HIMCAT
Newsletter No. 4 **July 2009**

Strengthening of SLM knowledge sharing in the Himalayan region through spreading of WOCAT tools.

N-Fixing plants along riser bunds of paddy field - a traditional technology from Nepal's mid hills (Madhav Dhakal).

Documentation of traditional knowledge in Nepal using WOCAT tool (Madhav Dhakal)

Contents

Coordinator's note

The HIMCAT extranet network is pleased to distribute the forth HIMCAT newsletter on **"Strengthening of SLM knowledge sharing in the Himalayan region through spreading of WOCAT tools".**
Himalayan Conservation Approaches and Technologies (HIMCAT) network was established as regional network of WOCAT. ICIMOD is serving as a focal organization to coordinate the network for documenting and sharing Sustainable Land Management (SLM) knowledge in the Himalayas with regional and national partners. The first "on the ground regional training" was organized in Kathmandu in 2003 as a HIMCAT initiative. Since then, country level trainings were organized in Bangladesh, Bhutan, Nepal and Pakistan. Some technologies and approaches that were documented during the trainings were shared with global community through WOCAT global overview book: '***where the land is greener'*** and BANCAT overview book '**Selected *Natural Resource Conservation Approaches and Technologies in the Chittagong Hill Tracts, Bangladesh'***. The methodologies and tools developed by the World Overview of Conservation Approaches and Technologies (WOCAT; www.wocat.org) are being used for documenting, sharing and evaluating SLM technologies and approaches in the Himalayan region and it is being accepted by the Himalayan member countries and partners.
We are confident that, in future, more SLM knowledge will be documented by using WOCAT tool and will be shared among wider communities through the HIMCAT network.

In this issue of the HIMCAT newsletter, a number of members from different Himalayan countries have shared their experience on activities and technologies on sustainable land management. Furthermore, an interview with a new HIMCAT member from the Kathmandu University is also shared.

Enjoy the reading.

Thank you to the members who contributed to this newsletter.

M. Dhakal– Assistant HIMCAT coordinator

WOCAT / HIMCAT

The World Overview of Conservation Approaches and Technologies (WOCAT), is a network of Sustainable Land Management (SLM) specialists from all over the world. The WOCAT network facilitates the sharing of valuable knowledge land management and the efficient use of existing know-how www.wocat.net.
The Himalayan Conservation Approaches and Technologies (HIMCAT) is an offspring of this global initiative. The HIMCAT is primarily a network of sustainable land management and watershed management practitioners working for sustainable development of the Himalaya. The HIMCAT network welcomes discussion and experience sharing on issues related to soil, land and water management activities in Asia.

ICIMOD

The International Centre for Integrated Mountain Development (ICIMOD) is an international, independent mountain learning and knowledge centre committed to improving the sustainable livelihoods of mountain peoples in the extended Himalayan region. ICIMOD serves eight regional member countries of the Hindu Kush Himalaya area: Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan as well as the global mountain community. Founded in 1983, ICIMOD is based in Kathmandu, Nepal, and brings together a partnership of its regional member countries, over 300 partner institutions, and committed donors. www.icimod.org.
ICIMOD is the focal point of WOCAT in the Himalayan region and is hosting the HIMCAT extranet site. http://extranet.icimod.org.np/himcat/.

Announcements

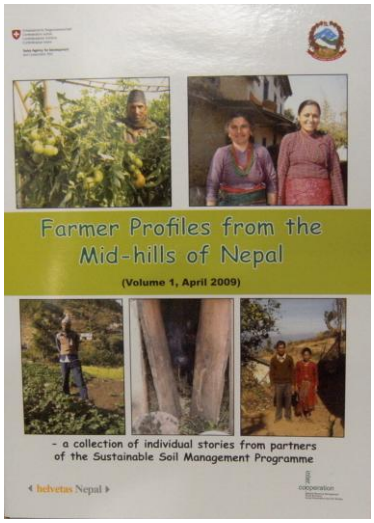
Announcement of 14th Annual WOCAT Workshop and Steering Meeting in October 2009, Morocco

Since 1996, WOCAT has organized International Annual Workshops and Steering Committee Meetings (known as WWSM) with the goal (a) to bring together the main collaborating and funding institutions and the core collaborators, (b) to assess the progress and exchange experiences, (c) to further develop the programme and (d) to plan for the future including budgetary consequences. The 14th WWSM will be organised in Morocco in October 2009. Please check the WOCAT website www.wocat.org or contact the WOCAT secretariat wocat@giub.unbe.ch for further information.

ICIMOD's First International Training on "Participatory Integrated Watershed Management"

ICIMOD announce an 11 day first international training course on "Participatory Integrated Watershed Management" from 5-15 October 2009 at Kathmandu. The training aimed to broaden the understanding and visioning capability of watershed mangers on participatory integrated watershed management. Further information can be checked in web http://www.icimod.org/index.php?page=370 Interested person can apply through website.

SSMP book release - "Farmer Profiles from the Mid-hills of Nepal"



This booklet has been published by the SDC-funded Sustainable Soil Management Project (SSMP) in April 2009. SSMP, jointly implemented by Helvetas and Intercooperation, both Swiss INGOs, was initiated in 1999, and currently operates in 10 districts of the mid-hills of Nepal.

In response to the decline in soil fertility due to increased cropping intensity, the main focus of SSMP is to improve the livelihood of the smallholder farming community located on the rainfed uplands, the *bari* areas, through the promotion of improved farmyard manure management, cattle urine collection and use, composting, integrating legume into the cropping system, integrated plant nutrient management, organic pest management, and linking vegetable cash crops, and improved varieties of cereals, with improved soil management. SSMP thus has two main purposes: a) to improve the soil conditions and b) to generate additional income for the farmers of the mid hills.

The booklet is part of the SSMP monitoring programme which aims to assess the impact that programme initiatives have had on the production practices, livelihoods and well-being of mid-hill farmers.

Twenty farmers from 9 mid-hill districts tell their stories in this first volume of Farmer Profiles, describing life before and after adopting improved soil management practices, and relate some of their experiences and thoughts after several years of working with SSMP and its partners.

These profiles show that the improved soil management practices have had a direct beneficial impact on soil health and productivity, household incomes, food sufficiency, children's education, family health, decision making and social status in the community.

The Farmer Profiles booklet, in either English or Nepali, is available from SSMP; please contact Neeranjan P Rajbhandari or Richard Allen at +977 1 5543591 or ssmp@helvetas.org.np.

News items

Shangri-La Workshop 2009, Sustainable Land Management in the Highlands of Asia, 18-22 May, 2009, Northwest Yunnan, China

The international workshop was organized by Kunming Institute of Botany, Chinese Academy of Sciences (KIB-CAS), World Agroforestry Centre (ICRAF), and International Center for Integrated Mountain Development (ICIMOD). The Shangri-La workshop explored ongoing research and practical initiatives addressing issues of land-use and land degradation from environmental changes in the highlands. The workshop reflected on some of the state of art of research findings in soil and water erosion, degradation and desertification, physical and social vulnerability, livelihoods and environmental services locally and regionally in the highlands of Asia. Furthermore, the workshop aimed to explore issues of sustainable land management at present and in future under the impact of various socio-economic changes (and in particular climate change) across many levels – from village and watersheds to transbasin and global. The workshop brought together around 70 scientists, practitioners, researchers, representatives of governmental and nongovernmental organisations (NGOs), and students for five days to share and discuss practical experiences and research findings from the highlands of Asia.

The key messages from the Shangri-la workshop were:
True to the extreme diversity of the region, the key sustainability issues span a wide range of ecological and social areas; however, many of the livelihood challenges faced by people in upland ecosystems are quite similar.

Across this tremendous diversity of contexts and complexity, there is a growing sense of shared understanding in the knowledge and scientific community about critical issues: land

and ecosystem degradation; risks and disasters including soil erosion and floods; scarcity and yet also abundance of water and sedimentation; climate change impacts and vulnerability of people along with adaptation efforts; and the exploration of livelihood options.

Much effort is being placed in bringing together multiple stakeholders as well as to engage in the public policy process to address social and ecological conditions and seek creative as well as pro-active responses and solutions.

The Shangri-La workshop has resulted in commitments to:

- Further strengthen understanding of ongoing research and grassroots initiatives
- Explore institutional innovation and people's adaptation particularly to climate change
- Identify weak areas of knowledge
- Strengthen linkages between science and policy
- Catalyse further research, pro-active responses and policy dialogue towards sustainable management of the Asian highlands

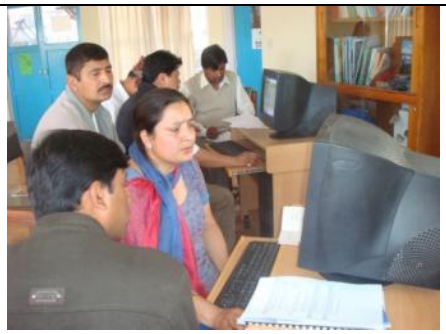
WOCAT training in Nepal and Pakistan

A 6 day training on 'documentation of Sustainable Land Management (SLM) technologies and approaches using WOCAT tools' was organised in Nepal and Pakistan. In Nepal the training was jointly organised by Kathmandu University (KU), Sustainable soil Management Program (SSMP) and ICIMOD from April 6 – 11, 2009; and in Pakistan it was organised jointly by Interco-operation (IC) and ICIMOD from April 28 – May 3, 2009. As being the focal organization of the regional WOCAT network known as HIMCAT, ICIMOD has provided resource persons to facilitate those trainings.

The training objectives were a) to enable the participants to use the WOCAT tools for documentation, evaluation, monitoring and dissemination of sustainable land management (SLM) technologies and approaches, and b) to exchange experiences and knowledge in the field SLM. The training was designed covering following six sessions table1).

Table1: **Sessions covered in the training**

Sessions	Nepal	Pakistan
Session I: General introduction to WOCAT		

Session II: Experience sharing by the participants		
Session III: Introduction to WOCAT methodology and tools		
Session IV: Practical training in the field		
Session V: Training on data management tool (database)		
Session VI: Presentation of action plan		

In Nepal, there were 18 participants from Department of Soil Conservation and Watershed Management (DSCWM), Nepal Agriculture Research Council (NARC), District Agriculture Office-Baglung, Kathmandu University, International Development Enterprises (IDE-Nepal), CEAPRED- Surkhet, NEPED-India, LIBIRD, ICIMOD, ECARDS-Dolakha, and SSMP. Class room sessions were held at Kathmandu University and field sessions in Panauti area of Kavrepalanchowk district.

Likewise, in Pakistan, there were 19 participants from NARC/PARC, Water Resource Research institute (WRRI), Interco-operation (IC), Pakistan Forest Institute (PFI), NWFP-Agriculture University, Forest Planning and Monitoring Circle, NWFP Agriculture Extension Departments, soil and Water Conservation Research Institute (SAWCRI), Arid Agriculture University, Gomal University and ICARDA. Class room sessions were held in Islamabad and field sessions in Kaller Kohar, Punjab Province.

In both countries, participants were divided into 2 groups, each group documented 1 technology and 1 approach, and those were entered into database (table 2). Short summary of two technologies are presented below.

Table2: **Documented technologies and approaches in the training**

Country	Technologies	Approaches
Nepal	1. Potato cultivation in Comb-shaped raised bed 2. Riser Stabilization by Vegetative Measures on Upland (Bari land)	1. Farmer to Farmer Technology Evolution and Diffusion 2. Trans generational approach for the protection of Gully
Pakistan	1. Gully farming *(Kappi)* 2. Loose stone structure construction for the management of terraces	1. Demonstration of Terraced Farming through Loose Stone Outlets 2. Promotion of loose stone structures through community participation

The action plan (technologies and approaches to be documented in future) was prepared and presented by the participating organizations in both countries.

Through this training, participants and their institutions have build their capacities on the use of WOCAT tools for documenting and sharing good practices on SLM and the country level initiatives (Pakistan Conservation Approaches and Technologies-PAKCAT and Nepal Conservation Approaches and Technologies –NEPCAT), were initiated and enhanced.

Interview with HIMCAT member

Interview with Ms. Sabita Aryal, Lecturer, Department of Environment Sciences and Engineering, Kathmandu University (sabita@ku.edu.np)

Q: How did you get to know WOCAT and since when are you member of WOCAT network?
A: I came to know WOCAT on 6th of April 2009 during WOCAT training in Nepal. I became member from 11th of April 2009 onwards.

Q: According to you what are the most important land management issues in the Himalayan areas?
A: Erratic rainfall, soil and organic matter loss, diversity loss, chemical encroachment, agricultural intensifications.

Q: In order to promote sustainable land management, what are the most important aspects that one must consider?
A: Watershed management, organic farming, permaculture, bioengineering, irrigation and safe drainage.

Q: How useful do you believe WOCAT as a tool to document, share and evaluate SLM experiences?
A: Very useful.

Q: Is your organization using WOCAT in research and education? How?
A: Yes. We are teaching the WOCAT tool in our B. Sc. student of Environmental Science and we guide the student to use this tool to conduct their research dissertation.

Q: Do you find the HIMCAT network beneficial for promoting sustainable land management? Any suggestions how it can be further strengthened?
A: I still have to know more about this network to give my suggestions.

Profile HIMCAT member: Ms. Sabita Aryal

Present designation / organisation
Lecturer, Department of Environment Sciences and Engineering, Kathmandu University

Contact address
Ms. Sabita Aryal, Phone: 9841540579, 01- 4601323 (R), 011-661399 (O)
Email: sabita@ku.edu.np, sabitaaryal@hotmail.com

A short summary of professional experience
Worked in Bagmati watershed project as social worker as well as a principal investigator for the terrace improvement impact study. Worked in IUCN for integrated Shiwalik conservation plan. Worked in Haryana Community Forestry Project, India as a trainer of trainer. In Women Development and Empowerment Project, India as a monitoring officer. Since 7 years working in Kathmandu University as a lecturer in the Environmental Science and Engineering department. Also involve in organic farming, hydropower potential and energy in rural Nepal.

List of key publications

- Study of Socio-economic Condition and Drinking Water Quality of Rain Water Harvesting Jars in Madanpokhara VDC, Palpa District, Nepal (2007) report submitted to University Grant Commission, Nepal.
- "Mathematical Modeling of Residual Effects of Distillery Effluents Application by Finite Difference Method**"** published on **http://www.ku.edu.np/kuset/second_issue/o2/Dr%20Jyoti-.pdf**, (2006)

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- "Traditional water saving technologies and the strategy of water conservation in the ecological farm of Panchkhal", paper presented on International Workshop on water saving technologies (February 22-24, 2006) United States Educational Foundation in India.
- Integrated plan for Shiwalik Conservation (1999), published by IUCN, Nepal.
- "Residual Effects of Distillery Effluent Application on wheat crop" 1998 M.Sc. thesis.
- "Residual Effect of Long term Distillery Effluent Application on wheat crop", paper Presented on National Conference on Salinity management in Agriculture, December 1998, Central Soil Salinity Research Institute Karnal India.
- " Effects of Distillery Effluent on Germination of Wheat", paper presented on National Symposium on Combating Pollutants Accumulation in Ecosystem for Sustainable Agriculture, October 1998, Department of Chemistry Allahabad Agricultural Institute Allahabad, India
- "Terrace Improvement Impact Study" 1997 a report to Bagmati Watershed Project
- "Drinking Water Quality and Use of Rain Water Harvesting Jar in Madanpokhara VDC, Palpa District, Nepal", paper presented on National Conference on Environment, June 2007, Kathmandu, Nepal.

Contributions from members

HELVETAS AFGHANISTAN

1. Sustainable Watershed Management

Contributing to improved livelihoods of poor rural population

In the districts of Bamyan, Baghlan and Samangan provinces of Afghanistan the predominantly rural population sustains on very limited irrigated land in the valleys. An uncontrolled use on less fertile watersheds/rangelands is leading to more floods in the valleys decreasing soil fertility and reduced income for land users.

Heavy erosion in watersheds

Debris destroy rare fertile land

Floods endanger people's lives

The main reasons for watershed degradation are deforestation during thirty years of war and conflict, plowing of pasture areas; uncontrolled overgrazing; cutting out shrubs in a destructive way. Prolonged droughts have intensified the man-made depletion of the watersheds.

Overgrazing

Overcutting of shrubs

Plowed fields

Helvetas has launched a participatory sustainable watershed management programme in Kahmard district of Bamyan and the measures being applied are as follows:

- Establishment and strengthening of watershed committees to develop and enforce institutional arrangements (rules), properly manage projects in the watershed, and up-scale promising results.
- Application of structural (supported by vegetative) measures to reduce flood damage in the villages and contribute to re-vegetation in the watersheds.
- Re-establishment of vegetative soil cover supported by soil and water conservation (SWC) measures.
- Capacity development (organization, cooperation, institutions and skills) to support and anchor the proposed strategies and approaches in the local communities.
- Participation in policy dialogues to promote community based NRM legislations.

The project also has complementary energy efficient activities in the valley to reduce shrub cutting. Establishment of a watershed institute and WOCAT/HIMCAT-linked Afghanistan Conservation Approaches and Technologies (AFCAT) community of practice, together with interested collaborators, are also planned.

		
Watershed committees take management responsibilities	Helvetas engineers provide technical support	The communities are trained on SWC techniques
		
Staggered contour trenches on gentle slopes	Gabion check dams in gullies	Half-moon pits on gentle slopes
		
Grasses/forbs (Agropyron, Sanfoin, Lucerne) and shrubs (e.g. Safflower)	Non fruit (Acacia, Russian willow) and fruit (Almond, Pistachio)	Grazing management

The direct partners of Helvetas' SWM project are the watershed management committees, Community Development Councils (CDCs), land owners and traditional land users, District governor's office. Others include Ministry of Agriculture, Irrigation and Livestock; Local specialists and suppliers; other NGOs, communities of neighbouring CDCs, Universities.

Funding: Helevtas; the International ReSource Award for sustainable watershed management 2009.

Contacts for more information: khalid.azami@helvetas; sanjeev.bhuchar@helvetas.org

2. Improving the soil fertility in the mid-hills of Nepal[1] - a summary of work in progress (The Programme Management Unit, The Sustainable Soil Management Programme)

Introduction

Nepalese hill farmers are facing formidable challenges in maintaining soil fertility and productivity, the most valuable resource for their main livelihood. Declining soil fertility is due largely to increased cropping intensity, necessitated by increasing population, in the mid-hills of Nepal, resulting in more nutrient export than replacement.

The small landholders of the b*ari* (rainfed upland areas) region in the mid-hills of Nepal practice a subsistence form of farming; they have no or little access to chemical fertilizers either due to distance from the roadhead or due to the unaffordable cost of fertilizer. Where agrochemicals are available near the roads, these chemical fertilizers and pesticides are often used inappropriately applied resulting in increased production costs, health problems and environmental hazards.

At the same time, valuable farm resources like farmyard manure and cattle urine produced from the 11 million large ruminants in Nepal are frequently underutilized, poorly managed or ignored. Equally, other appropriate concepts such as integrating nitrogen fixing legumes into the farming system, proper use of crop residues and stubbles, and use of the locally available natural resources are also insufficiently publicized and extended.

The SSMP, initiated in 1999, has concentrated its activities in the mid hills of Nepal to improve the livelihood of the smallholder farming community located on the rainfed uplands, the *bari* areas, through SSM practices. The major SSM practices promoted by SSMP include improved farmyard manure management, cattle urine collection and use, composting, integrating legume into the cropping system, integrated plant nutrient management, organic pest management, and linking vegetable cash crops, and improved varieties of cereals with SSM – there are two main purposes, a) to improve the soil condition, and b) to generate additional income for the men and women farmers of the mid hills.

SSMP has continuously monitored the effects of the recommended soil management practices on the farms where it has been adopted by establishing and sampling benchmark plots. The analytical results from the samples taken from these benchmark plots have been helpful in sharing with the partner organizations and farmers both the existing soil conditions, and the changes that occur over the years after the adoption of SSM practices.

Bt 2008, SSMP had established a total of 2500 benchmark sites in the 15 districts where SSMP has worked. The sites have been regularly monitored and the information gleaned from the analysis results has been explained to the partner farmers.

The Benchmark Plots

The benchmarks plots constitute selected farms where the farmer has adopted SSM practices and continues to crop; if the farmer stops using SSM practices, or ceases cropping that area, that site is no longer used for comparative purposes. The FYM samples are taken from pits where the farmer is managing the compost and manure according to SSM practices.

[1] This paper is the first review of on-going work of SSMP

After selecting each benchmark site, representative samples of soil up to plough layer depth (6" to 9", 15 to 22.5 cm) are taken according to a documented instruction manual. Similarly the FYM samples are taken from the pit in a prescribed manner. Samples are first taken before the farmer has implemented any changes on his farm, and as s/he begins training. The same sites are re-sampled at regular intervals, often after 2 to 3 years.

During this period, all the agricultural practices adopted by the farmers on the sampled field and the adopted FYM improvement practices are recorded on a simple form which is provided to each partner farmer.

Many samples have been taken over the years, and many analyses carried out. In the following section, only those samples and analysis results in which the programme has complete confidence are used for comparison.

Results and discussion

The Soil Nutrient Status – a general picture

Overall results from a comparison of the before and after scenarios show that SSM practices indeed improve the general soil nutrient status, the impact being most clear in the P and OM levels, see Table 1.

There appears to be no positive impact on the potassium content, and although K levels in the soils of Nepal are relatively high, the declining trend requires further query. The change in pH is not significant.

Table 1 Change in soil nutrients over the three year period, 2003 to 2006 (n = 75)

Nutrients	1st Year (2003)	3rd Year (2006)	Relative change after 3 years %	Absolute change after 3 years
Nitrogen (N %)	0.18	0.20	+ 11%	+ 0.02%
Phosphorous (P kg/ha)	28.70	37.50	+ 30%	+ 8.8 kg/ha
Potassium (K kg/ha)	333.59	234.8	- 30%	- 98.8 kg/ha
Soil Organic Matter (%)	3.59	4.05	+ 13%	+ 0.5 %
pH	5.77	5.67	- 2%	- 0.1

Soil Organic Matter

The text books tell us that SSM practices should contribute to increasing the organic content of the soil through: improved farmyard manure preparation and incorporation, composting, integrating legumes into the cropping system, and improved management of crop residues and stubbles.

A more detailed look at the changes in soil organic matter levels over two and three year periods provides stronger evidence of a real impact of SSM practices - see Figure 1, where each of the four series of results are a mean of results from 50 sites.

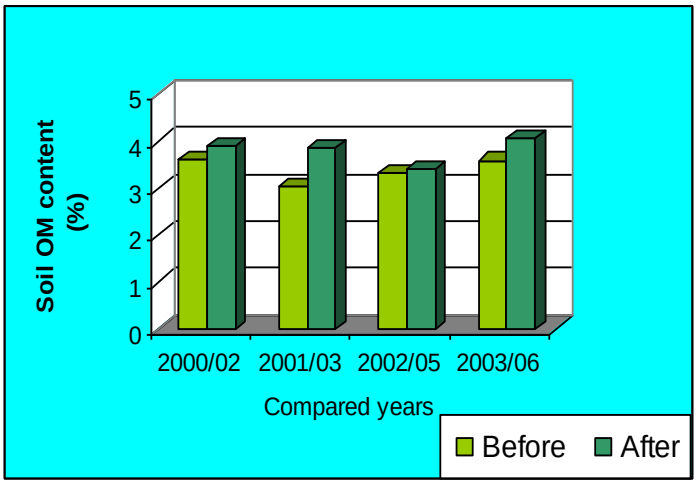


Figure 1: Changes in soil OM content at the SSMP benchmark sites

In all four series, soil OM levels are higher following SSM practices. The increment of improvement, however, is not uniform, and this might be due to variable agro-climatic site conditions, differences in farming practices and management, or the nature of the land and the crops grown.

From the reliable data currently to hand, one impact of introducing SSM practices would be a potential absolute annual increase in soil OM levels, somewhere in the region of 0.2%.

Nitrogen content in farmyard manure (FYM)

Nitrogen is generally the most limiting nutrient in relation to plant growth, and also the fertilizer most commonly purchased by the mid-hill farmers. In the subsistence mid-hill farming systems, FYM is generally the major source of nitrogen and the single most important fertilizer used for crop production. However, the traditional management methods (collection, storage and application) often result in the loss of a major portion of nitrogen through leaching, direct sun exposure and loss of N in gaseous form, drying, and the inefficient use of cattle urine.

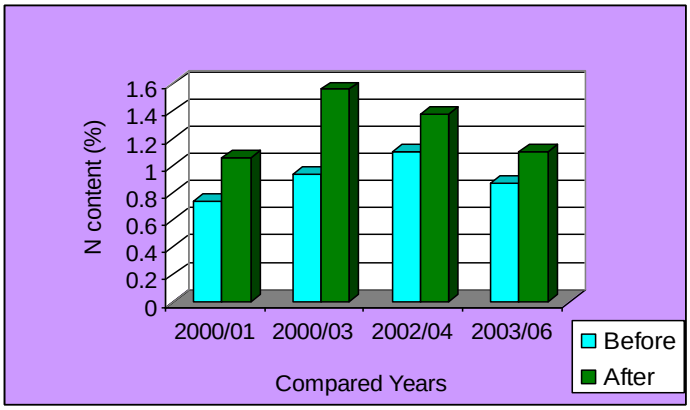


Figure 2: Changes in N content of FYM in SSMP benchmark sites

A major thrust of SSMP is to improve the nutrient content of FYM through a package of practices including cattle-shed improvement, that enhances the easier and more organized collection of manure and urine, protecting manure from direct sun exposure during monsoon, use of bedding materials for urine utilization, and urine collection and utilization as a plant tonic fertilizer and for bio-pesticide preparation.

Results from the benchmark plots, see Figure 2, show these improved management practices assisted in increasing the levels of plant available nitrogen in the improved FYM. The sample size was n = 132 in 2001, and 35 in all other years. In all four series of results, N levels have increased in the FYM samples, following the adoption of improved FYM management practices.

From the available and reliable data currently to hand, one impact of adopting improved FYM management practices would be a potential increase in the N content of FYM, in the region of 0.1% per annum.

Soil phosphorus content

Due to sampling and analysis problems, and rigorous exclusion of all dubious samples and results, a number of different sample numbers have been used in the analysis of the soil phosphorus results. From the data to hand, which is highly variable, one impact of introducing SSM practices would be a relative increase in the soil P content in the region 10% per annum in the first few years, adding some 4 kg/ha of soil P per year.

Soil potassium content

The results from a comparison of a number of samples from these benchmark plots show no positive impact on available soil potassium.

The declining trend in potassium levels following the introduction of SSM practices might be due to:

i) increased cropping intensity – this would equally apply to P and N, although more P and N than K might be added to the soil by improved FYM techniques thus offsetting the crop uptake losses;
ii) an increase in K uptake from the soil by the plant due to generally more favourable soil conditions,
iii) with increasing OM levels in the soil, there is a tendency for more K to be fixed or bound by the organic matter in a form that cannot be extracted in the laboratory but is nonetheless available to the plant.

Although soil available potassium is generally high (>280 kg/ha) in the soils of the mid-hills, the declining trend in these benchmark samples demands attention for management of soil K in the future.

Changes in soil physical properties

The physical structure of the soil, which creates a suitable environment for the availability and uptake of nutrients, is often ignored though it plays a crucial role in crop growth and development, as well as agricultural operations. Many SSMP-farmers have been asked whether they noticed a clear difference in soil physical characteristics after adopting SSM practices. More than 65% of the benchmark plot farmers reported that the following qualitative improvements have been observed after adopting SSM practices: easier tillage operations, increased moisture availability, better soil aggregation, decreased crusting and clodding. Some farmers highlighted the fact that crop growth and development in the drier seasons have improved – this possibly due to improved soil water retention.

Further farmer perceptions and comments in relation to the improvement in soil physical characteristics are recorded in *Farmer Profiles from the mid-hills of Nepal (*SSMP, Volume 1, April 2009).

The Analysis Results in Summary

There are clear indications that the introduction of SSM practices increases the N content in FYM, the soil organic matter, and the soil N and P levels.

The declining trend of available soil potassium requires further investigation, but as K occurs naturally in relatively large amounts in the soils of mid-hill Nepal, in comparison to P and N, the generally small decrease in K levels after the introduction of SSM practices need not raise alarm bells, though calls for occasional monitoring over time.

For some parameters, after one year following SSM practice introductions, there appears to be a first year flush (eg. soil P content and N content in FYM).

Farmer perceptions and comments as recorded in *Farmer Profiles from the mid-hills of Nepal (*SSMP, Volume 1, April 2007) support these laboratory data in a qualitative manner, and specifically highlight improvements in soil physical quality, yield and productivity.

Conclusions

The following technologies and practices promoted by SSMP combine to improve the soil nutrient status and general fertility of the dryland mid-hill soils of Nepal.

for improvement of the quality of FYM and compost:

- better design and management of cattle sheds so that collection and utilization of manure and cattle urine is maximized and more efficient,
- better use of bedding materials to retain urine,
- avoiding exposure of FYM and compost to the direct sunlight – in the shed, pit, pile or field,
- protecting the FYM/compost from rain and runoff, and -
- better placement and management of the biomass in a pit or semi-pit instead of widespread scattering;

for general improvement in soil fertility, both physical and chemical:

- use of the improved FYM within a system of integrated plant nutrient management,
- collection of cattle urine and its utilization as a general fertilizer and plant tonic (as well as for preparation of organic pesticides),
- integrating legume crops into the cropping system,
- increased use of the locally available natural resources and promotion of fodder and forage crops.

In view of the high cost of commercial fertilizers and the poor availability of all agrochemicals in many of the more remote areas of the mid-hills, SSM practices are highly relevant in improving the fertility status of the mid-hill soils.

3. Summary of documented technologies during the training in Pakistan and Nepal (Mr. Madhav Dhakal and training team)

A. Gully farming *(Kappi)*-Pakistan

Left: Gully after intervention: grazing land converted into farm land (PAKCAT training team)
Middle: Inlet view of loose stone drainage structure (PAKCAT training team)
Right: Outlet view of loose stone drainage structure (Zaheer)

The Technology was documented from Chakwal area, Punjab province of Pakistan. The area, before the intervention, was a degraded grazing area severely eroded by water forming a gully which couldn't be utilized for crop production. The technology was introduced by the Soil and Water Conservation Research Institute (SAWCRI). A gully was divided into different segments by constructing mudstone risers. Loose stone drainage structures were constructed at the strategic points on the risers to drain the excess runoff safely from higher to lower field.

On an average two trolley stone gathered to construct one drainage structure and two persons could complete a structure within a day. After the intervention, gullies were converted into farmlands.

The Technology addresses the land degradation caused water i.e. gully erosion and loss of top soil. Main technical functions of the technology are: a) to retain/ trap sediment, b) to increase infiltration, c) to drain / divert concentrated runoff, and d) to enhance crop production.

The average annual rain fall of Chakwal varies from 500 to 700 mm and the area falls in sub humid region. The livelihood of the people is dependent on the agriculture and subsistence agriculture. The rain fed area in Pakistan covers about 1 million ha and are home to about 2 million people, of which 70 % live in rural area and depend on agriculture for their livelihood.

The main strengths of this technology are: a) it is a low cost technology, b) easy to construct c) no major maintenance is required, and d) crop production increases due to moisture and nutrient conservation.

B. Potato cultivation in Comb-shaped raised bed *(Aintho-Dyang Aalu Kheti Prabidhi)* -Nepal)

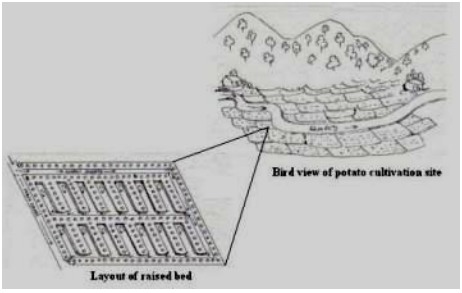
Left: Potato is planted in fine tilled raised beds by making comb shaped ridge and furrow in the field (NEPCAT training team)

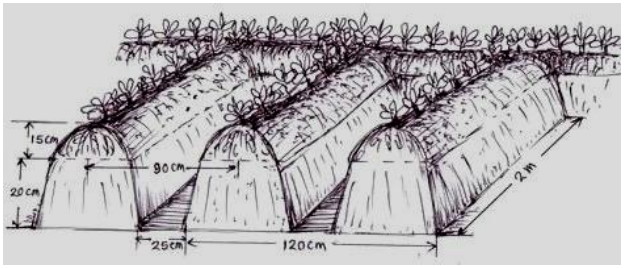
Right: A beautiful potato valley of Panauti (Madhav Dhakal)

The technology refers to the system of potato cultivation by making Comb -shaped raised bed.The technology is originated/evolved during intensive cultivation of potato in Panchkhal valley of Kavrepalanchowk district and out scaled through the process of farmer to farmer diffusion in other potato cultivated areas of Kavrepalanchowk district of Nepal.

It is generally practiced in irrigated condition with heavy to medium textured soil. After the land preparation- digging/ploughing, harrowing and levelling, farmers mark the field for alignment of ridge and furrow followed by application of compost/FYM and chemical fertilizers in comb shaped fashion. Then, fertilizer is covered by soil making ridge and furrow. The potato tuber is planted on ridge by maintaining plant to plant distance 12-15 cm and row to row 80-90 cm. The furrows in the field are made up of cum shaped with long ridge *(Aintho)* followed by short ridge *(Dyang).* The average height of the ridge ranges from 30- 35 cm and the average width of the furrow (ridge-ridge) is 20 cm. The average length of the short ridge (*Dyang*) is 2 m and length of the long ridge (*Aintho*) particularly depends upon the length and width of the terrace and the local field condition.

The main purpose of this technology is to combat with excessive moisture present in heavy textured soil due to poor drainage and infiltration. The shape and formation of ridge and furrow facilitates to uniform application of fertilizer and irrigation water. In addition, it also helps to harvest scarce winter rain water.





Left: Land scape view of potato cultivation area with layout of raised basin (B.B. Tamang).
Right: Cross section drawing of raised bed of potato cultivation (B.B. Tamang).

The major advantages of the technology are:
a) structure avoids water logging in the field, b) prevents seed rot by water logging, and c) easy to plant seeds, apply fertilizer and pesticides, practice intercultural operations and harvest.

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The HIMCAT newsletter is distributed two times a year, only by e-mail.
Editorial team: HIMCAT team M. Dhakal and I. Providoli, ICIMOD, GPO Box 3226 Kathmandu, Nepal

Next issue, Winter 2009

Special topic of the issue will be decided at a later stage. You are invited to send us information about announcements, publications, training courses, and your current WOCAT work on new technologies and approaches etc.

Thank you.
