



## Efficient Methods of Watershed Management through Micro Irrigation System

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### INTRODUCTION

Although water is a renewable resource, its availability in appropriate quality and quantity is under severe stress due to increasing demand from various sectors. Agriculture is the largest user of water, which consumes more than 80% of the country's exploitable water resources. The over all development of the agriculture sector and the intended growth rate in GDP is largely dependant on the judicious use of the available water resources. While the irrigation projects (major and medium) have contributed to the development of water resources, the conventional methods of water conveyance and irrigation, being highly inefficient, has led not only to wastage of water but also to several ecological problems like water logging, salinization and soil degradation making productive agricultural lands unproductive. It has been recognized that use of modern irrigation methods like drip and sprinkler irrigation is the only alternative for efficient use of surface as well as ground water resources. Hence, this Scheme on Micro Irrigation (MI), which aims at increasing the area under efficient methods of irrigation viz. drip and sprinkler irrigation.

### NATURE OF SCHEME

This will be a Centrally Sponsored Scheme under which out of the total cost of the MI System, 40% will be borne by the Central Government, 10% by the State Government and the remaining 50% will be borne by the beneficiary, either through his/her own resources or soft loan from financial institutions. In other words, out of the Governmental assistance, 80% share (40% of unit cost) will be met by the Government of India (GOI) and the balance 20% (10% of unit cost) will be met by the participating State Government. The concerned States shall make available their share of 20% to the Implementing Agencies (IA) during the financial year.

### Pattern of Assistance

In the case of drip irrigation, the assistance will be limited to 50% of the cost of the System for the specified crop spacing and for the area covered under the crop by the farmer. The assistance for sprinkler irrigation will also be 50% of the cost. In both the cases, the assistance will be limited to five ha per beneficiary family. The assistance for MI demonstrations, to be taken in farms belonging to State/Central Governments, State Agricultural Universities (SAUs), ICAR Institutions, progressive farmers and Non-Governmental Organisations (NGO)/Trusts, on their own land will be @ 75% of the cost for a maximum area of 0.5 ha per beneficiary, which will be met entirely by the Central Government. The Scheme will cover all categories of farmers irrespective of the size of land holding. However, while selecting the beneficiaries, care will be taken to ensure that the Small & Marginal farmers are given due priority for supplying the system. At least 25% of the beneficiaries should be Small & Marginal farmers. The Panchayati Raj Institution (PRI) will be involved while selecting the beneficiaries. SCHEME COMPONENTS

The Scheme will have two major components viz (1) Area Coverage under MI and (2) Human Resource Development including Demonstrations in the related sector, besides a mechanism for Scheme administration and monitoring.

### Area Coverage under Micro Irrigation

The scheme will facilitate increase in coverage of area under drip as well as sprinkler irrigation systems for enhancing crop productivity. Initially the focus will be on covering the areas under horticultural crops being promoted under National Horticulture Mission (NHM), which are conducive to drip irrigation or sprinkler irrigation and fertigation. For other crops, it will be restricted to potential belts/regions in the water

deficit, arid and semi-arid areas. A cluster approach will be adopted in implementing the Scheme.

### Drip Irrigation:

Drip Irrigation involves technology for irrigating plants at the root zone through emitters fitted on a network of pipes (mains, sub-mains and laterals). The emitting devices could be drippers, micro sprinklers, mini sprinklers, micro jets, misters, fan jets, micro sprayers, foggers and emitting pipes, which are designed to discharge water at prescribed rates. The use of different emitters will depend upon specific requirements, which may vary from crop to crop. Water requirement, age of plant spacing, soil type, water quality and availability are some of the factors which would decide the choice of the emitting system. Sometimes micro-tubes are also used as an emitter, though it is inefficient. All types of surface and subsurface irrigation systems are covered under MI Technology. An indicative list of system components required for installing a drip irrigation system in areas ranging from 0.4 ha to 5 is given in Annexure -I. The estimated cost of Drip Irrigation System (assuming peak water requirement with source of water at the corner of the plot) for different crop spacing and plot sizes is given in Table-1.

**Table-I: Estimated Cost of Installing Drip Irrigation System (Cost in Rupees)**

Spacing (Metre) -	Area, hectares					
	0.4	1	2	3	4	5
12x12	10600	16700	25200	32600	53700	71300
10x10	12100	18000	27700	36000	57900	76900
9x9	12400	22100	35500	55900	61400	81100
8x8	12900	19900	31300	41700	65500	86200
6x6	14400	30200	51200	70300	105800	137400
5x5	15100	32800	56600	83100	117100	150800
4x4	16900	39300	63100	100700	142200	179300
3x3	17900	35600	71400	96100	130800	158300
1.3x1.5	19700	40200	80500	109700	146100	180900
2.5x2.5	20000	39800	81400	111200	199500	239600
2x2	21300	49800	86400	122700	164900	223400
1.5x1.5	26100	55000	109500	165100	205900	281000
1x1	26500	57600	96500	146500	199900	249200

The unit cost of Drip Irrigation system varies with respect to plant spacing and location of the water source. Moreover, the cost of the drip system varies from State to State depending upon the existing demand and marketing network. Accordingly, the States have been categorized into three categories, viz., Category "A", "B" and "C". States where more than 10,000 hectares have been brought under drip irrigation as on 1.4.2004 would come under 'A' Category. This would include the States of Andhra Pradesh, Gujarat, Karnataka, Kerala, Maharashtra and Tamil Nadu. All the States except those covered under Category 'A' and those falling in the Himalayan belt would come under Category 'B'. All the North Eastern States, Sikkim, Himachal Pradesh, Jammu & Kashmir, Uttaranchal and Darjeeling district of West Bengal would come under Category 'C'. Keeping in view the level of awareness, proximity to the manufacturing units, distance involved in transportation, potential for drip irrigation, the cost of drip system in Category 'B' States is estimated to be 15% higher than Category 'A' States while for Category 'C' States it is estimated to be 25% higher than Category 'A' States. Accordingly, the average unit cost of drip irrigation system for different State categories is given in Table-2.

**Table-2: Average of Unit Cost for installing Drip Irrigation System**

State Category	Average Cost, Rs./ha
A	40,000
B	46,000
C	50,000

The assistance under the scheme is available for all types of drip irrigation systems such as on-line drip irrigation systems, in-line systems, sub surface drip irrigation systems, micro jets, fan-jets, micro sprinkler, mini sprinklers, misters and similar other low discharge irrigation systems. Use of microtubes as an emitting device under the MI Scheme will be allowed only under exceptional circumstances where the water quality does not permit use of any other type of emitters.

Assistance will be available to the farmers growing all horticultural crops like fruit, vegetables including potato, onion and other root and tuber crops, spices, medicinal & aromatic plants, all plantation crops excluding tea, coffee, rubber and oil palm. The scheme will be implemented on compact area basis.

Only new installations i.e. systems invoiced and installed during i 2005-06, which have not availed any subsidy under any of the Government Schemes shall be eligible for assistance under the Scheme.

Cooperative Societies/Self Help Groups/Incorporated Companies will also be entitled to avail assistance on behalf of its members. In such cases, the individual beneficiary will receive assistance through the Co-operative Society /SHG/Incorporate company and not directly.

Assistance of drip irrigation will be 50 per cent of the system cost applicable to different crop spacing as given in Annexure -II.

In case of crops with plant spacing other than those mentioned in Table -1, the amount of assistance could be calculated on pro rata/ average basis of the nearest plant spacing. Alternatively assistance amount may be calculated as per the unit cost of the nearest spacing of plants. As small farm holdings may not have individual source of water, it would be preferable to encourage a group of farmers to avail the benefits of drip irrigation through a common water source. However, the cost norms for smaller areas (0.4 ha) also has been provided with a view to enable small and marginal farmers to avail the Scheme. A beneficiary cannot split an area into small pockets of the same crop for claiming assistance under the scheme.

In case of inter-cropping, assistance will be available for the prescribed plant spacing indicated in Annexure -II subject to the condition that the assistance will be provided only for one crop as per the farmer's choice. However, if the beneficiary has more than one crop with different crop spacing being grown separately in his/her land holding, assistance will be available for installing the drip irrigation system as per the individual crop spacing the combined area of which will not exceed 5 ha per beneficiary family.

**Sprinkler Irrigation:** Under sprinkler irrigation water is sprinkled under pressure into the air and plant foliage through a set of nozzles attached to network of aluminum or High Density Poly Ethylene (HDPE) pipes in the form of rainfall. These systems are suitable for irrigating crops where the plant density is very high where adoption of Drip Irrigation Systems may not be economical. Sprinkler irrigation is suitable for horticultural crops like vegetables and seed spices. Conventionally, sprinkler irrigation has been widely in use for irrigating Cereals, Pulses, Oil Seeds and other field crops.

The indicative list of components required for a sprinkler irrigation system is given in Annexure-III. The cost of sprinkler irrigation for one hectare plot with different coupler diameters is given in Table 3.

**Table 3: Cost of Sprinkler Irrigation System**

Coupler diameter (mm)	Cost (Rs.)
63 mm	13690
75 mm	14270
90 mm	17280

Financial assistance to the beneficiary for sprinkler irrigation will be limited to 50 percent of the system cost subject to a maximum of Rs.7500/-per ha. Since sprinkler systems are moveable, the cost of the

system will be governed by the actual quantity of material used.

The sprinkler systems sets, unlike drip system, are moveable. Hence one sprinkler set could cover more than one ha by shifting from one place to another. Only those farmers who have not availed of assistance for sprinkler irrigation from any other scheme would be eligible for assistance under this scheme. Assistance for sprinkler irrigation will be limited to only those crops for which drip irrigation is uneconomical. Depending upon the type of crop a farmer can avail assistance for sprinkler as well as drip irrigation, the combined area of which should not exceed five ha per beneficiary. However, assistance for both sprinkler and drip irrigation will not be available for a crop on the same plot/field being cultivated by the farmer. Moreover, assistance for sprinkler irrigation alone, which is less efficient than drip irrigation, should be discouraged.

The cost for installation of system will be borne by the beneficiary. The beneficiary will also be responsible for all electrical and mechanical works such as pumps, panels, electrification works, etc; at his own costs. The manufacturer will be responsible for repair or replacement of the system components against manufacturing defects. Since the system manufacturers are supplying a tailor made system to the farmers, the transportation and installation charges of the system will be borne by the farmers.

A farmer shall be eligible for assistance only if adequate water is available for the area proposed to be brought under Drip/Sprinkler irrigation. The installation of Drip/Sprinkler Irrigation system and the assistance should be limited to the area for which adequate water is available. The scheme does not provide for creating new water sources. However, various schemes of the Government such as National Horticulture Mission (NHM) and Macro Management Schemes of Ministry -of - Agriculture, Integrated Watershed Development Scheme (IWDS), Swamajayanti Gram Swarozgar Yojana (SGSY), Sampoorna Grameen Rozgar Yojana (SGRY) and Integrated Watersheds Development Project (IWDP) of Ministry of Rural Development, Rashtriya Sam Vikas Yojana (RSVY) of Planning Commission are being implemented under which there is provision for creating water resources. These schemes should be availed and the water resources developed through such schemes should be used in conjunction with drip/sprinkler irrigation systems.

Assessment of water availability should be made by the implementing agencies. The officers of the concerned Irrigation Association may also be associated in the process. The Irrigation Association may also nominate accredited trained graduates for verifying the drip installation systems. Sample format for collecting application from a farmers/beneficiary is given Details on the principles of estimating water and power requirement for installing drip irrigation system is given in Annexure V and the methodology for assessment of water and power is given in Annexure VI. The questionnaire at Annexure VII which provides the format for assessing water and power availability for installing drip irrigation system may be used for assessing water availability in the beneficiary's plot. The Field Functionaries should collect the data accurately and thereafter an assessment of adequacy should be made on the basis of norms given in these Guidelines. In general the following thumb rule may be followed:

- Orchard crops: Orchard crops may be irrigated with Drip irrigation system if assured water supply of one litre per second / hectare is available for four hours per day from the existing water sources.
- Vegetables and other closely spaced crops: Drip Irrigation system may be used if assured water supply of three litres per second / hectare is available for four hours per day from the existing water sources.

Where a farmer proposes to use Canal water for drip irrigation, overhead storage capacity (assessed in accordance with Annexure VII) should be created.

All efforts should be made to arrive at the realistic water requirement of the crop for the particular region. Moreover, the drip irrigation system should be designed in such a manner that required amount of water is made available to the crops depending upon stage of growth of the crop.

One or more farmer who agree to use the same water source for irrigating their land, could be permitted to avail assistance for installing the Micro Irrigation system as an individual.

The availability of motive power and pumps of adequate capacity should be ensured before installation of the Drip Irrigation system and sanction of assistance. In general when water is to be lifted from a depth of 15 m to 25 m, the power requirement would be:

- a. 1 H.P./ha for orchard crops
- b. 3 H.P./ha for vegetables and other closely spaced crops

Assistance should not be sanctioned without ensuring adequate power availability. Assistance should be limited to the extent of land for which adequate power is available. The source of power could be electricity through State Electricity Boards, Distribution companies, non-conventional energy or diesel engines.

**Transfer of Technology**

**a) Training programmes**

Human Resources Development through training programmes for officials, farmers, entrepreneurs and other active players involved in microirrigation is an important element of the scheme. These training programmes will be coordinated by the Horticulture Division, DAC with the involvement of NCPAH and will be organized through PFDCs, SAUs, ICAR Institutes etc and reputed manufacturers. These training programmes will be project based which will be approved by the Executive Committee of NCPAH. In general, for a 5 days training programme the total assistance will be limited to Rs. 25,000/-for a group of 25 participants.

**b) Seminars/Exhibitions**

The scheme will facilitate organizing Seminar, Workshops, Exhibitions publicity campaigns at different levels. The norms of assistance for Seminar/Workshops is as follows:

Category	Duration (days)	Maximum assistance (Rs. in lakh)
International	5	50.00
National Level	5	10.00
Regional/District Level	2-3	5.00

The events will be organized through public sector or directly by the DAC with 100% assistance. In case of Private Sector, the assistance will be limited to Rs. 5.00 lakh for International, Rs. 2.5 lakh for National and Rs. 1.00 lakh for regional events, which will be project based.

**Demonstrations of Micro Irrigation**

The demonstration will be taken up only on recognised farms belonging to State/ Central Government / SAUs/NGOs of repute/Trusts, on their own land/ ICAR Institutes and progressive farmers growing horticultural crops. Each farm will get a demonstration unit of 0.5 hectares area only. The demonstration would be laid at strategic locations along road side for the maximum benefit of the farmers.

The procedure to implement this component of the scheme is the same as suggested for drip irrigation installation component. The manufacturers/suppliers approved for drip irrigation installation may lay demonstrations.

For demonstrations, assistance would be provided @ 75% of unit cost for a maximum area of 0.5 ha per beneficiary family.

**PRECISION FARMING DEVELOPMENT CENTRES (PFDCS)**

The existing 17 PFDCs (list at Annexure VIII) will provide necessary technical support and research back up while implementing the Micro Irrigation scheme. Five more PFDCs will be established in a regionally differentiated manner to cater to the needs of the region where PFDCs do not exist presently. Based on project based proposals, the new PFDCs as well as the programmes of the ongoing PFDCs will be taken up. Besides, depending on the need, sponsored projects will also be taken up on specific areas of Micro Irrigation.

**SCHEME ADMINISTRATION**

The scheme will have a three tier system for effective implementation and monitoring of the scheme.

**I. National Level**

**a) National Committee on Plasticulture Applications in Horticulture (NCPAH)**

At the national level, the National Committee on Plasticulture

Applications in Horticulture (NCPAH) under the Chairmanship of Minister of Agriculture, GOI will be the apex body which will provide overall guidance and review the progress on the coverage of area under MI in the country.

**b) Executive Committee on Micro Irrigation**

The Executive Committee (EC) of NCPAH headed by the Secretary, Department of Agriculture & Cooperation will oversee the activities of the MI scheme and approve the Action Plans including plans of PFDCs, projects on Technology Transfer and Sponsored Project.

The allocation for various states/components would be within the discretions of EC. It will ensure smooth functional linkages among different agencies. The EC shall meet as frequently as necessary but at least once every quarter.

**II. State Level**

**(a) State Micro Irrigation Committee**

**The concerned State Government under the Chairmanship of the Agriculture Production**

Commissioner/Principal Secretary/Secretary Horticulture/Agriculture will form a State Micro Irrigation Committee (SMIC). The SMIC will devise strategies to promote MI in their respective States. The Panchayati Raj Institutions existing in the State will be involved in the implementation structure, particularly the selection of beneficiaries. The Structure of SMIC will be as follows:

Designation	Status	
APC/ Secretary (Hort. / Agri.)	Chairman	
Secretaries: Water Resources Rural Development Panchayati Raj Rep. of Ministry of Agriculture	Member Member Member Member Member Member Member Member Member Member Member	
Directors: 1 Director/Head of Rural Development		
Directors) of Research of SAUs of the State		
Principal Investigator (PI) of PFDC		
Representative of Lead Banks		
Two representatives of State level Growers Associations		
Representative of State Agro Industries		
Representative of Irrigation Association of India <IAI>		
Experts (one each from the fields of Horticulture, Agronomy, Soil Science, Agricultural Engineering, Water Management, Economist, IT)		Members
Representative from state ground water board		
Director of Horticulture/Agriculture/ Mission Director (NHM)	Member Secretary	

The Chairman at his direction can co-opt official/expert as an invitee. The SMIC will have the following functions:

Organize base line survey and feasibility studies in different parts of the State, covering various crops and technologies. Ensure smooth implementation of Micro Irrigation project in different Districts of the State. Ensure allocation of State's share of resources required for implementing the Scheme and make it available to the Implementing Agencies at the District level. Finalize and forward the consolidated Action Plan of the Districts to

DAC. Circulate the list of System Manufacturers registered with them along with the price list to the District Micro Irrigation Committee (DMIC) and Implementing Agency. They will also indicate the quantum of money to be paid by the beneficiary / Bank to the Manufacturer before installing the system. Mobilize credit requirement of the farmers for installing Micro Irrigation System through the Financial Institutions. Facilitate PFDCs in organizing various training and extension programmes for farmers, officials, NGOs, entrepreneurs etc.

This Committee shall host a website indicating the details and status on the progress of the Micro Irrigation Scheme in different Districts of the State.