

## DM 2003 Project Implementation PROGRESS REPORT

[05/31/2004]

In order to ensure transparency, accountability, as well as to share lessons learned, we will post this Progress Report on the Development Marketplace website at [www.developmentmarketplace.org](http://www.developmentmarketplace.org). However, if you would like to share any sensitive information with us, you can do so in section VI. The information provided in this part of the report will be handled as confidential, thereby it will not appear on the DM website.

### I. Background Information

<b>DM Project Number and Title</b>	000407 – Arsenic Biosand Filter: Sustainable Implementation of an Appropriate Household Drinking Water Filter for Rural Nepal	
<b>Report Author's Name (if different from Team Leader)</b>	Tommy Ngai & Susan Murcott	
<b>Total Award</b>	US\$ 115,000	
<b>Amount Disbursed to Date</b>	US\$ 69,000	( 60 % of the Total Award)

### II. Progress Against Milestones

i) List the milestone objectives in the first column as expressed in the Project Agreement. The second column should indicate the current status of each milestone objective. In the third column, please provide quantitative data and qualitative information describing the status of the project against that particular milestone.

<b>Milestone Objectives (Copy from the Agreement)</b>	<b>Status (Completed/ In Progress)</b>	<b>Descriptive Information on the Status</b>
Train local entrepreneurs and local masons in 11 districts	Completed	<ul style="list-style-type: none"> <li>• Conducted a successful training in Birgunj to a group of entrepreneurs on April 15-16, 2004.</li> <li>• 26 participants from 10 districts were trained on ABF construction, troubleshooting, entrepreneurship, and management techniques</li> </ul>
Select 25 model VDC and provide orientation and awareness	Completed	<ul style="list-style-type: none"> <li>• Selected 30 VDC from Kapilvastu, Rupendehi, Nawalparasi, Bara, Parsa, and Rautahat for intensive orientation and capacity-building programs</li> <li>• Selected all arsenic-affected wards (180 in total) from the above 30 VDCs for village-level education and awareness activities</li> <li>• Arsenic awareness activities was conducted in the village of Kunwar in Nawalparasi District in collaboration with Nepal Red Cross Society, Asia Arsenic Network of Japan and Filters for Families of USA</li> </ul>
Start health survey	Completed	<ul style="list-style-type: none"> <li>• Health workers have completed one round of health monitoring in Kapilvastu and Rupendehi Districts</li> <li>• Three rounds of health monitoring will be conducted in collaboration with NRCS starting in June 2004</li> </ul>

Setup website	Completed	<ul style="list-style-type: none"> <li>• A website containing information about this DM2003 project has been setup.</li> <li>• This website will be located on the MIT server, and will be available online on June 15, 2004</li> </ul>
Continue to monitor installed ABF (1000+) in all districts	Completed	<ul style="list-style-type: none"> <li>• Over 800 existing ABFs have been monitored for arsenic, iron, phosphorus, flow rate, and pH.</li> <li>• Information about GPS location, number of users, users' comments, etc has been collected as well.</li> <li>• All data have been compiled into an ACCESS database</li> </ul>
Distribution of ABF to poorest households	Completed	<ul style="list-style-type: none"> <li>• Began to distribute of ABF to the poorest households in Kunwar and Sukrauli.</li> <li>• Additional ABFs (about 400) will be distributed as part of the VDC and Ward-level awareness programs</li> </ul>
Provide services to other water supply implementers	Completed	<ul style="list-style-type: none"> <li>• We are in constant contact with major water supply implementers, such as NRCS, NEWAH, UNICEF, etc to communicate about the progress of this World Bank project.</li> <li>• We also learned about the progress of their own water supply programs, and we provided technical information and expertise to support their programs.</li> <li>• At the request of a number of water supply implementers, we conducted an experiment to evaluate the accuracy of the ENPHO arsenic test kit to be used to test ABF filtered water. The results showed the ENPHO arsenic test kit is the most accurate among 3 different test kits.</li> </ul>
Submit a progress report of activities carried out during this period to the Project Liaison	Completed	<ul style="list-style-type: none"> <li>• This is the progress report</li> </ul>

ii) If you did not achieve some of your stated milestone objectives, please explain the reasons.

We have completed all of our milestones despite the lack of funds and the unstable political and safety situation.

iii) Has your project's overall accomplishments to date exceeded the original plan?

Yes       No

If Yes, describe your achievements:

We have conducted a workshop at ENPHO on information dissemination of the Arsenic Biosand Filter on May 25, 2004. Attendance includes major water supply implementers representatives, government officials, donor agencies, media, and other interested parties. The feedback from the participants was very positive. Many indicated that the workshop was very useful and practical. They are glad to learn about this innovative technology. They also provided us with suggestions on future technology improvement and implementation plan.

### III. Overall Project Progress

i) What have been the main challenges of your project to date? What, if any, adjustments have you made to your original business plan in order to overcome the challenges and meet your objectives?

Challenges:	Adjustments:
The U.S. dollar have fallen in value to as low as \$1 to 70 NRs in April, as compared to \$1 to 74 NRs at the start of the project. The reduced exchange rate causes insufficient funds to perform all activities as originally planned.	ENPHO have to revise their original budget allocated to each activity to compensate for the reduced exchange rate. Currently ENPHO has allocated adequate reserve to cover an exchange rate shortfall of up to \$1 to 71 NRs.
The unstable political and security situation continues to cause unexpected delay and changed in scheduled activities. Some meetings and travel plans have to be postponed and cancelled.	We have to closely monitor the current political and security situation, and to plan our daily activities according to the situation.

ii) Have any of your objectives changed or have you added new objectives since you signed your Project Agreement? If Yes, explain the changes.

Yes       No

iii) Do you have any concerns about meeting your next milestone objectives?

Yes       No

If Yes, what are the concerns and how do you plan on addressing those challenges?

1. We are concern that this year’s early monsoon (seems to have started in mid-May, rather than mid-June) will interrupt our VDC-level and village-level awareness activities. Due to the difficulties in travel to field sites during the rainy season, there may be delays in completing our programs to 30 VDCs and 180 wards. To solve this program, we are collaborating with NRCS. The addition human resources from NRCS will allow us to conduct multiple programs in different districts parallely, thus will save us time.

2. The extension for a visa for Tommy Ngai has proven to be more difficult than originally thought. Without visa extension, he, who will be in Boston in June and July, cannot return to Nepal in August. An immediate solution must be found in order for him to return to Nepal to complete this project. We are requesting the World Bank to help us.

iii) Although this is an interim report, are there any development outcomes or results of your activities to date that you would like to call attention to?

iv) **Reminder:** In accordance with Paragraph 3.1.1 of the Project Agreement, each project team is required to submit a statement of account showing the use of the funds within three months after the last disbursement. As a part of periodical expenditure review exercise, please provide an annex with un-audited summary of expenses during this reporting period.

#### IV. Ancillary Achievements

i) Have you or has your organization received any awards/recognitions or media attention as a result of your DM-funded project during this period?

Yes       No

If Yes, please specify the sources and identify the names.

Award /Recognition	Media e.g. <input checked="" type="checkbox"/> International: BBC News on Dec. 3-4, 2003
<input type="checkbox"/> Local: <input type="checkbox"/> National: <input type="checkbox"/> International:	<input type="checkbox"/> Local: <input checked="" type="checkbox"/> National: <i>various Newspaper, TV programs, conferences</i> <input type="checkbox"/> International: <i>conference</i>

Explain the Award/Recognition or the Media content:

**News clip 1:** 27 April 04 – Rajdhani Daily, Kathmandu  
 A simple technology has been developed to remove arsenic from drinking water in the Nepal Terai. This technology has been awarded by the World Bank

**News clip 2:** 26 May 04 – The Rising Nepal, Kathmandu  
 The Kanchan Filter developed by Massachusetts Institute of Technology (MIT), Environment and Public Health Organization (ENPHO) and Rural Water Supply and Sanitation Support Programme (RWSSSP) is effective to remove arsenic in drinking water.

**News clip 3:** 26 May 04 – Kathmandu Post, Kathmandu  
 The Arsenic Biosand Filter developed by MIT, ENPHO, and RWSSSP is a promising technology to remove arsenic, iron, and bacteria from drinking water. If the government can develop a proper plan on arsenic mitigation, then the arsenic problem in the Terai can be solved.

**News clip 4:** 26 May 04 – Samachar Patra, Kathmandu  
 A new, simple yet effective technology, the Kanchan Filter, has been developed by MIT, ENPHO, and RWSSSP after years of research and development. Some organizations are adopting this technology for arsenic and bacteria removal. With little investment, this technology can be an appropriate and sustainable solution for the Terai.

**News clip 5:** 30 May 04 – Kantipur, Kathmandu  
 MIT, ENPHO, and RWSSSP have developed the ABF. Experts think this can be the best arsenic removal technology for Nepal. The technical performance for arsenic, iron, and bacteria removal is excellent. The filter is also made with locally available materials, easy to operate, easy to transport, and inexpensive. Hundreds of ABF are already in operation, and hundreds more will be distributed in this project. Almost 30 entrepreneurs have been trained in arsenic-affected districts to manufacture this filter. Based on available data, about 20 million rupees is necessary to solve the arsenic problem in the Terai. Collaborations with many NGOs, donors, and government to provide adequate training, awareness, and subsidy is necessary.

**Newsletter:** Spring 04 – MIT Public Service Center, Boston  
 The MIT Public Service Center Newsletter, which is circulated among the MIT community and for external communications, ran an article about the development of the ABF, and the implementation of this technology

in Nepal as part of the DM2003 project.

**TV News Program: 25 May 04 – Metro**

The ABF information workshop conducted at ENPHO on May 25 was on the evening news. The news showed footage of the workshop, as well as explanation of the ABF technology as an appropriate option for arsenic removal from drinking water.

**Conference: 22 April 04, Earth Day – City Hall**

A group of secondary school students presented about the ABF as part of the Earth Day activities at City Hall. Not only did the students learned extensive knowledge about the ABF, many participants were also informed about the technology for arsenic removal.

**Conference: 26-27 April 04 – Regional Workshop on Operational Responses to Arsenic Contamination in Groundwater, Kathmandu**

Details of the ABF technology was demonstrated at this international conference organized by the World Bank. Participants from many countries, including Pakistan, Mongolia, and Japan, were very impressed at this technology. They were interested to obtain further information, and might possibly pilot implement this technology in their countries.

**Conference: 21 May 04 – AGU Conference in Montreal, Canada**

Susan Murcott presented the details of the ABF, including the technology development process, technical performance, implementation scheme, and financial sustainability issues to a group of geologist, scientists, engineers, and policy makers.

**Conference: 23-28 May 04 – Inter-country workshop on Capacity Building in the use of WHO Field Guide for the detection and Management of Arsenicosis, Dhaka, Bangladesh**

Representative from ENPHO attended this meeting and communicated the ABF technology to conference participants.

Attach web links/news clips, if available:

**आर्सेनिकको समस्या छ ? चिन्ता नगर्नुस् !**  
 27<sup>th</sup> APRIL 2004, Rajdhani Daily, Kathmandu

रैलेन्द्र बस्नेत / राजधानी  
 काठमाडौं, १५ वैशाख

तपाईं आर्सेनिकको समस्याबाट विभ्रित हुनुहुन्छ ? तर, अब चिन्ता नगर्नुस् । कृत्रिमरूपले आर्सेनिक सकिने हटाउन सकिने फिल्टर निर्माण गरिदिएका छन् ।

यस्तो फिल्टर ब्याट पाइन्छ अबका फिल्टर नसकिने पो हो कि भन्ने चिन्ताबाट पनि तपाईं टाढै रहनुपर्छ । तपाईं यस्तो फिल्टर आफ्नै घरमा सरल प्रविधि अपनाएर नै बनाउन सक्नुहुनेछ ।

यस्तो फिल्टरको आविष्कारपछि अर्कोदिश आर्सेनिकको समस्या फेर्दै आएका तराईवासीले अब चाहे नै सो समस्याबाट मुक्ति पाउने सम्भावना पनि बढेको छ ।

आर्सेनिकलाई स्थानीयस्तरमै लभार पारिएको फिल्टरले हटाउन सकिने प्रविधिको विकास नभइसकेकाले यस्तो सम्भावना प्रचल भएकै हो ।

भिन्न-भिन्न तराई क्षेत्री संस्थाले दुई वर्षको अघक प्रयासपछि आर्सेनिक बायोफिल्टर फिल्टर तयार पारेका छन् ।

अमेरिकाको म्यासाचुसेट्स इन्स्टिच्युट अफ टेक्नोलोजी, काताहरण र जनसाम्प्रदाय संस्था (इन्फो) प्राथमिक खानेपानी तथा खरसफाई सहयोग कार्यक्रमको संयुक्त प्रयासले पानीबाट आर्सेनिक र जीवाणु हटाउन सक्ने सरल घरमै प्रविधिको सो फिल्टर निर्माण सम्भव भएकै हो ।

नेपालमा निर्मित यो फिल्टरलाई 'कम्पन फिल्टर' नामकसँग परिचयको छ । यो फिल्टरलाई प्लास्टिक अथवा फर्कितको भाँडा बनाउन सकिन्छ । सम्बद्ध विज्ञहरू अनुसार यस्तो फिल्टर निर्माणका लागि स्थानीयस्तरमै चाहिने सामग्री मिट्टी, बालुवा र जिल्लाको प्रयोग गर्न सकिन्छ ।

कम्पन फिल्टरबाट छरिएर आएको पानीमा आर्सेनिक १२ प्रतिशत घट्ने दावी यसका निर्माताको छ । त्यसैगरी पानीमा रहेको आइरन र धमिलोपना पनि ९५ प्रतिशत घटाउन सकिने उनीहरूले बताएका छन् ।

दुई वर्षको अभ्यास अनुभवनामक कम्पन फिल्टरको यस्तो परिणाम आएको पनि दुनीहरूले बताएका छन् ।

इन्फो र मिट्टीका डा. राजाराम श्रेष्ठका अनुसार फिल्टर निर्माण गरिएको यस्तो फिल्टर कम्पन पनि दुई वर्षसम्म प्रयोग गर्न सकिन्छ । जलभर अनुसार यस्तो फिल्टर सफाईप्रयत्नले सबैत सामान्य तालिमपछि निर्माण गर्न सकिन्छ ।

सम्बन्धित सिपको जल्दगरीआधार यस्तो तालिम लागूभएर ११ वटा जिल्लामा यसको नै विस्तारिएको छ । श्री जिल्लामा फिल्टर बनाउन सक्ने जनशक्ति लभार परिचयको छ । फेदले तालिमप्राप्त भएकाले

यसपछि निर्माण गरिएका आर्सेनिक हटाउन सक्ने प्रविधि विद्युत् । फेदका अनुसार तौ फिल्टरको अर्को अवगुण के थियो भने ती थियो पनि हुँदैनथे ।

यो फिल्टरले प्रतिघण्टा २० लिटर पानी छान्न सक्छ । विशेषगरीरूका अनुसार आर्सेनिकयुक्त पानी फिल्टरमा बन्द्याएपछि माथिल्लो भागमा रहेका खिया सफेका किल्लामा आर्सेनिक टाँसिएर पानीबाट आर्सेनिक हट्छ । त्यसैगरी फिल्टरमा रहेको माथिल्लो बालुवाबाट माध्यमबाट केही ठूला जीवाणु छानिन्छन् भने अन्य साना जीवाणु बालुवाको माथिल्लो सतहमा हुने जैविक प्रक्रियाबाट नाष्ट हुन्छन् ।

तराई क्षेत्रको माथिल्लो अर्को पनि सुरक्षित खानेपानीबाट पनिन्त छन् । हालै गरिएको एक अध्ययनले पनि तराई क्षेत्रमा दुवैलेको पानीमा अत्यधिक मात्रामा आर्सेनिक रहेको देखाएको छ ।

तराईका २० जिल्लाका ८ हजार ६ सय ३३ ट्युबेलमा गरिएको सो अनुसन्धानबाट ती जिल्लामा अत्यधिक आर्सेनिक भएको पाइएको थियो । जुन जिल्लामा त विश्व स्वास्थ्य संगठनले तोकेको मापदण्डभन्दा १८ गुणा बढीसम्म आर्सेनिक पाइएको थियो ।

कम्पन फिल्टरको प्रयोग सक्ने गर्न सकेका अनुसार रोको चारक आर्सेनिकबाट केही हदसम्म टाढा रहन सकिन्छ ।

# Kanchan filter boon to rid water of arsenic

By Our Correspondent

Kathmandu, May 25: Speakers at a programme on information dissemination about Arsenic Bio-sand Filter (ABF) said that the ABF or Kanchan filter is the only effective means to remove the arsenic from the water in the Terai region.

They said that the ABF removes about 95 per cent of the arsenic and 99 per cent of iron. A modified version of the bio-sand filter used in the homes, the ABF filter has a tray containing 6 kilograms of iron nails located above the sand layer. The filter removes iron, turbidity and arsenic without the use of additional chemicals.

Developed in 2002 with the joint efforts of the US-based Massachusetts Institute of Technology, Environment and Public Health Organisation (ENPHO) and Rural Water Supply and Sanitation Support Programme (RWSSSP), the filter costs about Rs. 2,500 in the market. But they have been selling it at Rs. 100 to Rs. 300 a piece.

About 1000 ABFs have been installed by Nepal Red Cross Society, RWSSP, Rural Water Supply and Sanitation Fund Development Board and DoE in the arsenic-affected districts in the Terai.

Kalawati Pokharel, health and sanitation specialist of Butwal-based RWSSSP, said that 456 filters have been distributed in Rupandehi, Kapilbastu and Nawalparasi in Southwest Nepal. She said the arsenic has been found in 20 districts of the Terai, adding all the tube wells have to be tested before using their

In the programme organised by the ENPHO, its executive chairman Roshan Raj Shrestha said that 40,000 filters would be distributed in the arsenic-affected districts. He said that the filters would be distributed to local entrepreneurs for distribution to the local community.

According to the data gathered by the National Steering Committee of the ENPHO in 2003, seven per cent of the 28,956 tube wells tested so far have been found to contain arsenic levels above the national limit of 50 ppb.

Studies have also indicated that arsenic distribution is not uniform across the country. Many villages in Nawalparasi and Rautahat districts and some in the other Terai districts—Bara, Parsa, Siraha, Kapilbastu, Rupandehi, Bardia and Kailali—have high arsenic content.

The findings showed that out of the 354 patients suffering from arsenic's, 173 have shown improvement. Majority of the patients were in the first phase of the symptomatic stage.

Continued use of arsenic-contaminated water leads to various diseases, including skin cancer, gangrene, hematological poisoning, cardiovascular and nervous disorder. The lungs, genitourinary tract and other organs may also be affected.

# Teral poor find arsenic filter too expensive to afford

BY SHARIP K C  
KIRKMANU NEW 25

A simple filter can protect thousands of vulnerable people from the ill effects of arsenic contamination, but experts worry that the rural Teral communities who need it the most may not just have it.

This, despite the fact that the filter - made up of sand, gravel and a few iron nails, called Arsenic Biosand Filter (ABF) - doesn't cost much. It's been priced at Rs 1,100. Yet those who need it the most may not be able to afford it for everyday use.

"It not only filters arsenic by over 95 percent, it also significantly removes iron and other microbial contamination in the water," says Tommy Negal, a lecturer from the Massachusetts Institute of Technology (MIT), one of the experts who developed the filter.

Experts argue that the filter can prove to be a boon for the thousands of

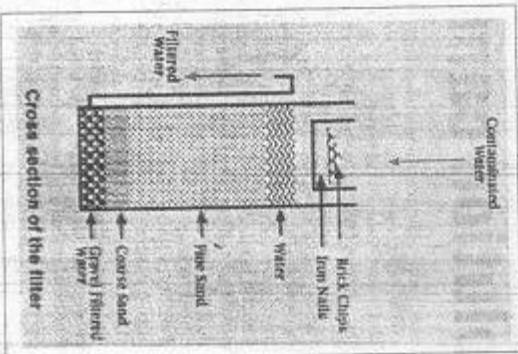
Teral communities forced to drink arsenic-contaminated water.

In fact, it has already started showing positive results. Approximately 800 such filters have already been distributed to the people in the dozen or so arsenic-affected districts of the Teral.

The filter was developed by a group of experts from MIT, the Environment and Public Health Organization (ENPHO), and the Rural Water Supply and Sanitation Support Program (RWSSSP).

"Its efficiency and its flow rate is making it popular among rural communities," said Negal. According to him, unlike traditional two-pot and three-pot filters, the ABF filtered 15 to 30 liters of water per hour.

Experts say arsenic contamination is evident in at least 11 districts in the southern plains, where tens of thousands of people have been forced to drink the 'slow poison', that is ar-



senic, a byproduct of rock-withering process.

Some places have exceptionally high concentration while others are within acceptable levels. Most of the samples, researchers say, contain concentration of arsenic of more than 500 ppb (parts per billion).

This means that people are drinking water that has concentration of arsenic 50 times higher than the World Health Organization (WHO) recommended level and 10 times higher than the national standard.

According to the WHO standards, concentration of arsenic in water should be below 10 ppb while the national standard sets it below 50 ppb.

Continued consumption of Arsenic contaminated water is usually linked with patches, lesions and other skin problems. But that's not the only case.

"It affects are 'multi-system', re-

sulting in various internal disorders as well," says Dr Manen Gorkhali, who has been examining the people of arsenic-affected areas since the last four years.

Repeated cough leading to asthma and bronchitis, genito-urinary problems like kidney failure, hemorrhage through urine are other problems caused by arsenic.

This can change now - with filters like the ABF that are affordable for many, says Koshan Raj Shrestha, executive director, ENPHO.

The only problem is: How to make ABF accessible to the vulnerable population. "If the government comes up with a proper plan, a big problem of the country can be solved," says Shrestha.

"We need about 19 million rupees so that we can subsidize ABF and make it available to the needy," he said. He estimates that approximately 40,000 ABF are needed to protect the vulnerable populations.

# उपत्यका / विविध

May 25, 2004 - Samachar Patra

## आर्सेनिकको समस्या हटाउन सरल प्रविधिको फिल्टर विकास

● निमेष रेग्मी  
काठमाडौं

स्थान्तरको प्रमुख स्रोत मानिएको आर्सेनिकको समस्याबाट नेपालको तराई क्षेत्रका लाखौं जनता प्रभावित भइरहेका बेला नेपालमा आर्सेनिकविरोधकान्न गरिरहेका संस्थाहरूले पिउने पानीको शुद्धीकरणका लागि नयाँ खालको फिल्टर तयार पारेका छन् । पानीमा घुलेको आर्सेनिक छान्न सक्ने धेरैस प्रविधिमा आधारित सरल खालको सो फिल्टरलाई उनीहरूले 'कञ्चन' नाम दिएका छन् ।

अमेरिकास्थित म्यासाचुसेट्स इन्स्टिट्यूट अफ टेक्नोलोजी (एमआईटी) र नेपालमा रहेका वातावरण तथा जनस्वास्थ्य संस्था (इन्फो) एवम् ग्रामीण खानेपानी तथा तरसफाइ सहयोग कार्यक्रमले यस्तो फिल्टर तयार पारेका हुन् । थोरै लगानीमा गाउँघरमै तयार गर्न सकिने यस्तो फिल्टरले पानीमा घुलेको आर्सेनिक र जीवाणु दुवैलाई छानेर पानीलाई पुरैतः पिउनयोग्य बनाउने दाबी यी संस्थाहरूले गरेका छन् । विभिन्न घरघरको बैज्ञानिक परीक्षणपछि अहिले उनीहरूले यस्ता फिल्टर आर्सेनिकविरोध प्रयोग गर्न सिफारिस गरेका छन् ।

'आर्सेनिक बायोस्थान्ड फिल्टर' भनिने सो उपकरणको डिजाइन स्थानडाका डा डेविड मन्जले गरेका हुन् । एमआईटी र इन्फोले त्यसको स्तरबद्ध गरेका हुन् । पिउने पानीमा आर्सेनिकको मात्रा हटाएर त्यसबाट हेरान्ता लार्गी मानिसलाई मुक्ति दिन सक्ने सो फिल्टरलाई आर्सेनिकमुक्त गर्न उपयुक्त प्रविधिको सजा बिदे विश्ववैकको १ लाख १५ हजार अनारकी डलर राशिको डीएम २००३ गुरन्कार सहयोग यसअघि नै यी संस्थाहरूलाई प्रदान गरिसकेको छ । नयाँ खालको सोच र प्रविधिसाई सर्बसाधारणसम्म पुऱ्याउन वैकल्य यस्तो पुरस्कार दिँदै आएको छ ।

पानीमा नदेखिने तराई मिसिने तर लामो समय त्यस्तो पानी पिउँदा थिपको रूपमा शरीरमा दर्जनी स्वास्थ्य समस्या सिर्जना गर्ने आर्सेनिकको समस्याबाट नेपालका तराई क्षेत्रका अधिकांश जिल्ला प्रभावित छन् । ती जिल्लाका करिब ३० लाख मानिस यस्तो प्रदूषित पानी पिउन विवश छन् । तीमध्ये थारा, पल्ल, सिरहा, सप्तरी, कपिलवस्तु, रूपन्देही, नरिया, नवलपरासी, कैलालीलगायतका जिल्लामा यस्तो पानी पिउनेहरूमा रोगका लक्षणहरू देला पर्ने धालिसकेको पाइएको छ ।

अहिलेसम्म तराई क्षेत्रका विभिन्न जिल्लाहरूमा गरी कुल २८ हजार ९ सय ५६ टचुबवेल्को पानीको नमुना परीक्षण भएकोमा ७ प्रतिशतभन्दा बढी टचुबवेल्हरू आर्सेनिक संक्रमित पाइएका छन् । नेपालको आफ्नै मापदण्डअनुसार ७ प्रतिशत टचुबवेल् आर्सेनिकयुक्त देखिए पनि विश्व स्वास्थ्य सङ्गठन (डब्ल्यूएचओ) ले निर्धारण गरेका मानदण्डभन्दा २० प्रतिशत बढी मात्रामा आर्सेनिक नमुना परीक्षणहरूमा पाइएको छ । नेपालको आर्सेनिक मापदण्ड डब्ल्यूएचओको भन्दा ४० पीपीवी बढी रहेको छ ।

भारतका विभिन्न भागहरू र बंगलादेशमा एक दशकअघि विकराल रूप लिएको आर्सेनिक नेपालमा पनि रहेको तथ्य सन् १९९९ पछि प्रकाशमा आएको थियो । त्यसपछि त्यसबाट हुने स्वास्थ्य समस्याको न्यूनीकरण र बैकल्पिक उपायहरूको खोजी हुँदै आएको थियो । इन्फोका कार्यकारी अध्यक्ष एवम् पानी गुणस्तरविज्ञ डा. रोशनराज श्रेष्ठका अनुसार कञ्चन फिल्टर लामो अनुसन्धानको परिश्रमो नतिजा हो ।

अहिले विकास गरिएको फिल्टर प्लास्टिक वा तँक्रेतयै भाँडेमा बनाइन्छ । यस्ता मिठी, दाबुवा र किलाको माथै

प्रयोग गरिन्छ । यी वस्तुको प्रयोग गरी दुई वर्षसम्म गरिएको अध्ययनले फिल्टर गरिएको पानीमा आर्सेनिक ९५ प्रतिशत, आइरन र घमिलोपना ९९ प्रतिशत घटेको पाइएको डा. श्रेष्ठले नेपाल सस्थाकारपुस्तकालयमा उल्लेख गरेका छन् ।

प्रतिघण्टा ३० लिटरसम्म पानी छान्न सक्ने क्षमताको सो फिल्टर प्रवेदनको योजना इन्फो र एमआईटीले गरेका छन् । यस्तो फिल्टरको ती संस्था आफैँले व्यापार नगरेर स्थानीय व्यक्तिहरूलाई तालिम दिने बताएका छन् । आर्सेनिकमुक्त गर्न सक्ने यस्तो फिल्टरको मूल्य १ हजार २ सयभन्दा बढी पर्ने बताइएको छ ।

इन्फोद्वारा बायोस्थान्ड फिल्टरवारे मंगलवार आयोजित कार्यशालामा बोल्दै इन्फो अध्यक्ष डा. श्रेष्ठले आर्सेनिक प्रभावित तराईका तीस गाविसमा फिल्टर नुऱ्याउनु विशेष कार्यक्रम गरिन लागिएको जानकारीसमेत दिनुभयो ।

कार्यक्रममा एमआईटीका टोमी न्यागी र ग्रामीण खानेपानी तथा तरसफाइ कार्यक्रमको तरसफाइ विज्ञ कन्सावती पोखरेलले आर्सेनिक समस्या तथा कञ्चन फिल्टरको निर्माण र प्रयोगमा आधारित पढावट वारे प्रकाश पार्नुभएको थियो ।



# पानीमा आर्सेनिकको प्रभाव हटाउन फिल्टर प्रभावकारी

"KantiPur" MAY-30-2004  
राजीव रेग्मी

काठमाडौं, १६ जेठ- पानीमा पाइएको आर्सेनिकको प्रभावलाई हटाउन आर्सेनिक बायोम्यान्ड (कञ्चन) फिल्टर सबैभन्दा प्रभावकारी देखिएको विज्ञहरूले बताएका छन् ।

अमेरिकास्थित म्यासाच्युसेट इन्स्टिच्युट अफ टेक्नोलोजी (एमआईटी) बातावरण र जनस्वास्थ्य संस्था एन्फो र ग्रामीण खानेपानी तथा सरसफाइ सहयोग कार्यक्रम (आरडब्ल्यूएसएसपी) ले सयुक्त रूपमा दुई वर्ष अघिदेखि आर्सेनिक प्रभावित क्षेत्रमा कञ्चन फिल्टर परीक्षण गर्दै आइरहेको थियो । यस फिल्टरबाट छानिएर आएको पानीमा आर्सेनिक तत्त्व ९५ प्रतिशतसम्म घटेको पाइएको छ । यसका साथै उक्त फिल्टरबाट पानीमा रहेको आइरन र जीवाणु पनि ९९ प्रतिशत घटेको ती संस्थाहरूले गरेको अध्ययनले देखाएको छ ।

यसको निर्माण स्थानीयस्तरमै गर्न सकिने एन्फो कार्यकारी निर्देशक डा रोशनराज श्रेष्ठले बताउनुभयो । प्लास्टिकको भाँडोमा स्थानीय बजारमै पाइने गिट्टी, बालुवा र किला राखेर यसको निर्माण गर्न सकिन्छ । फिल्टरको माथिल्लो भागमा इटाका टुक्रा र खिया लागेको फलामका किला राख्नुपर्दछ । आर्सेनिकयुक्त पानी फिल्टरमा खन्याउँदा खिया लागेको किलामा आर्सेनिक तत्त्व टाँसित गई पानी आर्सेनिकमुक्त हुन्छ । त्यसपछि फिल्टरमा रहेको मसिना बालुवामा जीवाणुहरू छानिन्छन् । यसरी फिल्टरमा जहान गरिएको पाइप भएर निस्कने पानी खान योग्य हुन्छ ।

यसलाई सफा गर्नुभन्दा पहिले हात धुनुपर्दछ । सबैभन्दा पहिले किला र इटाको टुक्रा राखेको भाँडो बाहिर निकाल्नुपर्छ । त्यसपछि बालुवाको माथिल्लो सतह राम्ररी चलाउने र त्यसरी चलाउँदा निस्कने फोहोर पानीलाई सुरक्षित ढङ्गले निकाली गोबरमा फ्यालेमा आर्सेनिक तत्त्व जमिनमै नै तर्जान गर्नुपर्ने कार्यकारी निर्देशक डा रोशनराज श्रेष्ठले बताउनुभयो ।

आर्सेनिक प्रभावित तराई क्षेत्रका बासिन्दाहरूलाई एन्फोलायत संस्थाहरूले दुई वर्षदेखि कञ्चन फिल्टर वितरण गरिरहेको एन्फोका कार्यकारी निर्देशक डा रोशनराज श्रेष्ठले बताउनुभयो । यसबाट

पानीमा आर्सेनिकको मात्रा ९५ प्रतिशतले हटेको देखिएको एन्फोका कार्यकारी निर्देशक डा श्रेष्ठले भन्नुभयो ।

हामीहरूले उक्त फिल्टर घरघरमा पुऱ्याउनका लागि आर्सेनिक प्रभावित १० जिल्लाबाट २६ जना व्यवसायी छानेका छौं डा श्रेष्ठले भन्नुभयो- 'आगामी दिनहरूमा स्थानीय व्यवसायीहरूलाई फिल्टरको निर्माणको जिम्मा दिँदौं, जसबाट फिल्टर गुणस्तरमा एकरूपता रहन्छ' डा श्रेष्ठले बताउनुभयो ।

ग्रामीण खानेपानी संस्था तथा सरसफाइ सहयोग कार्यक्रम (आरडब्ल्यूएसएसपी) की कलावती पोखरेलका अनुसार आर्सेनिकको समस्याबाट केही हदसम्म छुटकारा पाउन कञ्चन फिल्टर प्रभावकारी देखिएको बताउनुभयो । हाम्रो स्थानले प्रभावित क्षेत्रका बासिन्दाहरूलाई बायोम्यान्ड फिल्टरका बारे जानकारी दिने गरेको छ' पोखरेलले भन्नुभयो । रूपन्देही, कपिलवस्तु र नवलपरासी जिल्लाका इनार टयुबवेलको पानीमा आर्सेनिक पाइएकाले त्यहाँ ४ सय ५० वटा कोक्रेटको कञ्चन फिल्टर स्थानीयस्तरमा बनाई सस्ती मूल्यमा आरडब्ल्यूएसएसपीले वितरण गरिरहेको पोखरेलले जानकारी दिनुभयो ।

हाल आर्सेनिक हटाउनका लागि चार थरीका फिल्टर प्रचलनमा रहेको छ । त्यसमध्ये 'प्लास्टिक जेम ५०५' कञ्चन फिल्टर कम खर्चिलो, हुवानी सञ्चालनमा प्रभावकारी रहेको अमेरिकास्थित म्यासाच्युसेट इन्स्टिच्युट अफ टेक्नोलोजी (एमआईटी) का प्राध्यापक टोमी नागीले भन्नुभयो । नागीका अनुसार उक्त फिल्टर १ हजार २ सय रूपैयाँमा बनाउन सकिन्छ । सन् २००४ सम्म आर्सेनिक प्रभावित जिल्लामा ८ सयभन्दा बढी कञ्चन फिल्टर वितरण गर्ने योजना रहेको एमआईटीका नागीले कान्तिपुरलाई बताउनुभयो ।

एन्फोका डा रोशनराज श्रेष्ठका अनुसार यो लक्ष्य पूरा गर्न २ करोडभन्दा बढी खर्च हुनेछ । यो कार्यक्रमलाई सफल पार्ने बढीभन्दा बढी सहयोगीहरूको खाजी भइरहेको छ' उहाँले भन्नुभयो । उहाँले कञ्चन फिल्टरसम्बन्धी तालिम र आर्सेनिकसम्बन्धी अन्य जानकारीको लागि काठमाडौंमा रहेको एन्फो कार्यालयमा सूचना केन्द्रको स्थापना गरिएको जानकारी दिनुभयो ।

For example, students in the Water Jet Cutting class have visited a school for developmentally disabled children, and are now creating devices that will aid their education.

Two new engineering classes this semester offer students the chance to design solar energy systems for community partners in developing countries. Gender and Law in U.S. History is the first service learning class offered in the History department, and we have enjoyed working with the students to help them find opportunities to volunteer in ways that will inform their understanding of the subject.

To learn more about the service learning program at MIT, visit [web.mit.edu/mitpsc/servlearn](http://web.mit.edu/mitpsc/servlearn).

### **IDEAS Winner Works to Improve Water Quality in Nepal**

Many villagers in the rural Terai region of Nepal have no access to safe drinking water. Drinking water sources are contaminated by both arsenic and pathogens. Because of the lack of appropriate and satisfactory solutions, many villagers continue to drink contaminated water, and suffer from preventable water-borne diseases including diarrhea, stunting, skin lesions and cancer. After observing the socio-economic conditions at numerous affected villages in Nepal, and studying the previous work of an MIT lecturer and the MIT Nepal Water Project, graduate student Tommy Ngai developed an improved household level water treatment technology: the Arsenic Biosand Filter (ABF). The ABF can effectively remove arsenic and pathogens, as well as iron, turbidity, color and odor. This invention was awarded a \$5,000 Lemelson International Technology Prize at the

MIT IDEAS Competition in 2003, enabling further development and implementation of the ABF.

Tommy's team traveled to Nepal and collaborated with local water supply agencies in Kathmandu and Butwal. A one-year pilot study showed very favorable results. Arsenic and pathogen removal is excellent. Filter users like the high flow rate, simple operation, minimal maintenance, as well as the clean-looking and good-tasting filtered water. They think the filter is a durable, permanent solution to their drinking water problems. Over 800 ABF have been distributed in Nepal so far, serving thousands of people. In order to expand the ABF implementation program throughout Nepal, Tommy's team submitted a proposal to the World Bank Development Marketplace Global Competition in 2003, winning a \$115,000 award. Tommy has since traveled to Nepal to assist the promotion of ABF throughout the country. Key activities include training local entrepreneurs and technicians on filter construction and repair, educating villagers on water-borne diseases and treatment options, training villagers on filter operation and maintenance, orienting local governments on safe water provision and management, and disseminating technology information. This project is expected to raise awareness among rural villagers about water quality and health such that they can make informed decisions to protect their health. Another goal includes making ABF technology available at the grassroots level in a sustainable manner, as well as making further improve-



ments for even wider implementation.

So far, filter users are impressed. Satish Chaudhary, from the village of Manari-Jawa, raved about how the water now "is clean and tastes good." He uses the filter every day for his family of twelve. Before, "the well water that I used to drink was turbid. Sometimes the water had bad smell and color. Rice cooked in untreated well water is red and sometimes black. The filtered water has none of these problems. My rice is white."

Filters were also given to the villagers of Sarawal-Goini. Chatra Narayan Chaudhary uses it every day in her home of 23 family members. Since the well water contains arsenic and has infected 11 family members with arsenic-related diseases, she makes sure to filter the water every day before drinking and cooking. Now, she and her family members are able to enjoy the "clean and tasty" filtered water.

#### **Dates to Remember**

##### **April 26, 7:30 PM**

IDEAS project displays and judging session  
Lobby 10  
Contact [amybanz@mit.edu](mailto:amybanz@mit.edu)

##### **April 27, 4-5:30**

MIT/Cambridge Science Expo  
Johnson Athletic Center  
Contact [trickett@mit.edu](mailto:trickett@mit.edu)

##### **April 29, 7:30 PM**

IDEAS Awards Ceremony  
6-120  
Contact [amybanz@mit.edu](mailto:amybanz@mit.edu)

##### **May 1, 9 - 4**

KEYs Workshop  
Contact [jsoucy@mit.edu](mailto:jsoucy@mit.edu)

##### **May 7, 11:30 - 2**

Community Service Celebration  
W20-307  
Contact [jsoucy@mit.edu](mailto:jsoucy@mit.edu)

ii) Has your organization made any new partnerships as a result of this project during this reporting period?

Yes       No

If Yes, specify type of the organization from the list below and describe nature of the partnership:

<input type="checkbox"/> Local Government: <input type="checkbox"/> National Government: <input checked="" type="checkbox"/> NGO: <i>Nepal Water for Health (NEWAH), Asia Arsenic Network (AAN) of Japan, Filters for Families of U.S.A,</i> <input type="checkbox"/> Bilateral Development Agency:	<input type="checkbox"/> Multilateral Development Agency: <input type="checkbox"/> Private Corporations: <i>Research Group for Applied Geology (RGAG) of Japan</i> <input type="checkbox"/> Other: <i>Kathmandu University</i>
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- *NEWAH will be providing the ABF as an arsenic mitigation option in their model village program in the Kailali District.*
- *Filters for Families, a U.S.-based NGO led by Dr. Linda Smith, are collaborating with us to provide arsenic awareness workshop and ABF subsidy to villages in Nawalparasi.*
- *Asia Arsenic Network (AAN) of Japan and Research Group for Applied Geology (RGAG) of Japan are collaborating with us in Kunwar village of Nawalparasi to conduct health awareness and water quality monitoring activities.*
- *Student from Kathmandu University is working with us to conduct scientific research into the ABF technology, and to optimize the design for wider implementation.*

iii) Sustainability and scalability after completion of the DM fund are top of the DM Team's priorities. Has your organization leveraged new funding or secured future funding during this reporting period?

Yes       No

If Yes, provide the following information.

Funding Sources: Names of the Organizations  
 Amounts Funded/Committed: US\$ 000,000

## V. Requests to the DM

i) Do you have any comments on the overall process and support provided by the DM Team or Project Liaison?

<p>We are happy that the first payment has finally arrived. The administrative, paper work, and the fund releasing processes seem to be getting quicker also.</p>
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ii) If your contact information has changed, please provide us with the new information.

*Please send all project correspondence/information to both Susan Murcott (Principle Investigator) and Tommy Ngai (in-country representative). Contact information for Tommy Ngai is shown below:*

Contact Name:	Tommy Ngai
Title:	Lecturer and Researcher
Organization:	Massachusetts Institute of Technology

Primary Email Address:	tommy.ngai@alum.mit.edu
Secondary Email Address:	
Organization's Website	http://ceemeng.mit.edu/~water/index.html www.enpho.org
Phone:	+1-617-306-6548 (US), +977-1-4468641 (Nepal)
Fax:	
Address:	U.S.A. ADDRESS: Massachusetts Institute of Technology Department of Civil and Environmental Engineering Room 1-138 77 Massachusetts Avenue, Cambridge, Massachusetts 02139, USA  NEPAL ADDRESS: Environment & Public Health Organization Thapagaon, New Baneshwor, Kathmandu, Nepal. P.O.Box 4102
Postal Code:	02139

## VI. Confidential Report

Please provide, if any, sensitive comments or requests in the box below. Information provided in this section will be handled as confidential and will not be publicly posted on the DM website.

## VII. Next Steps

- Send this Progress Report to your Project Liaison via email
  - cc to the DM team [dmwinner@worldbank.org](mailto:dmwinner@worldbank.org)
- The Project Liaison will review the Report and will either
  - a) approve the Report and authorize disbursement via email with cc to [dmwinner@worldbank.org](mailto:dmwinner@worldbank.org) ; or
  - b) does not approve (or does not authorize disbursement) but responds with comments, questions, requests for team to address with cc to [dmwinner@worldbank.org](mailto:dmwinner@worldbank.org) (in this case, the team would address PLs concern to move to approval)
- Once approved, team send signed Request for Payment to DM Team
  - via fax +1-202-522-2042
  - or scanned document via email to [dmwinner@worldbank.org](mailto:dmwinner@worldbank.org)
- Upon receipt of the following, the DM Team can process disbursement:
  - a) Progress Report & Expense Addendum in Annex I
  - b) Signed Request for Payment
  - c) Project Liaison's approval of report and authorization of payment

## Annex I. Project Expenses for this Reporting Period (ending May 31, 2004)

Items	Sub-Totals (USD)
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<b>1 Personnel</b>	8,000
<b>2 Materials and Equipment</b>	3,000
<b>3 Training</b>	1,500
<b>4 Travel</b>	2,500
<b>5 Evaluation/Information Dissemination</b>	1,500
<b>6 General Administration/Overhead</b>	3,000
<b>7 Other</b>	500
<b>Total Expenses</b>	20,000

<b>For Internal Use Only</b>	
Progress Report Number	<input type="text"/>
Approved by Project Liaison	<input type="text"/> Date <input type="text"/>
Received by DM Team	<input type="text"/> Date <input type="text"/>