MICRO IRRIGATION
(DRIP & SPRINKLER IRRIGATION)

GUIDELINES

MINISTRY OF AGRICULTURE
DEPARTMENT OF AGRICULTRE & COOPERATION
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Radha Singh
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Secretary
(Government of India)

Government of India
Ministry of Agriculture
Department of Agriculture & Cooperation
Krishi Shawan, New Delhi-110001
Phone:23382651,23388444
Fax No. : 23386004

MESSAGE

Water is one of the most critical inputs for agriculture which consumes more than 80% of the water resources of the country. Availability of adequate quantity and quality of water are, therefore, key factors for achieving higher productivity levels. Investments in conservation of water, improved techniques to ensure its timely supply, and improve its efficient use are some of the imperatives which the country needs to enhance. Poor irrigation efficiency of conventional irrigation system has not only reduced the anticipated outcome of investments made towards water resource development, but has also resulted in environmental problems like water logging and soil salinity thereby affecting crop yields. This, therefore, calls for massive investments in adoption of improved methods of irrigation such as drip and sprinkler, including fertigation.

The Ministry of Agriculture had initiated the programme for promoting drip irrigation during the VIII Five Year Plan as a Centrally Sponsored Scheme on Use of Plastic in Agriculture. Besides, program for micro irrigation has been taken up through different schemes like Technology Mission for Integrated Development of Horticulture in North East (TMNE), Integrated Scheme for Oilseeds, Pulses & Oil Palm and Miaze (ISOPOM). Despite these efforts, the coverage of area under micro irrigation is only about two million ha. whereas the Task Force on Micro Irrigation (2004) has indicated a potential of 69 million ha. Launch of these mission mode programmes envisages several other interventions in which enhanced plastic use in Agriculture will pave the way for precision farming, improved packaging, lowering cost of cultivation, and bridging gaps in technology.

The scheme will be implemented by an identified Implementing Agency at the district level with focus on the areas under horticulture crops being covered under the National Horticulture Mission (NHM). The success of the Scheme will depend on an effective delivery mechanism with close coordination between the farmers, system suppliers and the Implementing Agency. The mechanism for achieving such synergy has been detailed in these guidelines. Besides, attempts have been made to provide details about cost norms, pattern of assistance, formats for furnishing project proposals and the role of various national and state level organizations for effective implementation of the scheme.

The Guidelines need to be disseminated widely for enabling the farmers to derive maximum benefits under the Scheme.

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(Radha Singh)

CONTENTS

Key features of the Micro Irrigation (MI) Scheme

- It 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 (para 2).

- Assistance to farmers will be for covering a maximum area of five ha per beneficiary family (para 3).

- Assistance for drip and sprinkler demonstration will be 75% for the cost for a maximum area of 0.5 ha per beneficiary which will be met entirely by the Central Government (para 3).

- The Panchayati Raj Institutions (PRIs) will be involved in selecting the beneficiaries (para 3).

- All categories of farmers are covered under the Scheme. However, it need to be ensured that at least 25% of the beneficiaries are Small & Marginal farmers (para 3).

- The focus will be on horticultural crops being covered under the National Horticulture Mission. A cluster approach will be adopted (para 5).

- The Scheme includes both drip and sprinkler irrigation. However, sprinkler irrigation will be applicable only for those crops where drip irrigation is uneconomical (para 18).

- There will be a strong HRD input for the farmers, field functionaries and other stake holders at different levels. Besides there will be publicity campaigns, seminars/workshops at extensive locations to develop skills and improve awareness among farmers about importance of water conservation and management (para 27).

- The Precision Farming Development Centres (PFDCs) will provide research and technical support for implementing the scheme (para 33).

- At the National level, National Committee on Plasticulture Application in Horticulture (NCPAH) will be responsible for coordinating the Scheme, while the Executive Committee on Micro Irrigation (ECMI) will approve the Action Plans (Para 35,36). At the State level the State Micro Irrigation Committee will coordinate the programme, while at the District level the District Micro Irrigation Committee will oversee the programme (Para 38,41).

- The Scheme will be implemented by an Implementing Agency (IA) appointed by the State Government, which will be the District Rural Development Agencies (DRDA) or any identified Agency, to whom funds will be released directly on the basis of approved district plans for each year (para 42).

- The IA shall prepare Annual Action Plan for the District, get it forwarded by the DMIC & SMIC for approval by the Executive Committee (EC) of NCPAH (Para 43).

- Payment will be made through crossed cheque. If the cheque is in the name of the system supplier, the same will be delivered through the farmer/beneficiary (para 51).

- Registration of System Manufacturers will be done by the SMIC for use of the Districts (Para 57).

- Supply of good quality system both for drip and sprinkler irrigation having BIS marking, proper after sales services to the satisfaction of the farmer is paramount (para 60).

CENTRALLY SPONSORED SCHEME ON MICRO IRRIGATION GUIDELINES

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

2. 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 ava ilable their share of 20% to the Implementing Agencies (IA) during the financial year.

Pattern of Assistance

3. 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

4. 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

5. The scheme will facilitate increase in coverage of are 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.

6. **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 -1: 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
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

7. 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

8. 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.

9. 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.

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

11. 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 Cooperative Society /SHG/Incorporate company and not directly.

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

13. 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.

14. 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 move 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.

15. **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.

16. 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

17. 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.

18. 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.

19. 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.

20. 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), Swarnajayanti Gram Swarozgar Yojana (SGSY), Sampoorna Grameen Rozgar Yojana (SGRY) and Integrated Waterlands 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.

21. 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 in **Annexure IV.** 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:

a. 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.

b. 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.

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

23. 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.

24. 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.

25. 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

26. 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**

27. 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**

28. 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

29. 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

30. 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.

31. 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.

32. 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)

33. 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

34. 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)**

35. 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**

36. 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.

37. 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**

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

39. 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.

40. 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.

III. **District Level**

(a) **District Micro Irrigation Committee (DMIC)**

41. At the district level, the State Government will constitute the District Micro Irrigation Committee (DMIC). The DMIC will be headed by the Chief Executive Officer (CEO) of Zila Parishad/District Rural Development Agency (DRDA)/Collector of the District having its members/ representatives from concerned Departments viz. Agriculture, Horticulture, Rural Development, Irrigation and Water resources, Growers' Association, Krishi Vigyan kendras (KVKs) and

representative of the local lead Banks including the IA. The local Panchayat Raj Institutions (PRIs) will be involved in implementation of MI Scheme to the extent and manner considered appropriate by the IA keeping in view the capacity of the PRI. The District Horticulture Officer/ District Agriculture Officer will be the Member Secretary of DMIC. The DMIC will have the following functions:

- Review and forward the Action Plan and forwards it to the Ministry of Agriculture through SMIC.
- Mobilize credit requirement of the farmers for installing Micro Irrigation System through the Financial Institutions.
- Monitor and review the physical & financial progress of implementation of MI Scheme.
- Review the submission of utilization certificate by the IA.
- Provide feed back to SMIC on monthly basis.

(b) **Implementing Agency (IA)**

42. In the States, the Scheme will be implemented by an Implementing Agency (IA) specially designated for this purpose by the State Government, which will be the District Rural Development Agencies (DRDA) or any identified Agency in conjunction with Directorate of Horticulture/Agriculture having the required infrastructure. The Directorate of Horticulture/Agriculture would provide the technical support for the scheme. The financial assistance to the farmers will be routed through the IA. Assistance to the tune of one percent of the annual outlay for the District will be provided for monitoring the scheme in the District by the IA. Assistance to the tune of one percent of the annual outlay for the District will be provided for monitoring the scheme in the District by the IA.

43. The IA shall:

- Formulate Action Plan for their District as per prescribed format (**Annexure -IX**).
- Forward Action Plan to Ministry of Agriculture through DMIC/SMIC.
- Receive funds directly from the Ministry of Agriculture.
- Disburse the assistance to the beneficiaries.
- Furnish Utilization Certificate and Monthly Progress Report in the prescribed proforma (**Annexure -X**) to Ministry of Agriculture.

44. The IA shall ensure that:

- The MI technology is promoted in an holistic manner involving appropriate cultivars, good agronomic practices, post harvest handling, processing and marketing with an end-to-end approach.
- The assistance for Micro Irrigation System is commensurate with the size of the holding of the beneficiary family as per revenue records.
- No service charges are levied by any institution/organization entrusted with the task of commissioning of the Drip/Sprinkler System. To avoid any discrepancies and for smooth implementation of the scheme, it will be necessary to have only one implementing agency in the Districts.
- Assistance is disbursed to the beneficiary within one month of commissioning the System.

Technical Support Group (TSG)

45. The MI scheme will have a strong technical back up at the Center as well as at the State levels. Technical support at the National and State level will be provided by the Horticulture Division of DAC through the NCPAH for which the NCPAH will be suitably strengthened it by deploying Experts in various related fields of agriculture, water management, Information Technology in the form of Technical Support Group. The TSG at the National Level will be housed

in NCPAH Secretariat. The NCPAH will have flexible norms for recruiting professionals, on contract. Retired experts, service personnel, computer professionals and other related persons could be engaged for TSG on contract basis. The honorarium will be fixed by the EC depending upon the qualifications, experience and expertise of the experts in accordance with the norms being followed in other Schemes of DAC like National Horticulture Mission. Fresh graduates could be employed as Research Associates (RA) as per the norms of ICAR and these RAs will help the TSG at the field level.

46. At State level also a TSG could be formed which will help the Implementing Agency at different stages for implementation and monitoring of the Scheme. The SMIC may select the Expert(s) for the State level TSG. The Principal investigator of the PFDC of the concerned State may be involved in the selection process and constitution of the TSG.

47. The TSG will have the following functions:

- Help in monitoring the Scheme in different States including guidance in technical matters.
- Assist in preparation of state plans and help creation of benchmark data for the States through consultants.
- Assess the projects submitted by the Districts/States for release of funds.
- Help in preparation of location and crop specific training modules.
- Assist on formulation/ updating of BIS standards.
- Advise on documentation and dissemination of success stories.
- Help in organizing State, National and International level Seminars / Conferences / Workshops.
- Plan technology development for situation specific problems (Hilly terrain, brackish water use etc.).

Procedure for Approval

48. The Implementing Agency shall prepare the Action Plans well in advance, get it approved by the DMIC and SMIC. The SMIC shall consolidate the proposal for the State as a whole and forward 30 copies of the same to the Ministry of Agriculture for approval by EC. The IA should strive to prepare the Action Plan for the next year as well duly ensuring the coverage of all potential crops under Micro Irrigation. After approval of EC, funds will be released directly to the IA. Release of funds during the subsequent year will be subject to furnishing of Utilization Certificate (UC) by the IA to the DAC.

GENERAL GUIDELINES IN ADMINISTERING THE MICRO IRRIGATION SCHEME

A) Transparency in Beneficiary Selection

49. The Implementing Agency (IA) at the District level should follow an uniform procedure duly ensuring full transparency in selecting the beneficiaries and releasing the assistance to them in an efficient manner. In order to bring about uniformity, the IA could adopt the procedure described below:

I) **Pre Installation**

a) The IA will:

- Widely publish the scheme at the block and village levels through its existing network.
- Appoint a Nodal Officer who is preferably well versed in horticulture/agriculture will be responsible for the Micro Irrigation Scheme.
- Disseminate the list of Suppliers and rate list approved by SMIC to the farmers.
- Organize at least one District Level Seminar/Workshop with the participation of Industry representatives.

- Compile the application forms/proforma invoice submitted by the farmers, scrutinize it, codify it and forward the same to the company's/Manufacturer's local office indicated by the farmer.

b) The Manufacturer/Company will:

- Assess the crop water requirement as per the crop for which the system is to be provided.
- Prepare an estimate of cost and submit to IA duly indicating the time frame by when the system will be supplied in the farmer's field.

c) The IA will examine the estimate and convey its approval indicating the approved amount and the farmer's share after deducting the eligible subsidy, duly endorsing a copy to the selected Company/Dealer and in case the farmer avails bank loan, a copy to the concerned bank.

d) Beneficiary will pay his/her share of contribution to the manufacturer/supplier; who issues receipt to the farmer in duplicate for the amount received. The payment of beneficiary's share could be in installments as decided by the SMIC while registering the Manufacturers.

e) In case the beneficiary intends to avail credit he/she will submit proposal along with the quotation from the manufacturer/supplier to the concerned Bank, who in turn will:

i) Scrutinize the proposal and sanction the loan amount based on guidelines and norms.

ii) Pay the beneficiary's sanctioned amount to the Manufacturer/Supplier under intimation to the beneficiary in suitable installments as decided by SMIC.

II) **Installation**

50. The Company will install the system and commission it to the satisfaction of the farmer duly ensuring the following:

a) Only good quality components having BIS marking will be installed in the farmer's field.

b) The installed system should match the water requirement of the crop standing in field at the time of installation.

c) Provide necessary orientation training to the farmer on the agronomic practices to be followed for irrigating the crop with drip/sprinkler irrigation.

d) Provide proper warranty and also a users manual for running & maintenance of the system, whether drip or sprinkler or both, as the case may be.

III) **Disbursement of Assistance – Post Installation**

If beneficiary pays his own share :

51. Subject to satisfactory installation of the System, the IA will release payment to the beneficiary through crossed Cheue/Draft. In case the cheque is drawn in favour of the company, it will be delivered through the farmer. The farmer will pay the balance amount due to the Manufacturer.

If beneficiary takes loan:

52. If the sanctioned loan amount is less than 50% of the system cost, the beneficiary shall bear the balance amount.

53. Subject to satisfactory installation of the System, the balance amount payable to the Manufacturer/Supplier will be released by the IA through the beneficiary by crossed cheque. The Bank will also release the balance amount, if any, due to the manufactures by crossed cheque through the beneficiary.

54. The IA will ensure that the payment of subsidy is made within a month from the date of installation of the system. The applicant should be informed about sanctioning of the system within one month from the date of receipt of his/her application. As far as feasible, the details of the beneficiary and the amount sanctioned, the Company and area covered should be posted on the web site by the IA.

55. The farmers shall be free to select the manufacturers/suppliers from an approved list of Manufacturers/Suppliers registered by the SMIC for installing the Micro Irrigation System in the area/taluka/ of the location of farmer's field.

56. The IA should ensure that bills are accepted and passed only for the material conforming to BIS standards. (If at a later date, it is found that the subsidy is paid for the sub standard material, not bearing BIS markings, the concerned official of IA will be held responsible). If Implementing Agency finds that system components supplied does not bear BIS markings, they should reject the bill and take steps to black list the company which has supplied the sub standard system and take necessary corrective steps to supply standard quality material to the concerned farmer. Supply of substandard materials should be severely dealt with.

B) Registration of Manufacturers

57. Registration of the System manufacturers will be done by the SMIC, for use of the Districts. Only those Manufacturers Companies which have all the facilities to ensure the quality of product and who can provide prompt after sales services will be registered. The companies who wish to participate in the Micro Irrigation Scheme should either manufacture all the major drip components within their factory or in collaboration with specialized manufacturers. While registering, the manufacturers should declare the technical details of the components proposed to be manufactured and supplied.

58. While registering the manufacturers, the following aspects shall be ensured:

i. In the case of drip irrigation, the Company must manufacture at least laterals and emitting devices (other than micro-tubes) conforming to BIS quality. In the case of Sprinkler Irrigation the company should manufacture at least the HDPE pipes and nozzles as per BIS specifications. They must provide guarantee of quality assurance of other components which is not manufactured by them.

ii. The Company must provide free after sales service to the farmers at least for three years. Moreover, they should set up Service Centres for providing technological and agronomic support at the grass root level.

iii. The companies will supply the BIS marked material only. The list of relevant BIS components is given in **Annexure XI.**

iv. In case, the company intends to supply imported components, they should have prior approval of the DAC.

v. The material should be supplied directly by the manufacturers only or their authorized Distributor / Dealer. In all cases the manufacturers should authenticate the invoices. Such Manufacturers/Dealers shall furnish a Bank Guarantee, quantum of which will be prescribed by the SMIC, valid for a maximum period of three years.

vi. Each company will have its own pricing system. However, the company would be required to submit the same to the Registering Authority/SMIC in the beginning of the year and as and when the prices are revised by the Manufacturers.

59. A registration fee not exceeding Rs.50,000 per annum may be charged from system manufacturers at the time of registration. The revenue generated from the registration fee may be used for promoting micro irrigation in the State such as engagement of State TSG.

(C) Quality Control

60. The crucial aspect of supply of micro-irrigation system is quality of the hardware delivered to the farmer. Poor quality can directly affect performance of the system. The poor performance may affect yield of the crop, quantity of water applied, quantity of fertilizers delivered to the plant etc.. It may also increase energy consumption. In fact, sub standard system will not only impact performance, but could also reduce the durability and the life of the components and/or system. Therefore, quality assurance is a prerequisite which can not be compromised under any circumstance.

61. Frequent surveillance by inspection teams comprising of officials from NCPAH/ PFDC, CIPET, IAI, BIS or personnel from these agencies/TSG will be a regular feature under the Scheme. They will draw samples periodically from the field on random basis within a period of three years from the date of installation of the system. At the time of inspection the system should be fully functional. Besides, the following criteria will be looked into:

Check list for sanctioning assistance under Micro Irrigation Scheme

1. Material supplied by the Manufacturer should be of good quality having BIS certification. Moreover, the components installed should conform to the specifications declared by the manufacturer during their registration.
2. Distribution of the Drip laterals and emitters should be in accordance with the crop spacing duly ensuring effective root zone wetting.
3. The application of water between the first and the last emitter on a lateral should be fairly uniform (within 10% variation).
4. The drip system should be installed and commissioned to the satisfaction of the farmer.
5. The farmer should be in possession of a user's manual of the relevant manufacturer who has installed the system.

62. In case of detection of failures or supply of poor sub standard quality material, the concerned manufacturer will be issued warning for first offence. In case of subsequent offences, the Company will be deregistered and debarred from participating in the MI Scheme through out the country in addition to invoking of bank guarantee furnished by their dealers.

63. In order to ensure supply of BIS quality materials to the farmers the manufacturers who are registered to participate in Micro Irrigation Scheme should manufacture only such system components which has BIS Certification. It will be responsibility of the Irrigation Association of India (IAI) to promote the quality assurance mechanism by registering only such manufacturers who gives an undertaking this effect, as a Member of IAI.

(D) After Sales Service

64. The manufacturers should have the network for providing after sales service in the area of operation. Operation and maintenance of the system though simple, requires training for maintenance, fertigation, chemigation etc. in the initial stage. Therefore the manufacturers should provide detailed operational and maintenance manuals in vernacular languages at the time of installation of the system. The beneficiaries should be made aware to follow the instructions provided by the manufacturers in operation and maintenance of the drip/sprinkler irrigation system.

65. SMIC should ensure that drip/sprinkler system manufacturers should open their Regional offices/service centers at the District/Block level when a reasonable area has been covered by the company in a Block/District. These service centers and/or offices should have the facilities to provide technical guidance on agronomic practices, system maintenance schedule to the farmer, supply spare parts and ensure satisfactory performance of the system during the warranty period. List of such after sales centre with full address/telephone numbers/e-mail should be widely published.

66. Free after sales service should be provided by the manufacturer/authorized distributor at least for three years. In the event, if any system Manufacturer fail to abide by his commitments, the same should be brought to the notice of DMIC and DAC/EC for taking appropriate action.

67. The manufacturer should take the responsibility in case of any dispute arising from the supply of their product through their Distributor or Dealer. The IA/SMIC of individual State shall evolve a process and modus operandi for redressal of disputes or arbitration at Taluka/Block Levels.

68. The SMIC/IAs are free to evolve strong punitive measures against earring companies as well as against their own staff, in order to safeguard the interests of farmers and in order to ensure qualitative utilization of public funds.

(E) Supply of Imported Components

69. In the case of suppliers importing systems/components into India, only those may be considered who have a definite intention to manufacture the presently imported systems/ components within the country within a period of two years from the date of registration. The intention to manufacture would be assessed by the NCPAH with reference to the following factors:

1. The manufacturing facilities and capacities for different components proposed to be set up by the supplier and the time frame within which they are proposed to be set up.

2. The scale of investment proposed to be made in the manufacturing facilities.

3. The foreign collaboration agreement, if any, entered into by the supplier for setting up manufacturing facilities.

4. The reputation and competence of the joint venture partner, if any.

5. The approvals obtained for setting up of the manufacturing facilities and the appraisal of the project made by a financial institution.

6. The term loans and working capital tied up for the project from financial institutions.

7. Steps taken for acquisition of land, provision of utilities and other steps crucial for initiation of the project.

8. The track record, size, financial health and performance of the promoters or companies with which the promoters are associated.

70. In order to establish supplier's intention to manufacturer systems/components, NCPAH may call for such information from the supplier as may be appropriate. SMIC will also ensure that the items which are proposed to be imported in the initial phase are actually manufactured at a subsequent stage as per the requirement of the farmers.

71. Suppliers importing systems/components into India whose intention to manufacture is established will be included in the list of approved suppliers under the scheme initially for a period of one year. The following points would be considered while registering these companies for supplying imported components/systems under the MI Scheme:

a. The imported components carry the quality certification of the national standards institution of the concerned country or International standards or a Standards Institutions included in the list of such institutions furnished by the BIS.

b. The imported components shall not be inferior to the BIS standards for these components. The conformity to BIS standards will be got certified by CIPET (or such other institutions as may be notified) by the Company directly.

c. BIS are available for most of the drip components. However, where no BIS standards exist, the imported components should conform to the standards prescribed by the national

standards institution of the exporting country included in the list of institutions furnished by BIS. The conformity to the relevant standard will be got certified from the CIPET or other notified institution after the testing of samples.

72. The Suppliers of importing systems/components into India who desire to get themselves included in the approved list of suppliers will first get their intention to manufacture assessed by NCPAH, obtain certificate of conformity to BIS / other relevant standards (as the case may be) from CIPET or other notified institution and then go for manufacture.

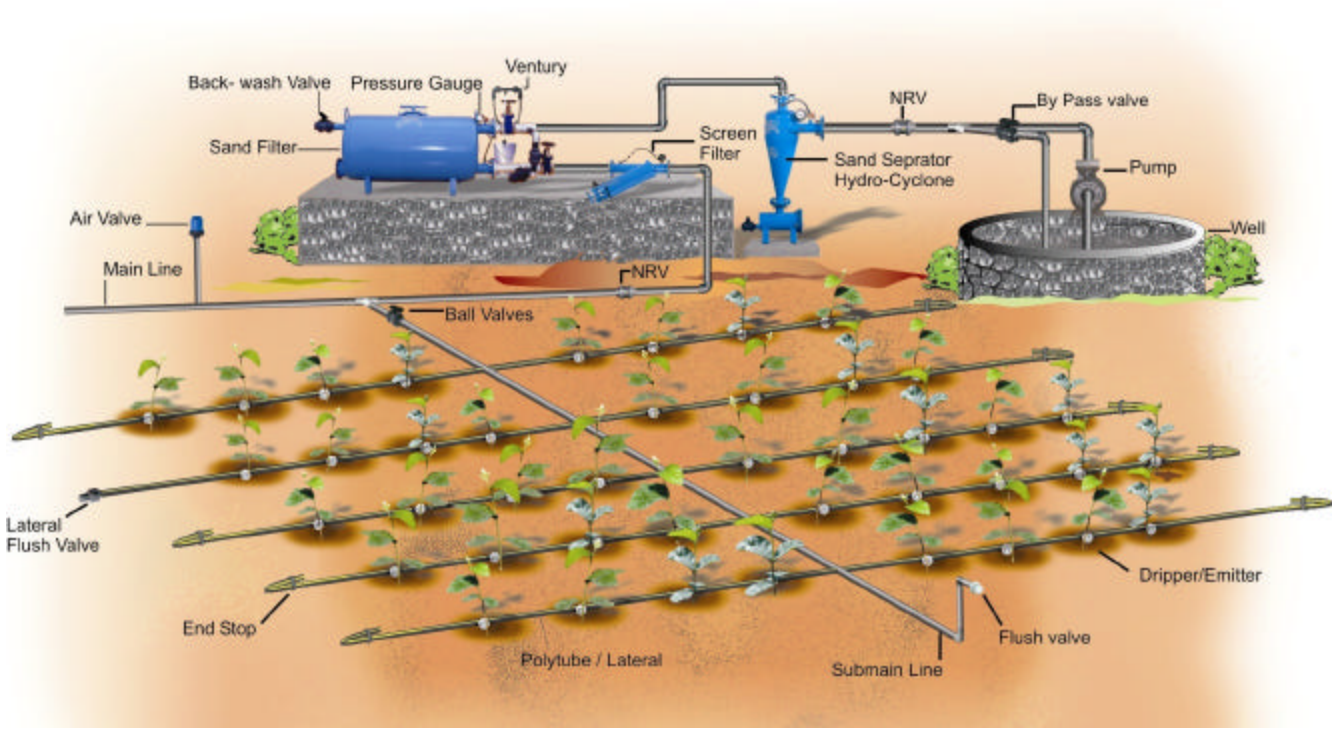
73. The suppliers importing systems/ components into India who fulfill the above conditions will have to get their approval renewed at the end of one year, provided they produce proof for having taken steps to set up manufacturing facilities in accordance with the above procedure.

74. In the event of the manufacturing facilities not having been established at the end of the second year, the approval will be liable to be withdrawn. In the case of suppliers manufacturing certain components in India and importing certain other components, the guidelines as per indigenous components would apply in respect of components manufactured within the country and guidelines relevant to imported components would apply in respect of imported components.

OVERALL TARGETS

75. The Micro Irrigation Scheme has been approved for implementation during the Tenth Plan for covering a total area of 6.2 lakh ha involving 3.8 lakh ha under drip irrigation and 2.4 lakh ha under sprinkler irrigation. The scheme also envisages organizing 500 training programmes, 950 awareness programmes and 900 demonstrations besides organizing one International, two National level and 14 regional levels seminars/workshops.

LAYOUT OF DRIP IRRIGATION SYSTEM



Annexure -I

INDICATIVE REQUIREMENT OF MATERIAL FOR DRIP IRRIGATION SYSTEM

I. For 0.4 hectare

SN	DESCRIPTION	Unit	Quantity of material required for different crop spacings (metre)												
			12 X 12	10 X10	9X9	8X8	6 X 6	5X5	4 X 4	3 X3	3 X 1.5	2.5 X 2.5	2 X 2	1.5 X 1.5	1 X 1
1	PVC PIPE 90 MM	Metre	0	0		0	0	0	0	0	0	0	0	0	0
2	PVC PIPE 75 MM	Metre	0	0		0	0	0	0	0	0	0	0	0	36
3	PVC PIPE 63 MM	Metre	0	0		0	0	0	0	0	0	0	0	0	66
4	PVC PIPE 50 MM	Metre	66	96	96	96	96	96	96	96	96	96	96	96	0
5	LATERAL 12 MM	Metre	360	425	460	535	710	850	1050	1410	1410	1700	2125	2825	2020
6	LATERAL 16 MM	Metre	0	0		0	0	0	0	0	0	0	0	0	0
7	EMITTER 4 LPH / 8 LPH	No.	115	165	210	260	460	490	760	910	1810	1296	1020	1810	2020
8	MICRO TUBE 6MM	Metre	90	125	160	195	345	370	570	0	0	0	0	0	0
9	CONTROL VALVE 75MM	Metre	0	0		0	0	0	0	0	0	0	0	0	1
10	CONTROL VALVE 50MM	Metre	1	1	1	1	1	1	1	1	1	1	1	1	0
11	FLUSH VALVE 63MM	Metre	0	0		0	0	0	0	0	0	0	0	0	1
12	FLUSH VALVE 50MM	Metre	1	1	1	1	1	1	1	1	1	1	1	1	0
13	SCREEN FILTER 10 M³/HR	No.	1	1	1	1	1	1	1	1	1	1	1	1	1
14	BY PASS ASSEMBLY - 1.5"x1.5"	No.	0	0		0	0	0	0	0	0	0	0	0	1
15	BY PASS ASSEMBLY - 1½"	No.	1	1	1	1	1	1	1	1	1	1	1	1	0
16	VENTURY & MANIFOLD (2½")	No.	0	0		0	0	0	0	0	0	0	0	0	1
17	VENTURY & MANIFOLD (1½")	No.	1	1	1	1	1	1	1	1	1	1	1	1	0
18	FITTING & ACCESSORIES	Set	1	1	1	1	1	1	1	1	1	1	1	1	1
	OPTIONAL ITEM														
19	SAND FILTER 10 M³/HR	No.	1	1		1	1	1	1	1	1	1	1	1	1

II. For one hectare

SN	DESCRIPTION	Unit	Quantity of material required for different crop spacings (metre)												
			12 X 12	10 X10	9X9	8X8	6 X 6	5 X5	4 X 4	3X3	3 X 1.5	2.5 X 2.5	2 X 2	1.5X1.5	1 X 1
1	PVC PIPE 90 MM	Metre	0	0		0	0	0	0	0	0	0	0	0	102
2	PVC PIPE 75 MM	Metre	0	0		0	0	0	0	54	54	54	54	54	102
3	PVC PIPE 63 MM	Metre	0	0		0	54	156	156	102	102	102	102	102	0
4	PVC PIPE 50 MM	Metre	156	156	156	156	102	0	0	0	0	0	0	0	0
5	LATERAL 12 MM	Metre	850	1050		1310	0	0	0	3500	3500	4000	5100	6700	5050
6	LATERAL 16 MM	Metre	0	0	1150	0	1760	2020	2625	0	0	0	0	0	0
7	EMITTER 4 LPH / 8 LPH	No.	300	425	500	660	1150	1225	1875	2250	4500	3200	2510	4500	5050
8	MICRO TUBE 6MM	Metre	250	325	375	495	865	920	1410	0	0	0	0	0	0
9	CONTROL VALVE 75MM	Metre	0	0		0	0	0	0	1	1	1	1	1	2
10	CONTROL VALVE 63MM	Metre	0	0		0	1	1	1	0	0	0	0	0	0
11	CONTROL VALVE 50MM	Metre	1	1	1	1	0	0	0	0	0	0	0	0	0
12	FLUSH VALVE 63MM	Metre	0	0		0	0	1	1	1	1	1	0	0	2
13	FLUSH VALVE 50MM	Metre	1	1	1	1	1	0	0	0	0	0	1	1	0
14	SCREEN FILTER 25 M³/HR	No.	0	0		0	0	0	0	0	0	0	0	0	0
15	SCREEN FILTER 10 M³/HR	No.	1	1	1	1	1	1	1	1	1	1	1	1	1
16	BY PASS ASSEMBLY - 2"x1.5"	No.	0	0		0	0	0	0	0	0	0	1	1	0
17	BY PASS ASSEMBLY - 1.5"x1.5"	No.	0	0		0	0	0	0	1	1	1	0	0	1
18	BY PASS ASSEMBLY - 2"	No.	0	0		0	1	1	1	0	0	0	1	1	0
19	BY PASS ASSEMBLY - 1½"	No.	1	1	1	1	0	0	0	0	0	0	0	0	0
20	VENTURY & MANIFOLD (2½")	No.	0	0		0	0	0	0	1	1	1	0	0	1
21	VENTURY & MANIFOLD (2")	No.	0	0		0	1	1	1	0	0	0	1	1	0
22	VENTURY & MANIFOLD (1½")	No.	1	1	1	1	0	0	0	0	0	0	0	0	0
23	FITTING & ACCESSORIES	Set	1	1		1	1	1	1	1	1	1	1	1	1
	OPTIONAL ITEMS														
24	SAND FILTER 30 M³/HR	No.	0	0		0	0	0	0	0	0	0	0	0	1
25	SAND FILTER 10 M³/HR	No.	1	1	1	1	1	1	1	1	1	1	1	1	0

III. **For two hectares**

SN	DESCRIPTION	Unit	Quantity of material required for different crop spacings (metre)												
			12X12	10X10	9X9	8X8	6 X 6	5 X5	4 X 4	3 X3	3X1.5	2.5X2.5	2X2	1.5X1.5	1X1
1	PVC PIPE 90 MM	Metre	0	0		0	0	0	0	0	0	0	0	0	0
2	PVC PIPE 75 MM	Metre	0	0		0	72	72	108	168	168	168	168	168	168
3	PVC PIPE 63 MM	Metre	72	72	72	72	144	144	284	284	284	284	284	284	284
4	PVC PIPE 50 MM	Metre	144	144	144	144	0	0	0	0	0	0	0	0	0
5	LATERAL 12 MM	Metre	1680	2050			0	0	5050	6730	6750	8070	10090	13450	10100
6	LATERAL 16 MM	Metre	0	0	2250	2530	3370	4040		0	0	0	0	0	0
7	EMITTER 4 LPH / 8 LPH	No.	560	800	1000	1260	2250	2400	3750	4450	8900	6400	5000	8890	10000
8	MICRO TUBE 6 MM	Metre	420	600	750	950	1700	1800	2815	0	0	0	0	0	0
9	CONTROL VALVE 75MM	Metre	0	0		0	1	1	2	2	2	2	2	2	2
10	CONTROL VALVE 63MM	Metre	1	1	1	1	0	0	0	0	0	0	0	0	0
11	FLUSH VALVE 63MM	Metre	0	0		0	1	1	2	4	4	4	0	0	2
12	FLUSH VALVE 50MM	Metre	1	1	1	1	0	0	0	0	0	0	4	4	0
13	SCREEN FILTER 25 M3/HR	No.	0	0		0	1	1	1	1	1	1	0	0	0
14	SCREEN FILTER 10 M3/HR	No.	1	1	1	1	0	0	0	0	0	0	1	1	1
15	BY PASS ASSEMBLY - 1.5"x1.5"	No.	0	0		0	1	1	1	1	1	1	0	0	0
16	BY PASS ASSEMBLY - 2"	No.	1	1	1	1	0	0	0	0	0	0	1	1	1
17	VENTURY & MANIFOLD (2 1/2")	No.	0	0		0	1	1	1	1	1	1	0	0	0
18	VENTURY & MANIFOLD (2")	No.	1	1	1	1	0	0	0	0	0	0	1	1	1
19	FITTING & ACCESSORIES **OPTIONAL ITEMS**	Set	1	1	1	1	1	1	1	1	1	1	1	1	1
20	SAND FILTER 10 M3/HR		1	1	1	1	1	1	1	1	1	1	1	1	1

IV. For three hectares

SN	DESCRIPTION	Unit	Quantity of material required for different crop spacings (metre)											
			12X12	10X10	9X9	8X8	6X6	5X5	4X4	3X3	3X1.5	2.5X2.5	2X2	1.5X1.5	1X1
1	PVC PIPE 90 MM	Metre	0	0		0	0	0	0	0	0	0	0	222	222
2	PVC PIPE 75 MM	Metre	0	0	174	0	180	180	180	222	222	222	222	0	0
3	PVC PIPE 63 MM	Metre	264	264	174	264	174	174	174	348	348	348	348	348	348
4	PVC PIPE 50 MM	Metre	0	0	0	0	0	0	0	0	0	0	0	0	0
5	LATERAL 12 MM	Metre	2530	3030		3800	0	0	0	10100	10100	12120	15140	20200	15200
6	LATERAL 16 MM	Metre	0	0	3400	0	5046	6060	7570	0	0	0	0	0	0
7	EMITTER 4 LPH / 8 LPH	No.	836	1200	1500	1880	3350	3600	5630	6670	13340	9600	7500	13340	15000
8	MICRO TUBE 6 MM	Metre	630	900	1125	1410	1215	2700	4225	0	0	0	0	0	0
9	CONTROL VALVE 90MM	Metre	0	0		0	0	0	0	0	0	0	0	4	4
10	CONTROL VALVE 75MM	Metre	0	0		0	2	2	2	2	2	2	4	0	0
11	CONTROL VALVE 63MM	Metre	1	1	2	1	0	0	0	0	0	0	0	0	0
12	FLUSH VALVE 63MM	Metre	1	1	2	1	2	2	2	4	4	4	0	0	0
13	FLUSH VALVE 50MM	Metre	0	0		0	0	0	0	0	0	0	4	4	4
14	SCREEN FILTER 25 M³/HR	No.	0	0	1	0	1	1	1	1	1	1	1	1	1
15	SCREEN FILTER 10 M³/HR	No.	1	1		1	0	0	0	0	0	0			
16	BY PASS ASSEMBLY - 1.5"x1.5"	No.	0	0		0	1	1	1	1	1	1	0	0	1
17	BY PASS ASSEMBLY - 2"	No.	1	1		1	0	0	0	0	0	0	1	1	0
18	VENTURY & MANIFOLD (2½")	No.	0	0		0	1	1	1	1	1	1	0	0	1
19	VENTURY & MANIFOLD (2")	No.	1	1	1	1	0	0	0	0	0	0	1	1	0
20	FITTING & ACCESSORIES	Set	1	1	1	1	1	1	1	1	1	1	1	1	1
	OPTIONAL ITEMS														
21	SAND FILTER 30 M³/HR	No.	0	0		0	1	1	1	1	1	1	1	1	1
22	SAND FILTER 10 M³/HR	No.	1	1	1	1	0	0	0	0	0	0	0	0	0

V. For four hectares

N	DESCRIPTION	Unit	Quantity of material required for different crop spacings (metre)											
			12X12	10X10	9X9	8X8	6 X 6	5 X5	4 X 4	3 X3	3 X 1.5	2.5X2.5	2X2	1.5X1.5	1 X 1
1	PVC PIPE 90 MM	Metre	0	0		0	0	0	0	256	150	256	256	150	288
2	PVC PIPE 75 MM	Metre	0	0		0	252	252	252	0	102	0	0	102	240
3	PVC PIPE 63 MM	Metre	256	256	256	256	408	408	408	402	408	402	402	408	402
4	PVC PIPE 50 MM	Metre	402	402	402	402	0	0	0	0	0	0	0	0	0
5	LATERAL 12 MM	Metre	3500	4200	4500	5250	0	0	0	13750	13750	0	21000	27250	20200
6	LATERAL 16 MM	Metre	0	0		0	6760	8250	10500	0	0	16800	0	0	0
7	EMITTER 4 LPH / 8 LPH	No.	1150	1650	2000	2550	4500	4850	7550	8900	17800	12820	10200	17800	20200
8	MICRO TUBE 6MM	Metre	865	1240	1500	1910	3375	3640	5660	0	0	0	0	0	0
9	CONTROL VALVE 90MM	Metre	0	0		0	0	0	0	2	2	2	2	2	3
10	CONTROL VALVE 75MM	Metre	0	0		0	2	2	2	0	0	0	0	0	0
11	CONTROL VALVE 63MM	Metre	2	2	2	2	0	0	0	0	0	0	0	0	0
12	FLUS H VALVE 63MM	Metre	0	0		0	4	4	4	4	4	4	0	0	0
13	FLUSH VALVE 50MM	Metre	4	4	4	4	0	0	0	0	0	0	4	4	6
14	SCREEN FILTER 25 M^3/HR	No.	1	0	1	0	1	1	1	1	1	1	1	1	1
15	SCREEN FILTER 10 M^3/HR	No.	0	1		1	0	0	0	0	0	0	0	0	0
16	BY PASS ASSEMBLY - 3"	No.	0	0		0	0	0	0	1	1	1	0	0	0
17	BY PASS ASSEMBLY - 1.5"x1.5"	No.	0	0	1	0	1	1	1	0	0	0	1	1	1
18	BY PASS ASSEMBLY - 2"	No.	1	1		1	0	0	0	0	0	0	0	0	0
19	VENTURY & MANIFOLD (3")	No.	0	0		0	0	0	0	1	1	1	0	0	0
20	VENTURY & MANIFOLD (2½")	No.	0	0		0	1	1	1	0	0	0	1	1	1
21	VENTURY & MANIFOLD (2")	No.	1	1		1	0	0	0	0	0	0	0	0	0
22	FITTING & ACCESSORIES	Set	1	1		1	1	1	1	1	1	1	1	1	1
	OPTIONAL ITEMS														
23	SAND FILTER 40 M^3/HR	No.	0	0		0	0	0	0	1	1	1	1	1	1
24	SAND FILTER 30 M^3/HR	No.	1	1	1	1	1	1	1	0	0	0	0	0	0

VI. For five hectares

SN	DESCRIPTION	Unit	Quantity of material required for different crop spacings (metre)												
			12X12	10X10	9X9	8X8	6 X 6	5X5	4 X 4	3 X3	3X1.5	2.5X2.5	2 X 2	1.5X1.5	1 X 1
1	PVC PIPE 110 MM	Metre	0	0		0	0	0	0	0	0	0	336	336	336
2	PVC PIPE 90 MM	Metre	0	0		0	336	336	336	336	336	336	0	0	0
3	PVC PIPE 75 MM	Metre	336	336	336	336	0	0	0	0	0	0	672	672	672
4	PVC PIPE 63 MM	Metre	450	450	450	450	450	450	450	450	450	450	0	0	0
5	PVC PIPE 50 MM	Metre	0	0	0	0	0	0	0	0	0	0	0	0	0
6	LATERAL 12 MM	Metre	4200	5020	5600	6280	0	0	0	16730	16730	0	25100	33460	25100
7	LATERAL 16 MM	Metre	0	0		0	8370	10040	12550	0	0	20070	0	0	0
8	EMITTER 4 LPH / 8 LPH	No.	1400	2000	2500	3130	5560	6010	9380	11120	22230	16000	12520	22230	25020
9	MICRO TUBE 6MM	Metre	1050	1500	1875	2350	4170	4510	7035	0	0	0	0	0	0
10	CONTROL VALVE 90MM	Metre	0	0		0	2	2	2	0	0	0	0	0	0
11	CONTROL VALVE 75MM	Metre	2	2	2	2	0	0	0	4	4	4	6	6	6
12	FLUSH VALVE 63MM	Metre	4	4	4	4	4	4	4	4	4	4	6	6	6
13	FLUSH VALVE 50MM	Metre	0	0		0	0	0	0	0	0	0	0	4	6
14	SCREEN FILTER 25 M³/HR	No.	1	0	1	0	1	1	1	1	1	1	1	1	1
15	SCREEN FILTER 10 M³/HR	No.	0	1		1	0	0	0	0	0	0	0	0	0
16	BY PASS ASSEMBLY - 3"	No.	0	0		0	0	0	0	1	1	1	0	0	0
17	BY PASS ASSEMBLY - 1.5"x1.5"	No.	0	0		0	1	1	1	0	0	0	1	1	1
18	BY PASS ASSEMBLY - 2"	No.	1	1		1	0	0	0	0	0	0	0	0	0
19	VENTURY & MANIFOLD (3")	No.	0	0		0	0	0	0	1	1	1	0	0	0
20	VENTURY & MANIFOLD (2½")	No.	0	0		0	1	1	1	0	0	0	1	1	1
21	VENTURY & MANIFOLD (2")	No.	1	1		1	0	0	0	0	0	0	0	0	0
22	FITTING & ACCESSORI ES	Set	1	1		1	1	1	1	1	1	1	1	1	1
	OPTIONAL ITEMS														
23	SAND FILTER 40 M³/HR	No.	1	1	1	1	1	1	1	1	1	1	1	1	1

Annexure -II

LIMIT OF ASSISTANCE FOR INSTALLING DRIP SYSTEMS (CONSIDERING 50% SUBSIDY)

A. Category A States

(Andhra Pradesh, Gujarat, Karnataka, Kerala, Maharashtra and Tamil Nadu)

(Rupees)

Spacing (Metre)	Limit of Assistance for different areas					
	0.4 ha	1 ha	2 ha	3 ha	4 ha	5 ha
12x12	5300	8350	12600	16300	26850	35650
10x10	6050	9000	13850	18000	28950	38450
9x9	6200	11050	17750	27950	30700	40550
8x8	6450	9950	15650	20850	32750	43100
6x6	7200	15100	25600	35150	52900	68700
5x5	7550	16400	28300	41550	58550	75400
4x4	8450	19650	31550	50350	71100	89650
3x3	8950	17800	35700	48050	65400	79150
3x1.5	9850	20100	40250	54850	73050	90450
2.5x2.5	10000	19900	40700	55600	99750	119800
2x2	10650	24900	43200	61350	82450	111700
1.5x1.5	13050	27500	54750	82550	102950	140500
1x1	13250	28800	48250	73250	99950	124600

B. Category B States

(Bihar, Chhatisgarh, Goa, Haryana, Jharkhand, Madhya Pradesh, Orissa, Punjab, Rajasthan, UttarPradesh, West Bengal (excluding Darjeeling District) and all Union Territories)

Spacing (Metre)	Limit of Assistance for different areas					
	0.4 ha	1 ha	2 ha	3 ha	4 ha	5 ha
12x12	6095	9603	14490	18745	30878	40998
10x10	6958	10350	15928	20700	33293	44218
9x9	7130	12708	20413	32143	35305	46633
8x8	7418	11443	17998	23978	37663	49565
6x6	8280	17365	29440	40423	60835	79005
5x5	8683	18860	32545	47783	67333	86710
4x4	9718	22598	36283	57903	81765	103098
3x3	10293	20470	41055	55258	75210	91023
3x1.5	11328	23115	46288	63078	84008	104018
2.5x2.5	11500	22885	46805	63940	114713	137770
2x2	12248	28635	49680	70553	94818	128455
1.5x1.5	15008	31625	62963	94933	118393	161575
1x1	15238	33120	55488	84238	114943	143290

B. Category C States

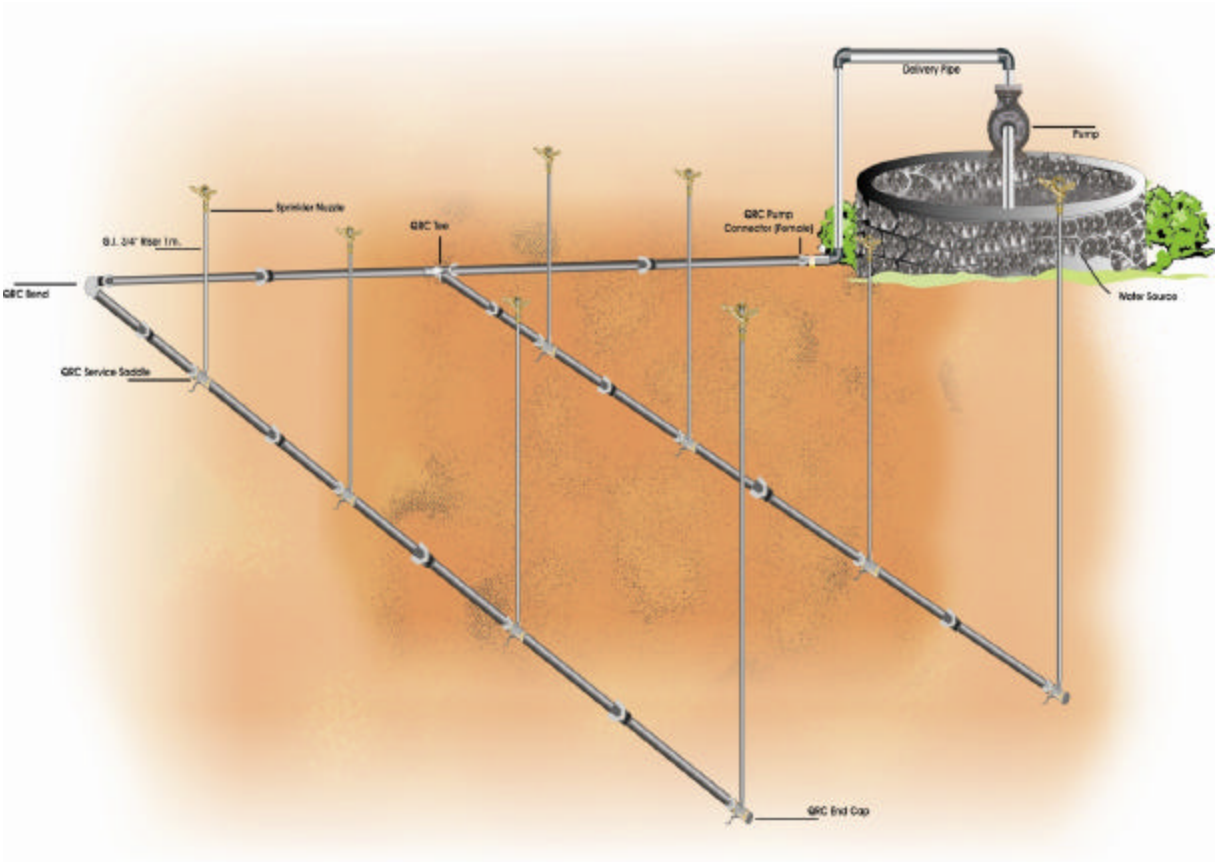
(Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Uttaranchal, Darjeeling District of West Bengal)

Spacing (Metre)	Limit of Assistance for different areas					
	0.4 ha	1 ha	2 ha	3 ha	4 ha	5 ha
12x12	6625	10438	15750	20375	33563	44563
10x10	7563	11250	17313	22500	36188	48063
9x9	7750	13813	22188	34938	38375	50688
8x8	8063	12438	19563	26063	40938	53875
6x6	9000	18875	32000	43938	66125	85875
5x5	9438	20500	35375	51938	73188	94250
4x4	10563	24563	39438	62938	88875	112063
3x3	11188	22250	44625	60063	81750	98938
3x1.5	12313	25125	50313	68563	91313	113063
2.5x2.5	12500	24875	50875	69500	124688	149750
2x2	13313	31125	54000	76688	103063	139625
1.5x1.5	16313	34375	68438	103188	128688	175625
1x1	16563	36000	60313	91563	124938	155750

*The costs given in **Annexure-II** are only indicative. The actual cost mainly depends upon the field dimensions, crop spacing, water source etc.*

The costs are based of system design for meeting peak water requirement of the crop, with source of water / well located at the corner of the field..

LAYOUT OF SPRINKLER IRRIGATION SYSTEM



Annexure – III

COMPONENT FOR SPRINKLER SYSTEM

I. Using 63 mm coupler

S.NO	COMPONENTS	Quantity (Nos)			
		1 ha	2 ha	3 ha	4 ha
1	HDPE Pipes with quick action coupler (Class of pipe -1 i.e. 2.5 kg/cm2 IS:14151) 63/50 mm diameter & 6m long	30	37	45	52
2	63 mm Sprinkler coupler with foot batten assembly Quick Action	5	7	11	14
3	Riser Pipe 20mm diameter x 75 cm long	5	7	11	14
4	Sprinkler Nozzles (1.7 to 2.8 kg/cm^2)	5	7	11	14
5	Bend with coupler 90^o (63/50 mm)	2	1	1	1
6	Pump Connecting coupler/Nipple Quick Action	1	1	1	1
7	End plug (63/50 mm)	2	2	2	2
8	Tee with coupler (63/50 mm)	0	1	1	1

II. using 75 mm coupler

S.NO	COMPONENTS	Quantity (Nos)			
		1 ha	2 ha	3 ha	4 ha
1	HDPE Pipes with quick action coupler (Class of pipe -1 i.e. 2.5 kg/cm^2 IS:14151) 75 mm diameter & 6m long	30	37	45	52
2	75 mm Sprinkler coupler with foot batten assembly Quick Action	5	7	11	14
3	Riser Pipe 20mm diameter x 75 cm long	5	7	11	14
4	Sprinkler Nozzles (1.7 to 2.8 kg/cm^2)	5	7	11	14
5	Bend with coupler 90^o	2	1	1	1
6	Pump Connecting coupler/Nipple Quick Action	1	1	1	1
7	End plug (75 mm)	2	2	2	2
8	Tee with coupler	0	1	1	1

III. Using 90 mm coupler

		Quantity (Nos.)			
		1 ha	**2 ha**	**3 ha**	**4 ha**
1	HDPE Pipes with quick action coupler (Class of pipe -1 i.e. 2.5 kg/cm^2 IS:14151) 90 mm diameter & 6m long	30	37	45	52
2	90 mm Sprinkler coupler with foot Batten assembly Quick Action	5	7	11	14
3	Riser Pipe 20mm diameter x 75 cm long	5	7	11	14
4	Sprinkler Nozzles (1.7 to 2.8 kg/cm^2)	5	7	11	14
5	Bend with coupler 90^o	2	1	1	1
6	Pump Connecting coupler/Nipple Quick Action	1	1	1	1
7	End plug (90 mm)	2	2	2	2
8	Tee with coupler	0	1	1	1

Annexure – IV

FORMAT OF APPLICATION FORM TO BE SUBMITTED BY THE HEAD OF BENEFICIARY FAMILY FOR AVAILING ASSISTANCE UNDER MICRO IRRIGATION SCHEME

Name of the farmer:

Father's name;

Husband's name (if female):

Caste:

Village:

Block/Taluka:

District:

Total hectarage in his name:

Survey Number(s) of the field(s)

where he wants to install the system

(Enclose certificate from Talati)

Has he or any of his family

members availed subsidy

from any GOI scheme earlier? Y/N

If yes, Details thereof:

Area (ha)

Crop covered (ha)

Year of installation

Crops cultivated:

Type of system required

Crop for which the system is required

If the system if for plantation crop any

inter crop is taken?

If, so the type(s) of inter crop

Total area under irrigation

Source of irrigation water

If wells, then open or tube well

Depth of the water table

in the well

Depth of the tube well

Quality of the irrigation water

(Attach analysis report)

Daily usage time of the well

If canal then any provision made

for storage

If, yes, then the dimensions

of the reservoir(lxbxd)

Any farm pond available

If yes the dimensions

of the pond (lxbxd)

If there is no water source

Then what is the plan

Hrs. of electricity available daily

Time of electricity available

Horse power of the pump

Horse power of the diesel engine

Dimensions of the land

Soil is problematic

or good (Enclose copy)

Soil depth

Water table depth in the land

Signature of Farmer/Beneficiary

The following certificates are to be attached

1. Field map along with the survey number and hectarage of field in his name.

2. Certificate to the effect that he or his family members(if undivided) has not availed subsidy for sprinkler/ drip under GOI scheme.

3. Consent letter from the neighboring farmer from whom he wishes to take water, in case he does not have a water source

4. Soil and water test reports

5. Agreement stating that he will not either sell or donate or lend his system to any body for a period of three years.

6. He will allow any officers from Agriculture/Horticulture/DRDA or any other Government officials to inspect the system installed in his field any time during the three years period.

Annexure V

PRINCIPLES FOR ESTIMATION OF WATER AND POWER REQUIREMENT FOR INSTALLATION OF DRIP IRRIGAITON SYSTEM

A. ESTIMATION OF QUANTITY OF WATER

To irrigate an area by drip irrigation system sufficient quantity and rate of water should be made available at the place, To estimate the minimum quantity of water for meeting the irrigation water requirement of any area, the following steps are required.

Collection of General Information

General information on water source, crops to be grown, topographic conditions, type and texture of soil and climatic data are essential for designing the drip irrigation system.

Layout of the field

The payout of the field by giving the path and lengths of main line, sub main line and lateral lines in meters to connect water source with the existing / planned crop in the area must be worked out.

Crop water requirement

Water requirement of crops (WR) is a function of plants, surface area covered by plants, evapotranspiration rate. Irrigation water requirement has to be calculated for each plants and thereafter for the whole plot based on plant population, for different seasons. The maximum discharge required during any one of the three seasons is adopted for design purposes. The daily water requirement for fully grown plants can be calculated as under:

$V = E_p \times K_c \times K_p \times W_p \times S_p$

Net depth of irrigation to be applied (V_n) = $V.R_e \times S_p$

The total water requirement of the farm plot would be V_n x No. of plants

Where :

V is the Water requirement (1 pd plant)

E_p is the pan evaporation (mm/day)

K_c is the Crop factor

K_p is the pan factor

W_p is the wetted area (0.3 for widely spaced crops and
0.9 for closely spaced crops)

S_p is the spacing of crops / plant, (M^2)

R_e is the effective rainfall (mm) and A is the area of the plot (M^2)

B. ESTIMATION OF HORSE POWER OF PUMPING UNIT

Power is required to pump the required irrigation water from the source and to develop sufficient pressure to operate the drippers effectively.

The ideal drip irriga tion system is one in which all drippers (or orifices) deliver the same volume of water in a given irrigation time. The dripper flow variation caused by water pressure can be controlled by hydraulic design.

Flow carried by each lateral line (d_e)

= discharge of dripper x No. of drippers per plant x No. of plants along each lateral.

Flow carried by each sub-main line (d_s) = d_e x No. of lateral line per sub main line

Flow carried by each main line (d_m = d_s x No. of sub-mains

The friction head loss in mains can be estimated by Hazen-Wliiams formula given below :

h_f = 10.68 x (Q/C)1.852 x D 4.87 x (L + L_e), where

h_f = Friction head loss in pipe (m)

Q = Discharge (M^3 / sec)

C = Hazen - William constant (140 for PVC pipe)

D = Inner dia of pipe (m)

L = Length of pipe (m)

L_e = Equivalend length of pipe and accessories (See Table C)

The design of lateral pipe involves selection of pipe for a given length which can deliver required quantity of water to the plant.

In designing the lateral, the discharge and operating pressure at drippers are required to be know and accordingly, the allowable head can be determines by the same formula as the main line.

DESIGN CRITERIA

1. It should be ensured that the head loss in the lateral length between the first and last emitter is within 10 per cent of the head available at the first emitter.

2. The friction head loss in the mainline should not exceed 1m/100m length of the mainline Friction head loss for various discharges is given in Table B and equivalent lengths of straight pipe in meters giving equivalent resistance to flow in pipe fittings in Table C.

After finalization of dimensions of main, sub-mains and laterals the selection of pump consist of the following steps.

Total pressure head drop in meters due to friction (H_f) = Friction head loss of main + Friction head loss of sub-mains + friction head loss of laterals.

Operating pressure head required at the dripper = He in meters.

Total static head = H_s in meters

Total Pumping Head (H) = $H_f + H_e + H_s$

Discharge of main = d_m, litres / sec

Efficiency (overall) = (60% in the case of electric pump,
40% in the case of diesel engine)

$$\text{H.P.} = \frac{H \times d_m}{75 \times e}$$

Table A: Function Head Loss in Meters per 100 m Pipe length

Flow	Inside diameter (mm)						
1ph	9.2	11.7	12.7	13.9	15.8	18.0	19.0
Head loss in meters per 100 length of pipe							
200	10.2	5.2	2.5	1.7	0.8	0.4	0.3
400	39.0	18.0	8.6	5.7	2.7	1.6	1.1
600		39.0	18.0	13.0	5.9	3.2	2.5
800			30.0	21.0	10.0	5.5	4.1
1000			45.0	30.0	16.0	8.3	6.2
1200			42.0	21.0	11.0	8.8	
1400				56.0	28.0	16.0	11.0
1600					36.0	20.0	15.0
1800					45.0	25.0	19.0
2000					54.0	30.0	23.0

Table B: Function losses for flow of water (m/100m) in smooth pipes (C-140)

Discharge	Bore diameter (mm)									
1ps	20	25	32	40	50	65	80	100	125	150
Head loss in meters per 100 length of pipe										
0.5	16.4	5.5	1.66	0.56						
1.0		10.0	6.00	2.00	0.68					
1.5			12.70	4.30	1.45	0.40				
2.0			16.00	7.30	2.50	0.68	0.25			
3.0				15.50	5.20	1.45	0.53			
4.0				26.40	8.90	2.50	0.90	0.30		
5.0					13.40	3.80	1.36	0.46		
6.0					18.80	5.20	1.90	0.64	0.22	
7.0						6.90	2.50	0.84	0.29	
8.0						8.90	3.20	1.10	0.37	0.1
9.0						11.10	4.00	1.36	0.46	0.19
10.0						13.40	4.90	1.66	0.55	0.32

Table C: Function losses for flow of water (m/100m) in smooth pipes (C-140)

Sl. No.	Pipe Size (mm)	Elbow Bend (Ks=0.7)	90 Bend (Ks=0.12)	Standard Tee (Ks=0.12)	Sluice Valve (Ks=0.4)	Foot of refluant Valve (Ks=)
1.	25	0.536	0.396	0.704	0.007	2.04
2.	40	0.997	0.596	1.131	0.142	3.05
3.	50	1.296	0.741	1.704	0.185	3.96
4.	65	1.814	1.037	2.384	0.259	5.18
5.	80	2.241	1.281	2.946	0.320	6.10
6.	100	2.959	1.691	3.889	0.422	8.23
7.	125	4.037	2.307	5.306	0.576	10.00
8.	150	5.125	2.928	6.735	0.732	12.00

Worked Example

A farmer propose to install drip irrigation system for a new citrus plantation on a 1 ha plot.

Basic Data Analysis

1. **No. of Plants**

Area = 1 ha = 100 x 100 m

Spacing (m) = 6 x 6

No. of plants = $\frac{100 \times 100}{6 \times 6} = 277$

2. Estimation of Water Requirement

The irrigation water requirement is determined using IMD pan evaporation data. The average monthly pan evaporation data for the area is given below:

Normal Monthly Pan Evaporation Data

Month	mm	Month	mm
January	99.2	July	145.6
February	119.6	August	134.6
March	176.3	September	134.6
April	210.2	October	144.6
May	245.4	November	112.2
June	198.8	December	94.4
TOTAL			**1,815.5**

From the above data the season wise total pan evaporation as well average pan evaporation is given below:

Sr.No.	SEASON	Days (Nos)	Total Pan evaporation during the season (mm)	Average Daily Pan evaporation (mm/day)
1	Kharif (15/6 to 15/10)	122	585.8	4.80
2	Rabi (16/10 to 28/2)	136	497.4	3.65
3	Summer (1/3 to 14/6)	107	737.3	6.83

The daily water requirement of plants is given below :

S. No.	Season	Evaporation Water requirement	lpd/plant	m3/day/ha
1	Kharif	4.8	36.3	10
2	Rabi	3.65	27.6	7.6
3	Summer	6.83	51.6	14.3

Therefore, the drip irrigation system has to be designed for the maximum requirement of 51.6 litre/day/plant during the summer season. For this the water requirement works out to 14.3m3/day/ha of plantation. If the average working hour of pumpset is taken as 4 hours per day, the discharge required would be as below :

Pumping rate = 13 litre / hr/plant

Pumping rate per ha. = 14.3 m^3/day/ha

= 3.6 m^3/hr/ha

= 0.97 LPs or day 1 LPs

Alternatively, a tank of 14.3 m3 capacity can be provided so that uninterrupted irrigation may continue for 4 hours even in areas where power shut offs are frequent.

3. Selection of Drippers

Number of Drippers

Depending upon the type of dripper and discharge required their number can be estimated. For a pressure head of 10 m and discharge at 4 litre / hour the number of drippers required are :

$$\text{No. of drippers/plant} = \frac{\text{Rate of pumping / hour / plant}}{\text{Avg. discharge of one dripper}}$$

$$= 13/4 \quad \text{or } 3.22 \quad \text{say } 3$$

The plot is square and of 1 ha. As such the mainline would be 100 m long and laterals would also be 100 m in length. A plant spacing is 6 m x 6 , a total of 17 laterals would be required. Each lateral would serve approximately 16 plants and there would be 3 drippers per plant. Thus, the total number of drippers per lateral would be 16 x 3 = 48 nos.

4. Main Line and Laterals

Main Line

The main line is designed to carry the maximum discharge required for total number of plants in the farm plot.

Maximum discharge required = No. of plants x peak discharge per plant

= 277 x 13 = 3601 LPH or 1 LPS

Friction Head loss in pipes (m)

Total length	=	100.0
Equivalent length of 17 straight connection	=	8.5

Equivalent length of tee bends, etc	=	6.0
TOTAL		114.5 or say 115.m

From Table B it would be seen that for discharge of 1 LPS through a pipe of say 40 mm diameter, the friction loss would be 2 m per 100 m length of 2.3 m for 115 m equivalent length.

Friction head loss	=	2.3 x 0.88 = 2.02
Conversion factor	=	(0.88)

As the proposed system uses multiple openings, the friction loss is taken as 1/3 of the total friction loss i.e. 2.03/3 i.e. 0.67 m. Thus the loss in mains is within 1.0 m/100 m and a pipe of 40 mm diameter will be ideal in the layout.

Laterals

A lateral is so selected that the pressure difference from the proximate end to the last dripper does not exceed 10 per cent of the normal operating head which in the present case is 10 x 10/100 = 1.0 for lateral of 100 m length. The land slope is 0.5 m / 100 m. Thus the total friction loss allowable is 1 + 0.5 = 1.5 m.

In addition to 100 m length of laterals there is additional loss due to connectors. This is generally taken as 0.1 to 1 m (on an average 0.5) of the equivalent length of a dripper. The equivalent length of 48 drippers would this be 48 x 0.5 = 4 m. Thus, total equivalent length for calculation of friction loss in laterals would be 24 m. The total flow in laterals is 192 lph. i.e. 4 x 3 x 16. A perusal of Table A shows that for 200 lph flow the friction loss in 13.9 mm inner diameter pipe would be 1.7 m per 100 m length. Therefore, in 124 m length it would be 2.20 m. It is a general practice that friction losses are taken at 1/3 of the total equivalent length of pipes with multiple

dripper / connections. Thus the friction loss works out to 1/3 x 2.2 = 0.74 m which is within the maximum permissible limit of 0.9 m. Therefore, 14 mm (OD) lateral pipe of 100 m length is suggested in this scheme.

5. Horse Power of Pumpset

The HP of pumpset required is based upon design discharge and total operating head. The total head is the sum of total static head and friction losses in the system.

Static Head

i) The total static head is the sum total of the following

	(m)
a. Depth to water (bgi)	15
b. Drawdown	3
c. Outlet level above ground level	1
d. Friction loss in pipes, bends, foot valves etc.	2
Total	21

ii) The friction loss in the drip unit is as under

a Friction loss inmain pipe	0.67
b Friction loss in laterals	0.75
c Minimum head required over drippers	10.00
	11.42

Total Head = Static Head + Friction head loss
= 21.00 + 11.42
= 32.42 or say 33 m

$$\text{Hp of pump set} = \frac{Q \times H}{75 \times e}$$

Where Q = Discharge (lps)
H = Head (m)
e = Pumping efficiency (0.6)

$$\text{Hp} = \frac{1 \times 33}{75 \times 0.60} = 0.73 \text{ or say } 1 \text{ H.P.}$$

ANNEXURE - VI

METHODOLOGY FOR ASSESSMENT OF WATER AND POWER AVAILABILITY

I. In cases where the water source is an open well or tubewell / borewell, then for assessment of water availability and pumping power requirement it is necessary to compute the following :

a. Depth of the water table

b. Discharge of the well

c. Total pumping level

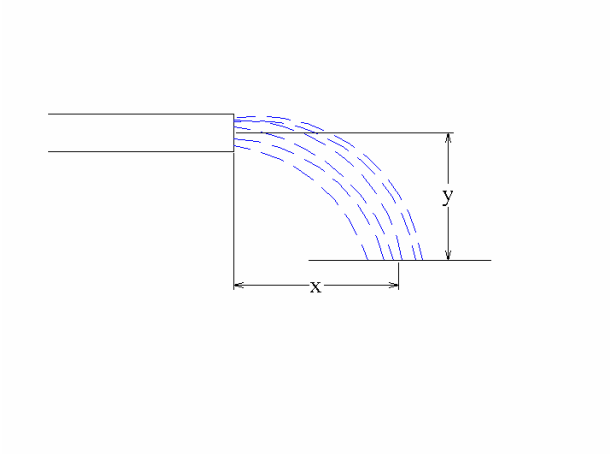
1. The depth of water level below the ground level, before pumping begins, is the depth of the water table. It can be measure by a simple procedure using a rope with a stone tied at one end.

2. The discharge of the well / tubewell is measure after running the pump for a period of 30 minutes to 1 hour. It can be measure by adopting volumetic measure. Under this method, the discharge is emptied into a ditch of container of know dimensions for a certain length of time. The rate of discharge is calculated by dividing the total volume of water discharged by the time taken. This method works for low discharge say upto 5 litres per second.

For higher discharges volumetric measurement may be difficult and therefore standard devices like water metre / c.notch/flume may be used. In the case of non availability of these devices the discharge may be assessed approximately using the co-ordinate method described below:

COORDINATE METHOD : For measuring the discharge from wells/ tubewells. the outlet pipe should be horizontal. The x and y co-ordinates are measured from the centre of the pipe to the centre of the water jet as indicated in the figure below :

FLOW SKETCH



The discharge is computed using the equation

$$Q = \frac{A \times v\,g \quad (1000)}{v\,2y}$$

where Q = Discharge in litres / second

A = Cross sectional area of the pipe in m^2

X = X co-ordinate in metres

Y = Y co-ordinate in metres

g = Acceleration due to gravity (M / sec^2)

3 Total pumping level includes the depth of the water level, drawdown and height of the outlet above the ground level. To measure the drawdown the pump installed over the well/tubewell is run for a period of 30 minutes to 1 hour so that constant water level is attained in the well/tubewell. The new depth of the water level is measured. The difference between the

depth and the original depth of the water table is the drawdown. The height of the outlet level above the ground level is also to be measured. Once the total pumping level is determines, the horsepower.

4 Power rating of the pump required can be approximately determined with the reference to the table given below:

POWER REQUIREMENT TO PUMP AND OPERATE DRIP IRRIGATION SYSTEM FOR ORCHARD AND VEGETABLE CROPS

SR. NO.	STATIC WATER DEPTH (M)	ORCHARD CROP (hp/ha)	VEGETABLE CROP (hp/ha)
1	00-10	0.64	1.93
2	10-20	0.87	2.61
3	20-30	1.10	3.30
4	30-40	1.31	3.93
5	40-50	1.53	4.59
6	50-60	1.76	5.28
7	60-70	1.98	5.94
8	70-80	2.20	6.60
9	80-90	2.42	7.26
10	90-100	2.64	7.92

II. In cases where the water source is perennial stream of low discharge generally available in hilly areas), drip irrigation systems can be operated by diverting these streams at a higher elevation to a small storage tank of approximately 2 cu metre capacity and it can be directly connected tot he drip irrigation system for irrigating lands at a lower elevation. If drip

irrigation system is being used with drippers then the average elevation difference between tank and area of operation should be 12-15 metres. If microtube system is used elevation difference of 3 m to 4 m would be sufficient to operate the system. The area proposed to be irrigated should be commensurate with the flow of water in the stream. If flow of one litre per second is available it is sufficient to irrigate 1 ha of orchard crops at a time.

The rate of flow of water in the stream can be measured by volumetric measurement or by using other devised mentioned above.

Annexure VII

FIELD LEVEL QUESTIONNAIRE FOR ASSESSMENT OF WATER AND POWER AVAILABILITY FOR INSTALLATION OF DRIP IRRIGATION SYSTEM

1	**Name of the applicant**	:
2	**Residential Address**	:
3	**Farm address/location (Sy. No. to be indicated**	:
4	**Total farm area**	:
5	**Area proposed to be irrigated under drip**	:
6	**Crop** Plot1	Plot 2 Plot 3 Plot 4
	Area under crop	:
	Row to row distance	:
	Total No. of Plants	:
	Type of Soil	:
7	**What is the water source proposed to be used by the farmer.**	1. Open well 2. Tube well/Bore well 3. Surface flow 4. Others (Specify) 5. Storage tank

8	**Open well**	
	a. Depth of water table (in metres)	:
	b. Date and season during which assessment made	:
	c. Draw down in meters (Please refer Annexure VIII)	:
	d. Height of outlet above ground level	:
	e. Assessment of water availability (in litters /second)	:
	f. Method used for determining water availability	:
	g. Total duration for which pumping was done	:
	h. Duration of pumping after which constant water level was obtained	:
	i. Pump used/ Mention make (electric/ diesel)	:
	j. H.P. of pump used	:
	k. Diameter of outlet pipe	:
9.	**Tube well/ Bore well**	
	a. Depth of water table (in metres)	:
	b. Date and season during which assessment made	:
	c. Draw down (in meters) (P1 refer Annexure VIII)	:
	d. Height of outlet above ground level	:

	e. Assessment of water availability (in litters/second)	:
	f. Method used for determining water availability	:
	g. Total duration for which pumping was done	:
	h. Duration of pumping after which constant water level was obtained	:
	i. Pump used (mentioned make) (electric/ diesel)	:
	j. Horse power of pump	:
	k. Diameter of outlet pipe	:
10	**Surface Flow/ Stream in Highly Areas**	
	a. Rate of flow of water (in litters/second) in the stream during the lean season	:
	b. Methodology used for assessing the rate of flow of water	:
	c. Whether storage tank is available? d. If so, capacity of the storage tank?	: :
	e. Structure used for diversion of water into storage tank	:
11	**Storage tank using canal water**	

	a. Distance of farmer's field from canal delivery point	:
	b. Whether storage tank has been constructed or is proposed to be constructed by the farmer	:
	c. If so, capacity of the storage tank?	:
	d. Elevation of the storage tank above ground level.	:
	e. Availability of water in the canal according to "turn" system (No. of days in a week/ fortnight/month) .	:
	f. Pump available with farmer (electric/diesel) to lift water from canal to water storage tank (mention make) g. Horsepower of the pump.	: :
12	**Details of Pump**	
	a. Does the farmer own a pump	:
	b. If so, of what make?	:
	c. What is the horsepower of the pump?	:
	d. In the case of electric pump no. of hours.	:
	e. Per day for which electricity is generally available.	:

	f. In case the diesel pump, name of the nearest diesel station	:
	g. Does the farmer propose to by a new pump (if so, specify make and H.P.)	:
	h. Other farm machinery owned by farmer (i.e. tractor, tiller, thresher *etc*)	:
13	**Nearby Drip Installation**	
	a. How many drip irrigation installation are there the same village?	
	b. What is the approximate area under these installations?	
	c. What are the problems faced by the existing drip installations?	

Name, Signature & Designation of the Field officer

14	**Analysis of water and power availability by an authorised officer of Implementing Agency**	
	a. Total requirement of water for the area proposed to be covered by farmer under drip irrigation (litres per day/ plant x total number of plants or total requirement in litre per ha. x total area)	
	b. Total availability of water?	
	c. Area recommended to be brought under drip irrigation	
	d. Horsepower of pump available.	

	e. Horsepower of pump required.	
	f. Recommendation regarding area to be covered under drip irrigation (also give recommendation regarding up-gradation of pumping capacity, if required)	
	g. Recommendation regarding elevation, capacity and construction of storage tank.	

Signature of authorised officer of Irrigation Association

Annexure -VIII

LIST OF PRECISION FARMING DEVELOPMENT CENTRES (PFDC)

Sl. No.	Name & Location of PDC
1.	Indian Agricultural Research Institute, New Delhi
2.	N.G. Ranga Andhra Pradesh Agricultural University, Hyderabad
3.	Assam Agricultural University, Jorhat, Assam
4.	Rajendra Agricultural University, Samastipur, Bihar
5.	Gujarat Agricultural University, Navsari, Gujarat
6.	Haryana Agricultural University, Hissar, Haryana
7.	Y.S. Parmar University of Horticulture & Forestry, Solan, Himachal Pradesh
8.	University of Agricultural Sciences, Bangalore, Karnataka
9.	Kerala Agricultural University, Tavanur, Kerala
10.	Mahatma Phule Krishi Vidyapeeth, Rauri, Maharashtra
11.	Indira Gandhi Krishi Vishva Vidyalaya, Raipur, Madhya Pardesh
12.	Orissa University of Agri. & Technology, Bhubaneswar, Orissa
13.	Rajasthan Agri. University, Bikaner, Rajasthan
14.	Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu
15.	G.B. Pant Univ. of Agri. & Technology, Pantnagar, Uttaranhchal
16.	Indian Institute of Technology, Kharagpur, West Bengal
17.	Central Institute of Sub-Tropical Horticulture, Lucknow, Uttar Pradesh

Annexure -IX

PROFORMA FOR FURNISHING ANNUAL ACTION PLAN BY IMPLEMENTING AGENCY

PART A: Summary Statement

Year:

1.	Name of State						
2.	Name of District						
	I. Area Coverage Physical and Financial Programme						
	A. Drip Irrigation						
	Sl. No.	**Crop/Spacing**	**No. of beneficiaries**	**Area**	**Total Cost involved**	**Financial Outlay**	
						Government of India share	**State Share**
		Sub total Drip					
	B. Sprinkler Irrigation						
	Sl. No.	**Crop Name**	**No. of beneficiaries**	**Area**	**Total Cost involved**	**Financial Outlay**	
						Government of India share	**State Share**
		Sub total Sprinkler					
	II. Demonstration for Drip Irrigation						
	Sl. No.	**Crop/Spacing**	**No. of beneficiaries**	**Area**	**Total Cost involved**	**Financial Outlay**	
						Government of India share	**State Share**
		Sub total Drip Demonstration					
		Grand Total					

Annexure -IX (Contd.)

PART B: General Details of Districts

1.	Land use:			
	Sl. No.	**Category**	**Area (ha)**	**% of total**
	1.	Agriculture		
	2.	Forest		
	3.	Wasteland		
	4.	Other		
2.	Average monthly rainfall (mm)			
3.	Average monthly temperature (^{o}c)			
4.	Broad Soil type			
5.	Area under Cultivation (Year)			
	A. Agricultural			
	Rice			
	Wheat			
	Pulses			
	Oilseeds			
	B. Horticulture			
	Fruits			
	Vegetables			
	Spices			
	Flowers			
	Medicinal & Aromatic Plants			
	Coconut			
	Arecanut			
	Cashew Cocoa			
6.	Irrigated area			
	a) Major Irrigation			
	b) Medium Irrigation			
	b) Minor Irrigation			
7.	Source of Irrigation			
	a) Ground water			
	b) Surface water			
8.	Canals in the district (Name & command area)			
9.	Status of land holding (Number & total area) 1, 1-2, 2-3, 3-4, More than 4 hectare			
10.	Number of Agro/ Horticultural processing units			
11.	Name of PFDCs nearest to the District			
12.	Crops selected under National Horticulture Mission (NHM)			

13.	Name of Industrial units in the District manufacturing drip/ sprinkler system components List of Manufacturers/ distributors/ dealers of Micro Irrigation System
	List of liquid fertilizers
14.	Professional Institutes/ Organisations/University preferably in Agricultural field available in the District alo ng with the probable help which may be rendered by them
15.	Existing Farmers' Associations & their main functions
16.	KVKs in the district
17.	District taxes & levies on Micro / Sprinkler Irrigation components/ systems
	Octroi
	Sales Tax on components
	Sales Tax on systems

PART C

1.	Present area covered under drip/ sprinkler (year wise/ crop wise in the district) (Ha)						
2.	Area proposed to be covered under Drip/Sprinkler Irrigation during 2005-06 & 2006-07						
	Sl. No.	**Name of Block/ Taluka**	**Crop /Spacing No. of beneficiaries**	**Area**	**Total Cost involved**	**Financial Outlay**	
						Government of India share	**State Share**
A. Drip Irrigation							
B. Sprinkler Irrigation							
C. Demonstration							

Name and complete details of the Bank where GOI assistance is to be paid:

Signature
(Name & Designation)
Authorized signatory of IA

Annexure -X

PROFORMA FOR FURNISHING PROGRESS REPORT UNDER MICRO IRRIGATION SCHEME

Name of State:
Name of District:
Period of Report:
Details of Progress Achieved:

Sl. No.	Crop/ Crop Spacing	During the month					Cumulative Progress				
		No. of Benefieiaries	Target (ha)	Ach. (ha)	Outlay	Exp.	No. of Benefieiaries	Target (ha)	Ach. (ha)	Outlay	Exp.
A. Drip Irrigation											
Sub Total											
B. Drip Demonstration											
Sub Total											
C. Sprinkler Irrigation											
Sl. No.	**Name of Crop**										
Sub Total											
Grand Total											

Number and area covered by Small & Marginal Farmers:

Annexure - XI

LIST OF BIS STANDARDS

1. Polyethylene pipes for laterals (IS 12786: 1989)
2. Emitters (IS 13487: 1992)
3. Emitting pipes system (IS 13488: 1992)
4. Strainer type filters (IS 12785: 1994)
5. Irrigation equipment rotating sprinkler Part II, Test method for uniformity of distribution (1st revision) (amendment 1) (IS-12232 (Part II) – 1995
6. Irrigation equipment rotating sprinkler Part I, Design and Operational requirements (1st revision) IS-12232 (Part I) -1996
7. Polyethylene microtubes for drip irrigation system (IS 14482 : 1997)
8. Fertiliser and Chemicals Injection system Part I Ventury Injector (IS 14483 (Part 1) 1997)
9. Micro sprayers (IS 14605 : 1998)
10. Media Filters (IS 14606: 1998)
11. Hydro cyclone separators (IS 14743: 1999)
12. PVC pipes for water supply - IS 4985 - 1999
13. Irrigation equipment sprinkler pipes specifications Part I Polyethylene pipes ISI4151 (part 1) 1999
14. Irrigation equipment sprinkler pipes specifications Part II Quick couples Polyethylene pipes ISI4151 (part II) 1999