved agriculture (especially orchard).

Reasons for *Life getting worse*:
28% of respondents indicate that their economic condition deteriorated in the past 5 years; mostly linked to illness, disability and old age.

Looking ahead 5 years, 73% expect their life to be better than it is now (5% expect life to be worse).

Wheat self-sufficiency in good (left) and bad (right) year & Household sources of income





- There are no subsistence-only households in DEM
- Low level of wheat self-sufficiency and especially high level of landlessness indicate that income in cash and kind is key to make ends meet
- All households need (and all respondents indicate, below) income from different sources
- Agriculture is important in DEM but by far not the only livelihood activity

Main sources of household income, in order to make ends meet				
Non-farm labour: 54%	Farm labour: 18%	Livestock: 14%	Farm sales: 8%	Remittances: 6%
Very high level of non-farm labour. High level of uncertainty in terms of both changing sources and unstable amounts of cash income over the years; cope with uncertainty; 90% of respondents indicate credits & loans.				

Aspired Livelihood Outcomes, Strategies & Needs of local people

Aspired Livelihood Outcomes (along categories of SLF, DFID 1999)
increased wellbeing > more income >> reduced vulnerability >>> improved food sec = more sustainable use of NR base

Livelihood strategies

Work hard (incl women's work)	Non-farm labour	Farming activities (More LS or land, inno)	Labour migration (Iran, everywhere AFG)	Son support (workforce, money)
20%	15%	14%	11%	9%

Conducive factors to achieve strategy

NGO support	Government support	Work opportunity, good wage	Favourable farming conditions	Non-farm labour
22%	22%	17%	11%	6%

Hindering factors to achieve strategy

No work opportunity, workforce issue	Unfavourable farming conditions	Health issue	Poverty	No migration, deportation
30%	14%	15%	12%	7%

Local people's Needs

Agriculture, access to…*	Health access	Drinking water	Work Opportunity	Assistance for poor, welfare
32%	20%	20%	16%	7%
*Agriculture, access to: more livestock, land or pasture, SLM practices, fertilizer, improved seeds				

Images Dasht-e-Mirzayi

DEM: Cropland and village

DEM: Kokcha river, with orchard

DEM: Gully inside village

DEM: Kokcha river

5 Assessment of SLM Practices from Different Perspectives

Table 4 presents the field data collected by both AE (15 FGDs resulting in 102 LUPs) and SE component (121 survey interviews). Partly integrated, this table shows an overview of costs, conditions of implementation, perception and interest of implementers and non-implementers on 11 SLM practices implemented in CWS. By consequence, the sample sizes vary between the different SLM practices and within each practice with regard to AE and SE methodology.
For AE: FGDs participant group size and LUPs collected was varying depending on the number of implementers of the specific SLM practice available at that time in the village.
For SE: respondents were asked to choose among 12 SLM practices 0-3 that they like the most and 0-2 that they like the least and have answered on those one only.

Table 4: Assessment of SLM practices from different perspectives

SLM Practice SE: Socio-Economic component AE: Agro-Ecological component	Collective or Individual	COST		Characteristics of SLM plot			Perceived Advantages	Perceived Disadvantages	IMPLEMENTATION			INTEREST FOR THIS SLM PRACTICE					
		Establishment [USD/ha] Eq: Equipment L: Labour Ex: Expendable	Maintenace [USD/ha/y] Eq: Equipment L: Labour Ex: Expendable	Slope S: Steep M: Moderate F: Flat	Soil D: Dark L: Light R: Red	Water R: Rainfed I: Irrigated SI: Supplementary Irrigated			Spontaneous [person]	Intention	Intention without support	Most	Least	Gender ♀ % ♂ %	Age Y: Young M: Middle E: Elderly	Village S: Sar-e_Joy J: Jawaz-Khana D: Dasht-e-Mirzayi	Wealth P: Poor M: Middle B: Better-off
Terracing with improved seed and fertilizer application SE 74 Respondents (Most Interest) SE 46 of which Implementers AE 26 Implementers in FGD	I	Tot: 1276 LIPT: 763 Eq: 64 L: 949 Ex: 263	Tot: 677 LIPT: 0 Eq: 0 L: 437 Ex: 240	S: 1 M: 24 F: 1	D: 10 L: 15 R: 1	R: 26 I: 0 SI: 0	+++ Increased crop production +++ Land less vulnerable to rainstorms +++ Increased soil moisture availability ++ Land less vulnerable to dry spells ++ Improved soil quality ++ Maintenance work well manageable + Increased plant diversity + Increased fodder production + More effective fertilizer application	--- High establishment cost --- High workload during establishment -- Sufficient own land required -- Technical knowledge required - Crop production area reduced	3	78%	32%	61%	9%	♀ 41% ♂ 59%	E > M > Y	S > J > D	P ≈ M ≈ B
Ferula cultivation on degraded slopes SE 26 Respondents (Most Interest) SE 9 of which Implementers AE 14 Implementers in FGD	I	Tot: 1055 LIPT: 779 Eq: 47 L: 200 Ex: 808	Tot: 89 LIPT: 0 Eq: 0 L: 98 Ex: 0	S: 9 M: 4 F: 1	D: 2 L: 8 R: 4	R: 13 I: 1 SI: 0	+++ Good income ++ Maintenance work well manageable ++ Increased plant diversity ++ Use of degraded areas ++ Less vulnerable to rainstorms + Less vulnerable to dry spells + Medicinal property of the crop	-- No yield for the first years -- Requires sufficient own land -- Access to seeds -- Seeds are costly -- Increase workload (establishment phase) - Technical knowledge required - Potential crop failure	4	58%	12%	21%	12%	♀ 31% ♂ 69%	E > M > Y	S > J > D	B > M > P
Gully treatment (mainly on cropland but also on grazing land and mixed land) SE 39 Respondents (Most Interest) SE 17 of which Implementers AE 3 Implementers in FGD	C/I	Tot: 277 LIPT: 245 Eq: 62 L: 127 EX: 88	Tot: 112 LIPT: 0 Eq: 0 L: 112 Ex: 0	S: 0 M: 3 F: 0	D: 0 L: 2 R: 1	R: 2 I: 0 SI: 1	+++ Land less vulnerable to rainstorms and flood +++ Maintenance work well manageable ++ Prevent infrastructure from flood damage ++ Land less vulnerable to dry spells ++ Improved soil management + Increased fodder production	-- High establishment cost -- High workload during establishment -- Technical knowledge required	2	54%	13%	32%	11%	♀ 59% ♂ 41%	Y ≈ M ≈ E	S > J > D	P ≈ M ≈ B
Contour lines of alfalfa on annual cropland (Hedgerows) SE 12 Respondents (Most Interest) SE 5 of which Implementers AE 6 Implementers in FGD	I	Tot:788 LIPT: 700 Eq: 115 L: 257 Ex: 416	Tot: 589 LIPT: 0 Eq: 7 L: 185 Ex: 397	S: 3 M: 2 F: 1	D: 1 L: 4 R: 1	R: 6 I: 0 SI: 0	+++ Land less vulnerable to rainstorms +++ Increased fodder production ++ Prevent land degradation ++ Land less vulnerable to dry spells ++ Maintenance work well manageable ++ Establishment work well manageable	-- Costly (seeds and fertilizer) - Increased workload	0	58%	25%	10%	12%	♀ 33% ♂ 67%	E > M > Y	S ≈ J > D	P ≈ M > B
Nursery for the production of fruit and non-fruit saplings SE 14 Respondents (Most Interest) SE 5 of which Implementers AE 3 Implementers in FGD	I	Tot: 903 LIPT: 763 Eq: 71 L: 499 Ex: 333	Tot: 298 LIPT: 139 Eq: 139 L: 159 Ex: 0	S: M: F: 3	D: 2 L: 0 R: 1	R: 0 I: 3 SI: 0	+++ Good income +++ Maintenance work well manageable +++ Improved soil quality ++ Increase in vegetation ++ Benefit of fruit production	--- Technical knowledge required --- High establishment cost --- High workload during establishment --- Vulnerable to dry spells -- Irrigated land required	0	64%	14%	12%	1%	♀ 43% ♂ 57%	Y > M > E	D >> J > S	M > P ≈ B

SLM Practice SE: Socio-Economic component AE: Agro-Ecological component	Collective or Individual	COST		Characteristics of SLM plot			Perceived Advantages	Perceived Disadvantages	IMPLEMENTATION			INTEREST FOR THIS SLM PRACTICE					
		Establishment [USD/ha] Eq: Equipment L: Labour Ex: Expendable	Maintenace [USD/ha/y] Eq: Equipment L: Labour Ex: Expendable	Slope S: Steep M: Moderate F: Flat	Soil D: Dark L: Light R: Red	Water R: Rainfed I: Irrigated SI: Supplementary Irrigated			Spontaneous [person]	Intention	Intention without support	Most	Least	Gender ♀ % ♂ %	Age Y: Young M: Middle E: Elderly	Village S: Sar-i_Joy J: Jawaz-Khana D: Dasht-i-Mirzai	Wealth P: Poor M: Middle B: Better-off
Establishment of improved orchards and vineyards SE 42 Respondents SE 14 of which Implementers AE 17 Implementers in FGD	I	Tot: 2125 UPT: 2015 Eq: 65 L: 159 Ex: 1901	Tot: 162 UPT: 18 Eq: 18 L: 106 Ex: 38	S: 0 M: 10 F: 7	D: 8 L: 9 R: 0	R: 7 I: 8 SI: 2	+++ Benefits of fruit and wood production +++ Maintenance work well manageable ++ Land less vulnerable to rainstorms ++ Fodder production ++ Good income ++ Improved soil quality, land protection and vegetation cover ++ The villages turn green ++ Land less vulnerable to dry spells	--- Require sufficient own land --- High establishment costs -- Increased workload during establishment - Technical knowledge and tools required	13	60%	24%	35%	0%	♀ 36% ♂ 64%	Y > E > M	D >> S ¤ J	P ¤ M ¤ B
Afforestation for firewood production SE 29 Respondents (Most Interest) SE 14 of which Implementers AE 12 Implementers in FGD	C	Tot: 999 UPT: 999 Eq: 47 L: 318 Ex: 634	Tot: 133 UPT: 0 Eq: 0 L: 133 Ex: 0	S: 6 M: 6 F: 0	D: 6 L: 5 R: 1	R: 9 I: 3 SI: 0	+++ Land less vulnerable to rainstorms +++ Wood production +++ Low maintenance work ++ Fodder production ++ Land less vulnerable to dry spells ++ Improved soil quality, land protection and vegetation cover ++ The villages turn green + Fruit production - Plant diversity + Recreational benefit	--- Land required -- Implementation on common land -- Workload during establishment phase - Technical knowledge required - Reduced grazing area	0	28%	0%	24%	9%	♀ 66% ♂ 34%	Y > E > M	S > J ¤ D	P ¤ M ¤ B
Lifestock shed SE 9 Respondents (Most Interest) SE 2 of which Implementers AE 4 Implementers in FGD	I	Tot: 367 UPT: 293 Eq: 0 L: 137 Ex: 230	Tot: 11 UPT: 0 Eq: 0 L: 11 Ex: 0	N.A.	N.A.	N.A.	+++ Animal production (avoid: cold, diseases, ...) +++ Livestock less vulnerable to rainstorms ++ Livestock less vulnerable to dry spells	--- High establishment costs --- Tools required -- Land required	1	78%	0%	7%	12%	♀ 11% ♂ 89%	N.A.	N.A.	N.A.
Community fodderbank SE 9 Respondents (Most Interest) SE 3 of which Implementers AE 3 Implementers in FGD	C	Tot: 1196 UPT: 1196 Eq: 129 L: 170 Ex: 897	Tot: 11 UPT: 0 Eq: 0 L: 11 Ex: 0	N.A.	N.A.	N.A.	+++ Avoid fodder shortage +++ Avoid purchasing fodder at high market price +++ Maintenace work very well managable +++ Land (pastures) less vulnerable to rainstorms +++ Land (pastures) less vulnerable to dryspells ++ Benefical for animal production	--- High establishment costs -- Land required	1	89%	22%	7%	3%	♀ 0% ♂ 100%	N.A.	N.A.	N.A.
Rotational grazing plan implemented on improved pastures SE 0 Respondents (Most Interest) SE 5 Respondents (Least Interest) AE 5 Implementers in FGD	C/I	Tot: 1477 UPT: 447 Eq: 14 L: 1287 Ex: 176	Tot: 927 UPT: 0 Eq: 0 L: 920 Ex: 7	S: 2 M: 3 F: 0	D: 1 L: 2 R: 2	R: 5 I: 0 SI: 0	+++ Improved fodder production +++ Land less vulnerable to rainstorms ++ Improved pasture quality + Increased plant diversity + Land less vulnerable to dry spells	N.A.	N.A.	N.A.	N.A.	0%	4%	N.A.	N.A.	N.A.	N.A.
Rehabilitation of degraded pasture with alfa-alfa SE 7 Respondents (Most Interest) SE 1 of which Implementers AE 5 Implementers in FGD	C/I	Tot: 1190 UPT: 123 Eq: 10 L: 1004 Ex: 176	Tot: 1273 UPT: 0 Eq: 8 L: 1265 Ex: 0	S: 5 M: 5 F: 5	D: 6 L: 6 R: 3	R: 10 I: 5 SI: 0	+++ Increased fodder prodcution +++ Improved soil quality +++ Land less vulnerable to rainstorms ++ Maintenance work well manageable + Improved animal production + Increased vegetation cover	--- Land required -- Implementation on common land - Workload during establishment phase	0	86%	14%	6%	3%	♀ 0% ♂ 100%	N.A.	N.A.	N.A.

SLM plot characteristics: The LUPs showed, that plots where mixed land use type SLM practices are implemented (nurseries, orchards & vineyards, and afforestation) in general have access to irrigation water.. This is true in Sar-e-Joy and Dasht-e-Mirzayi. In Jawaz-Khana none of the plots is irrigated. The lack of (irrigation) water in Jawaz-Khana also limits the choice of SLM practices. Most SLM practices were implemented on plots with dark (good soil quality) or at least light soil (moderate soil quality). Thus, the SLM interventions carried out within LIPT have mainly focused on preventing land degradation, and only partly on rehabilitation of degraded land. Targeting prevention of land degradation is in general more cost effective than investing in rehabilitation. SLM practices which are mostly implemented on plots with bad soil quality are ferula cultivation and grazing plans. The majority of SLM practices were implemented on moderate slopes. Establishment of orchards and vineyards, as well as nurseries was often implemented on flat slopes. The only SLM practices implemented to a large part on steep slopes are hedgerows, afforestation, and to a lesser part pasture rehabilitation and grazing plans.

Cost structure and project support: LIPT financial support for SLM practices was on average 51% of the total costs, but differed greatly among SLM practices with cost coverage of more than 85% for fodder banks, orchards /vineyards and afforestation, and only 5% for pasture rehabilitation. LIPT support included reimbursement of labour, equipment as well as the provision of (improved) seeds, saplings, fertilizer and herbicides. So far there is very little experience with adapted SLM designs, such as applying less fertilizer, which is likely if farmers replicate bearing the full costs by themselves. In future, ferula and alfalfa seeds as well as saplings of different tree species can be produced locally. Already today, saplings are not only bought from the nurseries established in Dasht-e-Mirzayi, but are shared around by farmers who have established orchards. Furthermore, all costs for equipment are listed in the above table, even if this equipment may be used for the implementation of SLM practices on several plots and for various SLM practices (e.g. shovels, sickles).

Benefits: During the establishment phase (year 1-3), the fodder production is considered the main benefit production from almost two thirds of the SLM practices (for all SLM practices on grazing land, on mixed land and also for the hedgerow practice).

Preferences for SLM practices: The best liked SLM practices with over 20% of the interviewees referring to them are terraces (61%), orchards/vineyards (35%), gully treatment (32%), afforestation (24%) and ferula (in Dari *hing*) cultivation (21%). SLM practices mentioned by less than 15% of interviewees as one of three most liked practices were hedgerows, all grazing land practices (fodder bank, livestock shed, grazing plan, and pasture rehabilitation), as well as nurseries. Taking into account that implementation of nurseries is limited, since these are only feasible where irrigation water is available and was implemented by LIPT only in Dasht-e-Mirzayi.

Clearly SLM practices on individual plots are preferred compared to practices on common land. This may be attributed to the challenges of managing common pool resources and the perceived advantages of private benefits over shared benefits. More than 90% of the interviewees declared the intention or the wish to increase their number of livestock. On the other hand, 90% perceive the actual state of pasture as medium to very bad. The reasons they give for the bad pasture condition is (apart from shortage of resources) bad management, overgrazing and many also stated that “people don’t care about pasture”. Also, some SLM practices that were planned to be implemented on common land in collective actions, ended to be individual actions. This included ferula cultivation, which was planned to be intercropped with alfalfa during pasture rehabilitation, but has spread on individual plots. It is also true for pasture rehabilitation, with alfalfa cultivation on plots protected from grazing being mainly individual plots instead of common grazing land.

In general, the views differ among women who have no experience of the SLM practices and those who are members of the household who implemented the SLMs. The former group was less aware and/or interested in SLM practices than men. The two SLM practices for which this group showed a bigger interest than men were afforestation and gully treatment. Women are in charge of collecting and providing fuel-wood for their household but wood or bushes are ever more sparse and women have to walk long distances to find fuel-wood. Planting trees closer to their home (afforestation) would be highly valuable for them. Gully treatment decreases the risk of damage caused by run-off and flood for the land but also for the infrastructures (homes, roads) and crops (vineyard, orchard). These SLM practices show not only advantages for agriculture productivity but also for villages’ security. But it is surprisingly that these women do not have more preferences for pasture land and related livestock practices, as they are mainly involved in livestock keeping and grazing.

On the contrary, women from the latter group have the experience in SLM practices and support the family in implementation of the SLM practices. These women see the production benefits of such practices as terraces, orchards and vineyards, pasture rehabilitation, grazing plan and livestock shed, although almost all of them apart from livestock shed, increase women's daily workload. Ferula cultivation ranks lowest in terms of the benefits that are perceived by women, which is explained by the fact that harvesting of the plant takes place only 5 years after planting. Overall, women from families with experience in SLM implementation, relate the achieved or expected benefits of the SLM practices to their household wellbeing.

Young (18-30-year-old) are in general less interested in SLM practices. We could imagine that the young generation sees SLM implementation as a long-term investment and would not be ready to invest and make such effort as they could envisage another future than agriculture based. However their interest is bigger for the 3 practices on mixed category (afforestation, orchard & vineyard, and nursery) that have principally long-term benefit (apart for fodder production).

Regarding the socio-economic aspect, as LIPT supported a large part of the implementation costs, there is not much difference between the interest of the poor and the better-off. There is one SLM practice for which the poor show little interest, this is ferula cultivation. Even though, ferula has significantly higher income generation (market value) than grain crops, it takes 2-5 years before the first harvest. The poorest households also have the smallest land ownership and can't afford to set aside a part or their full land for some years with no income generation.

People's preferences seem not influenced by the cost structure. There is no or very little relation with total cost, establishment, maintenance or cost borne by land users. There is only little relation with labor costs borne by the project. Preferences are a result of a mix of perceived advantages (visible-tangible-experienced short term return on production and income generation) and disadvantages (amount of additional financial investment, additional workload, risk of failure and longer waiting time before return of investment). As the ranking exercise showed conducted during the FGDs, crucial criteria are drought resilience and compatibility of establishment work with other household work.

As stated earlier, terraces appeared to be the most interesting practice for many farmers (61%) and have a relative high rate of replication (implementation) intention (73%) even without financial support (32%). However, terraces are considered relatively costly and the workload during establishment is considered high. Additionally, terraces require a certain technical knowledge and even a person that had already participated in terraces implementation declared to not have the technical ability to reproduce it without support. This has to be taken into consideration with regard to the sustainability of such a technology, especially since a bad implementation could lead in the long run to further land degradation.

A detailed legend of the SLM table is available in Annex 6.

The detailed description of three SLM practices - namely terracing, orchards / vineyards and pasture rehabilitation - in the form of WOCAT Factsheets is available in Annex 7. The assessment of the different SLM practices by SE survey respondents can be found in Annex 8.

6 Outlook using Scenario Modelling

We applied Soil Conservation Service curve number (SCS-CN) method developed by the US Department of Agriculture (USDA), but today also widely applied for example in the Chinese Loess areas (Huang et al. 2006). The modeling is used to identify important factors (such as seasonality and different types of rainfall events) and to get an indication of the impact that we can expect from SLM measures. However the absolute values presented here are uncalibrated estimations. They should only be used for relative comparisons.

6.1 Runoff Scenarios

The SCS-CN method is determined by hydrological properties. Thus, the Chokar watershed is the spatial unit for the runoff modelling. The scenarios are based on the underlying assumptions:

- **Seasons:** The rainfall patterns are best represented by five seasons, as characterized by daily rainfall events and vegetation cover (see also Section 3). There are marked differences between the upper and the lower watershed (e.g. in the upper watershed more precipitation is in the form of snow than in the lower watershed). However, for reasons of simplicity, climatic conditions were assumed to be uniform over the entire watershed.
- **Rainfall events:** Rainfall events of 5 and 10 mm represent non-erosive rains and were included to explore the lower limits of rainfall (not) generating runoff. Rainfall events of 15, 25, and 35mm are generally expected to trigger runoff and thus erosion processes, depending on soil, slope and land management characteristics. For each type of rainfall (5, 10, 15, 25, and 35mm rainfall events), frequency of rainfalls and their contribution to the overall amount of annual rainfall is provided in section 3.
- **Land use types:** The average area coverage per land use type calculated in percentage for the three study villages, is assumed to be representative for the whole Chokar watershed. Area percentages were thus used for modelling purposes and to compare the percentages of runoff contribution (Figure 14). Land use types observed in the study region, were best estimated by land use types with known CN (corresponding to “cover types as defined by SCS-CN” in Table 5 below).
- **Slope steepness:** Runoff generation is higher for plots on steep slopes compared to plots on moderate slopes, as indicated by the higher CN numbers. Thus, for the major land use types two slope steepness sub-classes were distinguished based on their slope characteristics: cropland and grazing land on steep and moderate slopes. In each case, half of the cropland area was attributed to either class. SLM practices were only tested for land use on steep slopes, where they are slightly more effective than on moderate slopes.
- **SLM practices**: Two (simplistic) scenarios for exploring the effect of SLM practices implemented on steep cropland and on steep grazing land were calculated. Since data inputs are of limited accuracy, and model parameters were specified only at a basic level, it would be overambitious to differentiate more detailed SLM scenarios. On cropland, the effect of terracing is assessed, with terracing being the best liked cropland SLM practice. The grazing land SLM scenario focused on pasture rehabilitation with alfalfa, thus including a change from an extensive grazing land use (pasture) to an intensive grazing land use (cut-and-carry system) for steep grazing lands.

Model input data is shown in Table 5.

Table 5: Overview on SCS-CN model input data

Land use type	Mean Slope	Area	Area	Cover type as defined by SCS-CN no SLM		CN corr. for slope*	Cover type as defined by SCS-CN with SLM	CN corr. for slope
	[%]	[%]	[ha]	Pre-vegetation	Spring			
Cropland (moderate slope)	20*	22.5%	1440	Fallow; Bare soil	Small grain; Contoured	88	Small grain contoured & terraced	78
Cropland (steep slope)	32*	22.5%	1440			89		79
Grazing land (moderate slope)	21*	11.5%	736	Arid and semiarid rangelands, herbaceous	Pasture, grassland, or range - continuous forage for grazing	83	Meadow - protected from grazing	64
Grazing land (steep slope)	37*	11.5%	736			84		64
Mixed	31	7%	448	Woods - grass combination		71		
Settlement	20	2%	128	Streets and roads; dirt		85		
Unproductive land	49	17%	1088	Natural desert landscaping		81		
Waterways	21	5%	320	-		-		
Wood lots	28	1%	64	Woods		66		

* Higher CN correspond with higher runoff

Runoff modelling for different seasons without SLM interventions

Figure 14 shows runoff from Chokar watershed during the pre-vegetation season, while Figure 15 shows runoff during the spring season. Rainfall events of 5mm do not result in runoff. But according to model results, amounts of 10mm and more rainfall is translating into runoff. With increasing rainfall amounts (10-35mm), runoff is calculated to be increasing on all different land use types. For same types of land use, runoff from steep slope is always slightly higher than from moderate slopes.

For the **pre-vegetative season** (10 Feb – end of March), cropland must be considered fallow, as plant cover is still very sparse. In these conditions model results show very high runoff contributions from cropland. Depending on the rainfall event ranging from 5-35mm, 98-60% of the total runoff respectively is originating from cropland (see Figure 16).

During the **spring season (April-May),** the same type of rainfall events are calculated to result in less runoff compared to the pre-vegetation season. This can be attributed to the vegetation cover being now higher all over the watershed. Rainfall events of 5mm do not result in runoff. Rainfall events of 10mm result only in runoff from (roads of) settlements. Runoff from cropland is now calculated to be under-proportional compared to its area percentage, while runoff from grazing land is calculated to be over-proportional. This reflects the degraded condition of the majority of the grazing land area.

Runoff results for different seasons with SLM interventions on steep land

When we compare the situation without and with SLM practices, the model results show that in the pre-vegetation season the runoff is reduced by around 36% and 30% in the spring season. However, the percentage varies greatly depending on the type of rainfall event.

Model results indicate that SLM practices on steep slopes may almost completely prevent runoff both from cropland and from grazing land for rainfall events up to 25mm. For 35mm rainfall events, runoff is predicted from terraced cropland, but not from steep grazing land used for growing fodder crops and protected from animal grazing. To summarize model results: While SLM measures on cropland are crucial for the pre-vegetation season, SLM measures on grazing land are contributing most during the spring season.

Furthermore, mixed land use types (forest and orchards with alfalfa as herbaceous vegetation layer) do not contribute to runoff production for rainfall events of 5, 10 or 15mm. For rainfall events of 25 and 35mm they contribute under-proportionally to their area covered. This indicates the potential of mixed land use types for runoff reduction.

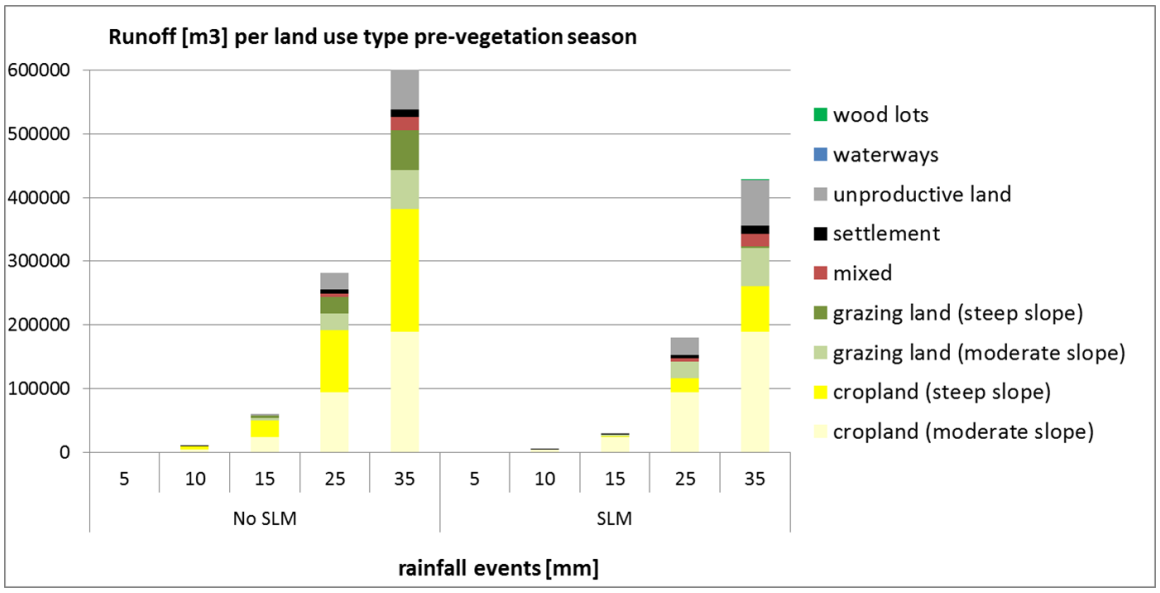


Figure 14: Runoff per land use type during pre-vegetation season

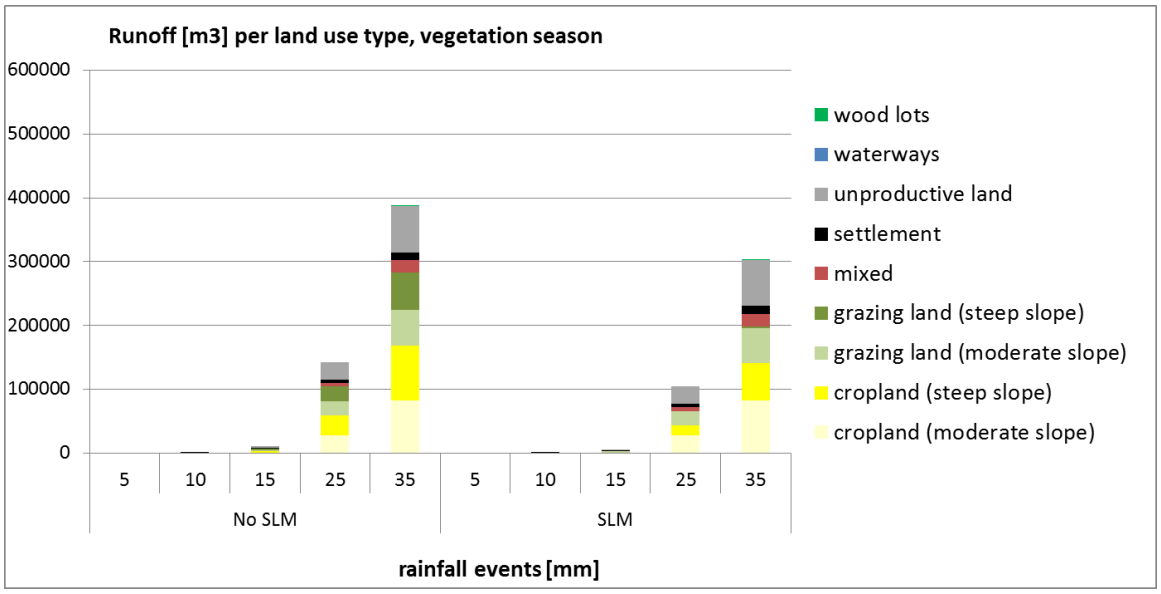


Figure 15: Runoff per land use type during vegetation season

Runoff during heavy rainfall events

SLM practices can intercept higher percentages of water of erosive rains of 10mm and 15mm. These are more frequent, and thus high amounts of water can be harvested, which is of great value for plant growth on cropland and on grazing land. However, the stronger the rainfall event, the higher is the percentage of rain translating into runoff. With regard to the control of disaster risks (flash floods) this indicates the need to also manage waterways such as gullies where runoff is quickly collecting. Furthermore, it might also require that to effectively reduce runoff during rainfall events with 35mm rainfall besides SLM practices on steep slopes also on moderate slopes interventions need to be implemented. According to the global climate dataset (CFSR), such 35 mm rainfalls must be expected on average once every year.

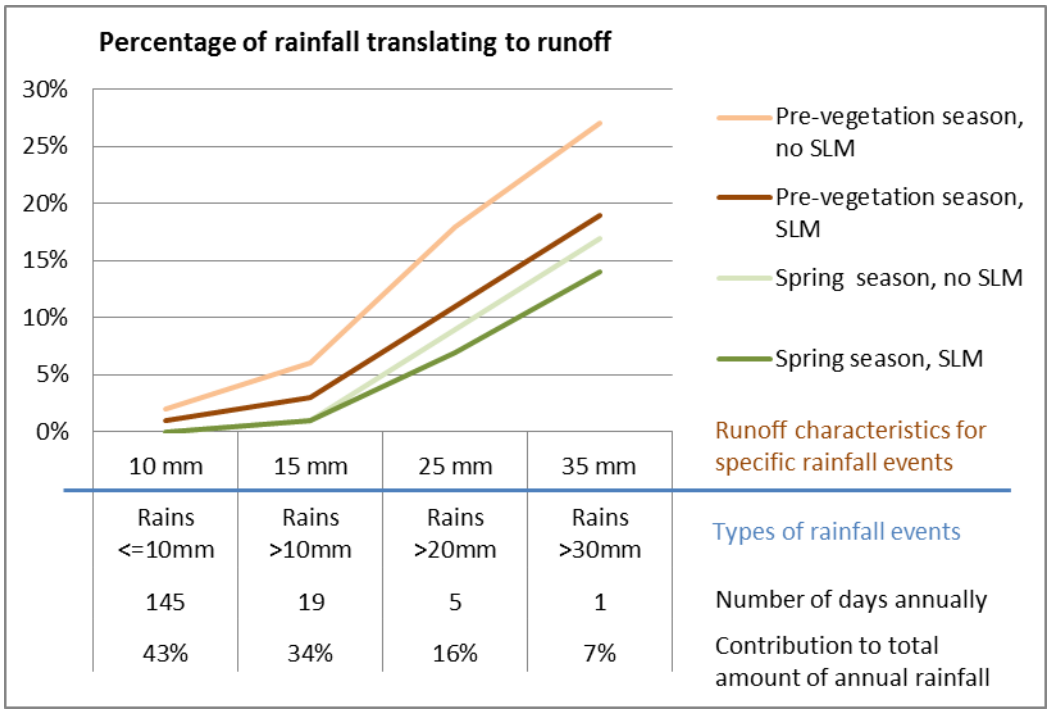


Figure 16: Percentage of rainfall translating to runoff for different types of rainfall events

Cost estimates

SLM interventions costs were calculated for terracing of all steep cropland and for turning all steep grazing land into (alfalfa) fodder production. No SLM interventions were considered for cropland or grazing land on moderate slopes, thus leaving half the cropland and half the grazing land untreated. Full labor costs were considered both for terracing as well as for protection of grazing land where pasture rehabilitation is implemented.

In the Chokar watershed, steep cropland covers an area of around 1440ha. With establishment costs for terracing of 1275 USD per ha, finances required to terrace the steep slopes would amount to 1'836'000 USD. Steep grazing land in Chokar watershed covers 736 ha. While initial establishment costs are 743 USD, the protection of the plot from grazing livestock is very costly and amounts to 1712 USD per year. Thus, establishment costs for pasture rehabilitation are about the double price compared with terraces. For a watershed like Chokar, the total establishment costs thus amount to 3.6 Mio USD. The expected runoff reduction was calculated to be as high as 42% in the pre-vegetation season, and 26% in the vegetation season. Very important is the amount of water that is thus intercepted and made available for crops onsite.

Table 6: Costs and benefits in terms of runoff

Land use type		**Establishment cost of SLM**		**Runoff reduction estimated**	
	Surface	**Unit costs**	**Total costs**	**Pre-vegetation season**	**Spring season**
	[ha]	**[usd/ha/y]**	**[usd / y]**	**[%]**	**[%]**
cropland terraced (steep slope)**	1440	1275	1'836'000	87	44
grazing land (steep slope)**	736	1477*	1'087'072	98	98
Total area Chokar watershed	**6400**		**2'923'072**	**42**	**26**

* Labor cost for protecting the fodder plot from livestock make up for 1287 USD. For more detailed cost information see the WOCAT documentations in Annex 7

** SLM interventions only on steep slope, none on cropland and grazing land on moderate slopes

Further model development

If a more precise model was to be developed for runoff calculations in Chokar watershed the following aspects should be considered:

- Climate data and river flow data (especially during events of high river flow and flash floods) need to be collected locally. This will allow a calibration of the estimated values with real measurements.
- Upper, middle and lower watershed zones differ with regard to precipitation and vegetation cover patterns. Characterization of different watershed zones is required.
- More precise characterization of the model parameters (namely rainfall events watershed zone) would then allow calculation of more detailed SLM scenarios, facilitating a comparison between different cropland and grazing land options.
- Land use changes are on-going. Area trends of different land use types are to be taken into account.

7 Discussion

This chapter discusses multiple aspects of the results presented in chapters 3, 4, 5 and 6. It is split into the following five parts: the adoption potential of SLM practices (7.1), local livelihoods and the importance of land (7.2), migration, youth and women (7.3), learning from LIPT (7.4) and a focus on pastures (7.5).

7.1 Adoption Potential of SLM Practices

The above Scenario development for Chokar watershed shows that **sustainable land management (SLM) practices have the potential to produce positive effects** in terms of reducing runoff, especially on steep-sloped land and for heavy, erosive rainfall events (Chapter 6). If implemented correctly, runoff is markedly reduced when SLM interventions are in place both in crop land and pasture, including a reduced risk for flash floods. As importantly: rainfall intercepted on-site increases soil moisture availability and thus plant growth and reduces the risk of crop failure during dry spells. Overall, and as assessed in this study's focus group discussions and interviews, this seems in line with local peoples' expectations towards individual SLM interventions. These expectations run high. In terms of conducive factors, and on the most general level, sustainable land management holds the promise for reduced vulnerability as well as the prospect for economic and social benefits (see Chapter 5). With interventions such as afforestation, gully treatment or hedgerows people expressed their hopes to curtail the risk for disaster and damage to their lives and assets and prepare better their land, livestock and homes against adverse circumstances such as rainstorms, floods, landslides, dry spells and the like. Besides ecological benefits, expectations towards SLM interventions also run high with respect to economic benefits, that is the prospect for increased and more reliable crop and fodder production as well as the possibility for diversification and cash income (e.g. fruits and fuel wood in orchard, cash crops such as ferula, fodder on the risers of terraces).

There exist however two **difficulties in assessing costs and benefits of individual SLM practices** through the eyes of local people in Chokar watershed at this point in time – and, by extension, also from a research perspective. On the one hand much of the intervention work was done relatively recently, and few people in the three villages were actually in the position to assess mid- and longer-term costs and benefits from their own, personal experience. On the other hand SLM interventions were externally supported with knowledge, training, tools, additional inputs and money. Such support makes it tricky for local people to genuinely assess the full extent of costs that would fall on their household in terms of the establishment and maintenance of specific practices. This implies that the people from the three study villages are still at an early stage of the innovation decision process as described by Rogers (2003). This process involves five stages, namely: knowledge, persuasion, decision, implementation and confirmation.

Rogers' (2003) five stages of the adoption of innovation, amongst others, conceptually underpinned the survey interview with 121 women and men in the three villages (see Section 5 of Questionnaire). The survey found that **both women and men respondents are aware** of, i.e. *know*, most of the introduced SLM practices – if to varying degrees. Many of them are therefore at the stage of *persuasion*, i.e. observing and experimenting with specific practices and assessing their relative advantage as compared to the necessary investments and previous practices. This process is, as mentioned above, impeded by the built-in bias of project support and the relatively short time since intervention. So far, while many respondents have participated in SLM-related work over the few years before the interview, only a **small number have actually spontaneously replicated** (or newly implemented) one of the SLM practices on their own. When asked whether they *intend* to implement a specific technology of their liking, numbers dropped – and dropped substantially further under the assumption that they would need to do it without external support. High costs – or correspondingly high labour demand and thus opportunity costs – figure prominently as people's reasons for non-replication. **Trade-offs in terms of land use, labour allocation** (including migration) **and assets** (e.g. investing in something different) thus seem to be major hindering factors for the implementation of SLM practices for the time being. In addition, **physical and mental health issues, debts and family duties** often absorb focus, workforce and money. In the years to come, and based on the knowledge acquired during the LIPT project, farmers might pursue more in-depth own observation and experimentation in order to take a more informed *decision* to adopt or to reject a practice before possibly moving into *implementation* at larger scale. The benchmark is yet to come, namely the final stage of the innovation process: c*onfirmation*. From numerous studies in different contexts we know that innovation can be – and often is – discontinued after some time.

It is important to note, after an exchange with Tdh staff in June 2017 that the survey results are not fully in line with their own monitoring. LIPT's Interim Report one year before the research took place actually refers to "…huge replication of terracing, orchards, pasture and reforestation" (LIPT 2015:6). The inconsistency of findings might be rooted in a different understanding of the relatively fuzzy notion of 'replication'. With *spontaneous* replication the research team refers to replication without any of the above mentioned externally provided incentives (money, additional inputs etc). Such spontaneous replication is the starting point for a better understanding of the diffusion of an innovation, like a specific SLM practice, and with it the viability of intervention. Tdh, in its monitoring, may have referred to replication including limited project support (i.e. reduced as compared to the very first round of implementation).

The fact that only few of the survey respondents replicated SLM practices spontaneously does not mean that farmers' attitude in the Chokar Watershed is innovation-averse, quite the contrary. Looking more closely into changing agricultural practices on the ground it becomes evident that **many farmers are seeking to improve specific aspects of their farming operations**. In fact, a large majority indicated some sort of change in the last few years (Chapter 4). The rapid spread of chemical fertilizers, the spread of orchards before LIPT intervention and the increased use of tractors – all mostly without external support – are three examples that illustrate farmers' willingness to try out new things and shift towards new practices if they perceive a relative advantage. Paradigmatic is the case of chemical fertilizer: it is easy to try out, easy to use, bears a seemingly straight-forward understanding of the cost-benefit ratio and is in line with previous farming practices (Rogers 2003). While on terraced land fertilizer is expected to be more effective, even on sloped land an effect can be observed easily, if applied correctly. Thus one means against declining yields – and in a sense dealing with negative effects of land degradation (in the short run) – is to apply fertilizer. Partly this might lead to a perception that the quality of crop land has improved recently – simply because it produces more yield (attribution gap). More generally it can be noted that in the three study villages SLM practices are competing with other new practices in terms of farmers' attention, financial resources and labour force.

7.2 Livelihoods and the Importance of Land

No doubt, in the three study villages of Chokar Watershed **agriculture is important**, and farming forms a major source of livelihood for many households. Crop land plays a vital role both in terms of access to and ownership of land. In all three studied villages the local understanding of poverty closely correlates with land ownership. This emerged during the different wealth ranking exercises yet also as a widely held view during interviews: with a few exceptions, '…individuals who do not have land in our village are poor people' [KII_202]. Overall, an estimated third of households do not own land in the study villages which is roughly in line with findings from others studies in Northern Afghanistan (e.g. Pain 2007, Schütte 2013).

Reasons for landlessness include having to sell land (due to illness, war/survival, getting married, depts etc), separating from one's parents' household, non-inheritance, and having moved to the village from elsewhere. In line with this, the idea of saving money in order to be able to acquire land was mentioned time and again, that '…all of the people who do not have land hope to buy land' [KII_104]. Farming, in a sense, is (still) the life most villagers seem to aspire for. In addition, and in all three villages alike, landlessness is also linked to a lack of political participation and power: in Sar-e-Joy it was stated that '…we do not have a member in the CDC and NRMC who is landless' [KII_104], and in Jawaz Khana that '…people who do not have land and livestock cannot be council members' [KII_204]. In Dasht-e-Mirzayi it was mentioned that '…usually the individuals who do not have land or have less land do not participate in elections; they think that the councils are not theirs and they therefore shouldn't participate in them' [KII_318]. Put differently, **land is an economic, social and political asset** which emphasises the value of land holding, of landedness – and by extension of agriculture. The importance of land is also made tangible in the fact that many conflicts in the three villages have to do with land issues (see below).

However, it is equally important to understand that **farming is by far not the only livelihood activity** in the three villages contributing to people's food and livelihood security. With an average of five months in a good agricultural year and two months in a bad agricultural year, the level of self-sufficiency of survey households in terms of wheat as the major staple crop is low. And so are the average of numbers of livestock. In fact, not one of the survey households was identified living from subsistence farming only. All respondents indicated income in cash and kind, mostly from two to three main sources. Data shows that there is a wide array of livelihood activities constituting the different sources of income ranging from farm sales (including livestock) and agricultural wage labour to non-farm labour and remittances (Chapter 4).

More generally, **two major livelihood strategies** can be isolated. On the one hand, this is a **focus on farming**, including intensification, upscaling and specialisation (e.g. niche products such as ferula/hing) – as small as the household's farming operation may be. On the other hand, this is the **diversification of livelihood activities** both as agricultural wage labour and non-farm income. In terms of wage labour, social relationships at the local level, such as the existence of and access to 'rich people' in the village, play a crucial role. Labour in other villages, districts and countries – and especially temporary labour migration to Iran – figure very prominently. By contrast, on-farm value addition, cooperation with other households, extensification of production and abandoning own farming activities were not or very rarely mentioned as livelihood strategies. Yet most notably is the fact that many people aim to **combine the two strategies**. One respondent pointed out that '…if the country develops […] I want to have a shop or I want to have a trade or will make a pharmacy, so that I brighten my future through this. Or I will brighten my future through livestock' [Q_1121]. Someone else stated that '…we work a lot. We struggle a lot on our land and livestock. In order to have a better future, we do share-cropping and travel wherever we can find good works.' [Q_2131]. In a sense, what many women and men interviewees shared was this flexibility, a more general focus on 'working hard' in whatever field an opportunity presented itself. This also means making the most of involving the whole household as workforce, including youth – or as one woman pointed out: '…I want to find an occupation for those in the house who do nothing' [Q_1092]. Put differently, it is about diversifying a household's rather than only an individual's income portfolio (Grace and Pain 2004; Pain 2007). The flexibility of two strategies is helping households in the study area to come to terms with uncertainty and risk. This is central as many respondents report a high level of uncertainty, namely changing sources and unstable amounts of income over the years. And: developing strategies to cope with uncertainty is key in a fragile context.

Time and again villagers highlighted the **link between security and agriculture** as well as **security and labour work**. Looking back, one woman pointed out that the security situation '…has effects on issues related to land and natural resource management because everybody left the village during war. Our lands were left useless. We could not cultivate our lands due to fear' [KII_117]. One man stated: 'if there is no security one may not want to establish an orchard, because one is not sure whether he will get the yields from his orchard or not' [KII_101]. Another man stated that people are concerned about the security situation in Afghanistan, and that 'insecurity in Kunduz has a lot of negative effects on our village and on those who go to Kunduz and other places for work' [KII102]. In a similar vein, someone pointed out that '…worsening of the security situation means the decrease of employments, people cannot go to the place they want' [KII_104]. A number of respondents emphasise the *if*, namely that the '…future of my family and myself will be good if the security is maintained in the country and our economic situation will also be improved [Q_1071]. Or: '…if there is peace, working opportunities will be provided for me' [Q_1121]. In this, the government has a role to play. If the government, according to a village elder '…is sympathetic to the people […] it provides security for us, so that the people are comfortably busy in their duties and employments' [FGD_209]. Security, in this sense, is crucial for both agriculture and off-farm labour.

From the level of landlessness, the increased number of people in the villages and the low level of self-sufficiency in grain one can follow that wage labour and linked to it temporary or more permanent migration is crucial to the coping strategies in the watershed. Or, as Pain (2007:61) holds, movement and diversification are essential livelihood strategies in the context of such geography and climate.

7.3 Migration, Youth, Women

Migration – and especially migration to Iran – is a vital livelihood strategy for very many households not only in the three study villages but the watershed at large. This is well documented in literature on issues to do with migration in Afghanistan. From Chokar watershed it is **almost exclusively young men leaving**, with typically economic motivations to get prepared for marriage, save for the prevalent bride price or for being able to separate from one's parents' household. In a FGD with young men in SEJ they pointed out that '…we migrate due to unemployment, non-unity and landlessness. We go in order to earn money and have an independent life for ourselves, get married, have our own house and buy land and livestock for ourselves. There isn't any other reason and motivation of going to Iran amongst young men except unemployment and poverty' [FGD_108]. In a focus group with young men in DEM one youth explained how local income can make him avoid 'becoming a borrower' and earning his initial travel deposit for the migration journey. Many people '…were earning money from working for the road construction project. No one wanted to go to other places such as Iran or somewhere else. Most of the people who worked in the road construction went to Iran after the completion of the project. Almost fifty young men of this village went to Iran' [FGD_303].

The leaving of young men has **repercussions at home**. Parents are anxious about their sons as both the illicit journey itself and wage labour at the destination bear risk and danger; they wish for a life of living-together under one roof; and partly fear changed values and norms that the young bring back to the village – such as aspirations for a different life in the city, for instance. Also, longer-term migration evidently brings about a shortage of labour inside the village and changes the internal arrangements of households. Many respondents pointed out that in case their son was away land needed to be worked either by another man from within the household, a day labourer or a close male relative of the family. If this was not possible, **women had to take over men's work** in addition to their own – including working in the field. This, for many, is a less-than-ideal solution but acceptable if the situation affords. In a FGD with elderly women one lady recalled that '…now her husband has gone to Iran and that lady is now responsible for all chores and her husband's responsibilities such as snow cleaning and irrigation' [FGD_214]. In a FGD with young women one lady said that '…in the case of men's absence, women take their responsibilities. I don't have much responsibility, because I do not have land and livestock. I only clean snow, bring water and collect firewood, but land owners work in their lands in the absence of men' [FGD_216]. It is unclear what this implies in the longer term. Yet as Grace (2004:8) has observed more than a decade ago in other parts of Northern Afghanistan, it is "…also possible that a continued and possibly increasing labour shortage inside the villages could mean that women's labour is brought into agriculture to a larger extent – a trend that has been evident in many other parts of the world". It remains to be seen to which extent in Chokar watershed this can be interpreted as small signs of a 'feminisation' of agriculture.

7.4 Learning from LIPT

In contrast to many other development projects in Afghanistan, LIPT III was designed along a so-called Outcome Mapping (OM) approach. OM is based on the understanding that development is, above all, about behaviour change of people or, more precisely, of partners the project is working with (so-called Boundary Partners). As a participatory approach OM focuses on capacitating partners to bring about the intended patterns of behaviour. This is why Tdh had established a new institution on the village level, the NRMC, as well as the WSA on the level of the watershed, in order to **work with and through local partners in the villages** while itself remaining at a distance. The envisaged role of NRMCs thus was to plan and implement SLM interventions in the villages on their own, alongside LIPT's facilitating support. According to LIPT staff, both NRMCs and WSAs had received capacity building by way of different trainings (administrative matters, integrated pest management, etc). Judging from an exchange with Tdh staff Rustaq in June 2017, it seems that this approach has worked well. In any case, the Interim Report holds that "…the watershed associations and NRMCs were empowered as planned" (2015:19). Facilitating such process was not possible entirely 'at a distance', of course, but necessitated time and presence in the field. It therefore does not come as a surprise that SLM-related work was **locally perceived by survey respondents as led by the 'organisation' or 'TDH'** – a visibility LIPT likely did not plan for.

LIPT interventions, by working through the NRMC, consisted not only of capacity building but also of more tangible incentives to villagers in terms of tools, inputs and cash. This **shift from a predominantly non-material to a partially material drive** aimed at getting villagers engaged and exposed to SLM practices such as terracing, reforestation or gully protection. It added an additional layer to the project, namely a novel source of income for villagers that some households could access, while others not. The boundary partner NRMC now had something to hand out to fellow villagers, most importantly opportunities for paid work right in the village. This was reflected in interviews time and again in terms of both **appreciation for those included and as a source of grief for the others**. Needless to say that many households in the villages were keen on such additional and local income: '…no one helps us to reach our goals. The government and the organization assisted other villagers but we received nothing. Our life will be better if the organization helps us' [Q_1042]. Or, as a woman respondent pointed out during the survey '…everyone is fighting to get work because there is little working opportunity' [Q_3072]. This shift in material support also resulted in conflicts. One person pointed out that '…sometimes conflicts occur due to the injustice of the village elders on a project which comes by the NGO, because they allocate all aid to themselves and the poor people are excluded from these aids' [KII_111]. Someone else highlighted that the '…conflicts inside the village on projects occur in some places between different Kundas; people who are in the NRMC and CDC only care about themselves and the benefit of their relatives' [KII_104]. Or, in another village, someone mentioned that '…they have divided the 30 terracings which have come to our village between their relatives and kinfolks such as their brothers, son-in-law and uncle. This itself caused non-unity in the village' [KII_317]. Such conflicts were alive to the extent that several households refused

an interview with the research team arguing that they would never see any support of sorts anyway. In addition, and related to this, **interventions themselves bear the risk that they are not equally appreciated by everyone**. Some interventions added conflicts by the way they were implemented. One respondent recalled that '…people did not create any problem at first, but in next year when the NGO decided to plant seedlings in the pastures people did not let. There is a pasture […] and the people of three villages […] use it. Based on the suggestion […] this was planted with seedlings by TDH. The villagers quarrelled, and they even went during the night and took out the planted seedlings' [FGD_207]. In another village, and in a FGD with elderly women, it was mentioned that '…NGO has planted seedlings in the pastures and has converted it to forest […] Some people are not satisfied about the weakening of the pastures, because fodder is expensive and they don't have pastures to graze their livestock […] people who have livestock are faced with the lack of pastures and become obliged to sell their animals' [FGD_307]. Thus, at times intervention can come at the price of increased conflict and social tension.

There are three important and intertwined learnings emerging, to do with (1) individual benefits of SLM interventions, (2) village leadership, and (3) land ownership.

Firstly: the SLM practices of most interest to survey respondents show that, among other factors, **individual benefits of sorts figure prominently**. One important dimension was **paid labour**, for instance for terracing, afforestation and gully treatment, thus financial incentives for local people to get engaged. One respondent pointed out that the '…son of my cousin and I worked with the projects conducted by TDH in the last couple of years. For example, we worked in the fields of terracing, in gully treatment and in orchards which was good income' [Q_2061]. In a focus group discussion with young men a youth stated that '…TDH has provided employment opportunities for people in orchard establishment, gabion making and terracing' [FGD_108]. And in a focus group with elderly women one lady pointed out that the 'NGO paid money to people in exchange for terracing and gully treatment' [FGD_214]. The findings imply that for many people taking part in SLM interventions, while exposed to new practices, this was also one way of earning additional income. A fair number of statements suggest that at least some villagers understood SLM more along the line of a *cash-for-work* setup. This is not to say that cash-for-work interventions are inadequate – quite to the contrary. Jobs are needed more than anything else. In fact, the numerous conflicts over labour opportunities and project-linked material benefits in the three study villages serve as an indicator of how sought-after jobs actually are. In addition, investing into a more sustainable, liveable and safe immediate environment might work as a meaningful driver in its own right for more human well-being. In terms of the adoption and the diffusion of innovation, however, this has far-reaching implications. No longer was interest and curiosity in SLM practices the sole prerequisite but intervention participants were selected also along other criteria. Inevitably this raises questions to do with the up- and outscaling of SLM practices and the overall viability of interventions over time. This could be undone if an intervention's emphasis was more prominently placed on capacity building and institutional development rather than monetary compensation.

Secondly: there is the issue of the **ability of local power holders to control and capture external resources** (Pain et al., 2017) in a setting that Jackson (2016) describes as 'personality-based networks of access'. While newly established only a few years ago, **implementing SLM interventions through NRMCs means by and large working with customary authorities**, village elders and landed, influential families in the villages. This is the background of many NRMC members (or certainly the core group within), and is thus comparable (or in DEM even identical) to the staffing of CDCs in the three study villages (Chapter 4). While such overlap might not come as much of a surprise, this approach is not free from challenges. Potentially it bears the risk that **structural causes of poverty and vulnerability might be reinforced** (ODI 2007). Yet in the given context of Chokar watershed **the question is less whether but rather how customary authorities are being involved** in project interventions, how such working relationships are structured and how it can be made productive as a driver for more inclusive community based development. One challenge has to do with the fact that the local economy is strongly distributional and based on social relations and mutual dependencies which also entails expectations (Pain et al. 2017). In terms of an external intervention this necessitates to carefully assess and understand the local context and the existing distributional mechanisms and local networks (e.g. Kundas) of sharing out benefits, and who gets what. Put differently in public good provision the meaning of 'public' starts to shift (Jackson 2016). It might need external support in this to address issues of wider benefit-sharing and distributional fairness in an understanding that sees, in the spirit of Outcome Mapping, Boundary Partners as "…outside of your control but they are within your sphere of influence" (Rodriguez and Hearn 2013).

Thirdly: it is about vested interests of landed households, often including the village leadership, and exclusive benefits derived from an external, substantial investment in one's private land (e.g. terracing, orchard, vineyard). Recalling the finding that landlessness and poverty are tightly interlinked and that crop production is not the most important source of livelihood for the poorest households, **direct benefits of SLM interventions on private land are likely to bypass a significant and sizeable group of villagers** (this would also include women-headed households). This could be undone if an intervention's emphasis was more prominently placed on collective action and common lands, such as pasture management for instance. It necessitates decoupling interventions from private lands.

7.5 A Focus on Pastures

As pointed out above, data analysis reveals that many farmers, if they take an interest, favour SLM practices on their own – thus on individually owned – rather than on common land. Put simply, there is more interest in terracing or orchards than in issues to do with pasture management. This somewhat contradicts research findings regarding farmers' perceptions and experiences in two important ways. First: farmers assess the condition of their crop land mostly as 'the same' or 'better', while a majority of respondents (63%) feels that the pasture they use is in worse condition now than ten years ago. Overgrazing, increased number of livestock, increased village population (most of which keep livestock), a lack of management as well as unfavourable rainfall patterns are mentioned as reasons for this. Second: the level of conflict regarding land issues in general but specifically conflicts to do with pasture areas figure prominently. A telling and often mentioned example is the **prevalent conversion of common pastures into private plots** of rain-fed crop land (done mostly by members from landed, influential families in the respective villages). By this way, an already scarce resource is further diminished – a process that is ongoing in the three study villages for years already. This is further aggravated by the finding that almost all respondents (92%) indicated in interviews the **wish for *more* livestock** – which inevitably will add pressure in the years to come. Although overgrazing is perceived as a prominent issue from a local perspective and **conflicts arise regularly over pasture access and use**, this does not immediately translate into prioritising measures to do with regulating more thoroughly livestock and grazing areas. When asked whether they and other pasture users had done something about the decline in the quality of pasture land, a large majority of respondents (75%) negated. Essentially, it is seen as an open-access system with the effect that '…people do not care about pasture' [Q_1082]. When asked in detail about measures regulating the access and use of pasture lands, a large majority of respondents replied that, according to them, pastures are public lands and not managed: 'everyone is busy in their own life and we do not have any consideration for public properties' [Q_1011].

Cleary, and learning from this research, working on issues to do with pasture land and its management might prove challenging. Yet it is crucial, and meaningful: pasture land is relevant in terms of reducing runoff; it is mostly a common pool resource and thus affects a large majority of villagers; it is a backbone for many a household's livelihood in the watershed; its benefits are relatively equally distributed; it is under pressure to be converted into crop land and being privatised; and it is at the roots of some of the more prominent conflicts in the villages.

Such insight is not new, and there is a considerable body of literature on issues to do with pastureland and its management in Afghanistan. Already in 2004 Alden Wily pointed out that a main finding from her study was that pastureland tenure needed priority attention. An ADB report under the title *Community Based Approaches for Rural Land Administration and Management in Afghanistan* holds that "disputes over land are manifold and […] evidence suggests that pastures are the principal source of conflict in Afghanistan" (2008:1). In a similar vein Stefan Schütte sees that access to pastures is "…heavily contested as the site of most unresolved tenure issues in Afghanistan and often the source of volatile conflict" (2015:5). He adds that it "…appears that many of the problems surrounding pastures appear to result out of missing, unclear or multiple certifications, and the complete absence of pasture user involvement in the development of ways to register rights to pastures in a shared and unanimous manner" (ibid:6). Put differently, **pasture management is less of a technical issue but rather one of communication, social skills, moderation and negotiation** in diverse social and political settings – thus essentially a question of governance. This is also highlighted in detail by Alden Wily in her report on conflict resolution of competing pasture claims, including an annex with relevant supporting materials (UNEP 2009a). While the Afghan law (e.g. Pasture Law 1970, Land Management Law 2000) understands all pasture land as state ownership and the definition of communal land is not provided for (AREU 2017), the National Land Policy (2007) has provided more room for pilots with some promising results. The community based methodology that came out of it – amongst ADAMAP – is straight-forward and ready to be used (ADB 2008; UNEP 2009a, Deininger et al.

2010): it sees a transfer of power to the local level, works with CDCs as land administration bodies (that is making use of an existing institution rather than establishing a new one), builds directly on the traditional system, elaborates agreements and written documentation and, by doing so, is linking localities to the central state. By way of more tenure security, it works towards encouraging the right holders to take a longer-term interest and to sustainably use the pasture resources. The devolution of authority to the local level entails the "…idea of expanding the state to literally encompass its localities, by turning local village councils into public service entities with ongoing responsibilities in pasture management and administration" (Schütte 2015:1). While different in terms of incentives and governance, this reverberates with some aspects of LIPT interventions and workings on the ground. An additional example, amongst many others, of a rather similar devolution process can be found in the so-called Pasture User Groups (PUGs) SDC has advocated and supported prominently in Mongolia as part of the award-winning Green Gold project.

Such devolution process will likely not happen by itself. External facilitation might be needed. In such process, interventions need to focus less on material and technical aspects but to a large extent on **capacity- and trust-building, collective action and dialogue**. It is also to acknowledge that results may be slow. Yet it is not only about the quantity of result but also about the **quality of process and learning**. By this way, a focus on pasture issues may bring about context-sensitive natural resource management, inclusive and flexible, tackling the roots of some of the more prominent conflicts in the villages. This is not to say that an NRM strategy should focus exclusively on common pool resources or, let alone, on pastures – but based on its unique characteristics grazing land seems particularly well placed to bring about change in mixed rain-fed farming and extensive livestock systems in mountainous communities. Change that is ecologically aware, socially agreed and economically manageable.

8 Conclusion

The overall goal of the Rustaq NRM Study is to inform future context-sensitive natural resource management strategies that contribute to more sustainable livelihoods in Rustaq district and other mountainous regions of Central Asia. This implies that the specific agro-ecological conditions and institutional setups as well as local people's lives, priorities and aspirations shall be taken into account. Correspondingly, this study investigated the potentials and limitations for SLM from an ecological, economic, social and institutional perspective.

SLM has the potential to reduce erosive processes and to increase the productivity of land on a longer term, as shown in the scenario modelling and reflected in local people's observations and expectations. It however requires substantial investments in terms of money, land, labour and process facilitation. Some SLM practices such as terraces and orchards seem to be attractive for local people having the means to implement them. For several of the SLM practices, however, it is questionable whether local people will be able and/or ready to mobilize the necessary resources. Many households lack the financial and physical capital (e.g. landless households) or seem to assign priorities differently: other agricultural practices and livelihood activities as well as health issues, debts and family duties absorb money, land, labour and attention. It is such everyday trade-offs – which are most pronounced among the very poor people – that constitute the major hindering factors in the implementation of SLM practices on people's own initiative. This is important to keep in mind especially when striving for pro-poor project interventions.

Implementing SLM practices as a project intervention provides local people with new insights, skills and – especially if done on a cash-for-work basis – a shorter-term source of income that may contribute to local economic development. NRM-related interventions in this regard may be meaningful in their own right yet might depend on public/external support. Research results show that external support for individual households in the form of money or inputs can have positive effects but at the same time bears the risk of favouring some over the many, the risk of unjust benefit sharing and more conflicts, and even potentially less sustainable land management practices (e.g. if wages are invested in specific measures of agricultural intensification). In addition, not all SLM interventions are appreciated equally by everyone (e.g. trees planted on pasture land).

Pastures constitute a backbone of many households' livelihoods, are at the roots of some of the more prominent conflicts in the villages – and at the same time have the potential to substantially reduce the risk of natural disasters. Also, land degradation on pastureland is perceived as a problem by many local people. And yet, the readiness to engage seems to be lower as compared to SLM practices implemented on private land. In common pool resources collective action is required and individual benefits tend to be less immediate. Depending on the village context – namely the public good orientation of the village authorities (Pain 2014) – this may be the area where external support and facilitation is most promising and needed with the potential to benefit the village more inclusively. This holds true not only in ecological and economic but also in social and institutional terms.

SLM/NRM strategies should therefore be developed and implemented in a genuinely participatory manner: patience, an in-depth understanding of local conditions, power-relations and priorities as well as distinct communication, facilitation and mediation skills are key to managing such challenges. In addition, it is important to acknowledge divergent interests of women and men, of landed and landless, of different wealth groups as well as of elderly and young struggling to manage multi-layered livelihoods.

In this, *Peacebuilding and Pasture Relations in Afghanistan* (Schütte 2015) may constitute a source of learning as well as a source of inspiration. It uses pasture management at the local level not only for managing common resources but adding the dimension of peace-building from the ground up. If working well, this is a precious added value, namely using NRM deliberately to make a contribution in countering fragility in local people's everyday lives.

9 Recommendations

The here listed recommendations are based on the results of the Rustaq NRM Study and refer to its Overall Goal, namely 'to inform future context-sensitive natural resource management strategies that contribute to more sustainable livelihoods in Rustaq district and other mountainous regions of Central Asia'.

These recommendations are to be shared, first and foremost, with Tdh project staff in the field and in the different offices, SDC Kabul and its projects in the field of NRM in Afghanistan (e.g. GIAA) as well as the wider community in Afghanistan and Central Asia taking an interest in NRM related issues (government offices, UNEP, NGOs etc). Some recommendations may also be of interest to stakeholders of other development or research projects.

- **Take into account local people's practices, assets, needs, aspirations and priorities** when defining the focus of a new project. Make sure that the diversity of perspectives is well understood. In Chokar watershed, this may lead to a focus on topics other than NRM (as found in this research).
- **Consider conducting small research studies prior to new projects**. This may contribute to sharpening the focus of future interventions and identifying possible partners on the ground**.** It further gives local people a voice and triggers mutual learning.
- **Ensure the availability of relevant competences in project implementation.** Strongly emphasize communication, process facilitation and conflict mediation rather than technical skills.
- **Develop and implement NRM/SLM strategies in a participatory manner.** Proactively foster the participation of women, youth, landless and other groups in decision-making in a culturally sensitive way. Encourage self-expression, knowledge and experience sharing.
- **Reinvigorate an NRM approach that transfers power to the local level.** Focus on institutional development, with close follow-up and facilitation. Fully capacitate partners at all levels to perform their roles. Define clear roles of partners yet also of facilitating NGO. Pay attention to institutions at the meso-level and link local initiatives to the policy/national context.
- **Consider collaborating with existing institutions instead of establishing new ones.** This may contribute to the sustainability of interventions, as such institutions are more likely to continue their activities after (shorter-term) projects end.
- **Strengthen non-material interventions**. Place capacity building, collective-action-oriented interventions and dialogue at centre stage. Use NRM deliberately as peace-building from ground up.
- **Be aware of fairness/benefit-sharing issues.** Select interventions that avoid injustice and foster fairness best (e.g. by working on common pool resources instead of individual household land).
- **Be aware of the multiple effects of cash-for-work systems.** They may fuel economic development and accelerate implementation but also bear the risk of unintended incentives and injustice.
- **Prioritize common pool resources** (especially pastures) as an NRM strategy that at the same time aims to foster fairness and peace-building from ground up. Apply participatory land use planning (and watershed management) approaches.
- **Focus on steep-slope (grazing) land** as an important contribution to sustainable soil, water, vegetation and livestock management.
- **Put in place a meaningful, qualitative M+E system.** It is about the quality of process and learning rather than about quantitative results. Include less immediate goals, stories of change, uptake logs. Be attentive about how external actors (state and non-state) relate to and work with local institutions.
- **Stay engaged.** Use Chokar watershed as a learning site where considerable investment has been done. Link Chokar watershed with the GIAA programme adding value to LIPT III.
- **Follow up SLM interventions in Chokar watershed.** Restudy the SLM intervention in Chokar watershed in five to ten years time. This will allow to better understand the adoption potential and the real costs and benefits of SLM practices to farmers.

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Annexes

Annex 1: Tabular Project Overview

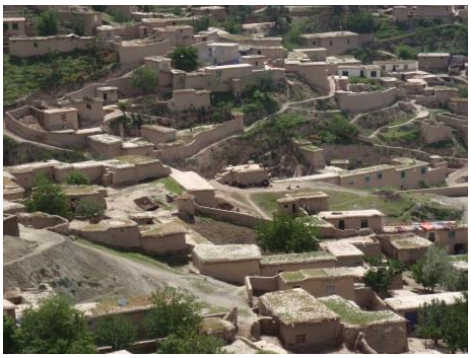
Overall goal	**To better understand the social-ecological systems and innovative sustainable land management (SLM) practices in Chokar watershed (CWS) in order to inform future context-sensitive natural resource management (NRM) strategies that contribute to more sustainable livelihoods in Rustaq district and other mountainous regions of Central Asia.**		
Components and objectives	**1. Agroecological component:** Potentials and limitations for improved NRM in CWS are better understood based on the participatory assessment of SLM technologies implemented, families' agricultural strategies with regard to land management costs and benefits, and the land resources potential in the CWS.	**2. Socioeconomic component:** Potentials and limitations for improved NRM in CWS are better understood based on the analysis of local people's livelihoods, their experience with innovations in agriculture and SLM as well as the context they are embedded in.	**3. Interface with development interventions:** The research benefits LIPT and selected stakeholders active in the development and implementation of NRM interventions, thereby contributing to context-sensitive NRM strategies at different levels and locations.
Subordinate objectives	1.1 Evaluation of existing, recently implemented and potential SLM technologies, with regard to their costs and benefits (based on the WOCAT SLM Technology Questionnaire) 1.2 Assessment of the land resources potentials and limitations for their upscaling (Participatory GIS of land resources and analysis of accessible remote sensing and GIS data) 1.3 Analyzing trade-offs between short- and long-term investments and benefits at the household and village level (scenario modelling of runoff and erosion control)	2.1 Local people's livelihoods and the relative importance of land in CWS are better understood. (Based on the Sustainable Livelihood Framework) 2.2 Local people's experiences with innovations in agriculture and land management in CWS are better understood. (Based on Rogers und co.) 2.3 The context (structures and processes) at village level in CWS and beyond is better understood regarding local people's livelihoods and NRM. (Based on Pain)	3.1 LIPT III staff benefits from the research activities in terms of research methodology. 3.2 Implications from the research contribute to the further development of LIPT interventions. 3.3 Research objectives, activities and results are discussed and evaluated jointly with multiple stakeholders 3.4 Research results are communicated to the larger public by various means of dissemination.
Research questions (AE and SE component) **Expected results** (Interface component)	**1.1 Evaluation of existing, recently implemented and potential SLM technologies, with regard to their costs and benefits** - What are the costs and benefits of SLM interventions? Especially with regard to establishment and maintenance inputs, and on-site benefits (biomass, food, fodder and fuel production; water use efficiency, soil moisture retention) and off-site benefits incl. runoff, erosion and sediment reduction, and disaster risk reduction (floods and droughts)? **1.2 Land resources potential** - What is the land resource potential of the three study villages as determined in a participatory manner between researchers, SLM experts and land users? - What are landscape patterns reflecting? What are its temporal characteristics (e.g. has there been distinct shifts?), its spatial characteristics (what is the size of the area covered by cropland, pastures and forests, or	**2.1 Local people's livelihoods and the relative importance of land:** - What are the livelihood outcomes local people are seeking, and why? - Which strategies do they follow to achieve these outcomes? - What are the key constraints and opportunities to achieving these outcomes? - How important is agriculture compared to other livelihood activities? - What are local people's agricultural and land management practices? - What are the differences by gender, age, socio-economic position and village context? - How does fragility influence local people's livelihoods? - What does this imply in terms of potentials and limitations for improved NRM in CWS? **2.2 Adoption of innovations in agriculture and land management:**	**3.1 LIPT III:** LIPT staff is trained and uses survey methodologies in order to assess impact of past and future LIPT interventions (e.g. final monitoring of Phase III). **3.2 LIPT Future / possible follow up NRM project in the Rustaq area:** - Through an internal workshop research results are shared and discussed with LIPT staff. - Implications from the research contribute to adjust possible future LIPT interventions to beneficiaries' needs and aspirations. - SLM practices of LIPT have integrated improved and innovative SLM practices assessed by the agro-ecological component. - SLM practices and strategies are in line with local peoples' aspirations and resources. - In general, better knowledge of peoples'

	settlements?) and can these be linked to socio-economic drivers such as seasonal migration? **1.3 Analyzing trade-offs between short- and long-term investments and benefits at the household and village level.** - What are the trades-offs between investing in soil conservation and benefitting from in-creased yields (short-term and long-term)? - What is the potential and limitations of agriculture, including various SLM interventions, with regard to securing livelihoods?	- What is local people's experience with innovation (= new or different practice) in agriculture in general? - Does land degradation trigger change in land management practices? If yes, what kind of change? - What is local people's perception of introduced SLM practices? What are (perceived) conducive and hindering factors for the adoption of these practices? - What are the differences by gender, age, socio-economic position and village context? - How does fragility influence the adoption of innovation? - What does this imply in terms of potentials and limitations for improved NRM in CWS? **2.3 Context at village level and beyond:** - How and to what extent do village institutions (both customary and newly introduced) affect local people's livelihoods and NRM in CWS? - How and to what extent do structures and processes beyond village level affect local people's livelihoods and NRM in CWS? - What does this imply in terms of potentials and limitations for improved NRM in CWS?	livelihood strategies allows LIPT strategies to achieve LIPT's global challenge to improve livelihood strategies and outcomes of local communities, those increasing their livelihood assets, reducing their vulnerability and improving their food sec. **3.3 Multi-stakeholder discussion:** - Research results are shared and discussed with WSAs and NRMCs at village level. - Multiple stakeholders gain a better understanding of: a) In a specific vulnerability context and a given set of livelihood assets, how are livelihood strategies prioritised and what livelihood outcomes can be expected. b) What are realistic scenarios for households to adopt SLM practices on their plots, and what are the results with regard to biomass management at village level. **3.3 Communication of research results:** - LIPT positive SLM strategies are documented and shared through the WOCAT network. - Through a larger learning event research outcomes are discussed and shared with Afghan and Tajik partner organisations and concerned government entities. - Simulation/strategy game (Bachmann 2006) - Final report is widely shared and published. - A more popular and illustrated version contributes to get a larger public to get a better under-standing of living conditions and dynamics of mountainous Qarluq communities in Rustaq.
Deliverables	- List of all produced materials and documents (based on the TORs of the Rustaq NRM Study mandate) - Fact sheet - Final report including scientific and operational results - Simulation/strategy game: Concept		

Annex 2: Land Use Types in Chokar Watershed

Waterways

Settlement



Cropland

Cropland

Grazing land

Wood lots

Mixed land (orchard with haymaking)

Unproductive land

Annex 3: Interface with Development Interventions: Stakeholders and Outputs (27.2.2017)

Stakeholder groups in development cooperation:	**Practitioners (land users, NRMCs, NGOs, GIAA)**	**Policy makers (SDC, Afghan Government etc.)**	**Research for development (transdisciplinary research)**	
Component 3 – Interface with development interventions:			**Agro-ecological research**	**Socio-economic research**
3.1 Implications for LIPT III				
(Tdh) staff benefits from the research activities in terms of research methodology (e.g. final monitoring of LIPT)	- Map prints showing SLM plots - GIS maps and database Chokar WS - Training of Tdh staff in FGD moderation and interview methodology	Examples on generating evidence for decision making using sound interview techniques, FGDs, participatory GIS.	FGD moderators trained for scientific studies	Interviewers and FGD moderators trained for scientific studies
3.2. Implications for future NRM interventions especially in Rustaq / Takhar, but more general in Afghanistan and Central Asia				
Through an internal workshop research results are shared and discussed	Skype conference with LIPT after integration workshop	Steering committee March 2017	Identification of potentials and limitations of scientific studies for development cooperation	
Implications from the research contribute to adjust possible future (NRM) interventions	Recommendations for Chokar and Nooristan watershed	Recommendations for future context sensitive (NRM) projects in Takhar / Afghanistan / Central Asia	Research recommendations for future context sensitive studies in Rustaq / Afghanistan / Central Asia	
In general, better knowledge of peoples livelihood strategies allows NRM strategies to achieve the global challenge to improve livelihood strategies and outcomes of local communities	Recommendations for Chokar and Nooristan watershed	Recommendations for future context sensitive (NRM) projects in Takhar / Afghanistan / Central Asia (and backstopping if desired)	Lessons learnt on the Sustainable Livelihoods Framework (SLF) as a conceptual framework for the Rustaq NRM study	
3.3. Multi-stakeholder discussions of Rustaq NRM study				
Research objectives / questions are discussed	Inception mission	Inception report	Inception report	
Research activities are integrating social learning approaches	Generic guidelines for participatory M&E: - FGD guidelines for SLM evaluations; - Manual for participatory GIS in Rustaq - Questionnaire for household interviews	Case study on research for development in Rustaq, Northern Afghanistan.	Scientific reflections on FGDs, household and key informant interviews. Lessons learnt on transdisciplinary research activities in Rustaq, Northern Afghanistan.	
Research results are shared and discussed	Restitution event Rustaq Conference (in Kabul)	Conference (in Kabul)	Conference (in Kabul)	
3.4. Communication of research results				
LIPT SLM practices documented and shared	LIPT SLM practices are documented in the WOCAT online database (~10 documentations)	SLM practices are documented in the WOCAT online database (~10 docus)	WOCAT docus used for further research	
Strategy game Household Decisions for Sustainable Land Management	Awareness raising on SLM scenarios in Chokar watershed	Participatory assessment on SLM options in rural areas	Results and recommendations on participatory SLM scenario modelling for scientific purposes	
Final report is widely shared and published	Final Report: Results of Chokar watershed case study	Final Report: Recommendations for LIPT evaluation and for SDC strategic planning	AE research results	SE research results, MSc thesis'
More popular and illustrated versions contribute to get a larger public interested	Fact sheet Rustaq NRM study	Fact sheet Rustaq NRM study (possibly: policy brief, publication in AAN, report on Qarluqs, Dari versions?)	(possibly: Presentations at scientific conferences, peer reviewed publication, possibly in Afghan journals in Dari)	

Annex 4: Factsheet Rustaq NRM Study

Rustaq NRM study

High pressure on land resources in mountainous regions
Photo: Reto Zehnder

Potential and limitations for improved natural resource management (NRM) in mountain communities in the Rustaq district, Afghanistan

The Rustaq NRM Study is embedded in the Afghan efforts and efforts of Swiss and other partners to contribute to develop mountainous regions in Afghanistan by strengthening the agricultural sector. In the mountainous regions of Rustaq district in Afghanistan's North, the conditions for rural communities are harsh. It is a mountainous terrain where rain-fed agriculture is conducted on steep slopes, prone to extreme weather events and marked by poor agricultural yields, and where health care, education services and non-farming income sources are scarce. Many families are surviving making use of unsustainable survival strategies which in turn lead to highly vulnerable livelihoods.

Survival strategies include laborious agricultural practices
Photo: Reto Zehnder

Study aim

The study aims to improve the understanding of the social-ecological systems of small watersheds in Rustaq district and evaluate innovative strategies and institutional arrangements for increasing benefits from sustainable land management (SLM) and for securing sustainable livelihoods.

Experiences with sustainable land management technologies are gained in the frame of the LIPT project
Photo: Reto Zehnder

Components

An inter- and transdisciplinary approach is used. Participatory identification of knowledge gaps, evaluation of possible solutions, and determination of strategies aim at a joint learning process. The study takes a pro poor approach, with special consideration of gender issues. The study activities are organized in three interlinked components:

Agro-ecology
1) Evaluation SLM technologies
2) Land resources mapping
3) Biomass management analysis

Socio-economy
1) Livelihoods and the importance of land
2) Innovation in agriculture
3) Context analysis: the village & beyond

Interface with policy and practice
1) Capacity building of LIPT staff
2) Feed into LIPT IV
3) Stakeholder workshop
4) Strategy game

Case study villages

In-depth research will be done in three villages of Chokar watershed: Sar-i-joy, Jawaz Khana, and Dashti Mirzai. These villages represent the upper, the middle and the lower zone of the watershed.

Funding agency

Swiss agency for development and cooperation (SDC) Kabul, Afghanistan

Project duration

From May 2015 to June 2017

Contact

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Research partners

Rustaq NRM study is jointly conducted by Swiss partners:

- HAFL (School of Agricultural, Forest & Food Sciences, Bern University of Applied Sciences)
- CDE (Centre for Development and Environment, University of Bern)
- ee-consultants based in Mauraz

Collaboration with implementing partners

Since 2006 Tdh (Terre des hommes) is implementing the Livelihood Improvement Project Takhar, LIPT. The focus of LIPT III (2012-2017) is on the thematic areas of Natural Resource Management and Rural Economic Development.

Annex 5: Draft Concept Strategy Game

Concept for Rustaq NRM Strategy Game

02-06-2017

Introduction

In the frame of the Rustaq NRM study the concept for a strategy game was developed, in order to building a bridge between (scientifically) identified possible agricultural household strategies and livelihood outcomes determined by local stakeholders. The game aims at doing scenario development and assessment for land resource use improvements jointly with the different stakeholders and communities. Existing strategy games and scientific literature were reviewed. The team made use of the long-term experiences in game development of other CDE researchers and the games that were developed for the Central Asia region, especially CONMICOM. The information collected in the frame of the Rustaq NRM study would allow a full version of the game to be tailored to the study region: data, information and knowledge from the different research activities should be used when designing the game.
It is envisaged to play the strategy game with different stakeholder groups (NGO staff [test run], the Natural Resource Committees (NRMCs), men from the communities, women from the communities, possibly government officials).

Game objectives

Aim of the game

Each family pursues the objective of identifying and adapting livelihood strategies serving its own interest, while at the same time optimizing use of the land resources in a way that prevents their degradation, for the families and communities own good.

Learning objectives

The game demonstrates the potentials and limitations for improved natural resources management in Afghan mountain communities. Following the SLF concept, it allows testing of livelihood strategies taking into account livelihood assets, changing structures and processes, and effects of the vulnerability context. Scenarios and their livelihood outcomes are tested in the play based on real world figures and setups.

The game allows an improved understanding of trade-offs between short-term and long-term returns of investments. It allows a comparison between investments on individual versus common land. But also between agricultural and non-agricultural investements.

Elements of the game

Please take note: So far the game includes text. However, the aim would be to replace text with pictograms and to make the game understandable for analphabets.

The game board

The board offers room for all playing material. At the center all soil puzzle pieces are joined together to form the land resources of the village. The color of the soil pieces indicates the fertility of the soil. Each family (group of players) has their land at one side of their village.

The game rounds

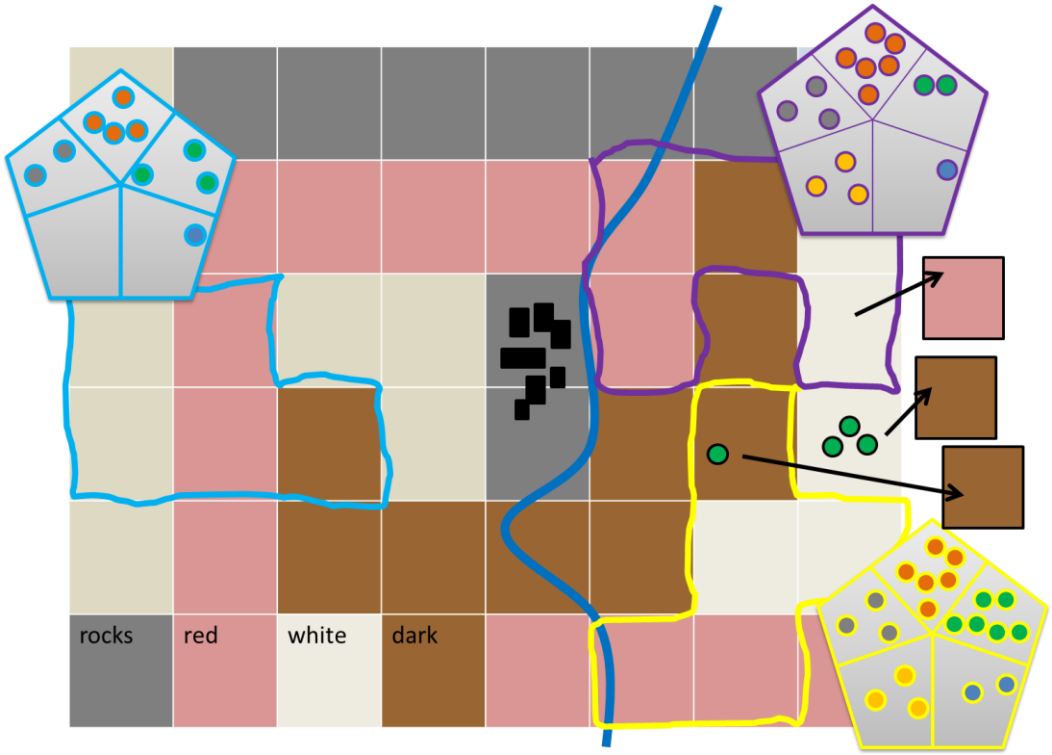
The game lasts for 6 rounds, each round represents one year. The “initial phase” covers the years 1, 2 and 3, and the “outcomes phase” covers the years 11, 12, and 13. During the first three rounds of the

initial phase each family plays in turns. During the outcome phase, the family with the highest livelihood assets plays first.

Families and their livelihood assets

There are three groups of players and their households. Each group gets an initial set of points reflecting their assets. Each household is different.

Visualization of the game board



Each group gets an initial set of points reflecting their assets. Each household is different.

3 Groups of players and their household

The soil puzzle

The puzzle is made up of *48 cards* representing each 3 jeribs of land. Colors are indicating soil quality categories. At the outset each family owns 15 jeribs of land (5 cards). During the initial phase (years 1, 2 and 3), the soils as indicated on the board remain. During the outcome phase (years 11, 12, 13) soil as affected by land use during the game is valid.

Land use and land degradation / conservation dynamics:

- **Degradation:** no green point (no natural capital= the land is degrading => card changes to a lesser soil quality category (brown> white, white>red, red>rock)
- **Prevention:** 1 green point = the land is prevented from degradation => card remains
- **Restoration:** 3 green points = the land is restored => card changes to a better soil productivity category

Population growth and subsistence needs are rising. Each family is growing and requires more and more plots:

- **Years 1, 2, 3: Initial phase**
  Each family starts with 5 plots of land to cover its needs: 1 dark, 2 white, and 2 red soil plots. This amount and quality it requires during year 1, 2 and 3.
- **Years 11, 12, 13: Outcomes phase**
  The families have grown and require at least additionally 2 brown, 4 white, or 6 red soil plots during year 11, 12 and 13

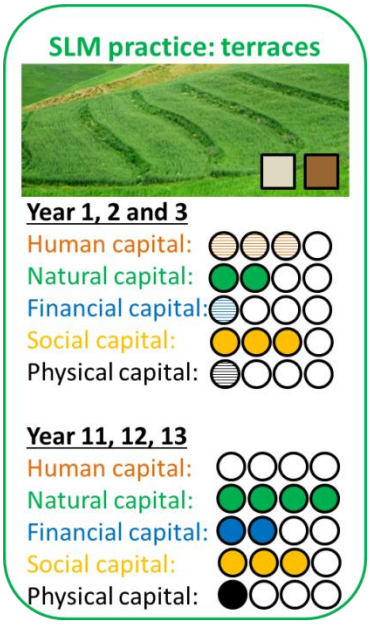
It is possible to buy and sell land use plots to each other.

Livelihood strategy cards or Action cards

Per year, per family action cards can be played. They show impacts on the livelihood assets. The indicated number of points are added (filled circles), or subtracted (striped circles) from the families household assets. If the household has not sufficient points to pay for the action, the players cannot (yet) use the card. The action cards cover different sectors:

- Agriculture – implementation of different SLM practices and combination of practices
- Migration – seasonal migration, multi-year migration abroad, international emigration forever etc
- Business opportunities, networks, infrastructure….

Examples of action cards:.

Agriculture	Migration	Business opportunities
		
The agricultural cards show on which soils the SLM practice can be implemented. In the case of terraces this is only possible on dark and white soils.		

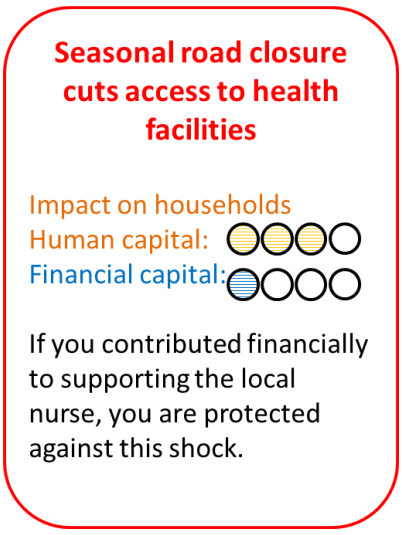
Vulnerability cards

The shocks and trends affect all players. After each round, the families in turn throw a dice. If the dice shows a number 1, the moderator draws a climatic shock card. If a number 2, then a price shock card, if a number 5 then a n insecurity situation card, and if a number 6, then a seasonal vulnerability card.

The different type of shocks and trends are as follows:

- Climatic shocks: e.g. rain storm
- Price shocks: e.g. fuel prices increase sharply
- Insecurity situations: e.g. Kunduz area is uncertain, men cannot go for labor migration
- Seasonal: e.g. road closure

The vulnerability cards specify what strategies / actions reduce vulnerability against the specific shock.



Transforming structures & processes

Either come down top down and affect all players. Else can be initiated by a minimum of 2 families together. Cards representing the different sectors:

- Institutions
- Private sector
- Laws
- Policies

End of the game: Livelihood outcomes

The family with the highest capital (including all assets) wins.

Development of a full version of the Rustaq NRM strategy game

Development of technical aspects of the game

- Development of game cards: A full set of cards needs to be developed. This includes vulnerability cards, livelihood asset cards and cards representing transforming structures & processes.
- Fine tuning of the "game mechanics": initial points of assets, impact points as noted on the vulnerability and livelihood asset cards, number of soil squares on the game board, number of game rounds etc.

Practical testing of the game

Test rounds of the game need to be played, followed by further revision of the game. Test rounds may include game rounds with the following players:

- The team of game developers
- Colleages from work or students not involved in the game development
- A group of test persons from the local context, such as the LIPT team
- Pilot game with people representing the target group (e.g. the NRMC from Sari Joy)

Annex 1: Strategy Games in Research and Development Cooperation

Guiding questions:

- *How do elaborated results and available information influence decision making processes (e.g. WOCAT documentations)?*
- *Does the use of (strategy) games contribute to test the acceptability of elaborated scenarios (in terms of up-scaling) or to derive realistic scenarios for modelling?*

Conceptual Background (Key Words)

- Learning for Sustainability / Social Learning => Facilitate learning processes / education

- Natural Resource Management / Governance => Understand and negotiate management processes

„While the theoretical debate continues about the definition and concept basis of social learning, there is an immediate need for practical tools that enable stakeholder learning and foster SLM. However it is defined, social learning should be embedded in structures and processes that enable joint action (Schusler et al., 2003). Facilitating action towards implementation of SLM demands a targeted process that goes beyond analysis and discussion of problems of land degradation and desertification.“ (Schwilch et al. 2012)

Strategy / Simulation Games on Sustainble Development

Present Application (Key Words)

...in school (Game-based Learning, Education for Sustainable Development)

...in research (Learning for Sustainability, Participation, Natural Resource Management, Conflict Mitigation, Education)

Contribution of simulation games in research

Holistic Learning (Bachmann, 2006)

The following characteristic aspects of simulation games (modified according to Capaul 2001) contribute to the promotion of holistic learning:

- The game system includes the cognitive as well as the affective dimension.
- The problems are in touch with reality, authentic and generally require an interdisciplinary approach.
- The game system promotes communication and interaction between the learners.
- The game system is aligned with the learners so that they can pick up on their previous knowledge and existing experience.
- Systematically looking back at the learning process is an integrated component of the game (debriefing). In this way the transfer to a future learning/practical field is prepared and the learning process is consciously completed.

Capacity Building (Bachmann, 2006)

- **Introduction to a new topic**: Introducing a new topic in the form of a game can make its complexity easier to grasp and conveys an initial overview of relations, links, and dynamics.
- **Identification of key aspects for the training**: The course of the game and the assessment that follows show what knowledge the participants already have and where there are still gaps. Core topics and needs for the training can be identified.
- **Creating a common reference framework**: The common game experience forms a shared experience which is used as a reference for the following discussions.
- **Applying new knowledge**: At the end of training newly acquired knowledge can be used and tested in game form.
- **Refreshing knowledge**: After completing a training course there is always a risk of losing this newly acquired knowledge. Learning games help to refresh already acquired knowledge in a playful way.

Further apsects

Strategy / Simulation games help to...

...facilitate participatory research

...stimulate (social) learning processes

...identify and discuss trade-offs of natural resource management on the household, village and watershed level

...gain insights into the acceptability of SLM technologies and approaches, and elaborated scenarios in terms of up-scaling

...derive realistic scenarios for up-scaling SLM technologies and approaches

...

Possible Challenges of using games in research

...to link the results of the game to reality (keeping seriousness) => debriefing

...to reduce/simplify the reality without losing crucial information

...to gain acceptance for this approach from the local participants

...to derive information/results from the game (record of information)

...

Current Exeperiences

... e.g. Sustainable Pasture Management in Kyrgyzstan

Annex 2: Literature reference list

References	Keywords	Remarks
Bachmann, F. 2006. Simulation games. A Stimulative Approach to Active Learning. Rural Development News (2).	**Holistic Learing, Capacity Building, CONMICOM**	!!! Game
Berkes, F. 2009. Evolution of co-management: Role of knowledge generation, bridging organizations and social learning	Co-Managment, **Social Learning, Governance**	Review Paper
Dielemann, H. & Huisingh D. 2006. Games by which to learn and teach about sustainable development. Exploring the relevance of games and experiental learning for sustainability. Journal of Cleaner Production 14: 837-847.	**Sustainable Development Education**, Experiental Learning, **Games and learning processes**	!!! Game
Fabricatore, C & López, X. 2012. Sustainability Learning through Gaming: An Exploratory Study. Electronic Journal of e-Learning Volume 10: 209 – 222.	**Sustainability,** complex systems, game-based learning, digital games	
Garmendia, E. & Stagi, S. 2010. Public participation for sustainability and social learning: Concepts and lessons from three case studies in Europe. Ecological Economics 69: 1712-1722.	**Social learning, Participatory approaches, Integrated assessment,** Complex adaptive systems, **Natural resource management**, Energy policy	!!
Hansmann, R. 2010. "Sustainability Learning": An Introduction to the Concept and Its Motivational Aspects. *Sustainability 2:* 2873-2897.	**sustainability learning**, motivation, affective, cognitive, learning goals, **social learning**	Review Paper !!
Henry, A. D. 2009. The Challenge of Learning for Sustainability: A Prolegomenon to Theory. Human Ecology Review 16: 131-140.	**sustainability, social learning,** individual learning, environmental policy, social networks, cognition	
Marschke, M. & Sinclair, A. J. 2009. Learning for sustainability: Participatory resource management in Cambodian fishing villages. Journal of Environmental Management 90: 206-216.	Transformative learning; **Participation**; **Local resource management committees**; Cambodia	Case Study !!
Pahl-Wostl, C., Mostert, E., and Tàbara, D. 2008. The Growing Importance of Social Learning in Water Resources Management and Sustainability Science. Ecology and Society 13.	adaptive management, European Water Framework Directive, **social learning, stakeholder participation**, water resources management	
Pahl-Wostl, C. & Hare, M. 2004. Processes of Social Learning in Integrated Resources Management. J. Community Appl. Soc. Psychol., 14: 193–206	**integrated water resources management; social learning;** group model building; **participatory processes**	
Pahl-Wostl, C. 2007. The Importance of Social Learning in Restoring the Multifunctionality of Rivers and Floodplains. *Ecology and Society* 11.	conflict resolution; **social learning**; **adaptive management; participatory modeling**; floodplain restoration	
Schulze, J., Martin, R., Finger, A., Henzen, C., Lindner, M., Pietzsch, K., Werntze, A., Zander, U. and Seppelt, R. 2015. Design, implementation and test of a serious online game for exploring complex relationships of sustainable land management and human well-being. Environmental Modelling & Software 65: 58-66.	**Serious game, Game-based learning, Environmental education, Sustainability,** Dynamic **model**, Spatial explicit model, System dynamics, **Systems thinking, SLM**	!!! Game LandYous
Schwilch, G., Bachmann, F., Valente, S., Coelho, Moreira, M., Laouina, A., Chaker, M., Aderghal, M., Santos, P., and Reed M. S. 2012. A structured multi-stakeholder learning process for Sustainable Land Management. Journal of Environmental	**Sustainable Land Management, Stakeholder, Participation, Learning, Decision support**	!!!

Management 107: 52-63.		
Sinclair, A. J., Diduck, A. and Fitzpatrick, P. 2008. Conceptualizing learning for sustainability through environmental assessment: critical reflections on 15 years of research. Environmental Impact Assessment Review 28: 415-428.	**Public participation; Education; Learning; Governance;** Canada	Review Paper !!
Webler, T., Kastenholz, H. and Renn, O. 1995. Public Participation in Impact Assessment: A Social Learning Perspective.		

Annex 3: List of Existing Games

Name	Application	Expected Results / Learning Objectives	Participants	Game type	Publisher	Key Word
Sustainable Pasture Management	Participatory research (Workshops)	1) Participants are aware of relevant questions and thematic issues concerning sustainable pasture management 2) Participants make experiences concerning the dynamic relations between pasture management, livestock development and overall development. 3)Participants are aware of the need for pasture use planning and management, and of their individual and collective responsibility.	Groups of 3-5 Persons	Simulation game (board game)	CAMP/CDE	Learning for Sustainability, Sustainable Pasture Management
Bougouni	Sek II (School) / Education in development cooperation	Realistic and exemplary acces to education for sustainable development: Insight into: 1) Local realities (Sahel) 2) Potentials and risks of household and community strategies aiming for sustainability	School classes (12-25 Participants)	Simulation game (board game)	CDE/PHBern /Education 21	Learning for Sustainability, Small-scale Agriculture, Developing Countires
CONMICOM	Participatory research (Workshops)	1) The game demonstrates how tension builds up, increases, and finally escalates 2) It shows how power positions work and alliances are formed 3) It enables the players to experience the great significance of mutual agreement and cooperation. *During the game and particularly during the debriefing and evaluation session it is important to link experiences made during the game to the players' real-life experiences, and to discuss these links in the group. The resulting insights will provide a basis for deducing important conflict prevention and transformation measures.*	Representatives of 3 families; facilitated by a moderator	Simulation game (board game)	CDE	Conflict mitigation in communities
3rd World Farmer	No specific application area	1) Insights into real-world mechanisms that cause and sustain poverty in farming households in developing countries 2) Starting point for discussions of „3rd World issues"	Individual	Computer Game	3rd World Farmer Team	Poverty, Small-scale Agriculture
Africulture	School (Higher	By playing the game, you experience many of	School	Simulation	Vrije	Education,

Name	Application	Expected Results / Learning Objectives	Participants	Game type	Publisher	Key Word
	leveL?)	the concepts that have been discussed in class: Input and output markets and prices, urban and rural Labour markets, migration and transaction costs, division of labour, education and health and risks and uncertainty.	classes / Students	game (board game)	Universiteit Amsterdam	Developing Countries, Small-scale Agriculture,
African Farmer	1) Ideal for classrooms and workplace training where a group is guided through the game by a 'game manager'(multiplayer) 2) The single player game can be played by anyone in a standard Internet browser	African Farmer simulates the complex decisions and uncertainties faced by small-scale farmers living in Sub-Saharan Africa.	Single player and mulitplayer	Open source online game	University of Sussex and Future Agricultures	Small-scale Agriculture, Sub-Saharan Africa
The Green Revolution Game	Training settings around the world	1) Demonstrating the complexity of decision-making 2) Helping sensitise players to the impact of rapid agrarian change from the farmer's point of view Examples: 3) Helping rural bank managers in India to understand the problems of small farmers 4) Helping political scientists in the UK to gain a greater appreciation of small-group dynamics	?	Computer game	Chapman, G. (1985)	Small-scale Agriculture, Decision-Making
Rehab Game	Participatory Research	It simulates the management of a natural resources and trade-off between conservation and livelihoods.	?	Board game and online version	ETH Group of Forest Management and Development	Management of a natural resources, trade-off between conservation and livelihoods.
Kodagu Game	Participatory Research („We want to understand the economic, social and environmental long term impacts of these policies")	Understand how a coffee agroforestry system is managed by farmers under different policy scenarios (you play the role of an Indian farmer in charge of managing a coffee agroforestry estate)	?	Board game and online version	ETH Group of Forest Management and Development	Management in coffee farms, policy intervention
LandYous	This game was developed for students (age 16+)	Provide a first impression on relationships between investments, land use, and different success indicators. (Invest capital to achieve the economic, social and ecological success at the same time.)	Single player (?)	Online game	Helmholtz-Zentrum für Umweltforschung - UFZ Department Landschaftsökologie	Management of a natural resources, trade-off between conservatio

Name	Application	Expected Results / Learning Objectives	Participants	Game type	Publisher	Key Word
						n and livelihoods.
Überleben in Katonida	14+ (with or without moderator)	Insights into relations between production, harves failures and food supply Insights into decision making under uncertain conditions Insights into relations between poverty, food insecurity and health	8-30	Simulation game (board game)	„Brot für di Welt“ und „Spiele zur Entwicklung spolitik“	Small-scale Agriculture, Poverty, Risks
Fluoride in food and water	Participatory Research	Identifying and showing paths of flouride intakes	Single player	Computer game	Eawag	Contamination of food and water, Health

Annex 6: Legend SLM Table (Chapter 5)

Legend of the SLM Assessment Table

Land use types	Short form for graph and text	SLM practices implemented by LIPT
Cropland	- Terraces (Terracing) - Hedgerows - Ferula cultivation - Gully treatment	- Terraces with improved seed and fertilizer application - Contour lines of alfalfa on annual cropland (Hedgerows) - Ferula cultivation on degraded slopes - Gully treatment (mainly on cropland but also on grazing land and mixed land)
Mixed land (Orchards/ Forest)	- Orchards - Vineyards - Nursery - Afforestation	- Establishment of improved orchards and vineyards - Nursery for the production of fruit and non-fruit saplings - Afforestation for firewood production
Grazing land	- Pasture rehabilitation - Grazing plan - Fodder bank - Livestock shed	- Rehabilitation of degraded pastures with alfalfa - Rotational grazing plan implemented on improved pastures - Community fodder bank - Livestock shed

Colour code	Cyan for cropland SLM practices Green for mixed land SLM practices Green-brown for grazing land SLM practices
AE	Agro-Ecologic component research team data (15 FGDs resulting in 102 LUPs)
SE	Socio-Economic component research team data (121 semi-directive interviews)
SLM PRACTICE	Sustainable Land Management Practice[1]
SE X Respondents (Most Interest)	X of the 121 SE respondents chose this practice in the 3 choices for their "most interesting SLM practice"
SE Y of which Implementers	Y of the "SE X respondents" had implemented (or someone of their household) this SLM practice
AE Z Implementers in FGD	Z is the number of participant of the FGD from AE that are all implementers of this SLM practice.
COLLECTIVE OR INDIVIDUAL	C = Collective = implemented collectively on common land I = Individual = implemented alone or collectively but on private land
COST	
Establishment [USD/ha]	Costs for establishment in the first year
Maintenance [USD/ha/y]	Costs for maintenance, yearly recurring/following the year of establishment
Tot:	Total cost
LIPT:	Costs borne by the LIPT project
Eq: Equipment	E.g. shovel, A-frame, etc.
L: Labour	Cash for work – XX AFN per day of labour
Ex: Expendables	E.g. Seeds, fertilizer, etc.
CHARACTERISTICS OF SLM PLOT	Agrophysical characteristics of SLM implementation plot
Slope	Slope steepness affects the run-off
S: Steep	> 31 %
M: Moderate	16-30 %
F: Flat	0-15 %
Soil	Locally used soil categories, their perceived fertility and expert determined characteristics:
D: Dark	Good soil fertility; Moderately deep, loamy and silty texture of topsoil, medium topsoil organic matter
L: Light	Moderate soil fertility; Moderately deep; loamy and silty texture of topsoil, low topsoil organic matter
R: Red	Low soil fertility: Shallow, medium and coarse texture, low organic matter
Water	Irrigation nature of the SLM implementation plot
R: Rain-fed	Production completely or to a large extent depends on rainfall
I: Irrigated	Full supply of irrigation water, e.g. through canals, ditches
SI: Supplementary Irrigated	Supply of irrigation water in addition to rain water perceived
PERCEIVED (DIS)-ADVANTAGES	Integrated data from AE and SE component **Rules for ranking SE data**: +++/--- if mentioned by 50% or more respondents, ++/-- if mentioned by 10-49%, +/- if mentioned by less than 10% **Rules of ranking AE data**: +++ if average rating 2.5 points or above, ++ 2.1-2.5, + 1.6-2, - If 1.5 or below not to be mentioned or mentioned as perceived disadvantage

[1] SLM practices for assessment have been proposed by LIPT
SE assessed vineyard and orchard separately and used the data provided for orchard for the table.

IMPLEMETATION	Question "Did your household replicate/implemented the practice"
Spontaneous [person]	Number of interested person for this practice that implemented the practice by their own without LIPT support.
Intention	% of the interested person for this practice that intend to replicate/implement it.
Intention without support	% of the interested person for this practice that intend to replicate/implement it even without support.
INTEREST FOR THIS SLM	What are the 3/2 practices of most/least interest to your HH?
Most	% of person (on 121) that chose this SLM practice as MOST interesting on 3 possible choices.[2]
Least	% of person (on 121) that chose this SLM practice as LEAST interesting on 2 possible choices.
Gender ♀ % / ♂ %	Share of women/men that are most interested in this practice
Age	Relative/Comparative share by age group that are most interested in this practice
Y: Young	18-30 years old
M: Middle	31-50 years old
E: Elderly	50-92 years old
Village	Comparative share of respondents by village that are most interested in this practice
S: Sar-e-Joy	Upper Chokar Watershed -> few irrigated land, steep to moderate slopes
J: Jawaz-Khana	Middle Chokar Watershed -> no irrigated land, steep slopes
D: Dasht-e-Mirzayi	Lower Chokar Watershed -> better irrigation, moderate to flat slopes.
Wealth	Relative/Comparative share of respondents by age group that are most interested in this practice
P: Poor	Predefined category by participatory discussion with villages' heads.
M: Middle	Predefined category by participatory discussion with villages' heads.
B: Better-off	Predefined category, by participatory discussion with villages' heads.
N.A.	Note applicable (i.e. size of sample too small)

[2] No interest or no answer were excluded but had 78 quotes on 363

Annex 7: WOCAT Factsheets

WOCAT Factsheet Terracing

WOCAT Factsheet Orchards and Vineyards

WOCAT Factsheet Pasture Rehabilitation

Terraced plot in Sari Joy (Mia Jan Maroofi)

Terraces with improved seed and fertilizer application (Afghanistan)

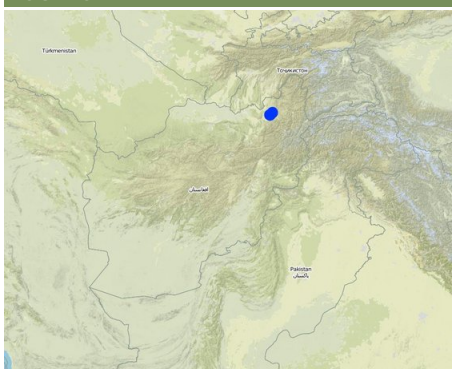
Palbandi bo tukhmihoi behbudyofta va kud

DESCRIPTION

Terraces are established on mountain slopes used mainly for cropping wheat, with the purpose of soil protection from erosion, preserving runoff, sediments and nutrients on-site. Improved seeds and fertilizer are applied on the terraces for increasing crop yield, but also vegetation cover and biomass production, and thus prevent further land degradation.

Project supported implementation of terraces with application of improved seeds and fertilizer has taken place in the villages Sari Joy, Jawaz Khana and Dashti Mirzai, located in Chokar watershed of Rustaq District in Northern Afghanistan. The Chokar watershed is a mountainous area situated between 600 - 2,500 m above sea level. The climate is semi-arid with harsh and cold weather in winter and hot and dry summers. The annual precipitation in average years is 580mm. Land degradation affects all forms of land use and includes low vegetation cover, heavy top soil erosion from water, and poor soil fertility. Unsustainable agricultural practices, over-exploitation and high pressure on the natural resources are adversely impacting on the socio-economic well-being of local communities as well as contributing to the risk for being adversely affected by drought as well as landslides and flash floods triggered by heavy rainfall. The data used for the documentation of the technology is based on field research conducted in Chokar watershed, namely in the villages: Sari Joy, Jawaz Khana and Dashti Mirzai. These villages represent the upper, the middle and the lower zone of Chokar watershed, respectively. They differ considerably in access to services and infrastructure, but in general are poorly served. The communities depend mainly on land resources for sustaining their livelihoods. In a good year with high yields, wheat-self-sufficiency lasts about 5 months. Since 2012 the Livelihood Improvement Project Takhar (LIPT) implemented by Terre des hommes (Tdh) Switzerland has initiated a range of NRM interventions. The project introduced terraces as sustainable land management practices on private plots, situated on rolling (11-15%) and hilly (16-30%) slopes to protect the land from soil erosion and prevent the loss of water and fertile topsoil, seeds and fertilizers. The average plot size for terrace implementation is 2 Jerib (0.4 hectares) with contour strips of 40m x 4m. The height of the risers is 1m-1,5 m. Terrace benches are built along the contour by moving the soil above the bench downwards. The leveled benches of the terrace are cultivated with wheat. The risers of the terrace are mostly used for growing fodder crops, mostly alfalfa, which also helps to stabilize the terrace. If medicinal herbs (ferula) are included they are cultivated along the bench contours . Maintenance activities include small repair work on the riser by adding some amount of soil and re-sowing of alfalfa seeds on those spots. The terraces allow application of improved seeds and fertilizers without them being washed off. The land-users report noticeable increase of wheat yield from the terraced plot with application of improved seeds and fertilizer compared to the non-terraced plot. An average plot of 0.2 ha on non-terraced hilly cropland used to give about 70 kg of wheat (350kg/ha). On terraces the yield has increased/ doubled to 140 kg on the same plot area (700kg/ha). The expectations regarding terraces remain high as over the time the land user hope their land will become more stable and improved soil moisture and fertility will have positive impact on the productivity as well. However, so far no cost-benefit assessment has been conducted allowing attribution of individual measure to the wheat increase. Many land users are interested in the terrace technology due to a number of environmental and economic benefits expected, however the costs for building the terrace are considered high by an average local land user. They have to rely on external support in order to have sufficient resources for implementation. Women considered an advantage that during the establishment phase, men were paid by the project to work on their own land (or other villagers land) when building the terraces. Thus, there was no need for men to go for seasonal labour migration and they stayed at home.

LOCATION



Location: Chokar Watershed: Sari Joy (upper watershed), Jawaz Khana (middle watershed), Dashti Mirzai (lower watershed), Takhar Province, Rustaq District, Afghanistan

No. of Technology sites analysed: 10-100 sites

Geo-reference of selected sites

- 69.85151, 36.99307
- 69.8559, 36.99288
- 69.85908, 36.98401
- 69.85951, 37.00393
- 69.86123, 36.99128
- 69.73747, 36.91176
- 69.72755, 36.91261
- 69.72692, 36.91439
- 69.72682, 36.91757
- 69.84744, 36.99752
- 69.84418, 37.00255
- 69.85151, 36.99307
- 69.71925, 36.90521
- 69.72571, 36.9058
- 69.72609, 36.90644
- 69.73147, 36.90648
- 69.71959, 36.90681
- 69.7314, 36.90869
- 69.73793, 36.90923

Spread of the Technology: evenly spread over an area (approx. 0.1-1 km2)

Date of implementation: less than 10 years ago (recently)

Type of introduction

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

Establishment works on the terraces in Sari Joy village (Mia Jan Maroofi)

Completed terraces in Sari Joy Village (Mia Jan Maroofi)

CLASSIFICATION OF THE TECHNOLOGY

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

Land use

Cropland - Annual cropping, Perennial (non-woody) cropping
Main crops (cash and food crops): Wheat, Alfalfa

Water supply
- ✓ rainfed
- mixed rainfed-irrigated
- full irrigation

Number of growing seasons per year: 1

Land use before implementation of the Technology: Before implementation of the Technology, only annual crops were cultivated, with wheat as the main crop. Plots were ploughed along the countors mostly by animal traction. In recent years land users are starting to use tractors for ploughing, , where villages and plots are accessible by machinery.

Livestock density: n.a.

Purpose related to land degradation
- prevent land degradation
- ✓ reduce land degradation
- ✓ 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, Wo: offsite degradation effects

physical soil deterioration - Pi: soil sealing

biological degradation - Bc: reduction of vegetation cover, Bq: quantity/ biomass decline

water degradation -

SLM group
- cross-slope measure

SLM measures

agronomic measures - A2: Organic matter/ soil fertility

vegetative measures - V2: Grasses and perennial herbaceous plants

structural measures - S1: Terraces

TECHNICAL DRAWING

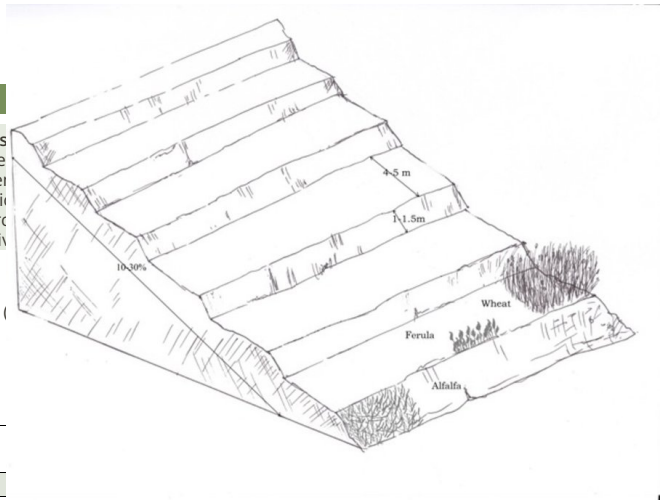
Technical specifications

Terraces are established predominantly on a privately owned land in a mountainous landscape with varying steepness of slopes.
The average size of a plot is 2 Jerib, which is equal to 0.4 ha. The design of the terrace depends on the steepness of the slope. Mostly rolling (11-15%) and hilly (16-30%) slopes are used for building terraces.
Using an A-frame, the terrace is designed by dividing the slope into contour strips. Depending on the slope steepness, the terrace bench is around 4m wide and the the height of the risers is 1m-1,5 m. The terrace benches are built along the contour by moving the soil of upper bench to the lower bench. The leveled benches of the terrace are cultivated with wheat. The risers of the terrace are mostly used for growing fodder crops, such as alfalfa, which also helps to stabilize the terrace. If medicinal herbs are included, such as ferula, they are cultivated along the bench contours.

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs
- Costs are calculated: per Technology area (size and area unit: **1 ha**)
- Currency used for cost calculation: **US Dollars**
- Exchange rate (to USD): 1 USD = 67.0.
- Average wage cost of hired labour per day: 5.2-5.3 USD.

Mos
Due
beer
agri
purc
deliv



Establishment activities
1. Selection of the area for establishing a terrace (Men) (Management; Autumn)
2. Designing of the terrace using A-frame, assisted by trained technician/project staff (Men) (
3. Leveling the soil with a shovel (Men) (Structural)
4. Sowing of alfalfa seeds on the risers (Men/women) (Vegetative)
5. Sowing of wheat seeds on benches (Men/Women) (Agronomic)
6. Sowing of ferula along the contours (Men/women) (Vegetative)

Establishment inputs and costs

Specify input	Unit				
Labour					
Designing of the terrace using A-frame	person-day	10.0	9.0	90.0	
Leveling the soil with a shovel	person-day	150.0	5.3	795.0	51.0
Sowing of wheat and alfalfa seeds	person-day	10.0	5.3	53.0	51.0
Sowing of ferula	person-day	2.0	5.3	10.6	100.0
Equipment					
Pick axe	Pcs	1.0	3.0	3.0	100.0
Pitchfork	Pcs	1.0	5.3	5.3	100.0
Wheel barrow	Pcs	1.0	38.0	38.0	100.0
Shovel	Pcs	1.0	3.8	3.8	
Hoe	Pcs	1.0	7.5	7.5	
A-Frame	Pcs	1.0	6.0	6.0	
Plant material					
Wheat seeds	Kg	140.0	0.42	58.8	
Alfalfa seeds	Kg	17.5	0.42	7.35	100.0
Ferula seeds	Kg	2.5	6.35	15.88	100.0
Fertilizers and biocides					
DAP	Kg	125.0	0.9	112.5	
Urea	Kg	125.0	0.45	56.25	
Herbicide	Liter	50.0	0.25	12.5	
			Total costs for establishment of the Technology	**1275.48**	

Maintenance activities
1. Ploughing the land with animal traction (Men) (Agronomic; Winter/Spring/Annually)
2. Sowing of wheat seeds on benches (Men/Women) (Agronomic)
3. Application of fertilizer (Men/Women) (Agronomic)
4. Weeding (Women) (Agronomic)
5. Harvesting wheat (Men and women together) (Agronomic)
6. Harvesting alfalfa (Men and women together) (Agronomic)
7. Collecting and delivering harvested wheat (Men and women) (Agronomic)
8. Collecting and delivering harvested alfalfa (Men and women) (Agronomic)
9. Repairing terrace risers with a shovel (Men) (Structural)
10. Sowing alfalfa seeds on the repaired area (Men/Women) (Vegetative)

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit	Total costs per input	% of costs borne by land users
Labour					
Ploughing the land with animal traction	person day	2.5	5.3	13.25	100.0
Sowing of wheat seeds on benches	person day	5.0	5.3	26.5	100.0
Weeding and Fertilizer application	person day	5.0	5.3	26.5	100.0
Harvesting and delivering wheat and alfalfa	person day	70.0	5.3	371.0	100.0
Equipment					
Sickle	Pcs	1.0			100.0
Plant material					
Wheat seeds	Kg	140.0	0.42	58.8	100.0
Fertilizers and biocides					
DAP	Kg	125.0	0.9	112.5	100.0
Urea	Kg	125.0	0.45	56.25	100.0
Herbicide	Liter	50.0	0.25	12.5	100.0
			Total costs for maintenance of the Technology	**677.3**	

NATURAL ENVIRONMENT

Average annual rainfall
- ☐ < 250 mm
- ☑ 251-500 mm
- ☑ 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
- ☐ sub-humid
- ☑ semi-arid
- ☐ arid

Specifications on climate
Average annual rainfall in mm: 580.0
Average annual precipitation for the area was calculated with 580 mm, with minimums in dry years (2000 and 2001) of 270 mm and maximums in wet years (2009/2010) of 830 mm. The absolute maximum rainfall was calculated for 1986 with 1024 mm. The data series covers the time from 1979 to 2014.

Name of the meteorological station: Climate Forecast System Reanalysis (CFSR), http://rda.ucar.edu/pub/cfsr.html
Specifications: Derived from the publically available dataset on length of growing period (LGP) (Fischer 2009 / IIASA-FAO). Internet link:
http://tiles.arcgis.com/tiles/P8Cok4qAP1sTVE59/arcgis/rest/services/Length_of_growing

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

Landforms
- ☐ plateau/plains
- ☐ ridges
- ☑ mountain slopes
- ☑ hill slopes
- ☐ footslopes
- ☐ valley floors

Altitude
- ☐ 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.

Technology is applied in
- ☐ convex situations
- ☐ concave situations
- ☐ not relevant

- [ ] 3,001-4,000 m a.s.l.
- [ ] > 4,000 m a.s.l.

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)
- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

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

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

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

Availability of surface water
- [ ] excess
- [ ] good
- [x] medium
- [ ] poor/ none

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

Is salinity a problem?
- [ ] Yes
- [x] No

Occurrence of flooding
- [x] Yes
- [ ] No

Species diversity
- [ ] high
- [ ] medium
- [x] low

Habitat diversity
- [ ] high
- [ ] medium
- [x] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

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

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

Relative level of wealth
- [ ] very poor
- [ ] poor
- [x] average
- [x] rich
- [ ] very rich

Level of mechanization
- [x] manual work
- [x] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic
- [x] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

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

Gender
- [x] women
- [x] men

Age
- [ ] children
- [ ] youth
- [x] middle-aged
- [x] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [x] 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
- [x] medium-scale
- [ ] large-scale

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

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

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

Access to services and infrastructure

IMPACTS - BENEFITS AND DISADVANTAGES

Socio-economic impacts

Crop production	decreased	increased	*Quantity before SLM: 350 kg / ha* *Quantity after SLM: 700 kg / ha* *The integration of measures including agronomic (improved seed and fertilizer) and structural (terraces to control water flow and loss of top soil, including nutrients and seeds) results in an increase of crop yield already in the first year. The effects cannot be attributed to one or the other measure specifically.*
fodder production	decreased	increased	*Alfalfa is planted on the risers.*
product diversity	decreased	increased	
production area (new land under cultivation/ use)	decreased	increased	*No change in total area for production, as the riser of the terraces are used for fodder production. However, there is some reduction of area available for annual crop production.*

Socio-cultural impacts

food security/ self-sufficiency	reduced	improved	*The yield of the main staple crop (wheat)has been reported to be double on terraced plots with application of improved seed and fertilizer. In addition, fodder crops, such as alfalfa grown on the risers, can be harvested.*
SLM/ land degradation knowledge	reduced	improved	*Technicians in the villages were trained in the use of A-frames. Implementers of terraces voiced that they themselves would not be able to replicated the designing of terraces.*
situation of socially and economically disadvantaged groups (gender, age, status, ehtnicity etc.)	worsened	improved	*Female headed households are not included. Technology is implemented on private land, therefore people without land are excluded. However, they have the opportunity to earn income as a hired worker for the SLM implementers.*

Ecological impacts

surface runoff	increased	decreased	
soil moisture	decreased	increased	*in situ water harvesting*
soil loss	increased	decreased	
vegetation cover	decreased	increased	*Both an increase in vegetation cover during the growing season when most erosive rains are observed as well as permenant vegetation cover from perennial alfalfa plants can been observed.*
biomass/ above ground C	decreased	increased	

Off-site impacts

downstream flooding (undesired)	increased	reduced	
downstream siltation	increased	decreased	
buffering/ filtering capacity (by soil, vegetation, wetlands)	reduced	improved	

Benefits compared with establishment costs

Benefits compared with maintenance costs

CLIMATE CHANGE

Climate change/ extreme to which the Technology is exposed

Climate-related extremes (disasters)
local rainstorm
drought

How the Technology copes with these changes/extremes

local rainstorm: not well at all ☐☐☐☐☑ very well
drought: not well at all ☐☐☐☑☐ very well

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 did so without receiving material incentives?
- ☑ 0-10%
- ☐ 10-50%
- ☐ 50-90%
- ☐ 90-100%

Number of households and/ or area covered
10.7 ha has been terraced within the 3 study villages with LIPT project support.

Has the Technology been modified recently to adapt to changing conditions?
- ☑ Yes
- ☐ No

To which changing conditions?
- ☐ climatic change/ extremes
- ☑ changing markets
- ☐ labour availability (e.g. due to migration)

Ferula is planted on the terrace in addition to wheat and alfalfa. The resin-like gum from the dried sap extracted from the stem and roots of Ferula is in high demand as a basic product for pharmaceuticals. Ferula can be sold to local merchants, who resell it to India, and is thus intercropped by some farmers on the terraces.

CONCLUSIONS AND LESSONS LEARNT

Strengths
- Notable higher crop yields on the plots where improved seeds and fertilizer are applied on newly established terraces. Farmers have high expectations for the years to come and for yields of annual crops (such as wheat) to remain high. (land user's view)
- Diversity of crops planted on terraces is valued by the land users. For example, cultivating wheat and alfalfa on the terraced plot provides household with the key crop and also fodder for the livestock and thereby contributes to securing food for the family and maintaining better health of their cattle. Additionally, some farmers have started intercropping Ferula, a medical herb and cash crop. (land user's view)
- Farmers percieve soil quality on terraced plots with fertilizer application to improve. An improvement in soil fertility (which may relate first of all to the effects of fertilizer application) and increased soil moisture have been reported. Single statements also related to effectiveness of applying fertilizer on terraced plots, as here fertilizer is not washed away during rains. (land user's view)
- Terraced plots are considered less vulnerable to the effects of rainstorms and dry spells, than non-terraced plots on slopes where annual crops are cultivated. (land user's view)
- Women considered an advantage that during the establishment phase, men were paid by the project to work on their own land when building the terraces. Thus, there was no need for men to go for seasonal labour migration and they stayed at home. At the same time the terracing of the land is seen as an opportunity to improve the land resources on their families plots. An increase in women's workload related to bringing food to the field during establishment was considered to be acceptable, especially compared to the expected increase in yields. (land user's view)
- The application of fertilizer on terraces is expected to show multiple effects: yields from these fertility depleted croplands can be increased. This includes an increase in biomass production, which may be used as green manure on the field or as animal feed or as straw. Further, vegetation cover during the growing period can be increased, which helps to protect the soil from erosive rains. (compiler's or other key resource person's view)
- The project paid establishment of terraces on farmers' plots provided 20 days of employment per 2 jerib (0.4 ha) plot for farmers in their home villages. At the same time the terracing is a long-term investment into the land resources. Terracing provides an opportunity to decrease soil degradation and even to rehabilitate degraded lands. Application of improved seeds and fertilizer contribute in the establishment year to increased crop and fodder yields. (compiler's or other key resource person's view)

Weaknesses/ disadvantages/ risks → *how to overcome*
- The implementation costs are high and land users state that it is impossible for them to cover establishment costs on their own. (land user's view)
- Farmers expectations partly exceeded the actual yield harvested from the terraces in the first years after the implementation. (land user's view)
- Both men and women from households that have implemened terraces state that during the establishment year the household experiences an increased workload, that is not well compatible with other on-going household / farm activities. (land user's view)
- The production area for annual crops only is slighty reduced. → *So far not all farmers seem to use the production area fully. Intercropping with perennial plants is recommended in order to use the risers of the terraces for fodder production. Some farmers have started intercropping of Ferula as cash crop.* (land user's view)
- Sufficient own land is required. → *How does the amount of cropland affect the innovation readiness of a farmer? A better understanding is required on farmers willingness to take a risk for investing in a new SLM technology, and especially terracing, and influencing factors.* (land user's view)
- The technology requires technical knowledge for implementation and maintenance, which is key for successful adoption, replication and upscaling. The project trained technicians to support land users with the design of terraces. While the project aided implementation of terraces has improved the general knowledge and awareness of the land users on the benefits of SLM practices, most farmers will not be able to design terraces on their own. (compiler's or other key resource person's view)
- Technically correct design of the terrace presents a challenge and might not be always achieved. Forward sloping terrace benches may lead to channeled runoff and have the risk of rills and gully formation. (compiler's or other key resource person's view)
- There is an attribution gap regarding the increased wheat yields, especially with regard to individual contribution of the terraces, the application of improved seeds and fertilizer, and the combined effects (role of terraces in making improved seed and fertilizer application effective). → *A cost benefit analysis (CBA) needs to be conducted to determine short- and long-term returns of the SLM technology. On farm trials are necessary for assessing impacts of the different measures (agricultural, vegetative and structural measures) before-and-after, as well as with-without the SLM technology.* (compiler's or other key resource person's view)
- Terrace maintenance is crucial. If not maintained properly for a longer period of time, the damaged terrace can lead to further land degradation through channeled runoff, sever erosion and possible risks of disaster for the surrounding settlements on the slopes. (compiler's or other key resource person's view)
- The technology is established mainly by better-off households, which own more land than the average SLM implementer. (compiler's or other key resource person's view)

REFERENCES

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Questionnaire created
Sept. 27, 2016

Last update
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Resource persons
Habibullah Mohammad Azim - land user
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Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_607/

Linked SLM data
n.a.

Documentation was faciliated by
Institution
- Bern University of Applied Sciences, School of Agricultural, Forest and Food Sciences (HAFL) - Switzerland
- Centre for Development and Environment, University of Bern (CDE) - Switzerland
- Swiss Agency for Development and Cooperation (SDC) - Switzerland
- Terre des hommes (Tdh) - Switzerland

Project
- Livelihood Improvement Project Takhar (LIPT)

- Potential and limitations for improved natural resource management (NRM) in mountain communities in the Rustaq district, Afghanistan (Rustaq NRM Study)

Key references

Links to relevant information which is available online

Newly established orchard in Sari Joy Village (Mia Jan Maroofi)

Establishment of improved orchards and vineyards (Afghanistan)

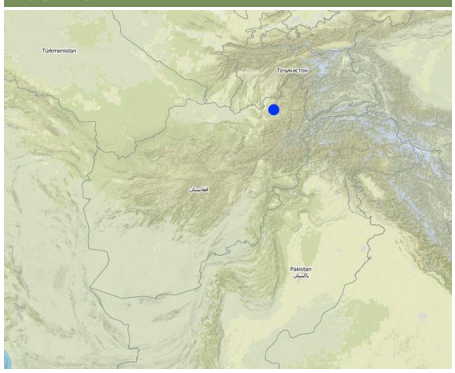
Bunyodi boghi va boghi anguri behbudyofta

DESCRIPTION

Local and new varieties of fruits are planted on degraded land in accordance with improved management practices. The established orchards and vineyards serve double purpose of soil protection and income generation for the rural households. The alfalfa under the trees supports tree growth and is used for livestock fodder.

Project supported implementation of improved orchards and vineyards has taken place in the villages Sari Joy, Jawaz Khana and Dashti Mirzai, located in Chokar watershed of Rustaq District in Northern Afghanistan. The Chokar watershed is a mountainous area situated between 600 - 2,500 m above sea level. The climate is semi-arid with harsh and cold weather in winter and hot and dry summers. The annual precipitation in average years is 580mm. Land degradation affects all forms of land use and includes low vegetation cover, heavy top soil erosion from water, and poor soil fertility. Unsustainable agricultural practices, over-exploitation and high pressure on the natural resources are adversely impacting on the socio-economic well-being of local communities as well as contributing to the risk for being adversely affected by drought as well as landslides and flash foods triggered by heavy rainfall. The data used for the documentation of the technology is based on field research conducted in Chokar watershed, namely in the villages: Sari Joy, Jawaz Khana and Dashti Mirzai. These villages represent the upper, the middle and the lower zone of Chokar watershed, respectively. They differ considerably in access to services and infrastructure, but in general are poorly served. The communities depend on land resources for sustaining their livelihoods. In a good year with high yields, wheat-self-sufficiency lasts about 5 months. The three villages are home to ethnic Qarluq communities. Since 2012 the Livelihood Improvement Project Takhar (LIPT) implemented by Terre des hommes (Tdh) Switzerland has initiated a range of NRM interventions. The rural population in Rustaq district of Afghanistan traditionally grows local varieties of apples, pears and grapes. Mostly it is subsistence farming with a small-scale local marketing. Shortage of irrigation water and lack of specific knowledge about horticultural and viticulture practices, negatively affects fruit yields. Apart of providing diverse fruits for consumption, orchards are also important for providing fodder for the livestock, retaining soil moisture and protecting the soil from erosion. The local land users interested in the establishment of improved orchards and vineyards were mobilized through the Natural Resources Management Committees (NRMC) in Sari Joy, Jawaz Khana and Dashti Mirzai villages. In addition to the local varieties of pears, apples and grapes, new improved varieties were used for orchards and vineyards on 6.5 ha of degraded land. Such orchards were established inside or close to the villages on mountain slopes with gentle (3-5%) and moderate (6 -15%) steepness. Fruit trees are planted on locally identified dark and light soils, which correspond to moderately deep and loamy soil of medium soil fertility. Considering the medium quality of the soil, the first step of tree plantation is application of organic fertilizer. Afterwards, the plot is designed according to 4m x 4 m spacing between the trees. Under such parameters, on 1 jirib (0.2 ha) of land 125 fruit tree (apple or pear) seedlings are planted. The depth of the planting pits is 60 x 50 cm. The planted tree is watered and the lower trunk is covered with lime and water solution. Alfalfa is sown under the trees to serve as a fodder for the livestock. The orchards are irrigated mostly during summer once a week. In areas where there is shortage of irrigation water the trees are rainfed. Other maintenance activities include pest and disease control provided by a trained local specialist. The new orchards only recently started giving fruits. The actual fruit yields are expected in 2017-2018. Expected higher yields of improved verities of pears, apples and grapes serves as a strong incentive for the local land users and their families to establish and maintain the orchards. Orchards are very demanding, but their reward is very promising in terms of improved harvest and more opportunities to sell the produce. Some land users have successful experience on their plots and already have fruits in their gardens and plan to enlarge their garden and plant more varieties of fruit trees, such as persimmons. Alfalfa which grows under the trees has important production value, particularly during the early years after the establishment phase, when the trees are too young to give fruits. Female members of the households, which implemented orchards are also involved in establishing and maintaining orchards and vineyards. They take part in planting trees, watering, hay making and protecting the trees from livestock and people. Their contribution, plays an important part for the successful implementation of improved orchards and vineyards in Sari Joy, Jawaz Khana and Dashti Mirzai.

LOCATION



Location: Sari Joy, Jawaz Khana, Dashti Mirzai, Takhar Province, Rustaq District, Afghanistan

No. of Technology sites analysed: 10-100 sites

Geo-reference of selected sites

- 69.91924, 37.10906

Spread of the Technology: evenly spread over an area (approx. < 0.1 km2 (10 ha))

Date of implementation: less than 10 years ago (recently)

Type of introduction

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

Young fruit trees in Sari Joy Village (Mia Jan Maroofi)

Orchard established in Chashmakan Village (Bettina Wolfgramm)

CLASSIFICATION OF THE TECHNOLOGY

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

Land use

Cropland - Perennial (non-woody) cropping, Tree and shrub cropping

Mixed (crops/ grazing/ trees), incl. agroforestry - Agro-pastoralism
Main products/ services: Apple, pear, almond, grapes, alfalfa

Water supply
- rainfed
- ✓ mixed rainfed-irrigated
- full irrigation

Number of growing seasons per year: 1
Land use before implementation of the Technology: About half of orchard plots are established on cropland.
Livestock density: n.a.

Purpose related to land degradation
- ✓ prevent land degradation
- ✓ reduce land degradation
- restore/ rehabilitate severely degraded land
- adapt to land degradation
- not applicable

Degradation addressed

soil erosion by water - Wt: loss of topsoil/ surface erosion

soil erosion by wind - Et: loss of topsoil

biological degradation - Bc: reduction of vegetation cover, Bq: quantity/ biomass decline

water degradation - Ha: aridification

SLM group
- agroforestry

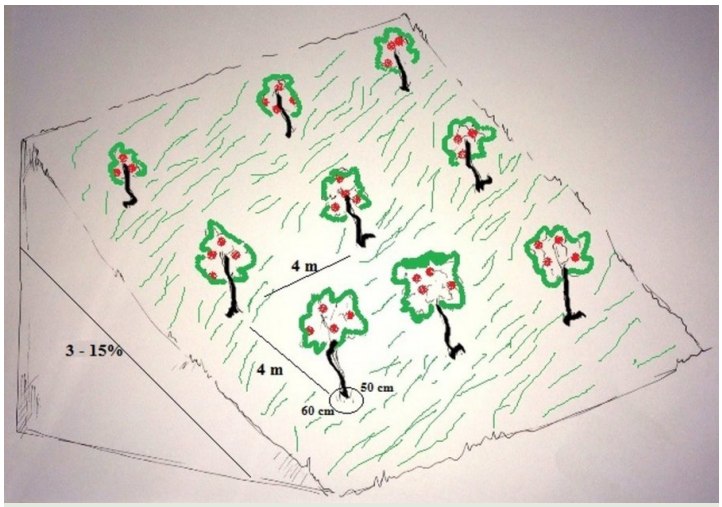
SLM measures

vegetative measures - V1: Tree and shrub cover, V2: Grasses and perennial herbaceous plants

management measures - M1: Change of land use type

TECHNICAL DRAWING

Technical specifications
Orchards are established on mountain slopes with gentle (3-5%) and moderate (6-10%) steepness. Considering the medium soil fertility, the first step of tree plantation is application of organic fertilizer. Afterwards, the plot is designed according to 4m x 4 m spacing between rows and trees. Under such parameters, on 1 jirib (0.2 ha) of land 125 fruit tree (apple or pear) seedlings are planted. The depth of the planting pits is 60 x 50 cm. The planted tree is watered and the lower trunk is covered with lime and water solution. Alfalfa is sown under the trees for livestock fodder.



Author: Aslam Qadamov; Roziya Kirgizbekova

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs
- Costs are calculated: per Technology area (size and area unit: **1 ha**)
- Currency used for cost calculation: **US Dollars**
- Exchange rate (to USD): 1 USD = 67.0.
- Average wage cost of hired labour per day: 5.2-5.3 USD per day.

Most important factors affecting the costs
Due to the remoteness of the villages where the Technology has been implemented, all the inputs for establishment, such as agricultural equipment, plant material, fertilizers, etc., are purchased in Rustaq town. The expenses for traveling and delivering the inputs affect the establishment costs.

Establishment activities
1. Selection of the area for orchard (Men) (Management; Fall)
2. Applicatoin of manure (Men) (Agronomic)
3. Design of tree spacing in the orchard assisted by project staff (Men) (Management)
4. Digging pits for planting (Men/Women) (Structural)
5. Planting of fruit trees (Men/Women) (Agronomic)
6. Sowing of alfalfa under the trees (Men/Women) (Vegetative)

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit	Total costs per input	% of costs borne by land users
Labour					
Application of manure	person-day	5.0	5.3	26.5	83.0
Design of tree spacing	person-day	5.0	5.3	26.5	
Digging pits for planting	person-day	15.0	5.3	79.5	83.0
Planting trees, sowing alfalfa and watering	person-day	10.0	5.3	53.0	83.0
Equipment					
Meter	piece	1.0	2.25	2.25	
Rope	Meter	500.0	0.07	35.0	
Shovel	piece	2.0	3.8	7.6	
Pick axe	piece	1.0	2.25	2.25	
Plant material					
Seedlings (apple/pear)	piece	625.0	0.75	468.75	
Alfalfa seeds	kg	17.5	0.42	7.35	
Fertilizers and biocides					
DAP	Kg	250.0	0.9	225.0	
Urea	Kg	250.0	0.45	112.5	
Animal manure	ton	10.0	60.0	600.0	
Pesticide	cc	500.0	0.9	450.0	
Lime	Kg	25.0	1.5	37.5	
Total costs for establishment of the Technology				**2133.7**	

Maintenance activities
1. Watering of the trees (Men/Women) (Agronomic; 2 times/month/Summer)
2. Weeding (Women) (Agronomic)
3. Pruning (Men) (Agronomic)
4. Lime application (Men) (Agronomic)
5. Hay making (Men/Women) (Agronomic)
6. Harvesting fruits (Men/Women) (Agronomic)

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit	Total costs per input	% of costs borne by land users
Labour					
Irrigation	person day	5.0	5.3	26.5	100.0
Weeding	person day	5.0	5.3	26.5	100.0
Pruning	person day	5.0	5.3	26.5	100.0
Lime application	person day	5.0	5.3	26.5	100.0
Equipment					
Scissors for pruning	piece	2.0	9.0	18.0	
Fertilizers and biocides					
Lime	Kg	25.0	1.5	37.5	100.0
Total costs for maintenance of the Technology				**161.5**	

NATURAL ENVIRONMENT

Average annual rainfall
- ☐ < 250 mm
- ☑ 251-500 mm
- ☑ 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
- ☐ sub-humid
- ☑ semi-arid
- ☐ arid

Specifications on climate
Average annual rainfall in mm: 580.0
Average annual percipitation for the area was calculated with 580 mm, with minimums in dry years (2000 and 2001) of 270 mm and maximums in wet years (2009/2010) of 830 mm. The absolut maximum rainfall was calculated for 1986 with 1024 mm. The data series covers the time from 1979 to 2014.
Name of the meteorological station: Climate Forecast System Reanalysis (CFSR), http://rda.ucar.edu/pub/cfsr.html
Derived from the publicly available dataset on length of growing period (LGP) (Fischer 2009 / IIASA-FAO). Internet link: http://tiles.arcgis.com/tiles/P8Cok4qAP1sTVE59/arcgis/rest/services/Length_of_growing

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

Landforms
- ☐ plateau/plains
- ☐ ridges
- ☑ mountain slopes
- ☐ hill slopes
- ☐ footslopes
- ☐ valley floors

Altitude
- ☐ 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
- ☐ 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)

Is salinity a problem?
- ☐ Yes
- ☑ No

Occurrence of flooding

- [ ] unusable

- [x] Yes
- [ ] No

Species diversity
- [ ] high
- [ ] medium
- [x] low

Habitat diversity
- [ ] high
- [ ] medium
- [x] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

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

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

Relative level of wealth
- [ ] very poor
- [ ] poor
- [x] average
- [x] rich
- [ ] very rich

Level of mechanization
- [x] manual work
- [ ] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic
- [x] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

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

Gender
- [x] women
- [x] men

Age
- [ ] children
- [ ] youth
- [x] middle-aged
- [x] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [x] 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
- [x] medium-scale
- [ ] large-scale

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

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

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

Access to services and infrastructure

IMPACTS - BENEFITS AND DISADVANTAGES

Socio-economic impacts

Crop production	decreased ✓ increased	*The local and new improved varieties of fruit trees planted and managed sustainably give better fruit yields. Enhanced fruit production is also due to proper and timely control of pests and disease.*
fodder production	decreased ✓ increased	*The grass (alfalfa and sainfoin), which is planted under the fruit trees is used as fodder for livestock.*
animal production	decreased ✓ increased	*Indirect contribution to animal production is achieved through availability of more fodder for the livestock from the grass in the orchards. Animals also feed on the tree leaves in autumn.*
wood production	decreased ✓ increased	*Production of wood is limited. Fuel wood is made from seasonal pruning of the trees.*
non-wood forest production	decreased ✓ increased	
product diversity	decreased ✓ increased	*Multiple varieties of fruit trees are grown, also through grafting techniques.*
production area (new land under cultivation/ use)	decreased ✓ increased	

Socio-cultural impacts

food security/ self-sufficiency	reduced ✓ improved	*The new practice of establishing orchards and vineyards ensures better yields. New variety of fruits such as apples, pears, almonds and grapes improve the diversity of household's production and consumption. The households have better opportunity to earn more from selling their fresh and dried fruits on the local market.*
SLM/ land degradation knowledge	reduced ✓ improved	*Land users learned new methods of planting trees according to the soil conditions and water availability. They were trained with such skills as grafting, pruning, pest and disease control and were introduced to improved verities of fruit trees.*
situation of socially and economically disadvantaged groups (gender, age, status, ehtnicity etc.)	worsened ✓ improved	*Female headed households are not included. Technology is implemented on private land, therefore people without land are excluded. However, they have they opportunity to earn income as a hired worker for the SLM implementers.*

Ecological impacts

surface runoff	increased ✓ decreased	
soil loss	increased ✓ decreased	
vegetation cover	decreased ✓ increased	*Improved vegetation cover resulting from the tree plantations and the grass.*

Off-site impacts

downstream flooding (undesired)	increased ✓ reduced	
downstream siltation	increased ✓ decreased	
buffering/ filtering capacity (by soil, vegetation, wetlands)	reduced ✓ improved	

Benefits compared with establishment costs

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

Benefits compared with maintenance costs

CLIMATE CHANGE

Climate change/ extreme to which the Technology is exposed	How the Technology copes with these changes/extremes
Climate-related extremes (disasters)	
local rainstorm	not well at all ✓ very well
drought	not well at all ✓ very well

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology
- [ ] single cases/ experimental
- [x] 1-10%
- [ ] 10-50%
- [ ] more than 50%

Of all those who have adopted the Technology, how many have did so without receiving material incentives?
- [ ] 0-10%
- [x] 10-50%
- [ ] 50-90%
- [ ] 90-100%

Number of households and/ or area covered
6.5 ha

Has the Technology been modified recently to adapt to changing conditions?
- [x] Yes
- [ ] No

Some of the land users built a wall around their orchard. The wall made from locally available clay material, protects the trees and the grass from animal and people intrusion.

To which changing conditions?
- [ ] climatic change/ extremes
- [ ] changing markets
- [ ] labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths
- The land users have high expectations about the benefits of the improved practices to grow fruit trees. They see the benefit of growing different types of fruits. Expectations are high about increased fruit yields and increased opportunities to sell more fresh and dried fruits and nuts on the local market. Fruits and nuts sell very well and can generate higher incomes for the households. (land user's view)
- The ecological benefits of the orchards in protecting the soil from heavy rains is valued by the land users. The villagers mark improved vegetation cover as their villages are becoming greener with the fruit trees and the alfalfa in the orchards. (land user's view)
- It is appreciated by the land users that they were introduced and provided with new varieties of fruits. They were also trained on planting and maintaining orchards and vineyards in accordance with local conditions and using such techniques as grafting, pruning, mulching, protection from pests and diseases, etc. (land user's view)
- The orchards not only give fruits, but also are the source of fuel wood, which is made from pruning the trees. Considering that many households keep livestock, the grass under the trees and tree leaves are used to feed the livestock. In return livestock manure is used as organic fertilizer for the trees. (land user's view)
- Some land users having seen the positive outcome of their work, are interested in enlarging their orchards. Others are ready to support those who want to plant fruit trees by sharing tree saplings or seedlings with them. (land user's view)
- Women share the expectations of earning more money for their household through growing more fruits and selling them on the local market. In Dashti Mirzai and Jawaz Khana women are particularly excited over their grape, which still need some time to give yields. (land user's view)
- Better management practices in growing fruit trees will benefit the land user and the land through strengthening soil resistance to heavy rainfall and prevent erosion. Over the period of few more years the trees and undergrowth grass will significantly enhance infiltration and moisture retention in the soil, which in turn increase the vegetation cover and halt the degradation process. (compiler's or other key resource person's view)
- The SLM knowledge obtained through project training is disseminating inside and beyond the villages, along with exchange of seedlings from new varieties of fruit trees. In addition to that, land users are aware of pest and disease control and have access to these services through trained specialist. (compiler's or other key resource person's view)
- Households do not have to rely only on wheat and legumes, but are able to diversify their agricultural production even more. The expected opportunity to sell more fruits and nuts has the potential to increase households income. This in turn will enable the family to secure their food supply for longer periods. (compiler's or other key resource person's view)
- Female family members' participation is one of the key elements for sustaining orchards and vineyards. Women highly value the importance of their work in orchards and the benefit it provides to their households. (compiler's or other key resource person's view)

Weaknesses/ disadvantages/ risks → *how to overcome*
- Lack of irrigation water is a crucial issue, especially in Jawaz Khana, which makes it very difficult for the land users to maintain their orchards. → *Rehabilitate the Yakhdons. Yakhdon is a local storage method for collecting snow water in winter to be used for drinking and irrigation in spring and summer. One Yakhdon can provide water for up to six months. Several of these Yakhdons are destroyed and their rehabilitation would provide better access to water for Jawaz Khana.* (land user's view)
- The young trees are sensitive to droughts and need to be watered regularly to ensure that they survive. (land user's view)
- Establishment of orchards requires hard work and sufficient money from the land user to buy seedlings and in some cases to build a wall around the orchard or build an irrigation canal. (land user's view)
- The establishment of orchards is reported as one of the most labour-intensive SLM practice for both men and women. Working in orchards increases the burden of women in addition to their household chores. (compiler's or other key resource person's view)
- Technical knowledge on planting and maintaining fruit trees and grapes is required to ensure tree survival, good productivity and protection from pests and diseases. (compiler's or other key resource person's view)

REFERENCES

Compiler
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Oct. 27, 2016

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Resource persons
Gholam Sakhi Mirza Bay - land user
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Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_669/

Linked SLM data
n.a.

Documentation was faciliated by
Institution
- Bern University of Applied Sciences, School of Agricultural, Forest and Food Sciences (HAFL) - Switzerland
- Centre for Development and Environment, University of Bern (CDE) - Switzerland
- Swiss Agency for Development and Cooperation (SDC) - Switzerland
- Terre des hommes (Tdh) - Switzerland

Project
- Livelihood Improvement Project Takhar (LIPT)
- Potential and limitations for improved natural resource management (NRM) in mountain communities in the Rustaq district, Afghanistan (Rustaq NRM Study)

Key references
Guidelines for Focus Group Discussions:
Methods section of the Rustaq NRM study:

Links to relevant information which is available online

Rehabilitated pasture in Sari Joy (Mia Jan Maroofi)

Rehabilitation of degraded pastures with alfalfa (Afghanistan)

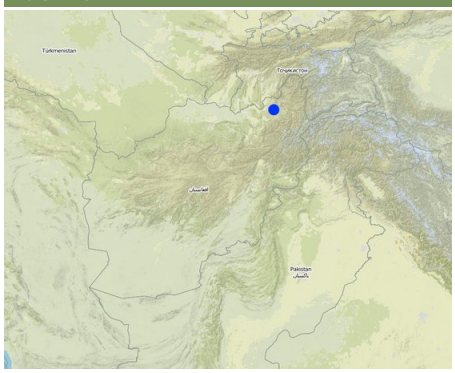
Ehyoye charogoh bo posheedani tukhmi reshqa

DESCRIPTION

Degraded pastures are restored with alfalfa through broad seeding method. The area is put under quarantine for three years to allow for the pasture to restore sufficiently.

Project supported pasture rehabilitation has taken place in the villages Sari Joy, Jawaz Khana and Dashti Mirzai, located in Chokar watershed of Rustaq District in Northern Afghanistan. The Chokar watershed is a mountainous area situated between 600 - 2,500 m above sea level. The climate is semi-arid with harsh and cold weather in winter and hot and dry summers. The annual precipitation in average years is 580mm. Land degradation affects all forms of land use and includes low vegetation cover, heavy top soil erosion from water, and poor soil fertility. Unsustainable agricultural practices, over-exploitation and high pressure on the natural resources are adversely impacting on the socio-economic well-being of local communities as well as contributing to the risk for being adversely affected by drought as well as landslides and flash foods triggered by heavy rainfall. The data used for the documentation of the technology is based on field research conducted in Chokar watershed, namely in the villages: Sari Joy, Jawaz Khana and Dashti Mirzai. These villages represent the upper, the middle and the lower zone of Chokar watershed, respectively. They differ considerably in access to services and infrastructure, but in general are poorly served. The communities depend on land resources for sustaining their livelihoods. In a good year with high yields, wheat-self-sufficiency lasts about 5 months. The three villages are home to ethnic Qarluq communities. Since 2012 the Livelihood Improvement Project Takhar (LIPT) implemented by Terre des hommes (Tdh) Switzerland has initiated a range of NRM interventions. Livestock keeping is one of the key livelihood strategies in rural Rustaq in addition to cultivation of cereals. Families rely on their livestock not only for consumption of meat from cows, goat and sheep, dairy products such as milk and sour milk, but also as means of transportation (donkeys), labour force in agriculture (oxen, donkey) and source of cash income. Every family strives to increase their household's livestock as much as they can, which increases the pressure on the local pastures leading to extensive overgrazing. The pastures in Jawaz Khana, Dashti Mirzai and Sari Joy are characterized by poor vegetation cover, low carrying capacity and sever erosion with deep rills clearly visible on the surface. These severely degraded pastures continue to be used uncontrollably without any management schemes or regulations in place. Cropland not suitable for cultivation has been converted to pastures. The quantity and quality of livestock fodder is insufficient for all the livestock affecting poor animal health. The village communities have recognized the poor condition of their pastures and the need to take measures to revert the situation. Pasture rehabilitation measures were introduced, which aim to restore heavily degraded pasture land with alfalfa. Initially the land user and the community agrees to leave the sown pasture under quarantine for three years. The restoration measures include: leveling the soil with a rack to soften the soil and prepare the seedbed. 3,5 kg of alfalfa is seeded on 1 jerib or 0.2 ha of pasture land using the broadcast seeding method. Fertilizer application (DAP and/or animal manure) is followed by the seeding. The area is protected from grazing during three years. During this quarantine period the alfalfa has to grow in sufficient size in order to be harvested for livestock fodder. It has been observed that after two years in some part it is already possible to harvest the alfalfa. Improvements of the pasture are visible given the fast growth rate of the alfalfa crop. The plant grows well without irrigation, which is favorable given the shortage of irrigation water in the villages. The rehabilitated pastures will slow down the run-off, improve water infiltration and protect the pasture from erosion during heavy rain fall. The land users recognize the pasture improvements and relatively increased fodder availability. Alfalfa reseeding is done in 5-10 years and appeals to the needs of the land users, which cannot afford annual reseeding. One of the constraint remains is the quarantine period of 1-3 years, which deprives the livestock from fodder and the farmers have to find options for covering the loss. Women are generally aware about the use of alfalfa for the production of better fodder for their livestock. Women do take part in haymaking, collecting the hay and bringing it to their homes or to the community fodder bank. Often they are helped by their children to do the work.

LOCATION



Location: Sari Joy, Jawaz Khana, Dashti Mirzai villages, Takhar Province, Rustaq District, Afghanistan

No. of Technology sites analysed: 2-10 sites

Geo-reference of selected sites

- 69.91936, 37.10933

Spread of the Technology: evenly spread over an area (approx. < 0.1 km2 (10 ha))

Date of implementation: less than 10 years ago (recently)

Type of introduction

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

Alfalfa harvest from rehabilitated plot in Sari Joy Village (Safiullah Safa)

CLASSIFICATION OF THE TECHNOLOGY

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

Land use

Grazing land - Main animal species and products: Main livestock: cow, goat and sheep. Main fodder crops are alfalfa and sainfoin.
Extensive grazing land: Semi-nomadism/ pastoralism
Intensive grazing/ fodder production: Cut-and-carry/ zero grazing

Water supply
- rainfed
- ✓ mixed rainfed-irrigated
- full irrigation

Number of growing seasons per year: 1

Land use before implementation of the Technology: Some plots of the pastures are previous croplands, which have been strongly degraded and no longer used for crop cultivation.

Livestock density: n.a.

Purpose related to land degradation
- prevent land degradation
- ✓ reduce land degradation
- ✓ restore/ rehabilitate severely degraded land
- adapt to land degradation
- not applicable

Degradation addressed

soil erosion by water - Wt: loss of topsoil/ surface erosion

soil erosion by wind - Et: loss of topsoil

physical soil deterioration - Pc: compaction

biological degradation - Bc: reduction of vegetation cover, Bq: quantity/ biomass decline

water degradation - Ha: aridification

SLM group
- area closure (stop use, support restoration)
- improved ground/ vegetation cover

SLM measures

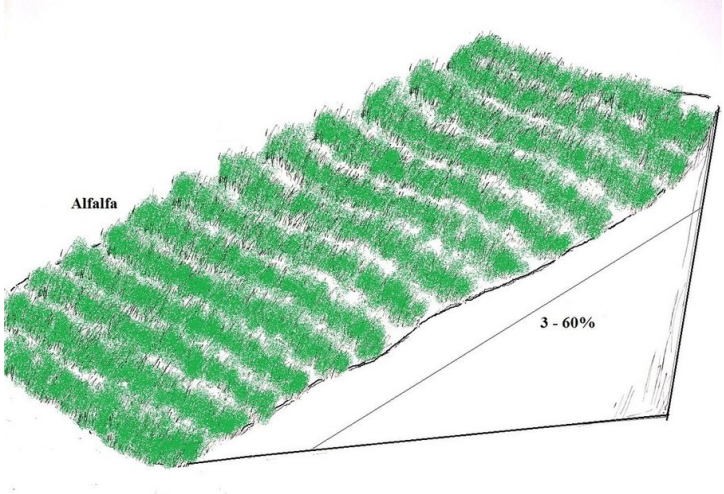
vegetative measures - V2: Grasses and perennial herbaceous plants

management measures - M1: Change of land use type, M2: Change of management/ intensity level

TECHNICAL DRAWING

Technical specifications

The degraded land is selected for rehabilitation. The preparation of seedbed consists of leveling the soil with a rack to make it even and soften the topsoil. Alfalfa seed is sown through broadcast seeding method. The amount of seeds for 0.2 ha of land is 3.5 kg of alfalfa seeds. Fertilizer is applied during the seeding. The pastures are rainfed in general, but those area which have higher water availability, irrigate their plots during dry season. The seeded pasture is closed for quarantine for three years and the livestock is not allowed in the area. There is no fence around the pasture.



ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs
- Costs are calculated: per Technology area (size and area unit: **1 ha**)
- Currency used for cost calculation: **US Dollars**
- Exchange rate (to USD): 1 USD = 67.0.
- Average wage cost of hired labour per day: 5.2-5.3 USD.

Most important factors affecting the costs
Due to the remoteness of the villages where the technology has been implemented, all the inputs for establishment, such as agricultural equipment, plant material, fertilizers, etc., are purchased in Rustaq town. The expenses for traveling and delivering the inputs affect the establishment costs.

Establishment activities
1. Selection of the land for rehabilitation (Management; Fall)
2. Leveling the land with a rake (Agronomic)
3. Sowing alfalfa (broadcast seeding) (Agronomic)
4. Site under quarantine (Management)
5. Site protection (Management)

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit	Total costs per input	% of costs borne by land users
Labour					
Leveling the land	person-day	100.0	5.3	530.0	100.0
Sowing alfalfa	person-day	5.0	5.3	26.5	100.0
Site protection	year	1.0	447.0	447.0	100.0
Equipment					
Shovel	piece	1.0	3.8	3.8	100.0
Rope	meter	50.0	0.07	3.5	100.0
Rake	piece	1.0	3.0	3.0	
Plant material					
Alfalfa seed		17.5	0.42	7.35	
Fertilizers and biocides					
DAP	kg	125.0	0.9	112.5	
Urea	Kg	125.0	0.45	56.25	100.0
Total costs for establishment of the Technology				**1189.9**	

Maintenance activities
1. Hay making (Agronomic; Summer)
2. Delivery of hay to the fodder bank (Other measures)
3. Protection of the pasture during quarantine (Management)

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit	Total costs per input	% of costs borne by land users
Labour					
Hay making	person day	35.0	5.3	185.5	100.0
Delivery of the hay to the fodder bank	person day	35.0	5.3	185.5	100.0
Protection during quarantine	year	2.0	447.0	894.0	100.0
Equipment					
Sickle	piece	1.0	2.25	2.25	100.0
Pitchfork	piece	1.0	5.3	5.3	100.0
Total costs for maintenance of the Technology				**1272.55**	

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

Specifications on climate
Average annual rainfall in mm: 580.0
Average annual percipitation for the area was calculated with 580 mm, with minimums in dry years (2000 and 2001) of 270 mm and maximums in wet years (2009/2010) of 830 mm. The absolut maximum rainfall was calculated for 1986 with 1024 mm. The data series covers the time from 1979 to 2014.
Name of the meteorological station: Climate Forecast System Reanalysis (CFSR), http://rda.ucar.edu/pub/cfsr.html
Derived from the publicly available dataset on length of growing period (LGP) (Fischer 2009 / IIASA-FAO). Internet link: http://tiles.arcgis.com/tiles/P8Cok4qAP1sTVE59/arcgis/rest/services/Length_of_growing

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

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

Altitude
- [ ] 0-100 m a.s.l.
- [ ] 101-500 m a.s.l.
- [ ] 501-1,000 m a.s.l.
- [x] 1,001-1,500 m a.s.l.
- [x] 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
- [ ] not relevant

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

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

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

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

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [x] 5-50 m
- [ ] > 50 m

Availability of surface water
- [ ] excess
- [ ] good
- [x] medium
- [ ] poor/ none

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

Is salinity a problem?
- [ ] Yes
- [x] No

Occurrence of flooding
- [x] Yes
- [ ] No

Species diversity
- [ ] high
- [ ] medium
- [x] low

Habitat diversity
- [ ] high
- [ ] medium
- [x] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

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

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

Relative level of wealth
- [ ] very poor
- [x] poor
- [ ] average
- [ ] rich
- [ ] very rich

Level of mechanization
- [x] manual work
- [ ] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic
- [x] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

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

Gender
- [x] women
- [x] men

Age
- [ ] children
- [ ] youth
- [x] middle-aged
- [x] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [x] 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
- [x] medium-scale
- [ ] large-scale

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

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

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

Access to services and infrastructure

IMPACTS - BENEFITS AND DISADVANTAGES

Socio-economic impacts

fodder production	decreased	increased
animal production	decreased	increased
product diversity	decreased	increased

Alfalfa is a fast growing forage crop with high yields. Cultivation of alfalfa and in some areas alfalfa and sainfoin has the advantage of providing quality fodder in sufficient amounts.

Sufficient amount of quality fodder and its availability in longer periods, particularly during winter and spring has a positive impact on animal health and productivity.

Negligible impact on diversity of fodder products. Main crops are alfalfa and sainfoin.

Socio-cultural impacts

food security/ self-sufficiency	reduced	improved
SLM/ land degradation knowledge	reduced	improved
situation of socially and economically disadvantaged groups (gender, age, status, ehtnicity etc.)	worsened	improved

The sum of improved access and availability of fodder and better animal health, is expected to have positive impact on household's food security and self-sufficiency.

Land users learned how to apply SLM measures to restore heavily degraded land and grow better fodder for livestock.

Female headed households are not included. Technology is mostly implemented on private land. People without land are using common pastures. They have the opportunity to earn income as a hired worker for the SLM implementers.

Ecological impacts

surface runoff	increased	decreased
soil loss	increased	decreased
vegetation cover	decreased	increased

Alfalfa develops a strong root system, which stabilizes the soil and prevents soil loss.

Alfalfa is a perennial crop, which grows up to 5 years without reseeding and thereby helps to increase the vegetation cover over longer periods.

Off-site impacts

downstream flooding (undesired)	increased	reduced
downstream siltation	increased	decreased
buffering/ filtering capacity (by soil, vegetation, wetlands)	reduced	improved

Benefits compared with establishment costs

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

Benefits compared with maintenance costs

CLIMATE CHANGE

Climate change/ extreme to which the Technology is exposed

How the Technology copes with these changes/extremes

Climate-related extremes (disasters)

local rainstorm	not well at all	very well
drought	not well at all	very well

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology
- [ ] single cases/ experimental
- [x] 1-10%
- [ ] 10-50%
- [ ] more than 50%

Of all those who have adopted the Technology, how many have did so without receiving material incentives?
- [ ] 0-10%
- [x] 10-50%
- [ ] 50-90%
- [ ] 90-100%

Number of households and/ or area covered
6.1 ha

Has the Technology been modified recently to adapt to changing conditions?
- [ ] Yes
- [x] No

To which changing conditions?
- [ ] climatic change/ extremes
- [ ] changing markets
- [ ] labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths

- The technology does not require too much labor and material inputs for establishment work. (land user's view)
- Alfalfa grows well and it can be harvested several years in a row without reseeding. The land users expect to have sufficient supplies of fodder during winter, which is the most difficult season to prevent animal loss and shortage of fodder is one of the main reasons. Alfalfa is considered as a good fodder for the, which makes it strong. (land user's view)
- Sowing alfalfa is a good method to make better use of bad lands or degraded cropland. Some land users plan to sow alfalfa on their lands, which are not fit for crop cultivation. (land user's view)
- The decision to grow alfalfa on the degraded cropland and pasture land is an efficient and low-cost technology. It makes it possible to produce good fodder on the degraded land under low or no availability of irrigation water. At the same time the plant has a good feature in terms of enhancing moisture retention and halting soil erosion. (compiler's or other key resource person's view)
- Land users learn about sustainable land management practices adapted to their local conditions and needs. The land users can collect their own seeds to use for seeding in the future. (compiler's or other key resource person's view)
- Female members of the family help to protect the plot. (compiler's or other key resource person's view)

Weaknesses/ disadvantages/ risks → *how to overcome*

- Land users expressed concerns that in 5 years they have to reseed again the alfalfa and they don't have seeds for it. (land user's view)
- Some land users' expectations were not met as they planned to sow alfalfa on bigger land, but in reality could only sow on 1-2 jeribs (0.2-0.4 ha). (land user's view)
- Female family members take part in haymaking and delivery of the hay to their homes or to the fodder storage. This increases their daily workload. (land user's view)
- There is no fence to protect the pasture from grazing during the quarantine period. Grazing on the pasture during quarantine may affect the quality of the pasture. The land user has to hire a guard to protect the pasture or the family members have to protect the plot. → *Further awareness raising about the importance of the quarantine regime within the village community. Affordable options for area closure, at least during quarantine.* (compiler's or other key resource person's view)
- The quarantine period of 1-3 years deprives the land user of its pasture and limits fodder production significantly. Although the land users did not specifically raise their concern about the quarantine, however it presents a major disadvantage in an area where there is already a shortage of grazing land and fodder. Such situation might cause conflict over the use of pasture land in the village. (compiler's or other key resource person's view)
- Not all land users are aware of seed collection or practice seed collection, which could be very helpful to save costs for buying alfalfa seeds. They could also sell their surplus seeds. (compiler's or other key resource person's view)
- The use of fertilizer is perceived by the land user as an important factor for growing quality fodder. Such perception might increase the reliance of land users on applying chemical fertilizers, rather than engaging in sustainable management of the plot. (compiler's or other key resource person's view)

REFERENCES

Compiler

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Questionnaire created
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Resource persons

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Full description in the WOCAT database

https://qcat.wocat.net/en/wocat/technologies/view/technologies_672/

Linked SLM data

n.a.

Documentation was faciliated by

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- Swiss Agency for Development and Cooperation (SDC) - Switzerland
- Terre des hommes (Tdh) - Switzerland

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Key references

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Links to relevant information which is available online

Annex 8: Assessment of SLM Practices by Survey Respondents

Terraces (with improved seeds and fertilizer application)

Q5.1.3 Are you aware of Terraces?
91% Yes

Most Interesting Practice Terraces

What are the most interesting SLM practice to you and your HH (3 possible choices)? Quote for Terraces

	First	Second	Third	Total
Amount out of 121 interviewees	35	29	10	74

What are the most interesting SLM practice? Quote for Terraces segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	32	26	16	74

What are the most interesting SLM practice? Share for Terraces by wealth group compared to the total

	Poor	Middle	Better-off
% Terraces	38	45	17
% Total (121)	39	45	16

What are the most interesting SLM practice? Share for Terraces segregation by age group

	18-30	31-50	50-100
% Terraces	23	35	42
% Total (121)	34	37	29

Age: 47.0 mean age for a 42.8 total average of respondents
Gender: 44 (59%) men and 30 (41%) women on 74
Land ownership: Among those 74 persons 5 (7%) have no land (only Pasture)

Where did you see this practice?
52% in the village, 42% by Tdh office, 4% by other resource persons, 2% by neighbor villages

What are some of the things you like about it?
32% It level the land, 28% keep moisture, 20% prevent land degradation (by water and flood), 14% it increases yield, 6% every parts are beneficial.

What are some of the things you dislike about it?
33 person said they like everything, 2 persons said it smaller the land, 2 persons said it is hard work, 1 person said it is costly and the rest (36 persons) didn't answered.

Did you or your HH participate in NRMC activities regarding this practice?
YES 46 persons (on 74 = 62%): the 46 participants received money (cash for work) and among them 19 worked on their own land and received additionally working tools (each time) and sometimes (6 persons) received black fertilizer too.

NO 28 persons (on 74 = 38%): 19 persons (68%) have not been offered to work, 5 persons (18%) didn't knew and 4 persons (14%) had no work force available.

Did your household replicate the practice on land your HH uses/operates?
3 persons (4%) did replicate: 2 had already terraced land and on had just participate in NRMC

- As I knew it benefits the land because I used that.
- I knew that it is for the rehabilitation and reinforcement of our lands.
- Because it levels the land and increases the yields and it also prevents soil erosion.

They received no support
They terraced their own land
1 will replicate further if he gets the time and the 2 others have no more land to terrace.

71 persons (96%) did not replicate
50% have not the financial ability, 13% have not the ability, 10% have no (or not enough) land, 7% have no work force, 6% have already terraced their land, 4% have no time, 4% have land that don't require Terraces, 3% are not interested because it is not paid and 3% have shared land

Does your HH intend to replicate this technique? For the 71 (96%) No
57 persons (80%) intend to replicate
30% because it increases the yield, 23% because it levels the land, 21% because it prevents the land from degradation and flood, 10% will do it if/when they will be able to afford its expense, 8% will do it if they receive support (from tdh) with money and tools, 5% will do it if they buy land, 2% because it keeps moisture of the land and 1% to apply fertilizer

23 persons (40%) would replicate without receive any subsidies/support for this?
44% because it is for their own benefit, 37% when/if they will have more money, 19% when/if they will have the work force/ability
They would all replicate on OWN LAND.

34 persons (60%) would NOT replicate without receive any subsidies/support for this?

14 persons (20%) do not intend to replicate
5 persons have no land, 4 have not the money to do it, 3 have already all their land terraced and 2 have land that don't require it

Least Interesting Practice Terraces

What are the Least interesting SLM practice to you and your HH (2 possible choices)? Quote for Terraces

	First	Second	Total
Amount out of 121 interviewees	8	3	11

What are the Least interesting SLM practice? Quote for Terraces segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	3	2	6	11

What are the Least interesting SLM practice? Share for Terraces by wealth group compared to the total

	Poor	Middle	Better-off
% Terraces	36	55	9
% Total (121)	39	45	16

Age: 32.7 mean age for a 42.8 average
Gender: 8 (73%) men and 3 (27%) women on 11
Land ownership: Among those 11 persons 3 (27%) have no land (Abi and Lalmi)

Where did you see this practice?
73% in the village, 27% by tdh office

What are some of the things you like about it?
50% It level the land, 31% keep moisture, 13% prevent land degradation (by water and flood), 6% it increases yield

What are some of the things you dislike about it?
5 had no critics, 3 didn't knew, 1 said it reduce the land, 1 said it keep mud when raining and 1 said it's not useful

Did you or your HH participate in NRMC activities regarding this practice?
YES 2 persons (on 11 = 18%): they both received money (cash for work)
NO 9 persons (on 11 = 82%): 5 persons (56%) had no (or not enough) land, 2 persons (22%) have not been offered to work and 2 persons (22%) where not aware about it

Establishment of improved Orchards

Q5.1.3 Are you aware of Orchard?
74% Yes

Most Interesting practice

!!! 10 quotes for Orchard & Afforestation have been integrated here (not in Afforestation)!!!

What are the most interesting SLM practice for you and your HH (3 possible choices)? Quote for Orchard

	First	Second	Third	Total
Amount out of 121 interviewees	23	12	7	42

What are the most interesting SLM practice? Quote for Orchard, segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	5	7	30	42
Without the 10 double quotes	1	1	30	32

What are the most interesting SLM practice? Share for Orchard by wealth group compared to the total

	Poor	Middle	Better-off
% Orchard	40	43	17
% Total (121)	39	45	16

What are the most interesting SLM practice? Share for Orchard segregation by age group

	18-30	31-50	50-100
% Orchard	40	29	31
% Total (121)	34	37	29

Age: 40.5 mean age for a 42.8 total average of respondents
Gender: 27 (64%) men and 15 (36%) women on 41
Land ownership: Among those 42 persons 14 (34%) have no Orchard and 3 have only Pasture

Where did you see this practice?
47% in the village, 44% by tdh office, 7% in the neighborhood ares, 2% by Mission East organization

What are some of the things you like about it?
49% benefits of the fruits, 19% benefits of the wood and branches (for fuel and the house), 16% the village become green, 14% generate good source of income, 2% protect the land

What are some of the things you dislike about it?
28 (68%) no disadvantages, 9 (22%) don't know, 4 (10%) said it is a hard work (more struggle)

Did you or your HH participate in NRMC activities regarding this practice?
YES 14 persons (on 41 = 34%): 13 participants received money (cash for work) and one of them received pistachio seeds
NO 27 persons (on 41 = 66%): 12 persons (45%) have not been offered to work, 9 persons (33%) didn't knew and 6 persons (22%) had no work force available (no time, sick, busy, in Iran).

Did your household replicate the practice on land your HH uses/operates?
13 persons (29%) did replicate: 32% to generate good source of income, 27% for the benefits of its fruits, 18% used the new improved sampling from nursery (tdh method), 9% benefits of the wood and branches, 9% the village become green, 5% it protects the land.
None of the 12 persons received any (financial) support
Orchard have been established on their own land
9 will replicate further if they have enough money (4 persons) or if they receive improved seeds/trees (5 persons), the 2 others have no more land for Orchard. One person didn't answer to this question.

29 persons (71%) did not replicate
38% have no (or not enough) land (irrigated), 35% have not the financial ability, 9% have no work force/abilities, 9% have already Orchard in their land and 9% have not the abilities (tools, samplings)

Does your HH intend to replicate this technique? For the 29 (71%) No
15 persons (52%) intend to replicate
36% to generate good source of income, 36% for the benefits of its fruits, 16% for the benefits of the wood and branches, 8% the village become green and 4% if I receive technical support.
5 persons (33%) would replicate without receive any subsidies/support for this?
4 persons said when/if they will have enough money and 1 because it has benefits
They would all replicate on OWN LAND.
10 persons (67%) would NOT replicate without receive any subsidies/support for this?

14 persons (48%) do not intend to replicate
12 persons have no (or not enough) land and 2 have already enough Orchard established

Least Interesting Practice

What are the Least interesting SLM practice to you and your HH (2 possible choices)? Quote for Orchard

	First	Second	Total
Amount out of 121 interviewees	0	0	0

Gully Treatment (mainly on cropland but also on grazing land and mixed land)

Q5.1.3 Are you aware of Gully Treatment?
77% Yes

Most Interesting practice

What are the most interesting SLM practice for you and your HH (3 possible choices)? Quote for Gully Treatment

	First	Second	Third	Total
Amount out of 121 interviewees	6	15	18	39

What are the most interesting SLM practice? Quote for Gully Treatment segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	21	12	6	39

What are the most interesting SLM practice? Share for Gully Treatment by wealth group

	Poor	Middle	Better-off
% Gully treatment	38	45	17
% Total (121)	39	45	16

What are the most interesting SLM practice? Share for Gully Treatment segregation by age group

	18-30	31-50	50-100
% Gully treatment	38	33	28
% Total (121)	34	37	29

Age: 44 mean age for a 42.8 total average of respondents
Gender: 16 (41%) men and 23 (59%) women on 40
Land ownership: Among those 39 persons 4 (10%) have no land

Where did you see this practice?
51% in the village, 47% by tdh, 2% in neighborhood areas

What are some of the things you like about it?
65% it prevents our lands from flood destruction, 27% it prevents our homes (roads, garden, orchard) from flood destruction, 6% everything, 2% give drinking water

What are some of the things you dislike about it?
26 persons don't know, 12 no disadvantage and 1 specified if bags are used, cannot be more beneficial.

Did you or your HH participate in NRMC activities regarding this practice?
YES 17 persons (on 39 = 44%): all 17 participants received money (cash for work) and one specified he worked on his own land
NO 22 persons (on 39 = 56%): 11 persons have not been offered to work, 8 persons were not informed, 3 had no work force available and 1 persons is living far from flood

Did your household replicate the practice on land your HH uses/operates?
2 persons (5%) did replicate: Even so they haven't participated to the NRMC project

- This prevent our land and roads not to be destroyed.
- Because my land was under the threat of floods, I therefor built gully treatment.

They both received no financial support
They applied the technique on their own land
1 will replicate further if/when he has enough money and the other not

37 persons (95%) did not replicate
34% have land that don't require Gully Treatment, 28% have not the financial ability, 23% have not the ability, 10% have no land, 5% said that it require too much work

Does your HH intend to replicate this technique? For the 37 (95%) No
20 persons (54%) intend to replicate
73% because their land is under the threat of floods, 14% because their home (road) is under the threat of floods, 9 % because their orchard is under the threat of floods and 4% for irrigation.
4 persons would replicate without receiving any subsidies/support for this?
2 persons when/if they will have more money, 1 person because it is for their own benefit and 1 person if people cooperate
They would all replicate on OWN LAND.
16 persons would NOT replicate without receiving any subsidies/support for this?

17 persons (46%) do not intend to replicate
13 persons have land that don't require gully treatment and 4 have no land

Least Interesting Practice

What are the Least interesting SLM practice to you and your HH (2 possible choices)? Quote for Gully Treatment

	First	Second	Total
Amount out of 121 interviewees	5	8	13

What are the Least interesting SLM practice? Quote for Gully Treatment segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	5	4	4	13

What are the Least interesting SLM practice? Share for Gully Treatment by wealth group

	Poor	Middle	Better-off
% Gully Treatment	31	54	15
% Total (121)	39	45	16

Age: 38.6 mean age for a 42.8 average
Gender: 10 (77%) men and 3 (23%) women on 13
Land ownership: Among those 13 persons 4 (31%) have no land (Only Pasture)

Where did you see this practice?
77% in the village, 23% from tdh office

What are some of the things you like about it?
44% don't know, 37% it prevents our lands from flood destruction and 19% it prevents our homes (roads, orchard) from flood destruction

What are some of the things you dislike about it?
10 don't know, 2 had no critics and one said "Cotton-bag is not useful and does not produce result"

Did you or your HH participate in NRMC activities regarding this practice?
YES 3 persons (on 11 = 23%): they all received money (cash for work)
NO 10 persons (on 11 = 77%): 10 persons where not aware about it, 2 persons were busy with other works and 1 person had no interest in it.

Afforestation for firewood production

Q5.1.3 Are you aware of Afforestation?
82% Yes

Most Interesting practice

What are the most interesting SLM practice for you and your HH (3 possible choices)? Quote for Afforestation[1]

	First	Second	Third	Total
Amount out of 121 interviewees	15	8	6	29

What are the most interesting SLM practice? Quote for Afforestation segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	15	6	8	29

What are the most interesting SLM practice? Share for Afforestation by wealth group

	Poor	Middle	Better-off
% Afforestation	36	52	12
% Total (121)	39	45	16

What are the most interesting SLM practice? Share for Afforestation segregation by age group

	18-30	31-50	50-100
% Afforestation	55	21	24
% Total (121)	34	37	29

Age: 37.4 mean age for a 42.8 total average of respondents
Gender: 10 (34%) men and 19 (66%) women
Land ownership: Among those 29 persons 10 (33%) have no land (Lalmi or Abi)

Where did you see this practice?
67% in the village, 23% by Tdh staff

What are some of the things you like about it?
36% for the benefit of the wood (fuel), 34% because it green the village, 13% for the benefit of the fruit (if planting fruit trees -> Orchard), 6% don't know and 11% have more hedonic consideration (benefit public people, pleasant and easy work, recreation)

What are some of the things you dislike about it?
19 persons don't know, 9 persons find no disadvantages and 2 young women (25 years) from DEM said they don't like that sampling are herbsed in pasture and animals can't graze

Did you or your HH participate in NRMC activities regarding this practice?
YES 20 persons (on 30 = 67%): 18 participants received money (cash for work), one said he works against cash and tree for irrigation and 1 said he works but was not paid
NO 10 persons (on 30 = 33%): 2 persons have not been offered to work, 6 persons (18%) didn't knew and 2 where not there (Iran).

Did your household replicate the practice on land your HH uses/operates?
29 persons (100%) did not replicate
16 persons have no (or not enough) land, 8 persons don't want to do it on their own land but on public land, 4 persons have not the ability (knowledge, work force) and 1 person share her land with different member of her family and have no consensus.

Does your HH intend to replicate this technique? For the 29 (97%) No
8 persons (28%) intend to replicate
3 persons will do it if they purchase more land, 3 because they want to benefit from their production and 2 because it greens the area.
None of them would replicate without receive any subsidies/support for this?

21 persons (72%) do not intend to replicate
16 persons have no (or not enough) land, 5 persons don't want to do it on their own land but on public land

Least Interesting Practice

What are the Least interesting SLM practice to you and your HH (2 possible choices)? Quote for Afforestation

	First	Second	Total
Amount out of 121 interviewees	7	4	11

What are the Least interesting SLM practice? Quote for Afforestation segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	3	3	5	11

What are the Least interesting SLM practice? Share for Afforestation by wealth group

	Poor	Middle	Better-off
% Afforestation	18	45	37
% Total (121)	39	45	16

Age: 43.1 mean age for a 42.8 average
Gender: 7 (64%) men and 4 (36%) women on 11
Land ownership: Among those 11 persons 3 (27%) have no land (Abi and Lalmi)

Where did you see this practice?
57% in the village, 43% by tdh office

What are some of the things you like about it?
6 persons for the benefit of the production (wood, fuel, fruits), 2 persons it greens the village, 1 person it protects the soil and 1 person said "I like its work because of its money".

What are some of the things you dislike about it?
5 persons don't know, 4 persons said it reduce pasture and 2 persons find no disadvantages

Did you or your HH participate in NRMC activities regarding this practice?
YES 4 persons (on 11 = 36%): they all received money (cash for work)
NO 7 persons (on 11 = 64%): 4 persons were not aware about it and 3 have not been offered to work

[1] 10 Quote was for Afforestation and Orchard and have been integrated in Orchard and not here.

Ferula cultivation on degraded slopes

Q5.1.3 Are you aware of Ferula cultivation?
70% Yes

Kind of herbs:
Ferula, Cumin, Black salsify and Shirinboya

Most Interesting practice

What are the most interesting SLM practice for you and your HH (3 possible choices)? Quote for Ferula cultivation

	First	Second	Third	Total
Amount out of 121 interviewees	7	8	11	26

What are the most interesting SLM practice? Quote for Ferula cultivation segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	14	8	4	26

What are the most interesting SLM practice? Share for Ferula cultivation by wealth group

	Poor	Middle	Better-off
% Ferula cultivation	19	58	23
% Total (121)	39	45	16

What are the most interesting SLM practice? Share for Ferula cultivation segregation by age group

	18-30	31-50	50-100
% Ferula cultivation	15	38	46
% Total (121)	34	37	29

Age: 49.9 mean age for a 42.8 total average of respondents
Gender: 18 (69%) men and 8 (31%) women on 26
Land ownership: Among those 26 persons 4 (15%) have no land (No Lalmi and no Abi)

Where did you see this practice?
56% in the village, 35% by Tdh office and 9% from other places (Badakhshan and Jalalabad)

What are some of the things you like about it?
19 persons said when it yields it gives good income and make life better, 3 it said it promote family economy, 3 don't know and 1 because it is also a medicine

What are some of the things you dislike about it?
10 persons don't know, 7 persons see no disadvantages, 4 persons said it take some year to start to produce yield, 4 persons said it need more work and one that he can't grow now any other things.

Did you or your HH participate in NRMC activities regarding this practice?
YES 9 persons (on 26 = 35%): 38% received Ferula seeds, 19% received money, 13% received tools, 6% received fertilizer, 6% received food, 6% received cumin seed, 6% received black salsify seed and 6% specified worked on their own land
NO 17 persons (on 26 = 65%): 8 persons have not been offered to work, 7 persons were not informed and 2 persons were busy with other work.

Did your hoehold replicate the practice on land your HH uses/operates?
4 persons (15%) did replicate: 3 of them had participated in NRMC project

- As it is expensive and beneficial.
- Since the price is high and more money makes the economic situation better.
- We used this as we got that Ferula is a precious plan and gives good yield.
- I got that it has good income

They received no support
They cultivate Ferula on their own land
1 will replicate further if he gets money, 1 because it gives good yield and income, 1 don't know and 1 will not replicate further because it is more struggle.

22 persons (85%) did not replicate
24% have no (or not enough) land, 20% have no seed (Ferula, cumin and black salsify), 20% have not the financial ability, 12% have not the working ability, 8% planted seeds but had no yield, 8% said that it gives too much work, 4% have no interest and 4% will implement it if he receives support.

Does your HH intend to replicate this technique? For the 22 (85%) No
13 persons (59%) intend to replicate
9 persons said when it yield it gives good income and make life better and 4 will implement it if they receive Ferula and cumin seed and or support
2 would replicate without receive any subsidies/support for this?
Both when/if they will have money
They would replicate on their personal LAND.
11 would NOT replicate without receive any subsidies/support for this?

9 persons (31%) do not intend to replicate
6 persons have no (or not enough) land, 2 have planted seeds but had no yield and 1 because it requires too much work

Least Interesting Practice

What are the Least interesting SLM practice to you and your HH (2 possible choices)? Quote for Ferula cultivation

	First	Second	Total
Amount out of 121 interviewees	11	3	14

What are the Least interesting SLM practice? Quote for Ferula cultivation segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	6	2	6	14

What are the Least interesting SLM practice? Share for Ferula cultivation by wealth group

	Poor	Middle	Better-off
% Ferula cultivation	36	57	7
% Total (121)	39	45	16

Age: 36.4 mean age for a 42.8 average
Gender: 6 (43%) men and 8 (57%) women on 14
Land ownership: Among those 14 persons 3 (21%) have no land (Only Pasture)

Where did you see this practice?
70% in the village, 30% by tdh office

What are some of the things you like about it?
10 persons said when it yields it gives good income and make life better, 3 don't know and 1 said nothing because it gives too much work.

What are some of the things you dislike about it?
7 persons don't know, 4 persons said it take some year to start to produce yield, 1 persons see no disadvantages, 1 persons said it need more work and one because he planted it and had no result.

Did you or your HH participate in NRMC activities regarding this practice?
YES 5 persons (on 14 = 36%): 2 received money (cash for work), 2 received seeds and 1 scattered Ferula seed in his own land, but it didn't give any result.
NO 9 persons (on 14 = 64%): 3 persons were not aware about it, 2 persons have no (or not enough) land, 2 persons have not been offered to work and 1 person received no seed and 1 was busy.

Establishment of improved Vineyards

Q5.1.3 Are you aware of Vineyard?
70% Yes

Most Interesting practice

What are the most interesting SLM practice for you and your HH (3 possible choices)? Quote for Vineyard

	First	Second	Third	Total
Amount out of 121 interviewees	9	7	8	24

What are the most interesting SLM practice? Quote for Vineyard segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	8	10	6	24

What are the most interesting SLM practice? Share for Vineyard by wealth group

	Poor	Middle	Better-off
% Vineyard	37	46	17
% Total (121)	39	45	16

What are the most interesting SLM practice? Share for Vineyard segregation by age group

	18-30	31-50	50-100
% Vineyard	37	46	17
% Total (121)	34	37	29

Age: 41.0 mean age for a 42.8 total average of respondents
Gender: 18 (75%) men and 6 (25%) women on 24
Land ownership: Among those 24 persons 5 (21%) have no land

Where did you see this practice?
52% in the village, 48% by tdh

What are some of the things you like about it?
40% like to benefit of the fruits, 34% said when it yields it gives good income, 13% like everything about this method, 10% don't know and 3% feed the tree leaves to the livestock.

What are some of the things you dislike about it?
13 persons don't know, 8 find no disadvantages, 2 said it is hard work and 1 that it makes too long to yield.

Did you or your HH participate in NRMC activities regarding this practice?
YES 13 persons (on 24 = 54%): all participant received money (cash for work) and among them 1 received vine sampling as well and another received tool.
NO 11 persons (on 24 = 46%): 7 persons were not aware of this activity and 4 persons have not been offered to work.

Did your household replicate the practice on land your HH uses/operates?
1 persons (4%) did replicate: he had already participated in NRMC project on Vineyard (from JWK)

- We knew that it has good income if produces yields.

He received no support and did it on his own land.
He would replicate further if he would receive vine samplings.

23 persons (96%) did not replicate
10 persons have no land, 7 can't afford the expense, 4 would need to receive vine samplings, 1 said it is too much work and 1 from SEJ said that vine give bad results in his village.

Does your HH intend to replicate this technique? For the 23 (96%) No
11 persons (48%) intend to replicate
5 persons because when it yields it gives good income, 3 persons will replicate if they buy land, 2 if they receive samplings and 1 If trees are improved.
3 (27%) would replicate without receive any subsidies/support for this?
2 if they have financial ability and 1 because It is good work and full of income.
They would all replicate on OWN LAND.
8 (73%) would NOT replicate without receive any subsidies/support for this?

12 persons (52%) do not intend to replicate
7 persons have no (or not enough) land, 2 have no interest, 1 would do it if he had the money, 1 would do it if he receives samplings and 1 will not replicate because it requires too much work.

Least Interesting Practice

What are the Least interesting SLM practice to you and your HH (2 possible choices)? Quote for Vineyard

	First	Second	Total
Amount out of 121 interviewees	17	5	22

What are the Least interesting SLM practice? Quote for Vineyard segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	9	5	8	22

What are the Least interesting SLM practice? Share for Vineyard by wealth group

	Poor	Middle	Better-off
% Vineyard	27	55	18
% Total (121)	39	45	16

Age: 48.9 mean age for a 42.8 average
Gender: 14 (64%) men and 8 (36%) women on 22
Land ownership: Among those 22 persons 3 (14%) have no land (Abi and Lalmi)

Where did you see this practice?
67% in the village, 29% by tdh and 4% in the city

What are some of the things you like about it?
8 persons don't know, 7 persons to benefit from the fruits, 5 if it yields it have good income and 2 don't like it because in SEJ it doesn't yield.

What are some of the things you dislike about it?
11 don't know, 5 see no disadvantage, 4 said it doesn't yield in DEM and 2 said the same for SEJ.

Did you or your HH participate in NRMC activities regarding this practice?
YES 10 persons (on 22 = 45%): 8 received money (cash for work), 1 received vine samplings and 1 said "Against work and medical pump".
NO 12 persons (on 22 = 55%): 9 persons were not aware of this activity, 2 persons have not been offered to work and 1 person was busy with other work.

Nursery for the production of fruit and non-fruit saplings[2]

Q5.1.3 Are you aware of Nursery?

19 persons from DEM (out of 40) quote it naturally in additional comment as it was out of the proposed list.

Most Interesting practice

What are the most interesting SLM practice for you and your HH (3 possible choices)? Quote for Nursery

	First	Second	Third	Total
Amount out of 121 interviewees	3	8	3	14

What are the most interesting SLM practice? Quote for Nursery segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	0	2	12	14

What are the most interesting SLM practice? Share for Nursery by wealth group

	Poor	Middle	Better-off
% Nursery	21	72	7
% Total (121)	39	45	16

What are the most interesting SLM practice? Share for Nursery segregation by age group

	18-30	31-50	50-100
% Nursery	43	36	21
% Total (121)	34	37	29

Age: 37.6 mean age for a 42.8 total average of respondents
Gender: 8 (57%) men and 6 (43%) women on 14
Land ownership: Among those 14 persons 1 (7%) have no Lalmi Land but have Abi

Where did you see this practice?

8 persons in the village, 5 by tdh and 1 by Arbab of the village

What are some of the things you like about it?

5 persons said that the sale of sampling have good income, 4 persons said that the sale of seedling have good income, 3 persons said it gives a good income when it yields and 2 like to benefit of the fruits.

What are some of the things you dislike about it?

9 persons see no disadvantage and 5 don't know.

Did you or your HH participate in NRMC activities regarding this practice?

YES 5 persons (on 14 = 36%): 1 participant received only money (cash for work) all the other received seeds and working tools, 1 received black fertilizer as well and 2 that worked on their own land received cash and trees as well.
NO 9 persons (on 14 = 64%): 6 persons have not been offered to work, 2 persons didn't knew and 1 persons was away (Iran).

Did your household replicate the practice on land your HH uses/operates?

14 persons (100%) did not replicate
5 persons have not the technical ability, 4 persons have not the financial ability, 3 persons have no irrigated land, 1 person have no work force for it and 1 person have not find the time yet.

Does your HH intend to replicate this technique?

9 persons (64%) intend to replicate
5 persons said it is a good source of income when it yields and 4 will replicate it if they receive guidance and support (sampling trees, seeds and/or tools).
2 would replicate without receiving any subsidies/support for this?
1 "Because it's a work full of income" and 1 "If opportunity is provided to me".
They would all replicate on OWN LAND.
7 would NOT replicate without receiving any subsidies/support for this?

5 persons (36%) do not intend to replicate
3 persons have no irrigated land and 2 have not the financial abilities and work force needed.

Least Interesting Practice

What are the Least interesting SLM practice to you and your HH (2 possible choices)? Quote for Nursery

	First	Second	Total
Amount out of 121 interviewees	0	1	1

Men of 28-year-old living in DEM with a middle income and all types of land. He sees this technic in this village during the tdh implementation. He likes it because "If seedlings start to yield people sell them and earn good income" and he doesn't know what he dislikes about it. He didn't participate in the NRMC project because he was not proposed to.

[2] Quotes for horticulture have been counted here.

Hedgerows - Contour lines of alfalfa on annual cropland

Q5.1.3 Are you aware of Hedgerow?
67% Yes

Most Interesting practice

What are the most interesting SLM practice for you and your HH (3 possible choices)? Quote for Hedgerow

	First	Second	Third	Total
Amount out of 121 interviewees	1	6	5	12

What are the most interesting SLM practice? Quote for Hedgerow segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	6	6	0	12

What are the most interesting SLM practice? Share for Hedgerow by wealth group

	Poor	Middle	Better-off
% Hedgerow	42	50	8
% Total (121)	39	45	16

What are the most interesting SLM practice? Share for Hedgerow segregation by age group

	18-30	31-50	50-100
% Hedgerow	16	42	42
% Total (121)	34	37	29

Age: 47.6 mean age for a 42.8 total average of respondents
Gender: 8 (67%) men and 4 (33%) women on 12
Land ownership: Among those 12 persons 2 (17%) have no land (only Pasture)

Where did you see this practice?
50% in the village, 42% by tdh office, 8% by the arbab

What are some of the things you like about it?
5 persons like that it prevents land degradation, 4 persons like that it produce fodder for livestock, 1 don't know, 1 like because it retain water (moisture) and 1 like it because NRMC project participation was well paid.

What are some of the things you dislike about it?
9 don't know and 3 find no disadvantages ("It has no specific disadvantage we can only not grow in the hedgerow, but still we can use its alfalfa.")

Did you or your HH participate in NRMC activities regarding this practice?
YES 5 persons (on 12 = 42%): 2 participants received money (cash for work) and 3 worked in exchange for DAP (fertilizer) and alfalfa seeds (3.5kg).
NO 7 persons (on 74 = 58%): 4 persons were not aware of it 2 have not been offered to work and 1 was not interest because he has no land.

Did your household replicate the practice on land your HH uses/operates?
12 persons (100%) did not replicate
4 persons don't need it because their land is leveled, 3 have not the financial ability (alfalfa seed and fertilizer), 3 have no (or not enough) land, 1 because he has no work force and 1 "Because hedgerows are not given in our lands".

Does your HH intend to replicate this technique?
7 persons (58%) intend to replicate
2 because it prevents land degradation, 2 because it produces fodder, 1 if he buys land, 1 if he have money and 1 if he receive guidance.
3 persons would replicate without receive any subsidies/support for this?

- because of its fodder.
- Because it is useful for our land.
- I decided.

They would all replicate on OWN LAND.
4 would NOT replicate without receive any subsidies/support for this?

5 persons (42%) do not intend to replicate
2 persons have no land, 2 have land that don't require it, 1 want to terrace his land, 1 have already hedgerow on his land and 1 from JWK because hedgerows do not produce result in his land.

Least Interesting Practice

What are the Least interesting SLM practice to you and your HH (2 possible choices)? Quote for Hedgerow

	First	Second	Total
Amount out of 121 interviewees	7	8	15

What are the Least interesting SLM practice? Quote for Hedgerow segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	10	4	1	15

What are the Least interesting SLM practice? Share for Hedgerow by wealth group

	Poor	Middle	Better-off
% Hedgerow	40	47	13
% Total (121)	39	45	16

Age: 47.1 mean age for a 42.8 average
Gender: 12 (80%) men and 3 (20%) women on 15
Land ownership: Among those 15 persons 1 (7%) have no land (only Pasture)

Where did you see this practice?
87% in the village, 13% by tdh

What are some of the things you like about it?
7 persons don't know, 5 because it produces fodder for livestock and 3 because it prevents land degradation.

What are some of the things you dislike about it?
11 persons don't know and 4 see no disadvantage.

Did you or your HH participate in NRMC activities regarding this practice?
YES 3 persons (on 15 = 20%): 2 received money (cash for work) and 1 worked in exchange of two bags of chemical fertilizer and 3.5 Kilogram alfalfa seeds.
NO 12 persons (on 11 = 80%): 8 persons were not aware about it, 2 persons have not been offered to work and 2 persons were not there (Iran).

Livestock shed

Q5.1.3 Are you aware of Livestock shed?
49% Yes

Most Interesting practice

What are the most interesting SLM practice for you and your HH (3 possible choices)?
Quote for Livestock shed

	First	Second	Third	Total
Amount out of 121 interviewees	3	3	3	9

What are the most interesting SLM practice? Quote for Livestock shed segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	2	3	4	9

What are the most interesting SLM practice? Share for Livestock shed by wealth group

	Poor	Middle	Better-off
% Livestock shed	45	45	10
% Total (121)	39	45	16

What are the most interesting SLM practice? Share for Livestock shed segregation by age group

	18-30	31-50	50-100
% Livestock shed	22	45	33
% Total (121)	34	37	29

- **Age:** 49.6 mean age for a 42.8 total average of respondents
- **Gender:** 8 (89%) men and 1 (11%) women on 9
- **Land ownership:** Among those 9 persons 3 (33%) have no land (only Pasture)

Where did you see this practice?
56% in the village, 22% by tdh office, 22% by Sher Aghaa in SEJ.

What are some of the things you like about it?
8 persons said that a settlement equipped with ventilation will be provided (and diseases and cold can't hurt livestock) and 1 don't know.

What are some of the things you dislike about it?
5 persons see no disadvantages and 4 don't know.

Did you or your HH participate in NRMC activities regarding this practice?
YES 2 persons (on 9 = 22%): 1 worked in exchange for 10 bags of cement, wood, ventilator, water tank and the other worked in exchange for cement, windows and wood.
NO 7 persons (on 9 = 78%): they all were not aware of this activity.

Did your household replicate the practice on land your HH uses/operates?
1 persons (11%) did replicate: he is 1 of the 2 that participated in NRMC project
"I recognized its importance and we were equipped as well."He received no support and implement it on his own land. He will not replicate further because this Livestock shed is enough for his livestock.

8 persons (89%) did not replicate
7 persons have not the financial ability and among them 2 have no land finally the last one have already a Livestock shed that is enough for its livestock.

Does your HH intend to replicate this technique? For the 8 (89%) No
7 persons (88%) intend to replicate. All said "Because I am interested in animal husbandry and it is important for livestock to have accommodation."
None of them 100% would replicate without receiving any subsidies/support for this?

1 persons (12%) do not intend to replicate
"The livestock shed (stable) we have made with the help of the institution is enough for our livestock."

Least Interesting Practice

What are the Least interesting SLM practice to you and your HH (2 possible choices)?
Quote for Livestock shed

	First	Second	Total
Amount out of 121 interviewees	12	3	15

What are the Least interesting SLM practice? Quote for Livestock shed segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	5	6	4	15

What are the Least interesting SLM practice? Share for Livestock shed by wealth group

	Poor	Middle	Better-off
% Livestock shed	40	33	27
% Total (121)	39	45	16

- **Age**: 49.7 mean age for a 42.8 average
- **Gender**: 15 (100%) men
- **Land ownership:** Among those 15 persons no one have no land

Where did you see this practice?
67% in the village, 33% by tdh office

What are some of the things you like about it?
7 persons don't know, 7 other say "Settlement is provided for animals, there is ventilation and air goes in/out freely. (Insects do not bite animals.)" And 1 find no interest.

What are some of the things you dislike about it?
8 don't know, 6 see no disadvantage and 1 said that livestock shed place becomes smelly.

Did you or your HH participate in NRMC activities regarding this practice?
NO 12 persons (on 12 = 100%): 12 were not aware, 2 have no work force available and 1 has no livestock

Community Fodder bank

Q5.1.3 Are you aware of Fodder bank?
32% Yes

Most Interesting practice

What are the most interesting SLM practice for you and your HH (3 possible choices)? Quote for Fodder bank

	First	Second	Third	Total
Amount out of 121 interviewees	2	1	6	9

What are the most interesting SLM practice? Quote for Fodder bank segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	1	4	4	9

What are the most interesting SLM practice? Share for Fodder bank by wealth group

	Poor	Middle	Better-off
% Fodder bank	22	67	11
% Total (121)	39	45	16

What are the most interesting SLM practice? Share for Fodder bank segregation by age group

	18-30	31-50	50-100
% Fodder bank	22	66	22
% Total (121)	34	37	29

Age: 40.1 mean age for a 42.8 total average of respondents
Gender: 9 (100%) men
Land ownership: Among those 9 persons 3 (33%) have no land

Where did you see this practice?
33% in the village, 67% by tdh.

What are some of the things you like about it?
All said it is very useful for animal husbandry during shortage of fodder like in winter. They can use or borrow fodder (to other) in storage. (otherwise they need to buy it and it is sometimes too expensive).

What are some of the things you dislike about it?
8 said there is no disadvantage and 1 don't know

Did you or your HH participate in NRMC activities regarding this practice?
YES 3 persons (on 9 = 33%): All participant received money (cash for work) (250/500/3000 Afs)
NO 6 persons (on 9 = 67%): 5 were not aware of this activity and 1 have not been offered to work

Did your household replicate the practice on land your HH uses/operates?
1 person (11%) did replicate: he had not participated to NRMC project
"As our livestock are faced with the lack of fodder in winter, fodder bank is there for needed." He received no support and built it on his own land. he will not replicate further

8 persons (89%) did not replicate
7 persons have not the financial ability and among them 3 have no land as well and 1 said Fodder and straw supplies require people and organization's cooperation.

Does your HH intend to replicate this technique? For the 8 (89%) No
8 persons (100%) intend to replicate
All said it is very useful for animal husbandry during shortage of fodder like in winter. They can use or borrow fodder (to other) in storage.
2 persons would replicate without receive any subsidies/support for this?

- If I had money and the cereals yields were increased.
- if I had facilities and money

They would both replicate on OWN LAND.
6 persons would NOT replicate without receive any subsidies/support for this?

Least Interesting Practice

What are the Least interesting SLM practice to you and your HH (2 possible choices)? Quote for Fodder bank

	First	Second	Total
Amount out of 121 interviewees	0	4	4

What are the Least interesting SLM practice? Quote for Fodder bank segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	1	1	2	4

What are the least interesting SLM practice? Share for Fodder bank by wealth group

	Poor	Middle	Better-off
% Fodder bank	0	75	25
% Total (121)	39	45	16

Age: 40.0 mean age for a 42.8 average
Gender: 4 (100%) men
Land ownership: Among those 11 persons none of them have no land

Where did you see this practice?
75% in the village, 25% by tdh

What are some of the things you like about it?
3 said that they can borrow during the lack of fodder and money and 1 don't know.

What are some of the things you dislike about it?
3 see no disadvantages and 1 don't know.

Did you or your HH participate in NRMC activities regarding this practice?
YES 1 person (on 4 = 25%): In exchange for fodder loan.
NO 3 persons (on 4 = 75%): 2 were not aware of this activity, and 1 have no work force.

Rehabilitation of degraded pastures with alfalfa

Q5.1.3 Are you aware of Pasture Rehabilitation?
40% Yes

Most Interesting practice

What are the most interesting SLM practice for you and your HH (3 possible choices)?
Quote for Pasture Rehabilitation

	First	Second	Third	Total
Amount out of 121 interviewees	2	2	3	7

What are the most interesting SLM practice? Quote for Pasture Rehabilitation segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	1	2	4	7

What are the most interesting SLM practice? Share for Pasture Rehabilitation by wealth group

	Poor	Middle	Better-off
% Pasture Rehabilitation	72	14	14
% Total (121)	39	45	16

What are the most interesting SLM practice? Share for Pasture Rehabilitation segregation by age group

	18-30	31-50	50-100
% Pasture Rehabilitation	22	66	22
% Total (121)	34	37	29

- **Age:** 46.4 mean age for a 42.8 total average of respondents
- **Gender:** 7 (100%) men
- **Land ownership:** Among those 7 persons 3 (43%) have no land (only Pasture)

Where did you see this practice?
57% in the village and 43% by tdh

What are some of the things you like about it?
6 persons said that livestock can develops because fodder increase and animal won't face fodder shortage and 1 like that it is an easy work.

What are some of the things you dislike about it?
1 person don't know and the other (6) see no disadvantages.

Did you or your HH participate in NRMC activities regarding this practice?
YES 1 persons (on 7 = 14%): He worked against alfalfa and shirinboya seeds and tools
NO 6 persons (on 7 = 86%): 5 were not aware and 1 was busy with other work

Did your household replicate the practice on land your HH uses/operates?
7 persons (100%) did not replicate
6 said to have no private pasture (and not enough land to do it on their private land). Among them 3 have even no private land. Finally 1 said "Because I don't have more facilities and ability".

Does your HH intend to replicate this technique?
6 persons (86%) intend to replicate
5 said are interested in animal husbandry and by consequences the public pastures must be rehabilitated to provide enough fodder. Finally 1 said "As most of our lands do not produce yield, we want to convert them to pasture."
1 would replicate without receive any subsidies/support for this?
We are interested to prevent destruction of our own land by using this method.
5 would NOT replicate without receive any subsidies/support for this?

1 persons (14%) don't know if he will replicate this method

Least Interesting Practice

What are the Least interesting SLM practice to you and your HH (2 possible choices)?
Quote for Pasture Rehabilitation

	First	Second	Total
Amount out of 121 interviewees	1	3	4

What are the Least interesting SLM practice? Quote for Pasture Rehabilitation segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	3	1	0	4

What are the least interesting SLM practice? Share for Pasture Rehabilitation by wealth group

	Poor	Middle	Better-off
% Pasture Rehabilitation	25	50	25
% Total (121)	39	45	16

- **Age**: 41.8 mean age for a 42.8 average
- **Gender**: 4 (100%) men
- **Land ownership:** Among those 4 persons 1 (25%) have no private land

Where did you see this practice?
50% in the village, 50% by tdh office

What are some of the things you like about it?
1 said "Pasture is controlled and fodder increases", 1 said "it greens the pasture", 1 said "Even though the pastures are protected, but the livestock still remains without forage" and 1 don't know.

What are some of the things you dislike about it?
They all don't know.

Did you or your HH participate in NRMC activities regarding this practice?
NO 4 persons (on 4 = 100%): 3 were not aware and 1 was not there (Iran).

Rotational grazing plan implemented on improved pastures

Q5.1.3 Are you aware of Grazing Plan?

30% Yes

Most Interesting practice

What are the most interesting SLM practice for you and your HH (3 possible choices)? Quote for Grazing Plan

	First	Second	Third	Total
Amount out of 121 interviewees	0	0	0	0

Least Interesting Practice

What are the Least interesting SLM practice to you and your HH (2 possible choices)? Quote for Grazing Plan

	First	Second	Total
Amount out of 121 interviewees	2	3	5

What are the Least interesting SLM practice? Quote for Grazing Plan segregation by villages

	SEJ	JWK	DEM	Total
Amount out of 121 interviewees	3	2	0	5

What are the least interesting SLM practice? Share for Grazing Plan by wealth group

	Poor	Middle	Better-off
% Grazing Plan	20	20	60
% Total (121)	39	45	16

- **Age**: 64 mean age for a 42.8 average
- **Gender**: 5 (100%) men
- **Land ownership:** Among those 5 persons none have no land

Where did you see this practice?

100% in the village

What are some of the things you like about it?

1 said “grazing becomes rotary and pastures remain perfect”, 1 said “it is for the benefit of our pastures” and 3 don’t know.

What are some of the things you dislike about it?

They all don’t know.

Did you or your HH participate in NRMC activities regarding this practice?

NO 5 persons (on 5 = 100%): they all were not aware and in addition 1 have no livestock.

Annex 9: Table of Contents Digital Annex

List of Digital Annexes