
Improved Land Management to Combat Desertification (MegaProject 3)

Introduction

A synopsis of activities, major achievements, shifts in emphasis, current and future research areas and beneficiaries of the two former MTP projects that were incorporated into MegaProject 3 in 2005 is presented. These are: Project 2.4: Rehabilitation and improved management of rangelands in dry areas, and Project 3.2: Soil conservation and land management.

Rehabilitation and Improved Management of Rangelands in Dry Areas

Introduction

More than half of the entire land area of Central and West Asia and North Africa (CWANA) is rangeland that is used by pastoralists for grazing small ruminants. It is the world's largest continuous area of grazed land, most of which is commonly grazed. These rangelands are essential resources for the poorest population of the region by providing primarily forage for small ruminants. Rangelands face severe problems of desertification and are producing less than half of their forage potential. Depending upon the region, use rights vary from completely free access (open to everyone) to exclusive use by tribes, communities or extended families. Livestock numbers are usually not controlled unless by government intervention. Indigenous management systems that were once sustainable such as the *Hema* system have broken down for various reasons, but mainly because of increased population pressure or inappropriate government policy and land tenure. Overgrazing and continuous grazing are usually the causes of degradation, but other factors include over-harvesting for fuel wood and temporary cultivation. Range development has focused on range restoration, either by direct seeding or transplanting shrubs; but they often revert back to degraded states soon after improvement because of inadequate management. Rangeland restoration will not be sustainable if the poor management that degraded the range is not changed. Rotational grazing and stocking rate control are the only known options to sustain the system and stop degradation. Community participatory approaches can help pastoralists and governments find a way to enable them to better manage the land. Herders who cooperate in rotational grazing or stock control can reverse the downward spiral of degradation and increase both forage and livestock productivity. Sustainable management not only assures pastoralist income but also contributes to carbon sequestration of importance to the international

community. The main beneficiaries are pastoral communities, mixed crop/range/livestock producing farmers, governments, scientists and extensionists of developing countries, national policy makers, global environmental community concerned about global warming, and NGOs building natural resource institutions.

Achievements

- **A socio-ecological survey of Syrian Steppe was completed.** The survey characterized the rangeland conditions and key social factors of the communities that rely upon the Syrian Steppe. Fifty communities, 128 ecological sample sites and 359 households were surveyed in collaboration with government staff. This information is being used to define the causes of degradation, target research and identify alternative mechanisms of cooperative rotational grazing management.
- **Rangeland plant materials were tested and establishment techniques developed.** Three experimental sites totalling 18 hectares were established on previously cultivated land that was banned from cultivation in 1995. Eighteen transplanted shrub and grass species were evaluated with and without water harvesting and 32 species were evaluated under two methods of seeding, either broadcast or by seeding with an ICARDA modified pitting machine that creates small water capturing basins. Eighteen species show promise for restoring severely degraded rangeland.
- **The community participatory approach to rangeland management was developed and applied in 5 North African countries.** The community approach is a research methodology developed in the context of the Mashreq & Maghreb Project. Communities in pilot areas are implementing action and development plans for improved rangeland management. Project results and research papers were presented in a final conference in 2005.
- **Inventory, assessment and mapping of rangeland resources and degradation.** Collaborating NARS scientists have developed range degradation and resource assessment processes relevant to agro-pastoral societies throughout the third world. The methodology combines sociological survey and ecological inventory using remote sensing and GIS. It has been used to characterize pastoral communities, assess their rangelands, and to document the extent of degradation in 5 North African countries and Syria. Land use and vegetation cover has also been mapped and reported for the Southeast Anatolia (GAP) project area in Turkey.
- **Fodder shrub intercropping was tested in the barley zone of Syria and in Morocco.** More high protein forage was produced and made available in the dry season. In addition grain and straw yields were as high as mono-cropping, and in some cases even higher. In addition, protective vegetative cover was provided year-round to reduce soil erosion.
- **Options for rangeland rehabilitation in the Arabian Peninsula were tested.** Germplasm was collected, evaluated and technical options for restoration of degraded rangeland developed.

Shifts in Emphasis

Most rangeland research in the past was devoted to restoration of degraded rangeland by developing germplasm and technologies for reseeding and planting both exotic and

indigenous species. Restored range is soon destroyed if the improper grazing management that caused the degradation has not changed. Although research on restoration technology will continue, greater emphasis will be placed on development of grazing management alternatives, both institutional and technical, to solve the real problem of improper grazing management. In so doing, greater research attention would need to be placed on the social/ecological factors that drive the plant succession process rather than the technology to fix what is destroyed. Since rangeland is nearly impossible to restore to its natural productive state once the vegetative cover is destroyed, emphasis must be on prevention of further degradation.

Current and Future Research

- **Natural resource assessment in degradation-prone areas.** This will include socio-economic and environmental characterization of rangeland using GIS in CWANA; and traditional management, rangeland health and suitability surveyed in Iran and Pakistan.
- **Development of better degradation indicators and ecological inventory.** This will enable managers in developing countries to monitor ecosystem health and adjust grazing timing and pressure as necessary. A methodology that combines remote sensing technology with sociological data, indigenous knowledge, and scientific field observation using a GIS framework will be developed. This will include spatial analysis on a landscape scale related to the new ecological concepts of state and transition models, thresholds and rangeland health.
- **Community-based approaches for reversing degradation.** Institutional studies, policy analysis, modelling, community based timed control grazing with stocking rate control, and ecological studies will be conducted to provide managers the knowledge and options needed to make decisions. For example, ecological studies would include defoliation stress physiology to determine when the major plants can be grazed with least impact. Sociological and institutional studies would be conducted to determine how human communities can change management to fit the plant ecology of the ecosystems they manage. Past and ongoing research has identified technical constraints but a more holistic systems approach that involves participation by the users is planned.
- **Develop and test rangeland plant materials and restoration technologies.** Research will continue to test new plant materials and establishment methods in the Arabian Peninsula, Syria and elsewhere in the CWANA region to restore severely degraded rangeland and increase forage production.

Soil Conservation and Land Management

Introduction

Stable and high productive land resources are an important factor contributing to sustainable and resilience livelihoods in dry areas. However, land resources in the dry areas are mostly in poor condition, due to removal of the vegetative cover, overgrazing, inten-

sive tillage practices, inappropriate irrigation practices and gradual disappearance of fallowing. The consequent land degradation processes include water erosion, wind erosion, tillage erosion, soil fertility mining and salinization. In dryland climates, about 1000 million ha are estimated to be degraded: 467 million ha by water erosion, 432 million ha by wind erosion, 100 million ha by chemical deterioration and 35 million ha by physical deterioration. Degradation of drylands or 'desertification' results in a deterioration and loss of unique ecosystems and their endemic components of biodiversity, and the breakdown of traditional livelihood systems that is causing major migration flows. The most affected eco-types are marginal agricultural dryland areas, dry mountains and rangelands (salinised irrigated areas are addressed by MP1).

The causes for land degradation in dry areas are complex and often of socio-economic nature: 1) limited awareness about land degradation due to stable but degraded state of the land, invisible or slow land degradation processes, and irregular rainfall (which is 'masking' the effect of land degradation); 2) social pressure to conform to certain land-use practices (e.g. clean fields); 3) lack of simple and affordable land management technologies adapted to the present (dynamic) livelihood strategies; 4) competition between investments in land management versus short-term rewarding activities, such as cash crops or off-farm labour; 5) lack of local institutions for collective management of common-pool natural resources, input supply and/or marketing; 6) poor enabling environment at market, institutional and policy levels; and 7) uncertainty caused by recurrent droughts. However, recent surveys in NW Syria indicate that there are local innovators who experiment with alternative ways to manage their land, and field experiences indicated that several farmers are keen to test new approaches if a truly participatory mode is used. Therefore, to cope with this complex challenge, there is a need for a comprehensive strategy to diagnose and tackle land degradation in close cooperation with other disciplines and other stakeholders. The main beneficiaries are farming communities, e.g. Khanasser valley and Afrin area in NW Syria and 'agriculturalists' or households whose livelihood mainly depend on cropping and livestock activities in Iran and Morocco.

Achievements

- Three major competitive grant projects were approved: Khanasser valley–Syria–1.3M\$; Water and Food Challenge Program - Iran - 0.95 M\$; and INRM conservation tillage - Morocco - 300K\$ with Diversification project. In addition, contributions were made to several interdisciplinary projects.
- Facilitated grants to NGO (Iran, Water and Food CP, 75K\$) and Community Based Organizations (CBO) (Syria, GEF SGP, 50K\$) to collaborate in research benchmark sites.
- Interdisciplinary teamwork and close collaboration with farmers and stakeholders.
- Strengthened participatory research within the former NRMP.
- Contribution to the INRM approach within NRMP and with NARS partners plus contributing at the CGIAR level via the organization of two INRM Task Force meetings (in 2002 in Aleppo, Syria and in Los Banos, Philippines in 2005).
- Developed technologies: tillage-enhanced water harvesting for fruit trees, stone

mulch, seed priming, natural vegetation strips and minimum tillage for sloping olive orchards, vetch as green manure in olive orchards, pre-summer tillage to control wind erosion.

- Quick assessment methods for rill and gully erosion, tillage erosion, wind erosion, nutrient mining and long-term land degradation.
- Holistic land degradation assessment framework at community level.
- Innovator survey for land management practices in NW Syria.
- Disciplinary and interdisciplinary publications (see lists of publications).
- Workshop on development options for dry marginal areas – Lessons from Khanasser valley (Syria, 12–13 January 2005).
- Policy briefing meetings on sustainable agriculture in marginal dryland areas – based on Khanasser experience (Syria, 6 July 2005 & 22 Jan 2006).
- Capacity of partners for research was strengthened through training of students: 2 Ph.D., 10 M.Sc. and 4 interns.

Current and Future Activities

During the five-year period, there has been a change of the soil conservation and land management (SC&LM) project leader, with a gap of about 1.5 years in between them. A major shift was the move from soil-based strategy to a more participatory, integrated and holistic SC&LM strategy. This includes focus on outscaling (via collaboration with CBO's and NGO's) and upscaling of research findings (via policy briefings). In addition, the studies of land degradation processes were focused on rapid land degradation assessment tools, which can be used by our NARES partners. Finally, the research program was broadened from Syria to other CWANA countries (Iran and Morocco).

The current SC&LM research agenda focuses on:

- An integrated multi-scale research approach for land degradation assessment and problem solving for degrading dry areas.
- Rapid tools for assessing land degradation processes.
- Participatory and community-based sustainable land management techniques and approaches for dry areas.
- Strengthened capacity of NARS and other stakeholders in land degradation assessment and integrated land development research for dry areas.
- Upscaling and outscaling of research results.

As the Khanasser Valley project will end in 2005, a major emphasis will be given to peer-reviewed journal papers and reports during 2006 and scaling out of the approach.

In the near-future, no major shifts are expected. However, the SC&LM program will become streamlined within the new MP3 project, which is focused on sustainable land management to combat desertification. Finally, we expect to expand our work to dry mountain areas in other CWANA countries.