CPWF Small Grants Program

Proposing Institution: IDE-International

Project Title: Development and Testing of Training Materials and Information for Scaling up Dissemination of Micro-Irrigation and Associated Water-control Technologies Designed for Small Plot Systems.

Brief Title: Water-control for Small Plot Farming Systems

Budget Requested: $74,644

Project Duration: 18 months

1. PROJECT TEAM

1.1. Lead Institution: IDE International
Name of Project Leader: Deepak Adhikari (Nepal);
IDE International Project Coordinator: Robert Yoder (USA);
IDE International Field Representative: Sudarshan Suryawanshi (India)
Project Leader Postal Address: G.P.O. Box 2674, Kathmandu, Nepal
Email: dadhikari@idenepal.org.np or deepaklochan@yahoo.com
Telephone number: (O) 977-1-552-0943, (M) 977-1-9851007916

Primary discipline/experience of importance to this proposal:
IDE International is a pioneer innovator in the field of micro-irrigation and water-control—manual (rower, treadle, rope & washer) pumps, low-pressure drip irrigation systems, micro sprinklers, and low cost water harvesting and storage—designed for small-plot subsistence farmers. Water-control, coupled with market-based changes in cropping practices, has enabled large numbers of small farmers to dramatically increase their income.[1] A recent innovation has been water systems designed for combined access to domestic and productive use water needs that is both safe and low cost. Many of these innovations have taken place in the Gangetic Basin (Nepal, India, and Bangladesh), where IDE has maintained country programs since the mid 1980s. IDE's programs have now spread to 11 countries in Asia and Africa. IDE International is registered as a foundation in Switzerland with its Secretariat office in Colorado, USA.
Type of Institution: INGO

1.2. Collaborating Institution: Society for Social Service (SSSP)
Name of Principal Investigator: Mr. Samundra Godar
Postal Address: Vayas-11, Damauli, Tanahun, Nepal
Email:
Telephone number: 977-65-560 430 (F) 977-65-560 417
Primary discipline/experience of importance to this proposal:
SSSP is qualified as a Support Organization by the Rural Water Supply and Sanitation Fund Development Board (RWSSFDB) funded by World Bank. Through the RWSSFDB and other programs such as those supported by UNICEF, SSSP has been involved in participatory approaches for construction of the piped water supply systems and training for improved sanitation and hygiene. SSSP is

[1] Keller, J., and A. Keller. (2005). "Mini-Irrigation Technologies for Smallholders" *Proceedings of the World Water & Environmental Resources Congress in Anchorage, Alaska, 15-19 May 2005*. Sponsored by the EWR Institute of ASCE.. Anchorage, Alaska. http://ide-international.org/Page.asp?NavID=224

expanding its activities to include small-scale irrigation for horticulture crops, including mango, citrus, and litchi, in hill districts of Nepal. SSSP is interested in working with IDE to gain experience with planning and designing multiple use water systems and in particular to increase their capacity in the area of water control for productive uses.
Type of Institution: NGO

1.3. **Collaborating Institution:** Dilasa Janvikas Pratisthan Sanstha (Dilasa)
Name of Principal Investigator: Vaishali Khadilkar
Postal Address: Hira Bhuvan, Plot 4, Padmapani Colony, Station Rd, Aurangabad (M.S) 431005, India
Email: dilasa@satyam.net.in
Telephone number: 91-240-2363741
Primary discipline/experience of importance to this proposal:
Dilasa is a Non-government Organization established in 1993, headquartered at Aurangabad (India). It works primarily in the water sector and with women. Most of its work is in association with the Indian government. During last 10 years, Dilasa has acquired comprehensive skills in the areas of watershed management, domestic water supply, irrigation and aquifer recharge. Agriculture extension, gender mainstreaming, and women's development activities are considered an integral part of its program. Dilasa also implements micro-finance, health and sanitation, school-based environmental education and carries out Panchayat Raj training.
Type of Institution: NGO

The project leader confirms that official representatives of all the institutions listed above have agreed to execute the proposal as described if it is selected for funding. Yes

2. LINK TO CPWF RIVER BASINS

CPWF Benchmark basin in which the project will be conducted: Indo-Gangetic—Western Hills of Nepal and Deccan Plateau of Maharashtra, India)

3. THE PROJECT

3.1 Provide a summary of the background leading to your proposal (maximum 300 words justifying why your proposal is important and the work, or lack of it, that it builds on).

IDE's mission is to confront the challenge of rural poverty by developing market systems for agriculture production that serve poor women and men. IDE's experience shows that smallholders gain maximum benefit from their limited land resources if they can introduce higher-value crops into their cropping system.[2] In addition to markets, access and control over water for irrigation is critical for reducing risk and increasing yield and quality of horticulture and other higher-value crops. Water-control technology—manual pumps, low-pressure drip irrigation, water harvesting and storage technologies, water purification filters and hygiene improvement—is the key entry point in most of the IDE interventions.

[2] Magistro, John, Michael Roberts, Steve Haggblade, Fritz Kramer, Paul Polak, Elizabeth Weight, and Robert Yoder. 2004. A Model for Pro-Poor Wealth Creation through Small-Plot Irrigation and Integrated Service Provision. Paper presented at IWMI Regional Workshop and Policy Roundtable on "Pro-Poor Intervention Strategies in Irrigated Agriculture in Asia." 25-27 August, 2004, Colombo, Sri Lanka
http://ide-international.org/Page.asp?NavID=224

IDE started a treadle pump program in Bangladesh in 1984. Since then, efforts by IDE and other organizations have resulted in the sale of well over 2 million pumps worldwide.[3] This rapid and massive dissemination was possible by harnessing private sector capacity to manufacture, distribute, and install pumps with sufficient profit at each step of the supply chain to attract many thousands of private sector entrepreneur participants. While massive marketing campaigns made farmers aware of the new technology and robust supply chains made pumps available locally, success was based on the fact that the pump design was made cheap enough that farmers could gain sufficient net profit to fully pay the unsubsidized cost of the pump in the first year and still have some surplus income.

Over the past 10 years, IDE has worked to lower the cost of drip and sprinkler irrigation. Affordable water storage for harvesting rainy season runoff for use in the dry season is currently being tested. Other successful technologies for increasing the net profit of resource-poor farmers ready for scaled-up dissemination are efficient methods for fertilizer application, greenhouses made of bamboo with plastic covering, micro-diesel powered pumps, crop processing and transport equipment.

The combination of these technologies opens new irrigation opportunities in areas of limited water supply. A prime example is the "hybrid" piped water systems that can serve both domestic and livestock/irrigation needs. These were developed when field staff in Nepal observed farmers collecting and storing the overflow water available from rural drinking water systems to irrigate gardens using newly available drip and sprinkler irrigation systems. Where the water source is adequate, it is now possible to plan and design a multiple use water system. The first priority is to provide the village domestic water supply. All excess water is then stored and distributed for livestock, irrigation and other productive uses. It is the water-saving combination of a storage system and the piped transmission from the source plus piped distribution to crops that creates this new irrigation opportunity for small farmers. Since the infiltration and evaporation losses of traditional earth canal and furrow distribution systems are very high, irrigation from small water sources was not feasible in the past.

Water storage and drip/sprinkler irrigation developments have demonstrated success at increasing small farmer incomes comparable to that of treadle pump farmers.[4] A number of projects are now embracing this new opportunity but are hampered by lack of trained staff and information materials necessary to rapidly scale up implementation. From IDE's experience with treadle pump dissemination it is clear that the involvement of several organizations is necessary to move improved technologies and practices beyond pilot projects with massive scale-up. These efforts must be supported with publicity, promotion and demonstration to raise awareness, all requiring information and staff training.

Resource-poor farmers seldom have access to information or ways to interpret and embrace new ideas without some form of outside assistance. The rapid increase in number of local NGOs and Community Based Organizations worldwide in the past two decades, together with increased commitment of donor, government, and private sector organizations to focus resources on poverty alleviation, provides an opportunity for scaling up the dissemination of low cost water-control technologies and practices.

This requires development and testing of design and installation guidelines and training materials for implementing organizations. It also requires adaptive testing to match new technologies to local

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[3] Shah, Tushaar, Alam, M., Kumar, M. Dinesh, Nagar, R.K., and Singh, M., 2000. Pedaling out of Poverty: Social Impact of a Manual Irrigation Technology in South Africa. International Water Management Institute. http://ide-international.org/Files/Pedaling_Out_Of_Poverty.pdf

[4] Verma, Shilp ; Tsephal, S. ; Jose, T. 2004. Pepsee systems: Grassroots innovation under groundwater stress *Water Policy, 6(4):303-318* http://www.iwaponline.com/wp/00604/0303/006040303.pdf

conditions in new environments. We propose, if awarded this grant, to use it to prepare written materials, photo and video presentations, and training guides necessary for other organizations to gain competency in disseminating affordable water-control technologies to small farmers. We will test the publicity and training materials by introducing them to one local NGO in Nepal and one in India. We will refine and improve the materials through this interaction with local NGOs.

3.2 Who is/are the target group/s of your project? (maximum 100 words)

The target groups for the output of this grant are local NGOs and community based organizations (CBOs) as well as the agencies and organizations that fund and support them in implementing village-level water projects. Implementing NGOs and CBOs will train "leader farmers," local masons and service providers of agriculture inputs to guide farmers in the use of these methods and technologies. The design and implementation guidelines will include sections for NGOs to use in training technicians.

In Nepal the RWSSFDB, which uses a large number of NGO support organizations (such as IDE grant partner SSSP) in implementing rural drinking water systems, has expressed interest in expanding its role from single purpose domestic rural water systems to systems that incorporate irrigation and other productive water use needs. The department of irrigation is interested in expanding its role for support of surface and groundwater irrigation to include the "non-conventional" irrigation activities that the technologies mentioned above address. Nepal's department of irrigation works with CBOs to improve farmer-managed irrigation systems (FMIS). Some FMIS are candidates for implementing micro-irrigation and sprinkler technologies. Dilasa, IDE's grant partner in India, is implementing components of a World Bank funded drinking water project in Maharashtra State. Dilasa will be able to incorporate these technologies into the World Bank funded project and at the same time incorporate other NGOs in scaling up their use.

3.3 What specific agricultural water management strategy or technological/dissemination innovation does the project intend to address? (maximum 100 words**)**

Water harvesting, storage, and distribution by micro-irrigation/sprinkler systems for small plot irrigation have been demonstrated and proven successful.[5] Many local NGO, CBO, district level government agencies and donor project staff in the Indus/Gangetic Basin are interested in incorporating new water-control technologies into their programs. The most urgent requirements for scaling up dissemination of water-control technologies to small, resource poor farmers is reliable information and training material. We propose to draw on the field experience of IDE and implementing partner staff in Nepal and India to prepare design information, planning and implementation best practices guidelines, publicity materials and training guides to make these innovations widely available. IDE will test and refine the materials in the process of training SSSP and Dilasa staff.

3.4 Provide a summary of your project methodology/approach activities for achieving the project results (maximum 500 words)

IDE will lead the project in direct collaboration with two local NGOs. In Nepal, IDE will work with the district-based NGO Society for Social Service, Pharakchour (SSSP). In Maharashtra, India, we will work with Dilasa Janvikas Pratisthan Sanstha (Dilasa).

The Project Leader, Deepak Adhikari, will manage all project activities. He is IDE's lead engineer in

[5] Rajendra B. Shrestha. 2004. Promoting effective water management policies and practices: gender equality for poverty reduction through improved irrigation management. Nepal Final Report prepared for the Asian Development Bank. http://www.adb.org/documents/pdas/nep/Final-Report-NEP-200302.pdf

Nepal, responsible for developing and implementing water harvesting, storage, and micro-irrigation/sprinkler systems. He will supervise IDE Nepal staff (who have extensive field-based experience) in preparing and testing the training, design, and promotional materials.

IDE International's Field Representative in Maharashtra, India, Sudarshan Suryawanshi, will supervise preparation and testing of the training, design, and promotional materials of products developed in India.

In both India and Nepal, as training and publicity materials are prepared, they will be tested by training staff of our partner NGOs, Dilasa and SSSP. Dilasa and SSSP will in turn use the design and implementation guidelines to train their own and private sector technicians in best practices for constructing and installing new water control systems. This process will be observed by IDE staff. The Dilasa and SSSP feedback and IDE observations in the field will then be used to update and improve the training and promotional materials before they are finalized. IDE International Coordinator Robert Yoder will review all materials as they are produced to provide technical input and quality control.

At the central level in Nepal, the project will liaison with the RWSSFDB and with IDE-Nepal projects SIMI and UJALO. The main objective will be:

- to document the existing information/literatures, for use in scaling
- to gain understanding about existing training materials
- to get advice on the design of the training modules/materials

At the district level in Nepal and the Maharashtra State level in India, the project will be coordinated by the SSSP and Dilasa, respectively. These NGOs will initiate site selection, planning, design and implementation of one or more new projects using RWSSFDB procedures in Nepal, and Dilasa's own procedures in India as augmented by new guidelines for adding productive use to the traditional domestic water-only design as presently used by RWSSFDB and Dilasa. SSSP and Dilasa will be responsible to work with district partners and government line agencies in carrying out implementation of the new multiple use water system(s). They will test both the publicity materials and the design/implementation guidelines through this process.

IDE will provide necessary backstopping in this process to observe and identify ways to improve the design and publicity materials. IDE's main role at the district level will be to:

- Provide project management training to the collaborating organization
- Provide technical training to the collaborating organization and partners
- Test and update the draft training materials
- Provide technical backstopping in all project related activities
- Monitor and evaluate the training materials and performance
- Prepare final training materials based on the feedback after testing

Similarly, SSSP and Dilasa will have the following roles, to:

- Organize consultative meetings for developing training materials
- Carry field assessment survey for selecting new sites
- Collect baseline information
- Liaise with the district level organizations in the project implementation
- Provide community mobilization and agricultural support
- Participate in the action research of the technologies
- Contribute to the design & testing of the training materials
- Receive technical training & provide technical support to the district/community level technicians and stakeholders

3.5 What results will your project provide to the CPWF? (maximum 200 words)

The outputs of this grant project will be training modules, design specifications, product technical descriptions and publicity materials that focus on water control for small plot irrigation. These will be delivered to the CPWF as part of the quarterly reporting activity.
The specific products are expected to include:

- Technical Guidelines (drawing, design, specifications) on the small scale water / irrigation technology, namely:
  - Drip irrigation system and all its components
  - Sprinkler irrigation system and all its components
  - Low Cost Water Tanks—soil cement, ferrow cement, plastic lined, plastic bag
  - Rainwater harvesting technology
  - Piped water systems designed to achieve multiple use needs
- Training Modules for the technical guidelines suitable for NGO and government agency staff;
  - Color Posters
  - Leaflets
  - Albums
  - Video (on technology installation, operation, and post installation management)
  - Specification fact-sheets
- Training materials for use by NGOs and other organizations to train field technicians
- Field Evaluation Reports
- Guidelines of best practices for introducing water harvesting, storage, and micro irrigation for market based crops
- User manuals for end users (mostly photos)

3.6 What elements of your proposal are innovative and why? (maximum 300 words)

The water supply for most irrigation systems is large surface water bodies or groundwater. This proposal focuses on areas where water sources are too small (for at least one or more growing seasons each year) to be tapped for conventional surface irrigation. The technologies and implementation design were developed to provide reliable water control for resource poor farmers with very small plots of land. It proposes to document the experience and development of low-cost technologies that have demonstrated good financial returns for small farmers while providing the same water conservation measures as much more expensive systems designed for large commercial farms.

Overall, the innovations here are scaling-up the introduction and integration of water harvesting (small springs and/or rainwater), piped water transport, storage, distribution by drip or sprinkler, and plastic greenhouses at costs that are affordable and cost effective to very small farmers. The objective is to develop guidelines, training and publicity materials so that other organizations can join in promoting new irrigated cropping opportunities for small farmers.

3.7 How, if at all, does your proposal address issues of (maximum 600 words total in this section)

1. stakeholder involvement (demand by them and their inclusion in project activities; acknowledgement of their contribution)
Stakeholders in scaling up the use of affordable water control technologies include: government agencies at the national, state/district, and local levels; funding agencies such as the World Bank and bilateral agencies; international and local NGOs; community based organizations; private sector manufacturers, equipment dealers, distributors and skilled technicians. In Nepal, IDE collaborated with RWSSFDB to identify SSSP, a RWSSFBD support organization. RWSSFDB will review and comment on draft training

and publicity materials. However, the primary stakeholders actively participating in preparation and testing the training and publicity materials will be our NGO partners, Dilasa and SSSP, and the private sector technicians with whom they partner in implementing field activities.

2. gender (for instance, in data collection and analysis, farmer group activities)
IDE's experience has shown that women farmers are enthusiastic in participating in micro-irrigation activities, particularly when they also include improved access to water for domestic needs. Since the targeted plots for irrigation are relatively small and located near the house, women have been very responsive in participating. Reduced drudgery in fetching water and opportunity to earn cash of their own by growing and selling vegetables or other high value crops are the primary reasons women give for supporting water development activities.

3. environmental security (e.g. biodiversity, water quality)
Being a low volume application, micro irrigation technologies have less negative impact on the physical environment than other forms of irrigation. Micro-irrigation does not cause any surface erosion, deep percolation, or salinity problems. Rather, it will create green cover that prevents erosion.

Similarly, water harvesting tanks and piped water systems are relatively small scale and tap unexploited small water sources which have very little impact in the prevailing ecosystem. The project will not undertake any testing or research that will affect the existing local environment. Water storage systems will be either covered or integrated with aquaculture.

4. impact on the poor (including food security and wellbeing)
Introducing irrigation to agriculture systems that have previously been only rain-fed will increase both the quantity and quality of production and reduce the risk of drought. Where higher value crops are introduced to replace subsistence crops, income will be increased. All of these are positive factors for poor farmers. Studies in Nepal and India have shown that use of water-control technologies increases net household income by an average of $100 annually and for some by as much as $500.[6] In addition, nutrition level of poor households is improved by access to fresh vegetables.

3.8 How do you intend to self-monitor the progress of the project towards obtaining the results? (including the roles of institutions/groups involved (maximum 200 words)

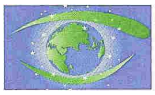
A detailed workplan will be prepared at the beginning of the project that sets out specific activities, a timeline for completing the activities, and milestones for outputs to be achieved. This plan will include the responsibilities and deliverables of each implementing partner and provide the base against which to measure monthly progress.

The project leader will be responsible to monitor and maintain progress. IDE's policy is to have each staff person prepare and get approval for a monthly workplan to guide the activities of each month. The project leader will work with each partner to develop a practical monitoring mechanism and to obtain consensus for implementation.

Indicators will be developed to monitor the performance of the technology and training materials.

[6] Shah, Tushaar, Alam, M., Kumar, M. Dinesh, Nagar, R.K., and Singh, M., 2000. Pedaling out of Poverty: Social Impact of a Manual Irrigation Technology in South Africa. International Water Management Institute. http://ide-international.org/Files/Pedaling_Out_Of_Poverty.pdf

4. BUDGET (Calculate in US$)				
Divided by institution as follows:	**Lead Institution**	**SSSP**	**Dilasa**	**Totals**
1. Personnel	22,640	7,800	6,240	36,680
2. Travel and accommodation	4,000	1,500	1,000	6,500
3. Other operational costs	18,000	5,000	4,000	27,000
4. Overheads	4,464	0	0	0
Total CPWF Budget	**49,104**	**14,300**	**11,240**	**74,644**
5. Additional budget provided by partner as 'matching funds'	25,500	$0	$0	$0
Total Cost	**74,604**	**14,300**	**11,240**	**100,144**



DEEPAK LOCHAN ADHIKARI
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EDUCATION:

M.Sc. Water Resource Engineering & Natural Resources Management (2005).

M. Sc. (With Honours) in Water Supply & Sewerage Engineering from Tazik Polytechnic Institute , Tazikistan USSR. (1992)

Certificate in Civil Engineering, CCE (Merits) from Institute of Engineering , under Tribhuvan University, Nepal (1979).

Intermediate in Science, I. Sc. (I Division) from Siddhartha Vanasthali Campus, Nepal (1987)

OTHER TRAINING

Professional degree on "Construction Materials for Development" from Asian Institute of Technology AIT, Bangkok, Thailand (Oct-Dec 1999).
Professional degree on "Irrigation & Soil Management " conducted by Institute of Soil and water, Volcanic Center, Israel (Oct-Dec, 1997).
Extensive use of computer in projects designing, implementation, and publications.
Attended several International & National training & Seminars, on Project Management, Water / Irrigation, & Training techniques.

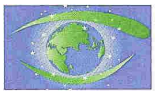
PROFESSIONAL EXPERIENCE:

More than 15 years of experience in Government, Non-government & Consulting Firms & associated in the project management, design, construction, research & development of appropriate water and irrigation technologies. Currently chief of the Engineering department of IDE/Nepal. Frequently involved in the IDE/International projects.

- Innovator of low cost micro-irrigation technologies (Simple Drip Irrigation, Preassembled Micro-Sprinklers), Low Cost Water Harvesting Tank, Affordable Drinking Water Filter (SAFA Filter), Low Cost Plastic House
- Associated in the design & testing of Agro-processing technologies : Essential Oils, Gasifiers, Solar Drier, Alternative Water Lifting Devices, Tea/Coffee processing etc.
- Survey, design & implementation of Water & Micro-Irrigation Projects
- Project Manager of the Civil, water supply and small scale irrigation projects (treadle pump, Multiple use piped water systems, micro-diesel pumpsets, drip & sprinklers)
- Involved in the establishment of the Quality Management System of the Treadle Pump, Simple Drip Irrigation & Micro-irrigation technologies..

Languages:

Nepali - Native Language, English (Excellent), Russian (Good), Hindi (Good)



ROBERT YODER
Project Coordinator

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EDUCATION:

Ph.D., 1986, Agricultural Engineering, Cornell University, Ithaca, NY

M.S., 1981, Agricultural Engineering, Cornell University, Ithaca, NY

B.S., 1972, Civil Engineering, University of Iowa, Iowa City, IA

PROFESSIONAL EXPERIENCE:

September 2003 to Present, **Director of Water Development**, International Development Enterprises, Lakewood, Colorado, with responsibility for design and development of IDE's water technologies, and for implementing donor funded projects that use water as an entry point for smallholder farmers to move beyond subsistence agriculture by accessing markets for high-value produce.

July 1992 to August 2003, **Senior Associate and Senior Engineer**, Associates in Rural Development Inc., (ARD), Burlington, Vermont.

August 1990-July 1992, **Independent Consultant**, International Irrigation Management Institute (IIMI), Colombo, Sri Lanka:

August 1990-December 1991, **Visiting Professor**, Iowa State University, Ames, Iowa.

September 1985-July 1990, **Head, Nepal Field Operations**, International Irrigation Management Institute (IIMI), Colombo, Sri Lanka.

November 1981-August 1985, **Research Associate**, Cornell University, Ithaca, NY.

July 1976- July 1978, **Project Leader**, United Mission to Nepal's Development and Consulting Services (DCS), Butwal, Nepal.

July 1966-July 1969, United Mission to Nepal's Butwal Technical Institute, Butwal, Nepal.

LANGUAGES:

English (native speaker), Nepali (excellent), German (fair)

SUDARSHAN SURYAWANSHI
Field Representative (India)

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Phone: 91-253-2575131 Email: sudarshan@irrinet.com

EDUCATION

- Masters of Technology in Water Resources Development & Management, IIT Kharagpur (India), 1992.
- Bachelor of Technology in Agricultural Engineering from Mahatma Phule Agricultural University, Rahuri (M.S), India, 1990.
- Advanced Irrigation & Extension, short course at Ruppin Institute of Agriculture, Ruppin, Israel, 1993

PROFESSIONAL WORK EXPERIENCE

2000 to present, IDE-International, of Denver, USA: as **Technical Expert** based in India, is responsible to develop and disseminate affordable irrigation technologies and farm production intensification for smallholder farmers in developing countries. Countries of experience include: Bangladesh, Cambodia, China, Egypt, Eritrea, Ethiopia, Honduras, India, Kenya, Mexico, Nepal, Nicaragua, Tanzania, Vietnam, Zambia and Zimbabwe.

1997 – 2000, IDE-India, as **Regional Director**, managed projects in Himachal and the U.P. Hills of India. Main responsibilities were development of affordable micro irrigation technology, marketing, supply chain, training, promotion, recruitment, planning and management of development projects illustrated below:

1992 – 1997, Jain Irrigation Systems Ltd., Jalgaon (M.S) India, as **Manager** (Technical Support) for four years and was responsible for marketing and executing micro-irrigation projects in agriculture and landscape. It included managing a project team for micro irrigation projects in India and abroad and carrying out planning, design and marketing of micro irrigation systems, import and export of irrigation systems, recruitment and training of irrigation engineers. For initial two years worked as irrigation **Design Engineer** and was responsible for design of large irrigation projects with drip and sprinkler sprinkler systems.

INTERNATIONAL CONSULTING MISSIONS

- **'Feasibility of Micro-Irrigation Technologies viz. Treadle Pump and low cost drip' in Myanmar,** for Erawadi Partners, 2003.
- **'Smallholder Irrigation & Market Development in Central America'** study in **Nicaragua and Honduras,** for SDC, 2003.
- **'Feasibility of Micro Irrigation (Low cost drip and Treadle Pump) for Smallholders in Zimbabwe, and its use for HIV affected household'** for the LEAD Program of USAID, 2002.
- '**Smallholder's Irrigation & Market Development in East Africa'** study in **Tanzania, Ethiopia, Kenya and Eritrea,** for SDC, 2002.
- **'Feasibility of Micro-Irrigation Technologies viz. Low cost drip and Treadle Pump in Eritrea',** for CDE Bern, 2000-2001.
- **'Conceptualization of Irrigation Technology for small holders', in Mexico,** for UNAM-FIRCO, 2000.
- **'Water Management at Farm and System Level' in Egypt,** for FAO-IPTRID, 1999.
- **'Potential for Low Cost Irrigation Techniques (Treadle Pump and Low cost drip) in China',** country feasibility study for IDE 1998-1999.