राष्ट्रीय सूक्ष्म सिंचाई मिशन
National Mission on Micro Irrigation

Taaqat Ek Boond Ki

National Mission on Micro Irrigation

Operational Guidelines

सत्यमेव जयते

Government of India
Ministry of Agriculture
Department of Agriculture & Cooperation

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प्रबीर कुमार बसु, आई० ए० एस०
सचिव
P.K. BASU, I.A.S.
Secretary

भारत सरकार
कृषि मंत्रालय
कृषि एवं सहकारिता विभाग
Government of India
Ministry of Agriculture
Department of Agriculture & Cooperation

Foreword

Water is one of the most critical inputs for agriculture. The availability of adequate water for irrigation is a key factor in achieving higher productivity. However, the poor efficiency of conventional irrigation systems has not only reduced the anticipated outcome of investments towards water resource development, but has also resulted in environmental problems like water logging and soil salinity, thereby adversely affecting crop yields.

A Centrally Sponsored Scheme on Micro Irrigation was introduced in January, 2006 to increase the area under improved methods of irrigation for better water use efficiency to provide stimulus to agricultural growth. Nearly two million hectares have so far been brought under micro irrigation through this scheme, which is extremely miniscule when compared to the potential of 69 million ha. Government of India has, therefore, decided to impart further thrust to this scheme by implementing it in a mission mode as the National Mission on Micro Irrigation (NMMI). The Mission will help converge micro irrigation activities under major government programmes such as Horticulture Mission for North East & Himalayan States (HMNEHS), National Horticulture Mission (NHM), Rashtriya Krishi Vikas Yojana (RKVY), National Food Security Mission (NFSM) etc. to create integrated water harvesting structures for increasing water use efficiency, crop productivity and farmers' income.

It is expected that adoption of improved methods of irrigation such as drip & sprinkler would not only save water, power, fertiliser consumption, weeding cost, etc. but would also mitigate environmental degradation such as water logging and soil salinity.

The success of the scheme will depend on an effective delivery mechanism which calls for close coordination among the beneficiaries, the Panchayats, the State Implementing Agencies and the system suppliers. The mechanism for achieving this synergy has been detailed in these guidelines.

It is hoped that introduction of revised norms along with incorporation of additional components will incentivize further investments in water saving technology to increase gross area under cultivation.

November, 2010
New Delhi

(P.K. Basu)
Secretary

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Abbreviations

A & C	Agriculture & Cooperation
APC	Agriculture Production Commissioner
BIS	Bureau of Indian Standards
BoQs	Bill of Quantities
CEO	Chief Executive Officer
CI	Cast Iron
CIPET	Central Institute of Plastics Engineering and Technology
CST	Central Sales Tax
CWR	Crop Water Requirement
DAC	Department of Agriculture and Co-operation
DMIC	District Micro Irrigation Committee
DRDA	District Rural Development Agency
DRS	Direct Reception System
EC	Executive Committee
EMC	Empowerd Committee
EC	Electrical Conductivity
FAQs	Frequently Asked Questions
FM	Frequency Modulation
GDP	Gross Domestic Product
GI	Galvanized Iron
GKVK	Gandhi Krishi Vigyan Kendra
GM	Gun Metal
GoI	Government of India
HDPE	High Density Polyethylene
HMNEHS	Horticulture Mission for North East & Himalayan States
HP	Horsepower
HRD	Human Resource Development
IA	Implementing Agency
IAI	Irrigation Association of India
ICAR	Indian Council of Agricultural Research
ICT	Information and Communication Technology
ID	Internal Diameter
IMD	Indian Meteorological Department
IS	International Standards
ISI	Indian Standards Institute
ISOPOM	Integrated Scheme of Oilseeds, Pulses, Oilpalm and Maize
ISRO	Indian Space Research Organisation
IT	Information Technology
KGK	Krishi Gyan Kendra
KVK	Krishi Vigyan Kendra
LDPE	Low Density Polyethylene

LLDPE	Linear Low Density Polyethylene
LPS / lps	Litres Per Second
LST	Local Sales Tax
MI	Micro Irrigation
MIS	Micro Irrigation System
mmhos	millimhos
MoA	Ministry of Agriculture
MS	Mild Steel
NABARD	National Bank for Agriculture & Rural Development
NCPAH	National Committee on Plasticulture Applications in Horticulture
NFSM	National Food Security Mission
NGO	Non-Governmental Organisation
NHM	National Horticulture Mission
NIC	National Informatics Centre
NRV	Non Return Valve
OD	Outer Diameter
PE	Polyethylene
PFDC	Precision Farming Development Centre
PI	Principal Investigator
PP	Poly Propylene
PRIs	Panchayati Raj Institutions
PSU	Public Sector Undertaking
PVC	Poly Vinyl Chloride
QRC	Quick Release Coupler
RA	Research Associate
RKVY	Rashtriya Krishi Vikas Yojana
SAU	State Agricultural University
SC	Scheduled Caste
SCP	Special Component Plan
SHG	Self Help Group
SMIC	State Micro Irrigation Committee
SPV	Special Purpose Vehicle
ST	Scheduled Tribes
TDS	Tax Deduction at Source
TIN	Tax Identification Number
TMC	Technology Mission on Cotton
TSG	Technology Support Group
TSP	Tribal Sub - plan
UAS	University of Agricultural Sciences
UC	Utilisation Certificate
USA	United States of America
WR	Water Requirement

Salient Features of National Mission on Micro Irrigation (NMMI) Scheme

- NMMI is a Centrally Sponsored Scheme in which 40% of the cost of the MI system will be borne by the Central Government, 10% by the State Government and the remaining amount will be borne by the beneficiary either through his / her own resources or loan from financial institutions. Additional assistance of 10% of the cost of the MI system will be borne by the Central Government in respect of small and marginal farmers. (Para 6).

- All categories of farmers are eligible to avail assistance under this scheme.

- Assistance to farmers will be limited to a maximum area of five ha per beneficiary. (Para 6.2).

- 75% of the cost of drip and sprinkler demonstration for a maximum area of 0.5 ha per demonstration will be borne by the Central Government. (Para 6.6).

- Assistance will be available for both drip and sprinkler irrigation for wide spaced as well as close spaced crops. However, assistance for sprinkler irrigation system will be available only for those crops where drip irrigation is uneconomical. (Para 14.1 Table. 1).

- Assistance will be available for irrigation systems for protected cultivation including greenhouses, polyhouses and shadenet houses. (Para 14.8).

- Assistance will be available for implementation of advanced technology like fertigation with fertilizer tank / venturi systems, sand filters / media filters, hydrocyclone filters / sand separators and other different type of filters and valves required for MI system. (Para 14.9).

- Panchayati Raj Institutions (PRIs) will be involved in promoting the scheme and identification of priority areas. (Para 5).

- At the National Level, the Executive Committee of NMMI will review the progress of NMMI and approve the Annual Action Plans of States (Para 4.1). At the State level, the State Micro Irrigation Committee (SMIC) will oversee the implementation of the Mission programme in districts. (Para 4.3). The District Micro Irrigation Committee (DMIC) will coordinate the implementation of NMMI programme at the District level. (Para 4.5).

  NCPAH will coordinate and monitor the programme of NMMI in different States. (Para 4.1).

- The scheme will be implemented by an implementing Agency (IA) at the State level duly appointed by the State Government. Funds will be released directly to the IA on the basis of approved plans for each year. (Para 4.7 & 7).

- The IA shall prepare the Annual Action Plan for the State on the basis of the district plans and get it forwarded by SMIC for approval of the Executive Committee (EC) of NMMI. (Para 4.7).

- SMIC shall forward 25 copies of the consolidated proposal to Ministry of Agriculture. (Para 12.4).
- Payment will be made through RTGS to the IA who will transfer funds to the identified districts. DMIC will provide funds to the system suppliers through the farmers' / beneficiaries'. (Para 7 & 17.4).
- Registration of System Manufacturers will be done by the SMIC for use in the Districts. (Para 17.5).
- Supply of good quality system, both for drip and sprinkler irrigation, having Bureau of Indian Standards (BIS) marking and proper after sales service to the satisfaction of the farmers, is paramount. (Para 17.5).

1. Introduction

1.1 India is an agrarian country. Water management is of critical importance to Indian agriculture. While the irrigated area in the country has almost doubled since independence, it is believed that the irrigated area can not exceed 50% of the cultivable area with the conventional methods of irrigation even if the irrigation potential is fully utilised. To address the judicious and improved methods / technologies for harnessing maximum benefits from available water resources to enhance crop productivity without affecting soil health. The scheme on Micro Irrigation, which was launched during the year 2005-06, has been upscaled to be implemented as the **'National Mission on Micro Irrigation' (NMMI)** during XI Plan period.

1.2 NMMI will have three components

(i) Area Coverage under Micro Irrigation.

(ii) Transfer of Technology through Demonstrations and,

(iii) Human Resource Development through training, awareness programmes, exhibitions, publications and quality control.

2. Mission Objectives

The main objectives of NMMI are as follows:

2.1 To increase the area under micro irrigation through improved technologies.

2.2 To enhance the water use efficiency in the country.

2.3 To increase the productivity of crops and farmers' income.

2.4 To establish convergence and synergy among on-going Government programmes

2.5 To promote, develop and disseminate micro irrigation technology for agriculture / horticulture development with modern scientific knowledge.

2.6 To create employment opportunities for skilled and unskilled person especially unemployed youth.

3. Strategy

3.1 To fulfill the above objectives, NMMI will be implemented by adopting the following strategy;

i) Most appropriate irrigation system will be provided, whether drip or sprinkler, depending upon the crop and agro-climatic conditions, duly ensuring least cost burden to the farmers.

ii) Supply of good quality system to the farmers with BIS mark will be ensured through a strict quality enforcement mechanism.

iii) Capacity building of farmers and field functionaries will be taken up through training and demonstrations with the active participation of the State Agricultural Universities (SAUs), Precision Farming Development Centres (PFDCs) and the Industry.

iv) A strong coordination mechanism will be put in place at the State and District levels for proper dovetailing of schemes involving land development and water management.

v) Easy flow of credit to the farmers will be ensured through the Finan-

cial Institutions and Banks by their active involvement in Committees responsible for administering the scheme.

vi) Information & Communication Technology (ICT) will be deployed extensively for ensuring transparency in the implementation process and effective monitoring of the Mission programme.

4. Mission Structure

4.1 National Level: Horticulture Division in the Department of Agriculture & Cooperation, Ministry of Agriculture will coordinate the overall activities and review the progress of implementation of the Mission in the country. The Executive Committee (EC) of NMMI will be constituted under the Chairmanship of Secretary (A&C), Department of Agriculture & Cooperation to oversee the activities of the Mission and to approve the State Annual Action Plans besides projects on technology transfer etc.

National Committee on Plasticulture Applications in Horticulture (NCPAH)

Composition of the Executive Committee

1	Secretary (A&C) Department of Agriculture & Cooperation Ministry of Agriculture	Chairman
2	Special Secretary / Additional Secretary In-charge of Horticulture Division Department of Agriculture & Cooperation	Member
3	Deputy Director General (Horticulture) Indian Council of Agricultural Research	Member
4	Additional Secretary & FA Department of Agriculture & Cooperation	Member
5	Horticulture Commissioner Department of Agriculture & Cooperation	Member
6	Joint Secretary Panchayati Raj Institution	Member
7	Joint Secretary Ministry of Chemicals & Fertilizers	Member
8	Representative National Bank for Agriculture & Rural Development	Member
9	Representative Central Ground Water Board, Ministry of Water Resources	Member
10.	Director Indian Agricultural Research Institute Pusa, New Delhi	Member
11.	Joint Secretary (Policy & Plan) Department of Agriculture & Cooperation	Member
12.	Joint Secretary National Committee on Plasticulture Applications in Horticulture	Member
13.	Joint Secretary (NHM) & Mission Director Department of Agriculture & Cooperation	Member Secretary

will be involved in monitoring and reviewing the progress of the scheme. The NCPAH secretariat will provide necessary support for this purpose.

4.2 Executive Committee (EC) will reallocate resources across States and approve programmes on the basis of approved subsidy norms. EC is empowered to approve special interventions for tackling emergent requirements. EC can also constitute Sub-Committee (SC) / Empowered Committee (EMC) and delegate power to SC / EMC for emergent requirements like revision of cost norms, inclusion of equipment, etc. if required based on the recommendations of EC of NMMI.

4.3 State Level Micro Irrigation Committee (SMIC)

At the State level, State Micro Irrigation Committee (SMIC) under the Chairmanship of Agriculture Production Commissioner / Principal Secretary (Horticulture / Agriculture) would oversee the implementation of the scheme in their respective States. The Panchayati Raj institutions in the State will be represented in the SMIC and involved in the implementation of the Scheme.

The Chairman, at his discretion, can co-opt officials / experts as invitees.

The SMIC meeting will be held once in every quarter.

4.4 The SMIC will have the following functions:

i. Organise base line survey and feasibility studies in different parts of the State covering various crops and technologies.

ii. Ensure smooth implementation of Micro Irrigation programme in different districts of the State.

The constitution of SMIC will be as under:

APC / Secretary (Horticulture / Agriculture)	Chairman
Secretaries	
Water Resources	Member
Rural Development	Member
Representative of Ministry of Agriculture, New Delhi	Member
Representative, State Panchayati Raj Institution	Member
Representative of NCPAH	Member
Representative of State PFDC	Member
Director / Head of Rural Development	Member
Director(s) of Research of SAUs of the State	Member
Representative of Lead Banks	Member
Two Representatives of State level Growers' Association	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, Economics, Information Technology)	Member
Representative from State Ground Water Board	Member
Director of Horticulture / Agriculture / Mission Director (SHM) of State	Member Secretary

iii. Ensure allocation of State share required for implementing the Scheme and make it available to the Implementing Agency.

iv. Finalise and forward the consolidated action plans of the Districts to DAC.

v. Register the System Manufacturers and circulate the list of System Manufacturers' registered with SMIC along with the quoted price to the District Micro Irrigation Committees (DMIC) and Implementing Agencies. They will also indicate the quantum of money to be paid by the beneficiaries / banks to the manufacturers' before installing the system.

vi. Mobilize credit requirement of the farmers through the Financial Institutions for installing Micro Irrigation System.

vii. Organise various training and extension programmes for farmers, officials, NGOs, entrepreneurs etc involving PFDCs.

viii. Host a website indicating the details and status of the progress of NMMI Scheme in different districts of the State.

4.5 District Level Micro Irrigation Committee (DMIC)

At the District level, District Micro Irrigation Committee (DMIC), headed by the Chief Executive Officer (CEO) of Zilla Parishad / District Rural Development Agency (DRDA) / Collector of the District, with members / representatives from concerned departments viz. Agriculture, Horticulture, Rural Development, Irrigation and Water Resources, Growers' Association, Krishi Vigyan Kendras (KVKs) and local lead Banks will be responsible for implementing the NMMI programme in the district. The DMIC meeting will be held once in every month.

4.6 The DMIC will have the following functions:

i. Forward the District Action Plan to SMIC for compilation of State Action Plan and forward it to the Ministry of Agriculture.

ii. Mobilize credit requirement of the farmers through the Financial Institutions for installing Micro Irrigation System.

iii. Monitor and review the physical & financial progress of implementation of Mission programme.

iv. Review the submission of utilisation certificate by the Implementing Agency.

v. Provide feedback to SMIC on monthly basis by 6th / 7th of each month.

4.7 Implementing Agency (IA)

i) The scheme will be implemented by an Implementing Agency (IA) specially designated for this purpose by the State Government. The Directorate of Horticulture / Agriculture would provide technical support for the scheme. Assistance to the tune of 1% of the annual outlay / actual release of funds will be provided for monitoring the scheme at District level by the IA.

ii) The implementing agency would have the following functions:

a) To disburse financial assistance to the beneficiaries at the rate

commensurate with the size of the holdings as per revenue records in accordance with the guidelines of the scheme.

b) To furnish Utilisation Certificates and Monthly Progress Reports in the prescribed proforma (annexed) to the Ministry of Agriculture.

c) To disburse financial assistance to the beneficiary / bank / MI manufacturer only against the authorization of the beneficiary within one month from the date of installation of MI system.

d) To ensure that no service charges are levied by any institution / organisation entrusted with the task of commissioning of the Drip / Sprinkler System.

e) To avoid any overlapping and for smooth implementation of the scheme, it will be necessary to have only one implementing agency in each District / State.

4.8 Technical Support Group (TSG)

NMMI will have a strong technical back up at the Centre as well as at State levels. Technical support at the National and State level will be provided by NCPAH for which NCPAH will be suitably strengthened by deploying experts in various related fields of agriculture, water management and Information Technology in the form of a Technical Support Group. The TSG at the National level will be housed in NCPAH Secretariat. NCPAH will recruit professionals, as required 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, National Food Security Mission (NFSM) etc. Research Associates could also be employed for the TSG as per the norms of ICAR for field level work.

A TSG could also be formed at the State level to help the Implementing Agency for implementation and monitoring of the Scheme. The SMIC may select expert(s) for the State level TSG. There are 22 Precision Farming Development Centres (PFDCs) set up in various agro-climatic regions across the country at SAUs, ICAR Institutes and IIT (as per annexed list). The Principal Investigator of the PFDC of the concerned State will be involved in constitution of the TSG and will support it through studies, applied research, technology demonstrations etc.

The TSG will

i. help in monitoring the Scheme including guiding in technical matters.

ii. assist in preparation of state plans and help in the creation of benchmark data.

iii. assess the projects submitted by the Districts / States for release of funds.

iv. help in preparation of location and crop specific training modules.

v. assist in formulation / updating of BIS standards.

vi. advise on documentation and dissemination of success stories.

vii. help in organizing State, National and International level Seminars / Conferences / Workshops.

viii. plan technology development for situation specific problems (hilly terrain, brackish water use, etc).

5. Role of Panchayati Raj Institutions (PRIs)

5.1 Panchayati Raj Institutions will be actively involved in the following activities:

i. Selection of crops and identification of priority areas for implementation.

ii. Authorization of beneficiaries, compilation of application forms / proforma invoices and creation of local initiatives in promotion of micro irrigation technology.

iii. Organization of interactive meetings with the representatives of MI industry.

6. Pattern of Assistance

6.1 Expenditure on the implementation of NMMI Scheme will be shared in the ratio of 50:10:40 between Central Government, State Government and the beneficiary in case of Small and Marginal farmers. In other words, subsidy assistance for Small and Marginal farmers will be @ 60% of the cost of the drip / sprinkler irrigation system and the remaining 40% will have to be borne by the farmer. In case of general category farmers, subsidy assistance will be @ 50% of the cost of the system which will be shared in the ratio of 40:10:50 by the Central Government, State Government and the beneficiary. States are free to provide additional financial assistance to lessen the burden of individual beneficiaries.

6.2 Assistance will be limited to five hectares per beneficiary. Those beneficiaries who have already availed subsidy benefits earlier will also be entitled to avail subsidy for additional area subject to the maximum ceiling of 5 ha after a period of 10 years (longevity of the equipment).

6.3 The land holding of a beneficiary to be covered under drip / sprinkler irrigation system could be located in one contiguous area or at different locations, for which financial assistance would be admissible with overall ceiling of 5 ha.

6.4 Cooperative Societies / Self Help Groups / Incorporated Companies / Panchayati Raj Institutions / NGOs / Trusts / Growers' Association will be entitled to avail financial assistance on behalf of their members. In such cases, the individual beneficiary will receive financial assistance only through the respective organisations with a maximum limit of 5 ha per beneficiary.

6.5 The beneficiaries / Institutions that have opted for contract farming or taken land on lease are also eligible for obtaining financial assistance under the National Mission on Micro Irrigation. However, to become eligible, the beneficiaries / institutions shall have to produce lease agreement for a minimum period of ten years from the date of approval of application by the MI implementing agency.

6.6 Assistance for demonstration of micro irrigation technology will be @ 75%

of the system cost for a maximum area of 0.5 ha per beneficiary and will be met entirely by the Central Government.

6.7 MI demonstration will be taken up on farmers' field and also on farms belonging to State / Central Governments, State Agricultural Universities (SAUs), ICAR Institutes, Non-Government Organizations (NGOs) / Trusts.

7. Mechanism of Fund Flow

7.1 Funds to implement the Mission will be released directly to the State Level Implementing Agency (IA), on the basis of the approved Annual Action Plan. The IA would make funds available to the District Micro Irrigation Committee in accordance with the approved programme of the District. Funds would be released to the State in installments based on the progress reports and utilization certificates. The first installment of 50% of State outlay will be released after the approval of Annual Action Plan. The remaining amount will be released subsequently on the basis of progress.

7.2 As far as possible, 'electronic banking' will be used for transfer of funds to the IA. The IA will have to maintain a separate budget and prescribed accounting system for the Mission, both at the State and District level.

8. Monitoring

8.1 The National Mission on Micro Irrigation will have a strong mechanism of monitoring and evaluation with the involvement of National Committee on Plasticulture Applications in Horticulture (NCPAH) and the Implementing Agency at State level.

8.2 The physical and financial performance would be closely monitored by monitoring / inspection teams, as per the format prescribed under NMMI.

8.3 At the National level, the activities of the Mission will be monitored by Joint Inspection Team (JIT) under the Chairmanship of Mission Director (NMMI / NHM) involving NCPAH. JIT will make field inspections at regular intervals.

8.4 At the State level, the activities of the Mission will be monitored by a Committee to be constituted under the Chairmanship of State Mission Director with members from SAUs / ICAR, Banks and Central Institute of Plastics Engineering and Technology (CIPET).

8.5 The Precision Farming Development Centres (PFDCs) working under NCPAH will be involved in data collection for monitoring of different parameters.

9. Reporting System

The State Implementing Agency / Department of Horticulture / Agriculture will furnish physical and financial progress through the web enabled progress monitoring system and furnish a hard copy of monthly progress report by the 10th of the following month in the prescribed proforma (Annexed). Similarly, the detailed Annual Progress Report (APR) should be sent to the Department of Agriculture & Cooperation, Ministry of Agriculture within two months after the end of the financial year.

10. Evaluation

10.1 A baseline survey will be conducted by each State to obtain information

on extent of productivity, water use efficiency electricity, fertilizer and labour cost, crop intensity, crop diversification and income.

10.2 An Impact Evaluation Study at the National level will also be undertaken through an independent Agency with involvement of NCPAH once in every three years of implementation to assess the impact of the scheme in increasing water use efficiency, productivity, enhancement of farmers' income, technology adoption etc.

10.3 Information communication technology will be used for monitoring and evaluation with the help of specialized tools / formats / software developed through NCPAH.

11. Criteria for Identification of Areas and Beneficiaries

11.1 The term "Beneficiary" under the scheme is defined as "every land holder, who possesses own land or leased land for a period of at least the projected life of the irrigation system (10 years) for the purpose of growing crops and who has a water source, either own or shared." The benefit of the scheme will also be available to public sector undertakings / ICAR / SAUs and on land belonging to Government.

11.2 All farmers are entitled to avail assistance for various components of the Mission limited to a total area of 5 hectares per beneficiary.

11.3 16% of the total allocation will be earmarked for SCP and 8% for TSP.

11.4 At least 33% of the allocation is to be utilized for small, marginal and women farmers. The allocation to SC / ST farmers will be proportionate to their population in the District.

11.5 Farmer who have already availed the benefit of central subsidy for micro irrigation would only be available for subsidy on the same land after the end of the projected life of the irrigation system i.e. 10 years.

11.6 PFDCs, ICAR, CIPET, Agricultural Technology Management Agencies (ATMA) and other reputed NGOs will be involved in planning, implementation, demonstration, training and evaluation. The implementing agency at the District level will converge activities under the programme of various departments on water management to get the desired output.

12. Procedure for Approval and Implementation

12.1 DAC will issue Administrative Approval of NMMI by April / May every year indicating the details of budget allocation.

12.2 States will prepare perspective / strategic plan and road map for micro irrigation technology duly projecting plan of action for XI and XII plan period. Perspective Plan will form the basis for preparing Annual Action Plan (AAP). The strategy and road map of the States should invariably contain information on potential of micro irrigation and strategy for its adoption in each State / District with reference to crop intensity, overall net irrigated area, percentage diversification of crops, and gains to farmers' income.

12.3 AAPs need to be supported with data and write ups on outcomes of past interventions covering the details of

impact of micro irrigation technology on crop productivity, changes in the pattern of crop production, area coverage under high value crops with MI system etc.

12.4 State will indicate district-wise allocation. Implementing Agencies at District level (DMIC) will prepare the AAP and submit it to SMIC for compiling and forwarding the consolidated AAP to this Ministry. 25 copies of AAP have to be provided to this Ministry for consideration of National level Executive Committee of NMMI. Format for submission of AAP is Annexed.

12.5 IA will arrange to furnish the progress report and utilization certificate to the DAC as per the proforma prescribed.

12.6 EC is empowered to make inter-componental changes based on actual needs to the extent of 20% of the allocation.

13. Position of On-going Scheme

13.1 The ongoing Centrally Sponsored Scheme on Micro Irrigation will be implemented as National Mission on Micro Irrigation (NMMI) in the country in all States and Union Territories. The components of drip and sprinkler irrigation system are at present also included in some other Centrally Sponsored Schemes namely:

(i) National Food Security Mission (NFSM).

(ii) Integrated Scheme of Oilseeds, Pulses, Oilpalm and Maize (ISOPOM).

(iii) Technology Mission on Cotton (TMC).

The micro irrigation components in those programme will be retained but will conform to norms and pattern of assistance stipulated under NMMI.

14. Scheme Component : Area Coverage & Technical Support through Transfer of Technology

14.1 **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 etc 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, plant to plant spacing, soil type, water quality and availability etc are some of the factors which would decide the choice of the emitting system. An indicative list of system components required for installing a drip irrigation system in areas ranging from 0.2 ha to 5 ha is Annexed. The indicative cost of Drip Irrigation System (assuming peak water requirement with source of water at the corner of the plot) for different lateral spacing and plot sizes is given in Table 1 on the basis of which subsidy will be calculated.

14.2 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 volume of demand, marketing network, etc. Accordingly,

Table 1: Indicative cost of Installing Drip Irrigation System for calculation of subsidy

Cost in ₹ / ha

Lateral Spacing (mxm)	Area (ha)						
	0.2	0.4	1	2	3	4	5
A. Wide Spaced Crops							
12x12	8057	13785	18820	29928	46467	57809	73611
10x10	8308	14277	20041	32323	50128	62787	79831
9x9	8490	14631	20900	34039	52704	66294	84219
8x8	8673	15088	22028	36217	56087	70893	89964
6x6	9492	16605	26551	44387	71715	86970	109129
5x5	10061	17977	30143	51438	74334	94465	126925
4x4	11177	18621	31793	55725	86926	113812	135459
3x3	12088	20048	36551	63269	97448	122553	153441
2.5x2.5	14939	27092	52230	95083	145227	203823	248954
2x2	18319	31616	63598	123441	179332	249134	305797
B. Close Spaced Crops							
1.5x1.5	21514	35973	74437	141858	211855	292595	360002
2.5x0.6	15463	26791	54909	100906	154213	214153	262885
1.8x0.6	18807	32909	70086	132653	199684	271986	338705
1.2x0.6	24063	43816	97598	185565	280886	378946	474070

the states have been categorized into three categories, viz. Category 'A', 'B' and 'C'.

States where more than 20,000 hectares have been brought under drip irrigation would come under 'A' Category. This would include the States of Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, 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, Uttarakhand 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.

14.3 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,

fanjets, micro sprinklers, mini sprinklers, misters and similar other low discharge irrigation systems.

14.4 In case of crops with lateral spacing other than those specifically mentioned in the Annexure, financial assistance shall be calculated on pro rata basis corresponding to the nearest lateral spacing given in the said Table I. Laterals of 12 mm Class II, 16 mm Class II and 20 mm Class I may be used as per the distance and requirement in the planning of implementation of the system as annexed.

14.5 In case of inter-cropping, financial assistance will be available for the prescribed lateral spacing given in the Annexures for the respective technologies, subject to the condition that financial assistance will be provided only for one crop as per the beneficiary's choice. However, if the beneficiary has more than one crop with different crop spacings on his / her land, financial assistance will be available for installing the drip irrigation system as per individual crop spacing, the combined area of which will not exceed 5 ha.

14.6 Micro Sprinklers (up to 3 m radius of throw): Micro Sprinklers are mostly used for irrigating leafy vegetables, nurseries, hardening of seedlings and a few vegetables. Apart from providing irrigation, the micro sprinkler also helps in changing the micro climatic conditions near the plant. Micro-sprinklers are low radius sprinklers which have a radius of throw up to 3 m. Discharge of micro sprinkler varies from 20 lph to 150 lph. The selection of micro sprinkler depends on the type of crop, soil, etc.

The categorization of states and other conditions for sanction of subsidy for micro sprinkler irrigation system would be same as that for drip irrigation systems. An indicative list of system components required for installing a micro sprinkler system is Annexed. The indicative cost of Micro Sprinkler irrigation system at different lateral spacings and area is given in Table 2.

Table 2: Indicative Cost of Micro Sprinkler and Mini Sprinkler Irrigation System

(Cost in ₹)

Area (ha)	Micro Sprinkler	Mini Sprinkler
	Spacing of Sprinkler (mxm)	
	5 x 5	10 x 10
0.2	17019	Not Feasible
0.4	25750	35968
1	51245	74097
2	90070	139142
3	129830	211289
4	175315	271958
5	221628	333150

14.7 Mini Sprinklers (more than 3 m up-to 10 m radius of throw): Mini Sprinklers are mid range sprinklers having radius between 3 m to 10 m. The discharge of these sprinklers vary from 150 lph to 600 lph. They are commonly used for close growing crops like Groundnut, Potato, Onion, Ginger, short statured fodder crops, etc. Mini sprinklers are also suitable for frost protection.

The categorization of states and other conditions for sanction of subsidy for mini sprinklers irrigation systems would be same as that for drip irrigation system. An indicative list of system components required for installing a mini sprinkler irrigation system is Annexed. The indicative cost of mini-

sprinkler irrigation system at different lateral spacings and area is given in Table 2.

Micro Sprinklers and Mini Sprinklers are distinct from drip system as the emitting systems are located above the ground with the help of risers duly supported with stakes. The discharge is high and all the standing crops within its radius can be irrigated. Accordingly, the unit cost for micro and mini sprinklers is high compared to unit cost for drip irrigation. Due care, therefore, needs to be exercised by the IA while administering subsidy for drip irrigation, micro and mini sprinklers by verifying the bill of material with the equipment installed on the field.

14.8 Irrigation Systems for Protected Cultivation including Green-houses, Polyhouses, Shadenet houses: Irrigation systems required for protected cultivation under greenhouses, polyhouses and shadenet houses are also eligible for financial assistance. The irrigation system would include various components as sand filters, screen filters, control valves, PVC pipes, laterals, drippers (on-line / in-line), foggers, misters, water tank with required fittings & accessories. The indicative cost for providing such an irrigation system inside the green house / shadenet is given in table 3.

Table 3: Indicative Cost of Drip Irrigation / Fogging / Misting System under Protected Cultivation

(Cost in ₹ per unit)

SN	Particulars	504 Sqm	100 Sqm
1.	Green House / Poly House a) High Cost b) Naturally Ventilated	55,000	21,000
2.	Shadenet	45,000	18,000

14.9 Other Components

14.9.1 Fertilizer tanks: To increase fertilizer use efficiency, fertilizer tanks have been included in the list of equipment eligible for financial assistance. The beneficiary can opt for either fertilizer tank or venturi system and financial assistance will be provided for either of these components.

14.9.2 Sand filters / media filters: To remove organic matter and inorganic contaminants from water sources like rivers, tanks and open wells sand / media filters have been included in the financial assistance.

14.9.3 Hydro Cyclone Filters / Sand Separators: To remove particles of the size of 75 micron (200 mesh) which have a higher density than water, hydro cyclone filters / sand separators have been introduced as an optional item for which financial assistance will be provided. These equipments require minimum maintenance and are useful for cleaning river water, canal water and tube well water which may contain sand.

The detailed guideline for filters selection is annexed. The indicative cost of sand filters, hydrocyclone filters and fertilizer tanks is annexed.

15. Sprinkler Irrigation

15.1 In Sprinkler Irrigation, water is discharged under pressure in the air

through a set of nozzles attached to a network of High Density Polyethylene (HDPE) pipes, simulating rainfall. Sprinkler irrigation systems are suitable for irrigating crops where the plant density is very high. It is widely used for cereals, pulses, seed, spices and other field crops. The categorization of States into three categories 'A', 'B' and 'C' done for drip irrigation is also applicable for the sprinkler irrigation system.

15.2 Financial assistance would be restricted as per the cost of High Density Polyethylene (HDPE) pipes used in sprinkler irrigation systems. The sprinkler irrigation systems may be portable, semi-permanent or large volume systems (Rainguns).

15.3 Portable Sprinkler Irrigation System

In portable sprinkler irrigation system, the HDPE pipes are used for mains and sub-mains which can be shifted from one place to another as per the irrigation schedule with respect to design layout. These types of sprinklers have a radius of throw from 12 m to 18 m with a discharge of 1200 lph to 1800 lph. These can be used in both plains and undulating terrains.

15.4 In portable sprinkler irrigation system, the beneficiary may avail financial assistance for different locations, only if separate water sources are available at each location & they are at a minimum distance of five hundred meters (500m) from each other.

15.5 The indicative number of components required for various area range of sprinkler irrigation system is Annexed. Financial assistance will be provided based on the number of pipes procured by the beneficiary for the area under reference. The indicative cost for various area ranges & pipe sizes is given in Table 4.

15.6 Semi-Permanent Sprinkler Irrigation System

In these type of sprinklers, the piping network for main line and lateral lines are permanently buried with risers fitted on the lateral lines. The sprinkler nozzles are fitted on each riser pipe and can be easily shifted from one place to another to irrigate the required area in shifts as per the irrigation schedule or the crop water requirement.

The indicative number of components required for various area range of

Table 4: Indicative Cost of Portable Sprinkler Irrigation System

(Cost in ₹)

Area	63 mm	75 mm	90 mm
Up to 0.4 ha	10399	NA	NA
More than 0.4 ha – 1 ha	16993	19044	NA
More than 1.0 ha – 2 ha	24533	27280	NA
More than 2.0 ha – 3 ha	NA	NA	36822
More than 3.0 ha – 4 ha	NA	NA	46438
More than 4.0 ha – 5 ha	NA	NA	52573

semi-permanent sprinkler irrigation systems is annexed.

The estimated unit cost for various area ranges is given in Table 5.

Table 5: Indicative Cost of Semi-Permanent Sprinkler System

Area	Cost (in ₹)
Upto 0.4 ha	19615
0.4 ha – 1 ha	31832
1.0 ha – 2 ha	60699
2.0 ha – 3 ha	81929
3.0 ha – 4 ha	104689
4.0 ha – 5 ha	127003

15.7 Large Volume Sprinkler Irrigation System (Raingun)

Large volume sprinkler irrigation systems (Rainguns) are used where larger areas are to be covered with one or two sprinklers. These sprinklers have a discharge ranging from 10,000 lph to 32,000 lph and radius of throw from 24 m to 36 m. As these systems cover larger areas they require high pressure and high discharge pipes & pumps to operate them. These are preferred for irrigating crops spread over large areas in short time. The indicative list of components is annexed.

The estimated unit cost for various area ranges is given in Table 6.

16. Technology Support and Transfer of Technology

16.1 States will be provided technology support through demonstrations and transfer of technology.

16.2 Technology Demonstration

i) Technology demonstration is an important component of the scheme. The objective of the said component is to demonstrate, innovations in the existing technologies on farmers' field / demonstration farms which may be visited by various stakeholders. The following technologies would be covered under the said component:

- Drip Irrigation System
- Micro Sprinkler Irrigation System
- Mini Sprinkler Irrigation System

ii) Demonstration will be taken up on farmers' field and farms belonging to Central / State Government / SAUs / NGOs / Trust / ICAR Institutes. Each demonstration unit will be of 0.5 hectares area. The demonstration would be laid at strategic locations for maximum visibility.

iii) The procedure to implement this component is the same as for installation of drip irrigation system.

Table 6: Indicative Cost of Large Volume Sprinklers (Rainguns)

(Cost in ₹)

Area	63 mm	75 mm	90 mm
More than 0.4 ha – 1 ha	24940	30011	NA
More than 1.0 ha – 2 ha	NA	38075	NA
More than 2.0 ha – 3 ha	NA	NA	54112
More than 3.0 ha – 4 ha	NA	NA	62720
More than 4.0 ha – 5 ha	NA	NA	68878

The manufacturers' / suppliers' approved for drip irrigation installation may be involved to lay demonstrations.

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

16.3 Training programmes

i) Human Resources Development through training programmes for officials, farmers, entrepreneurs and other active players involved in micro irrigation 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 involving reputed manufacturers' for exposure visits in respect of equipments and accessories required for micro irrigation system.

ii) Duration of training will be for 2-3 days. The number of participants will be limited to 30 for each training. The total number of trainings per District will be 5 to 10 in a year.

iii) Financial assistance will be limited to ₹ 50,000 per training in identified Districts. The detailed break-up of items for each training session are as follows:

iv) State Government officials may also avail training on Micro Irrigation at PFDC / KVK or any other institution for which the expenditure will be borne by State Government.

16.4 Seminars / Exhibitions

i NMMI will facilitate the organization of seminars, workshops, exhibitions and publicity campaigns at different levels. The norms of assistance for seminar / workshops is as follows:

Category	Duration (days)	Maximum assistance (₹ in lakh)
International	5	50.00
National Level	5	10.00
Regional / District Level	2-3	05.00

These events will be organized through State Implementing Agency or by DAC with 100% assistance. In case of Private Sector, assistance will be limited to ₹ 5.00 lakh for International, ₹ 2.5 lakh for National and ₹ 1.00 lakh for regional events, which will be project based.

16.5 Area wise / District wise Awareness Programme / Publicity

Awareness programme and publicity of the MI technology will be undertaken

SN	Item	Amount (in ₹)
1.	Honorarium for one facilitator @ ₹250 / - per session (for 20 session)	5000
2.	Training materials stationaries etc. (local languages)	5000
3.	For farmers stipend ₹1000 / per farmer (30 farmers)	30,000
4.	Field & other Miscellaneous programme	10,000
	Total	50,000

through print, electronic media and other methods. NCPAH will be actively involved in the publicity under TSG programme.

16.6. Exposure visit to International Organizations

i In order to enrich the knowledge base of the technical personnel involved in the Mission, exposure visits to and training of technical officers / staff in international organizations will be provided in the XI Plan period.

ii NMMI EC would approve the proposal made by the Scheme In-charge for organizing the envisaged exposure visits.

17. General Guidelines Administering the NMMI

17.1 Transparency in Beneficiary Selection

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

17.1.1 The criteria of small and marginal farmers is to be followed strictly i.e. marginal (holding up to 1.0 ha) and small (land holding from 1.00 to 2.00 ha).

17.1.2 At District Level, a Committee headed by Collector / DMIC will decide / finalize the number and list of beneficiaries based on the report submitted by the district level officer (MI) after verification of prerequisite like water availability, area, electricity, small & marginal farmer and general farmer etc. The size of holding of the beneficiary / farmer is to be vetted by representative of Panchayati Raj Institutions / Local Revenue officials.

17.1.3 Implementing Agency (IA) at District level should ensure that the selection of beneficiaries are as per the targeted area mention in the Annual Action Plan.

17.2 Pre-installation

17.2.1 The IA will

i) widely publicize the scheme at the block and village levels through its existing networks.

ii) appoint a nodal officer, who is well versed in horticulture / agri-culture, who will be responsible for the Micro Irrigation Scheme implementation.

iii) disseminate the list of suppliers and rate list approved by SMIC to the farmers.

iv) organize at least one District level seminar / workshop with the participation of Industry.

v) compile the application forms submitted by the farmers and scrutinize, codify and forward the same to the companies' / Manufacturers' local office indicated by the farmer.

17.2.2 The beneficiary shall be free to purchase MI equipments from any MI manufacture out of the approved list of registered manufacturers' (SMIC registered).

17.2.3 The Manufacturer / Company will

a. assess the crop water requirement as per the crop for which the system is to be provided.

b. design the system as per the crop water requirement.

c. prepare an estimate of cost and submit it duly indicating the time frame by when the system will be installed in the farmers' field.

17.2.4 The IA will approve the estimate and ensure that the cheque / payment in favour of system supplier is handed over to the farmer so that there is no time lag between implementation and payment.

17.3 Installation

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

i) good quality components having BIS mark are installed in the farmers' field and while making payment the implementing agency will ensure the BIS standard of supplied equipments.

ii) the installed system should match the water requirement of the crop.

iii) necessary orientation and training is given to the farmers on the agronomic practices to be followed for irrigating the crop with drip / sprinkler irrigation.

iv) proper warranty and a user's manual for running & maintenance of the system, whether drip or sprinkler or both, as the case may be is available with the farmer.

v) a certificate towards successful installation / commissioning of the system is obtained from the beneficiary.

17.4 Disbursement of Assistance – Post Installation

i) Financial assistance to the beneficiary will be limited to 50 per cent of the system cost or bill of quantities (BoQs) whichever is less. On receipt of certificate from beneficiary and physical verification of satisfactory installation of the System, the Implementing Agency will release payment to the beneficiary through crossed Cheque / 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 to the Manufacturer. In case the beneficiary has availed loan, the concerned financial institution will release the balance amount, if any, to the manufacturer / company by crossed cheque through the beneficiary.

ii) The IA shall ensure proper invoice with statuary commercial details i.e. Serial number, CST / LST / TIN number etc. printed on it and countersigned by the authorized representative of the MI system manufacturer is issued to the beneficiary & subsidy released on the same.

ii) The manufacturer will install the system within twenty one days on receipt of work order from IA.

iii) The IA will ensure that the payment of subsidy is made within seven working days from the date of installation of the system.

17.5 Registration of Manufacturers

i. Registration of the System manufacturers shall be done by the

SMIC. Only those Manufacturing Companies which have all the facilities to ensure the quality of product as per BIS standards and who can provide prompt after sales services will be registered. The Company once registered will be valid for 3 years. Companies who wish to participate in Scheme implementation of NMMI 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. A technical committee constituted at the State Level for physical verification and to check the material of the manufacturer will submit the report to the SMIC for consideration.

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

a) In the case of drip irrigation, the company must manufacture at least laterals and emitting devices as specified conforming to BIS standards. In case of Sprinkler Irrigation, the company should manufacture HDPE / PVC pipes / nozzles and other required equipment as per BIS specifications. They must provide guarantee of quality assurance of other components which are not manufactured by them.

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

c) The companies will supply only BIS marked material. The list of relevant BIS components is given in Annexure.

d) In case the company intends to supply imported components, they should have prior approval of DAC subject to indigenize the manufacturing of component within a period of two years. In case of imported equipments, the required acceptance will be provided by NCPAH after proper examination and verification and submission of report to DAC for approval.

e) The material should be supplied directly by the manufacturers or their authorized distributors / dealers. 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.

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

17.6 Quality Control

i The crucial aspect of supply of micro irrigation system is the quality of the hardware delivered to the farmer. Poor quality have

an adverse impact on performance of the system which may affect yield of the crop, quantity of water applied, quantity of fertilizer delivered to the plant etc. It may also increase energy consumption. In fact, sub standard system will not only adversely impact performance, but could also reduce the durability and the life of the components and / or system.

ii Frequent surveillance by inspection teams comprising officials from NCPAH / PFDC, CIPET, Irrigation Association of India (IAI), BIS and TSG will be a regular feature under the Scheme. They will draw random samples periodically from the field, 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 criteria will be looked into as given in the box.

iii In case of detection of failures or supply of poor sub-standard quality material, the concerned manufacturer will be issued warning for the first offence. In case of subsequent offences, the Company will be deregistered and restricted from participating in the NMMI Scheme through out the country in addition to invoking of bank guarantee.

iv In order to ensure supply of BIS quality materials to the farmers', the manufacturers' who are registered to participate in NMMI should manufacture only such components which have BIS certification. It will be the responsibility of the Irrigation Association of India (IAI) to promote the quality assurance mechanism by registering only such manufacturers who give an undertaking to this effect, as Members of IAI.

17.7 After Sales Service

i The manufacturers should have network for providing after sales service in their areas 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 the vernacular language at the time of installation of the system. The

Checklist for Sanctioning Assistance under NMMI	
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 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 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 users' manual of the relevant manufacturer who has installed the system.

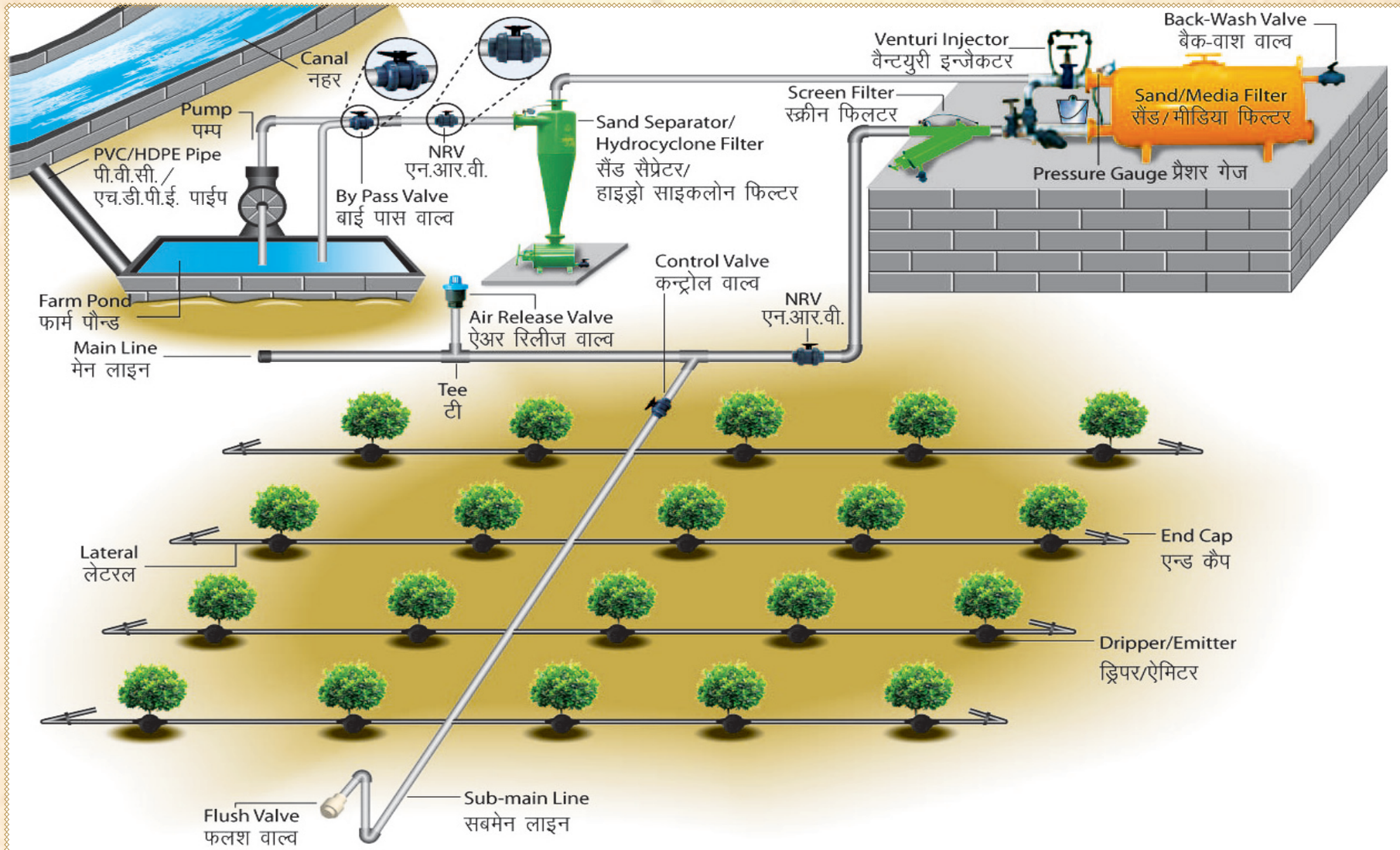
beneficiaries should be advised to follow the instructions provided by the manufacturers for the operation and maintenance of drip / sprinkler irrigation systems.

ii Service Centres and / or Offices of drip / sprinkler system manufacturers should have facilities to provide technical guidance on agronomic practices, system maintenance schedules, supply spare parts and ensure satisfactory performance of the system during the warranty period. List of service centres / offices with full address / telephone numbers / e-mail should be widely published.

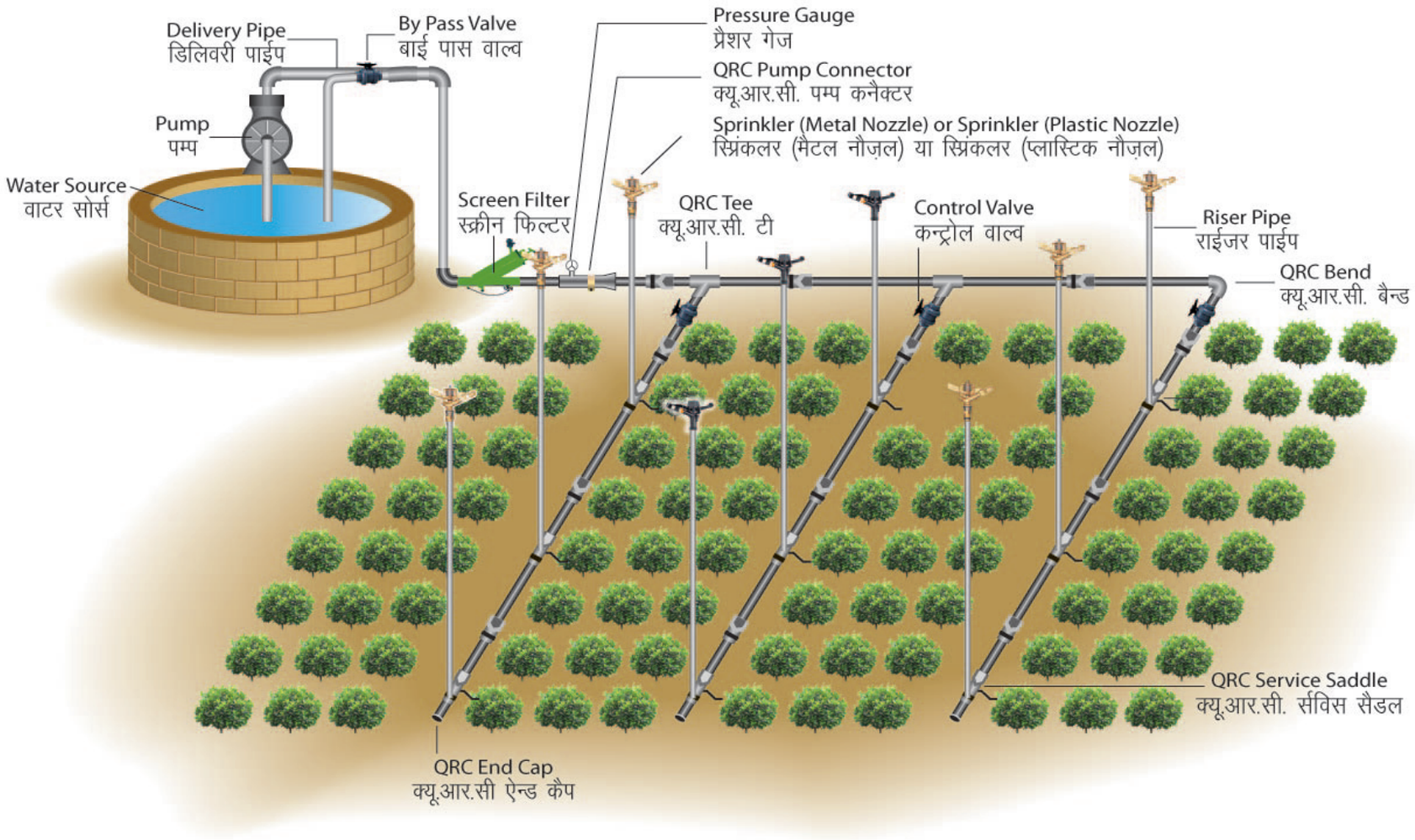
iii Free after sales service should be provided by the manufacturer / authorized distributor at least for three years. If any system manufacturer fails to provide such free service, the same should be brought to the notice of DMIC and DAC / EC for taking appropriate action.

iv The manufacturer should take the responsibility for any disputes arising from the supply of their product through their distributors or dealers. The IA / SMIC of each State shall evolve a process and modus operandi for redressal of disputes at Taluka / Block Levels.

v The SMIC / IAs are free to take strong punitive measures against erring companies as well as against their own staff, in order to safeguard the interests of farmers' and to ensure effective utilization of public funds.



Layout of Drip Irrigation System (ड्रिप सिंचाई पद्धति का रेखाचित्र)



Layout of Sprinkler Irrigation System (छिड़काव सिंचाई प्रणाली का रेखाचित्र)

Suggested System Selection for Different Crops

Crop	System	Remarks
Cereals like Wheat, Maize, Bajra, sorghum	Sprinkler	
Groundnut	Sprinkler / Mini Sprinkler / Drip	Not feasible of having high wind speed upon the degree of water scarcity and wind conditions.
Potato	Mini Sprinkler / Drip / Sprinkler	Depending upon the water scarcity. Sprinkler can be used if potato is grown in a sequence with cereal crop. If grown after crops like groundnut the system used for the first crop should be used for the following crop.
Banana	Drip	When intercropping is done, mini-sprinkler should be selected if the water requirement of inter crop can be adjusted with that of banana. If not drip should be used for both crops with appropriate control valves. If short duration inter cropis taken during kharif no separate MI System needs to be laid for the inter crop.
Sugarcane	Drip	
Sugarcane in paired row along with inter crop	Mini Sprinkler / Drip	Mini Sprinkler can be used if the water requirements of sugarcane and inter crop do not vary much. Otherwise drip should be used with appropriate control valves. If short duration inter crop is taken during kharif no separate MI system be laid for the inter crop.
Orchard crop with inter crop	Drip / Mini Sprinkler	Depending upon the water requirement of main and inter crop. If short term crops like vegetables / short statured pulses are grown during kharif no additional system be provided to the inter crop.

Contd...

Crop	System	Remarks
Onion / Garlic / Coriander and other short statured crops	Mini Sprinkler	If these crops are either preceded or followed any drip responsive cash crops then the same system (preferably in line emitting system) be preferred for both the crops. If they are either preceded or followed by cereals then sprinkler may be preferred.
Vegetables like Tomato, Brinjal, Okra etc. and Widely spaced Cucurbits like Bitter Gourd and Grapes	Drip	
Cotton / Pigeonpea rotation / Castor etc	Drip	
Nurseries	Micro Sprinkler / Mini-Sprinkler	
Small and marginal lands / farmers	Sprinkler / Drip	Drip should be low energy low cost system with microtubes.
Hills and Tribal area	Drip	Low cost affordable system with microtube.
Saline water and water with high Fe content	Drip	Microtube and not emitters. Should be combined with plastic mulch.

Water Quality Criteria in Relation to Clogging

The criteria for water quality for conventional irrigation is different from the one meant for irrigating through drip. The clogging hazard with different water qualities are presented below:

Extent of Clogging on the Basis of Quality of Irrigation Water

Quality of Water	Clogging Hazard		
	Slight	Moderate	Severe
Suspended Solids (ppm)	< 50	50-100	> 100
pH	< 7.0	7.0-8.0	> 8.0
TDS (ppm)	< 500	500-2000	> 2000
Manganese (ppm)	< 0.1	0.1-1.5	> 1.5
Iron (ppm)	< 0.1	0.1-1.5	> 1.5
Calcium and Magnesium (ppm)	< 20	20-40	> 40
Hydrogen sulphide (ppm)	< 0.5	0.5-2.0	> 2.0
Bacterial population (No. / ml)	< 10000	10000-50000	> 50000

Source: *Dasberg and Dani, 1999*

Indicative Requirement of Material for Drip Irrigation System

a) Wide Spaced Crops

For 0.2 hectare

SN	Component Lateral to Lateral x Dripper spacing (mxm)	Unit	12 x 12	10 x 10	9 x 9	8 x 8	6 x 6	5 x 5	4 x 4	3 x 3	2.5 x 2.5	2 x 2	1.5 x 1.5
1	PVC Pipe 50 mm; Class II; 4kg / cm^2	m	0	0	0	0	0	0	0	0	66	66	66
2	PVC Pipe 40 mm	m	66	66	66	66	66	66	66	66	0	0	0
3	Lateral 16 mm Class II, 2.5 Kg / cm^2	m	0	0	0	0	0	0	0	0	800	1000	1350
4	Lateral 12 mm	m	190	230	260	300	420	520	700	850	0	0	0
5	Emitter 4 / 8 lph	No.	50	80	100	100	220	270	400	500	640	1500	1800
6	Control Valve 50 mm	No.	1	1	1	1	1	1	1	1	1	1	1
7	Flush Valve 50 mm	No.	1	1	1	1	1	1	1	1	0	0	0
8	Air Release Valve 1"	No.	1	1	1	1	1	1	1	1	1	1	1
9	Non Return Valve 1"	No.	1	1	1	1	1	1	1	1	1	1	1
10	Throttle Valve ¾"	No.	1	1	1	1	1	1	1	1	1	1	1
11	Screen Filter 5 / 7 m^3 / hr	No.	1	1	1	1	1	1	1	1	1	1	1
12	By-pass Assembly – 1"	No.	1	1	1	1	1	1	1	1	1	1	1
13	Venturi & Manifold ¾"	No.	1	1	1	1	1	1	1	1	1	1	1
14	Fittings & Accessories	5%	1	1	1	1	1	1	1	1	1	1	1

Indicative Requirement of Material for Drip Irrigation System

a) Wide Spaced Crops

For 0.4 hectare

SN	Component Lateral to Lateral x Dripper spacing (mxm)	Unit	12 x 12	10 x 10	9 x 9	8 x 8	6 x 6	5 x 5	4 x 4	3 x 3	2.5 x 2.5	2 x 2	1.5 x 1.5
1	PVC Pipe 63 mm; Class II ; 4kg / cm^2	m	0	0	0	0	0	0	0	0	30	30	30
2	PVC Pipe 50 mm; Class II ; 4kg / cm^2	m	96	96	96	96	96	96	96	96	66	66	66
3	Lateral 16 mm Class II ; 2.5 kg / cm^2	m	0	0	0	0	0	0	0	0	1616	2020	2693
4	Lateral 12 mm; Class II ; 2.5 kg / cm^2	m	339	406	452	508	677	813	1016	1355	0	0	0
5	Emitter 4 / 8 lph	No.	113	163	201	255	453	653	510	907	1293	2010	1796
6	Microtube 6 mm	m	85	122	151	191	340	490	510	0	0	0	0
7	Control Valve 63 mm	No.	0	0	0	0	0	0	0	0	1	1	1
8	Control Valve 50 mm	No.	1	1	1	1	1	1	1	1	1	1	1
9	Flush Valve 50 mm	No.	1	1	1	1	1	1	1	1	1	1	1
10	Air Release Valve 1"	No.	1	1	1	1	1	1	1	1	1	1	1
11	Non Return Valve 1.5"	No.	1	1	1	1	1	1	1	1	1	1	1
12	Throttle Valve 1.5"	No.	1	1	1	1	1	1	1	1	1	1	1
13	Screen Filter 10 m^3 / hr	No.	1	1	1	1	1	1	1	1	1	1	1
14	By-pass Assembly – 1.5"	No.	1	1	1	1	1	1	1	1	1	1	1
15	Venturi & Manifold 1.5"	No.	1	1	1	1	1	1	1	1	1	1	1
16	Fittings & Accessories	5%	1	1	1	1	1	1	1	1	1	1	1

Annexure

Indicative Requirement of Material for Drip Irrigation System

Wide Spaced Crops

For 1.0 hectare

SN	Component Lateral to Lateral x Dripper spacing (mxm)	Unit	12 x 12	10 x 10	9 x 9	8 x 8	6 x 6	5 x 5	4 x 4	3 x 3	2.5 x 2.5	2 x 2	1.5 x 1.5
1.	PVC Pipe 75 mm; Class II ; 4kg / cm^2	m	0	0	0	0	0	0	0	54	54	54	54
2.	PVC Pipe 63 mm; Class II ; 4kg / cm^2	m	0	0	0	0	54	156	156	102	102	102	102
3.	PVC Pipe 50 mm; Class II ; 4kg / cm^2	m	156	156	156	156	102	0	0	0	0	0	0
4.	Lateral 16 mm Class II ; 2.5 kg / cm^2	m	0	0	0	0	0	0	0	0	4040	5050	6733
5.	Lateral 12 mm Class II ; 2.5 kg / cm^2	m	833	1000	1111	1250	1667	2000	2500	3333	0	0	0
6.	Emitter 4 / 8 lph	No.	278	400	494	625	1111	1600	1275	2267	3232	5050	4489
7.	Microtube 6 mm	m	208	300	370	469	833	1200	1250	0	0	0	0
8.	Control Valve 75 mm	No.	0	0	0	0	0	0	0	1	0	0	0
9.	Control Valve 63 mm	No.	0	0	0	0	1	1	1	0	1	1	1
10.	Control Valve 50 mm	No.	1	1	1	1	0	0	0	0	1	1	1
11.	Flush Valve 63 mm	No.	0	0	0	0	0	1	1	1	0	0	0
12.	Flush Valve 50 mm	No.	1	1	1	1	1	0	0	0	1	1	1
13.	Air Release Valve 1"	No.	1	1	1	1	1	1	1	1	1	1	1
14	Non Return Valve 1.5"	No.	1	1	1	1	1	1	1	1	1	1	1
15.	Throttle Valve 1.5"	No.	1	1	1	1	1	1	1	1	1	1	1
16.	Screen Filter 10 m^3 / hr	No.	1	1	1	1	1	1	1	1	1	1	1
17.	By-pass Assembly - 2"	No.	0	0	0	0	1	1	1	0	0	0	0
18.	By-pass Assembly – 1.5"	No.	1	1	1	1	0	0	0	1	1	1	1
19.	Venturi & Manifold 2"	No.	0	0	0	0	1	1	1	1	0	0	0
20.	Venturi & Manifold 1.5"	No.	1	1	1	1	0	0	0	0	1	1	1
21.	Fittings & Accessories	5%	1	1	1	1	1	1	1	1	1	1	1

Indicative Requirement of Material for Drip Irrigation System

Wide Spaced Crops

For 2.0 Hectare

SN	Component Lateral to Lateral x Dripper spacing (mxm)	Unit	12 x 12	10 x 10	9 x 9	8 x 8	6 x 6	5 x 5	4 x 4	3 x 3	2.5 x 2.5	2 x 2	1.5 x 1.5
1	PVC Pipe 75 mm ; Class II ; 4kg / cm^2	m	80	80	80	80	80	80	80	80	80	80	80
2	PVC Pipe 63 mm ; Class II ; 4kg / cm^2	m	150	150	150	150	150	150	150	150	150	150	150
3	Lateral 16 mm Class II ; 2.5 kg / cm^2	m	0	0	0	0	0	0	0	0	8250	11000	14000
4	Lateral 12 mm Class II ; 2.5 kg / cm^2	m	1850	2130	2350	2600	3500	4200	5200	6900	0	0	0
5	Emitter 4 / 8 lph	No.	600	800	1000	1300	2300	3300	2600	4800	6600	10400	9000
6	Microtube 6 mm	m	500	650	780	960	1700	2500	2600	0	0	0	0
7	Control Valve 75 mm	No.	1	1	1	1	1	1	2	2	1	1	1
8	Control Valve 63 mm	No.	0	0	0	0	0	0	0	0	2	2	2
9	Flush Valve 63 mm	No.	0	0	0	0	1	1	2	2	1	1	1
10	Flush Valve 50 mm	No.	1	1	1	1	0	0	0	0	0	0	0
11	Air Release Valve 1"	No.	1	1	1	1	1	1	1	1	1	1	1
12	Non Return Valve 1.5"	No.	1	1	1	1	1	1	1	1	1	1	1
13	Throttle Valve 1.5"	No.	1	1	1	1	0	0	0	0	1	1	1
14	Throttle Valve 2"	No.	0	0	0	0	1	1	1	1	0	0	0
15	Screen Filter 10 m^3 / hr	No.	1	1	1	1	1	1	1	1	1	1	1
16	By-pass Assembly - 2"	No.	1	1	1	1	1	1	1	1	1	1	1
17	Venturi & Manifold 2"	No.	0	1	1	1	1	1	1	1	1	1	1
18	Venturi & Manifold 1.5"	No.	1	0	0	0	0	0	0	0	0	0	0
19	Fittings & Accessories	5%	1	1	1	1	1	1	1	1	1	1	1

Indicative Requirement of Material for Drip Irrigation System

Wide Spaced Crops — For 3.0 Hectare

SN	Component / Lateral to Lateral x Dripper spacing (mxm)	Unit	12 x 12	10 x 10	9 x 9	8 x 8	6 x 6	5 x 5	4 x 4	3 x 3	2.5 x 2.5	2 x 2	1.5 x 1.5
1	PVC Pipe 90 mm; Class II ; 4kg / cm^2	m	0	0	0	0	0	0	0	0	90	90	90
2	PVC Pipe 75 mm; Class II ; 4kg / cm^2	m	0	0	0	0	216	216	216	216	132	132	132
3	PVC Pipe 63 mm; Class II ; 4kg / cm^2	m	216	216	216	216	336	336	336	336	174	174	174
4	PVC Pipe 50 mm; Class II ; 4kg / cm^2	m	336	336	336	336	0	0	0	0	0	0	0
5	Lateral 16 mm Class II; 2.5 kg / cm^2	m	0	0	0	0	0	0	0	0	12120	15150	20200
6	Lateral 12 mm; Class II; 2.5 kg / cm^2	m	2500	3000	3333	3750	5000	6000	7500	10000	0	0	0
7	Emitter 4 / 8 lph	No.	833	1200	1481	1875	3333	2400	3750	6667	9696	15150	13467
8	Micro / Poly tube 6 mm	m	625	900	1111	1406	2500	2400	3750	0	0	0	0
9	Control Valve 90 mm	No.	0	0	0	0	0	0	0	0	1	1	1
10	Control Valve 75 mm	No.	1	1	1	1	1	1	1	1	2	2	2
11	Control Valve 63 mm	No.	4	4	4	4	4	4	4	4	4	4	4
12	Flush Valve 75 mm	No.	0	0	0	0	0	0	0	0	1	1	1
13	Flush Valve 63 mm	No.	4	4	4	4	4	4	4	4	4	4	4
14	Air Release Valve 1"	No.	1	1	1	1	1	1	1	1	1	1	1
15	Non Return Valve 1.5"	No.	1	1	1	1	1	1	1	1	0	0	0
16	Non Return Valve 2"	No.	0	0	0	0	0	0	0	0	1	1	1
17	Throttle Valve 2"	No.	0	0	0	0	0	0	0	0	1	1	1
18	Screen Filter 20 / 25 m^3 / hr	No.	0	0	0	0	0	1	1	1	0	0	0
19	Screen Filter 10 m^3 / hr	No.	1	1	1	1	1	0	0	0	1	1	1
20	By-pass Assembly - 2"	No.	1	1	1	1	0	0	0	0	1	1	1
21	By-pass Assembly - 1.5"	No.	0	0	0	0	1	1	1	1	0	0	0
22	Venturi & Manifold 2.5"	No.	0	0	0	0	1	1	1	1	0	0	0
23	Venturi & Manifold 2"	No.	1	1	1	1	0	0	0	0	1	1	1
24	Fittings & Accessories	5%	1	1	1	1	1	1	1	1	1	1	1

Indicative Requirement of Material for Drip Irrigation System

Wide Spaced Crops

For 4.0 Hectare

SN	Component / Lateral to Lateral x Dripper spacing (mxm)	Unit	12 x 12	10 x 10	9 x 9	8 x 8	6 x 6	5 x 5	4 x 4	3 x 3	2.5 x 2.5	2 x 2	1.5 x 1.5
1	PVC Pipe 90 mm; Class II ; 4kg / cm^2	m	0	0	0	0	0	0	0	0	138	138	138
2	PVC Pipe 75 mm; Class II ; 4kg / cm^2	m	225	225	225	225	225	225	225	225	276	276	276
3	PVC Pipe 63 mm; Class II ; 4kg / cm^2	m	402	402	402	402	402	402	402	402	402	402	402
4	Lateral 16 mm; Class II; 2.5 kg / cm^2	m	0	0	0	0	0	0	0	0	16160	20200	26933
5	Lateral 12 mm; Class II ; 2.5 kg / cm^2	m	3400	4080	4533	5100	6800	8160	10200	13600	0	0	0
6	Emitter 4 / 8 lph	No.	1133	1632	2015	2550	4533	4896	7700	9244	12800	20000	17800
7	Microtube 6 mm	m	850	1224	1511	1913	3400	3296	5150	0	0	0	0
8	Control Valve 90 mm	No.	0	2	0	0	0	0	0	0	2	2	2
9	Control Valve 75 mm	No.	0	0	0	0	2	2	2	2	2	2	2
10	Control Valve 63 mm	No.	2	2	2	2	0	0	0	0	4	4	4
11	Flush Valve 75 mm	No.	1	1	1	1	1	1	1	1	1	1	1
12	Flush Valve 63 mm	No.	4	4	4	4	4	4	4	4	4	4	4
13	Air Release Valve 1.5"	No.	1	1	1	1	1	1	1	1	1	1	1
14	Non Return Valve 1.5"	No.	1	1	1	1	1	1	1	1	0	0	0
15	Non Return Valve 2"	No.	0	0	0	0	0	0	0	0	1	1	1
16	Throttle Valve 1.5"	No.	1	1	1	1	1	0	0	0	0	0	0
17	Throttle Valve 2"	No.	0	0	0	0	0	1	1	1	1	1	1
18	Screen Filter 20 / 25 m^3 / hr	No.	0	0	0	0	0	1	1	1	1	1	1
19	Screen Filter 10 m^3 / hr	No.	1	1	1	1	1	0	0	0	0	0	0
20	By-pass Assembly - 2.5"	No.	0	0	0	0	0	0	0	0	1	1	1
21	By-pass Assembly - 2"	No.	1	1	1	1	0	0	0	0	0	0	0
22	By-pass Assembly - 1.5"	No.	0	0	0	0	1	1	1	1	0	0	0
23	Venturi & Manifold 2.5"	No.	0	0	0	0	1	1	1	1	0	0	0
24	Venturi & Manifold 2"	No.	1	1	1	1	0	0	0	0	1	1	1
25	Fittings & Accessories	5%	1	1	1	1	1	1	1	1	1	1	1

Indicative Requirement of Material for Drip Irrigation System

Wide Spaced Crops — For 5.0 Hectare

SN	Component Lateral to Lateral x Dripper spacing (mxm)	Unit	12 x 12	10 x 10	9 x 9	8 x 8	6 x 6	5 x 5	4 x 4	3 x 3	2.5 x 2.5	2 x 2	1.5 x 1.5
1	PVC Pipe 90 mm; Class II ; 4kg / cm^2	m	114	114	114	114	114	114	114	114	168	168	168
2	PVC Pipe 75 mm; Class II ; 4kg / cm^2	m	168	168	168	168	168	168	168	168	342	342	342
3	PVC Pipe 63 mm; Class II ; 4kg / cm^2	m	450	450	450	450	450	450	450	450	456	456	456
4	Lateral 16 mm; Class II; 2.5 kg / cm^2	m	0	0	0	0	0	0	0	0	20200	25250	33667
5	Lateral 12 mm; Class II; 2.5 kg / cm^2	m	4250	5100	5667	6375	8500	10200	12750	17000	0	0	0
6	Emitter 4 / 8 lph	No.	1417	2040	2519	3188	5667	8160	6500	11556	16160	25250	22444
7	Microtube 6 mm	m	1063	1530	1889	2391	4250	6120	6438	0	0	0	0
8	Control Valve 90 mm	No.	2	2	2	0	0	0	0	0	0	0	0
9	Control Valve 75 mm	No.	2	2	2	2	2	2	2	2	2	2	2
10	Control Valve 63 mm	No.	4	4	4	4	4	4	4	4	4	4	4
11	Flush Valve 75 mm	No.	1	1	1	1	1	1	1	1	1	1	1
12	Flush Valve 63 mm	No.	4	4	4	4	4	4	4	4	4	4	4
13	Air Release Valve 1.5"	No.	1	1	1	1	1	1	1	1	1	1	1
14	Non Return Valve 1.5"	No.	1	1	1	1	1	1	1	1	0	0	0
15	Non Return Valve 2.5"	No.	0	0	0	0	0	0	0	0	1	1	1
16	Throttle Valve 1.5"	No.	1	1	1	1	1	0	0	0	0	0	0
17	Throttle Valve 2"	No.	0	0	0	0	0	1	1	1	0	0	0
18	Throttle Valve 2.5"	No.	0	0	0	0	0	0	0	0	1	1	1
19	Screen Filter 20 / 25 m^3 / hr	No.	0	0	0	0	0	1	1	1	1	1	1
20	Screen Filter 10 m^3 / hr	No.	1	1	1	1	1	0	0	0	0	0	0
21	By-pass Assembly – 2.5"	No.	1	1	1	0	0	0	0	0	0	0	0
22	By-pass Assembly - 2"	No.	1	1	1	1	0	0	0	0	0	0	0
23	By-pass Assembly – 1.5"	No.	0	0	0	0	1	1	1	1	0	0	0
24	Venturi & Manifold 2.5"	No.	0	0	0	0	1	1	1	1	1	1	1
25	Venturi & Manifold 2"	No.	1	1	1	1	0	0	0	0	0	0	0
26	Fittings & Accessories	5%	1	1	1	1	1	1	1	1	1	1	1

Indicative Requirement of Material for Drip Irrigation System

Close Spaced Crops

For 0.2 hectare

SN	Component Lateral to Lateral x Dripper spacing (mxm)	Unit	2.5 x 2.5	2 x 2	1.5 x 1.5
1.	PVC Pipe 50 mm; Class II; 4kg / cm^2	m	66	66	66
2.	Emitting Pipe 16 mm Class II; (0.6 m x1 to 4 lph)	m	800	1150	1700
3.	Control Valve 40 mm	No.	1	1	1
4.	Air Release Valve 1"	No.	1	1	1
5.	Non Return Valve 1"	No.	1	1	1
6.	Throttle Valve ½"	No.	1	1	1
7.	Screen Filter 5 m^3 / hr	No.	1	1	1
8.	By-pass Assembly – 1.5"	No	1	1	1
9.	Venturi & Manifold ¾"	No	1	1	1
10.	Fittings & Accessories @ 5%	set	1	1	1

Indicative Requirement of Material for Drip Irrigation System

Close Spaced Crops

For 0.4 & 1.0 Hectare

SN	Area (ha)		0.4			1.0		
	Component name / Lateral to Lateral x Dripper spacing (mxm)	Unit	2.5 x 0.6	1.8 x 0.6	1.2 x 0.6	2.5 x 0.6	1.8 x 0.6	1.2 x 0.6
1	PVC Pipe 75 mm; Class II ; 4 kg / cm^2	m	0	0	0	54	54	54
2	PVC Pipe 63 mm; Class II ; 4 kg / cm^2	m	0	0	0	102	102	102
3	PVC Pipe 50 mm; Class II ; 4 kg / cm^2	m	96	96	96	0	0	0
4	Lateral 16 mm Class II ; 2.5 kg / cm^2	m	38	53	79	60	83	125
5	Emitting Pipe 16 mm Class II (0.6 m x 1 to 4 lph)	m	1616	2245	3367	4040	5611	8417
6	Control Valve 63 mm	No.	0	0	0	1	1	1
7	Control Valve 50 mm	No.	1	1	1	1	1	2
8	Flush Valve 50 mm	No.	1	1	1	1	1	1
9	Air Release Valve 1"	No.	1	1	1	1	1	1
10	Non Return Valve 1.5"	No.	1	1	1	1	1	1
11	Throttle Valve 1.5"	No.	0	0	0	1	1	1
12	Screen Filter 10 m^3 / hr	No.	1	1	1	1	1	1
13	By-pass Assembly – 1.5"	No.	1	1	1	1	1	1
14	Venturi & Manifold 1.5"	No.	1	1	1	1	1	1
15	Fittings & Accessories	5%	1	1	1	1	1	1

Indicative Requirement of Material for Drip Irrigation System

Close Spaced Crops

For 2.0 & 3.0 Hectare

SN	Area (ha)		2.0			3.0		
	Component name / Lateral to Lateral x Dripper spacing (mxm)	Unit	2.5 x 0.6	1.8 x 0.6	1.2 x 0.6	2.5 x 0.6	1.8 x 0.6	1.2 x 0.6
1	PVC Pipe 90 mm; Class II ; 4 kg / cm^2	m	0	0	0	90	90	90
2	PVC Pipe 75 mm; Class II ; 4 kg / cm^2	m	75	75	75	132	132	132
3	PVC Pipe 63 mm; Class II ; 4 kg / cm^2	m	150	150	150	174	174	174
4	Lateral 16 mm Class II ; 2.5 kg / cm^2	m	120	150	200	156	217	325
5	Emitting Pipe 16 mm Class II ; (0.6 m x 1 to 4 lph)	m	8200	11500	17000	12120	16833	25250
6	Control Valve 90 mm	No.	0	0	0	1	1	1
7	Control Valve 75 mm	No.	1	1	1	2	2	2
8	Control Valve 63 mm	No.	2	2	2	4	4	4
9	Flush Valve 75 mm	No.	0	0	0	1	1	1
10	Flush Valve 63 mm	No.	1	1	1	4	4	4
11	Air Release Valve 1"	No.	1	1	1	1	1	1
12	Non Return Valve 1.5"	No.	1	1	1	0	0	0
13	Non Return Valve 2"	No.	0	0	0	1	1	1
14	Throttle Valve 1.5"	No.	1	1	1	0	0	0
15	Throttle Valve 2"	No.	0	0	0	1	1	1
16	Screen Filter 30 m^3 / hr	No.	1	1	1	1	1	1
17	By-pass Assembly - 2"	No.	1	1	1	1	1	1
18	Venturi & Manifold 2"	No.	1	1	1	1	1	1
19	Fittings & Accessories	5%	1	1	1	1	1	1

Annexure

Indicative Requirement of Material for Drip Irrigation System

Close Spaced Crops

For 4.0 & 5.0 Hectare

SN	Area (ha)		4.0			5.0		
	Component name / Lateral to Lateral x Dripper spacing (mxm)	Unit	2.5 x 0.6	1.8 x 0.6	1.2 x 0.6	2.5 x 0.6	1.8 x 0.6	1.2 x 0.6
1	PVC Pipe 90 mm; Class II ; 4 kg / cm^2	m	138	138	138	168	168	168
2	PVC Pipe 75 mm; Class II ; 4 kg / cm^2	m	276	276	276	342	342	342
3	PVC Pipe 63 mm; Class II ; 4 kg / cm^2	m	402	402	402	456	456	456
4	Lateral 16 mm; Class II ; 2.5 kg / cm^2	m	180	250	375	268	373	559
5	Emitting Pipe 16 mm; Class II (0.6 m x 1 to 4 lph)	m	16000	22000	33100	20200	28056	42083
6	Control Valve 90 mm	No.	2	2	2	2	2	2
7	Control Valve 75 mm	No.	2	2	2	2	2	2
8	Control Valve 63 mm	No.	4	4	4	4	4	4
9	Flush Valve 75 mm	No.	1	1	1	1	1	1
10	Flush Valve 63 mm	No.	4	4	4	4	4	4
11	Air Release Valve 1.5"	No.	1	1	1	1	1	1
12	Non Return Valve 2.5"	No.	1	1	1	1	1	1
13	Throttle Valve 2.5"	No.	1	1	1	1	1	1
14	Screen Filter 30 m^3 / hr	No.	1	1	1	1	1	1
15	By-pass Assembly – 2.5"	No.	1	1	1	1	1	1
16	Venturi & Manifold 2.5"	No.	1	1	1	1	1	1
17	Fittings & Accessories	5%	1	1	1	1	1	1

Indicative Material Requirement for Micro Sprinkler System – 5 m x 5 m spacing

SN	Components / Area (ha)	Unit	0.2	0.4	1	2	3	4	5
1	PVC / PE Pipe 90 mm; Class II ; 4 kg / cm^2	m	0	0	0	0	0	0	150
2	PVC / PE Pipe 75 mm; Class II ; 4 kg / cm^2	m	0	30	54	100	140	220	520
3	PVC / PE Pipe 63 mm; Class II ; 4 kg / cm^2	m	0	66	102	150	180	380	0
4	PVC / PE Pipe 50 mm; Class II: 4 kg / cm^2	m	48	0	0	0	0	0	0
5	PVC / PE Pipe 50 mm; Class II: 4 kg / cm^2	m	48	0	0	0	0	0	0
6	PVC / PE Lateral 20 mm Class II ; 10 kg / cm^2	m	0	0	2000	4000	6300	8000	10000
7	Lateral 16 mm Class II; 2.5 kg / cm^2	m	400	800	0	0	0	0	0
8	Micro Sprinkler set (100 lph)	No.	80	160	400	800	1200	1600	2000
9	Stake for Sprinkler set (45 cm)	No.	80	160	400	800	1200	1600	2000
10	Control Valve 90 mm	No.	0	0	0	0	0	2	2
11	Control Valve 75 mm	No.	0	1	1	1	1	4	4
12	Control Valve 63 mm	No.	0	1	1	3	4	0	0
13	Control Valve 40 mm	No.	2	0	0	0	0	0	0
14	Flush Valve 75 mm	No.	0	0	0	0	0	4	6
15	Flush Valve 63 mm	No.	0	1	1	1	1	0	0
16	Flush Valve 40 mm	No.	2	0	0	0	0	0	0
17	Air Release Valve 1"	No.	1	1	1	1	1	1	1
18	Non Return Valve 1.5"	No.	1	0	0	0	0	0	0
19	Non Return Valve 2"	No.	0	1	1	0	0	0	0
20	Non Return Valve 2.5"	No.	0	0	0	1	1	1	1
21	Throttle Valve 1.5"	No.	1	0	0	0	0	0	0
22	Throttle Valve 2"	No.	0	1	1	0	0	0	0
23	Throttle Valve 2.5"	No.	0	0	0	1	1	1	1
24	Screen Filter 30 m^3 / hr	No.	0	0	1	1	1	1	1
25	Screen Filter 20 / 25 m^3 / hr	No.	0	1	0	0	0	0	0
26	Screen Filter 10 m^3 / hr	No.	1	0	0	0	0	0	0
27	By –pass Assembly – 1.5"	No.	1	0	0	0	0	0	0
28	By-pass Assembly – 2.5"	No.	0	0	0	1	0	0	0
29	By-pass Assembly - 2"	No.	0	1	1	0	1	1	1
30	Venturi & Manifold 1.5"	No.	1	0	0	0	0	0	0
31	Venturi & Manifold 2"	No.	0	1	1	1	1	1	1
32	Fitting & Accessories	5%	1	1	1	1	1	1	1

Annexure

Indicative Material Requirement for Mini Sprinkler System – 10 m x 10 m spacing

SN	Components / Area (ha)	Unit	0.4	1.0	2.0	3.0	4.0	5.0
1	PVC / PE Pipe 90 mm; Class II ; 4 kg / cm^2	m	0	0	80	210	235	310
2	PVC / PE Pipe 75 mm; Class II ; 4 kg / cm^2	m	30	60	150	320	420	480
3	PVC / PE Pipe 63 mm; Class II ; 4 kg / cm^2	m	66	110	0	0	0	0
4	PVC / PE Pipe Lateral 32 mm ; Class II; 10 kg / cm^2	m	400	1000	2000	3000	4000	5000
5	Mini Sprinkler Head	No.	40	100	220	300	400	500
6	M S Riser Rod 8 mm (1.2 - 1.8 m length)	No.	40	100	220	300	400	500
7	Control Valve 75 mm	No.	0	2	2	4	4	4
8	Control Valve 32 mm	No.	6	0	28	0	0	0
9	Control Valve 25 mm	No.	0	20	0	65	80	88
10	Flush Valve 75 mm	No.	0	1	2	4	4	4
11	Flush Valve 63 mm	No.	1	0	0	0	0	0
12	Air Release Valve 1"	No.	1	1	1	1	1	1
13	Non Return Valve 2"	No.	1	0	0	0	0	0
14	Non Return Valve 2.5"	No.	0	1	1	1	1	1
15	Throttle Valve 2"	No.	1	0	0	0	0	0
16	Throttle Valve 2.5"	No.	0	1	1	1	0	0
17	Throttle Valve 3"	No.	0	0	0	0	1	1
18	Screen Filter 30 m^3 / hr	No.	1	1	1	1	1	1
19	By-pass Assembly - 2"	No.	0	0	0	0	0	1
20	By-pass Assembly – 1.5"	No.	1	1	1	1	1	0
21	Venturi & Manifold 2"	No.	1	1	1	1	1	1
22	Fitting & Accessories	10%	1	1	1	1	1	1

Indicative Material Requirement of Portable Sprinkler Irrigation System

Using 63 mm Coupler						
		Quantity of material required				
SN	Components	Unit	upto 0.4 ha	more than 0.4 ha & up to 1 ha	more than 1 ha & up to 2 ha	more than 2 ha & up to 5 ha
1	HDPE Pipes with Quick Release Coupler(Pipe of Class II; 3.2 kg / cm^2 IS:14151 Part I 63 mm diameter & 6m long	No	18	30	41	NA
2	QRC HDPE 63 mm Service Saddle IS:14151Part II	No	3	5	9	NA
3	GI Riser Pipe $\frac{3}{4}$" diameter x 75 cm long	No	3	5	9	NA
4	Sprinkler Nozzles (1.7 to 2.8 kg / cm^2) IS12232 Part I	No	3	5	9	NA
5	QRC HDPE Bend with Coupler 900 (63 / 50 mm) IS 14151 Part II	No	1	1	1	NA
6	QRC HDPE Pump Connecting Nipple 63 mm IS: 14151 Part II	No	1	1	1	NA
7	QRC HDPE End Plug (63mm) IS: 14151 Part II	No	1	2	2	NA
8	QRC HDPE Tee with Coupler (63mm) IS14151 Part II	No	1	1	1	NA
Using 75 mm Coupler						
1	HDPE Pipes with Quick Release Coupler(Pipe of Class I; 2.5 kg / cm^2 IS:14151 Part I, 75 mm diameter & 6m long	No	NA	30	41	NA
2	QRC HDPE 75mm Service Saddle IS: 14151 Part II	No	NA	5	9	NA
3	GI Riser Pipe $\frac{3}{4}$" diameter x 75 cm long	No	NA	5	9	NA
4	Sprinkler Nozzles (1.7 to 2.8 kg / cm^2) IS12232 Part I	No	NA	5	9	NA
5	QRC HDPE Bend with Coupler 900 (75 mm) IS:14151 Part II	No	NA	1	1	NA
6	QRC HDPE Pump Connecting Nipple, 75 mm IS:14151 Part II	No	NA	1	1	NA
7	QRC HDPE End Plug (75mm) IS: 14151 Part II	No	NA	2	2	NA
8	QRC HDPE Tee with Coupler (75 mm) IS:14151 Part II	No	NA	1	1	NA

NA : Not Applicable

Using 90 mm Coupler						
Quantity of material required						
SN	**Components**	**Unit**	**upto 0.2 ha**	**more than 2 ha & upto to 3 ha**	**more than 3 ha & upto 4 ha**	**more than 4 ha & up to 5 ha**
1	HDPE Pipes with Quick Release Coupler (Pipe of Class I; 2.5 kg / cm^2 IS:14151 Part I, 90 mm diameter & 6 m long	No	NA	41	52	58
2	QRC HDPE 90mm Service Saddle IS:14151Part II	No	NA	11	14	16
3	GI Riser Pipe $\frac{3}{4}$" diameter x 75 cm long	No	NA	11	14	16
4	Sprinkler Nozzles (1.7 to 2.8 kg / cm^2) IS:12232 Part I	No	NA	11	14	16
5	QRC HDPE Bend with Coupler 900 (90mm) IS:14151 Part II	No	NA	2	2	4
6	QRC HDPE Pump Connecting Nipple, 90 mm IS : 14151 Part II	No	NA	1	1	1
7	QRC HDPE End Plug (90 mm) IS: 14151 Part II	No	NA	2	2	2
8	QRC HDPE Tee with Coupler (90 mm) IS:14151 Part II	No	NA	1	1	2

NA : Not Applicable

Indicative Material Requirement of Semi Permanent Sprinkler System

SN	Particulars	Units	Upto 0.4 ha	0.4 - 1 ha	1 - 2 ha	2 - 3 ha	3 - 4 ha	4 - 5 ha
1	PVC / PE Pipe 90 mm; Class II; 4 kg / cm^2	0	0	0	0	0	0	173
2	PVC / PE Pipe 75 mm; Class II; 4 kg / cm^2	m	0	0	110	135	156	0
3	PVC / PE PIPE 63 mm; Class II; 4 kg / cm^2	m	96	154	273	340	395	440
4	PVC / PE Lateral 25 mm, Class II; 10 kg / cm^2	m	350	950	1904	3006	4000	5014
5	Control Valve 63 mm	No	1	1	2	2	2	2
6	By Pass Assembly - 2.5"	Set	1	1	1	1	1	1
7	Control Valve PVC 25 mm	No	12	20	42	51	80	88
8	Sprinkler Assembly	Set	12	12	12	12	12	12
9	Screen Filter 20 to 25 m^3 / hr	No	1	1	1	1	1	1
10	Fitting & Accessories	5%	1	1	1	1	1	1

Annexure

Indicative Material Requirement of Large Volume Sprinkler System (Raingun)

Using 63 mm Coupler				
SN	**Components**	**Unit**	**0.4 - 1 ha**	**1 - 5 ha**
1	HDPE Pipes with Quick Release Coupler (Pipe of Class II; 4 kg / cm^2 IS:14151 Part I 63 mm diameter & 6 m long	No	30	NA
2	Raingun 24 m radius of throw	No	1	N.A
3	Tripod Stand	No	1	N.A
4	QRC HDPE Bend with Coupler 900 (63 mm) IS: 14151 Part II	No	1	N.A
5	QRC HDPE Pump Connecting Nipple 63 mm IS: 14151 Part II	No	1	N.A
6	QRC HDPE End Plug (63 mm) IS: 14151 Part II	No	1	N.A
7	QRC HDPE Tee with Coupler (63 mm) IS 14151 Part II	No	1	N.A
8	Screen filter 20 / 25 m^3 / hr	No	1	N.A
9	By Pass Assembly 2"	No	1	N.A
Using 75 mm Coupler				
SN	**Components**		**Unit**	**0.4 - 1 ha**
1	HDPE Pipes with Quick Release Coupler (Pipe of Class II; 4 kg / cm^2 IS:14151 Part I, 75 mm diameter & 6m long		No	30
2	Raingun l 30m radius of throw		No	1
3	Tripod Stand		No	1
4	QRC HDPE Bend with Coupler 90 Degree (75mm) IS 14151 Part II		No	1
Using 75 mm Coupler				
SN	**Components**		**Unit**	**0.4-1 ha**
6	QRC HDPE End Plug (75 mm) IS: 14151 Part II		No	1
7	QRC HDPE Tee with Coupler (75 mm) IS: 14151 Part II		No	1
8	Screen Filter 20 / 25 m^3 / hr		No	1
9	By Pass Assembly 2"		No	1

Using 90 mm Coupler							
SN	**Components**	**Unit**	**0.4-1 ha**	**1-2 ha**	**2-3 ha**	**3-4 ha**	**4-5 ha**
1	HDPE Pipes with Quick Release Coupler (Pipe of Class II; 4 kg / cm^2 IS:14151 Part I, 90 mm diameter & 6 m long	No	NA	NA	45	52	60
2	Raingun 34 m radius of throw	No	N.A	N.A	1	1	1
3	Tripod Stand	No	N.A	N.A	1	1	1
4	QRC HDPE Bend with Coupler 90 Degree (90mm) IS: 14151 Part II	No	N.A	N.A	1	1	1
5	QRC HDPE Pump Connecting Nipple, 90 mm IS : 14151 Part II	No	N.A	N.A	1	1	1
6	QRC HDPE End Plug (90 mm) IS: 14151 Part II	No	N.A	N.A	1	1	1
7	QRC HDPE Tee with Coupler (90mm) IS: 14151 Part II	No	N.A	N.A	1	1	1
8	Screen Filter 30 m^3 / hr	No	N.A	N.A	0	1	1
9	Screen Filter 20 / 25 m^3 / hr	No	N.A	N.A	1	0	0
10	By Pass Assembly 2"	No	0	0	1	0	0
11	By Pass Assembly 2.5"	No	N.A	N.A	0	1	1

N.A. : Not Applicable

Annexure

Format of Application Form to be submitted by the Beneficiary for Availing Financial Assistance under NMMI

Beneficiary Name	:
Father / Husband's name	:
Caste	:
Village	:
Block / Taluka	:
District	:
Total Area (ha) in his name	:
Survey Number(s) of the field(s) where he wants to install the system (Enclose certificate from Talati)	:
Whether he / she or any of his / her family members have availed subsidy from any GOI scheme earlier?	:
Y / N If yes, Details thereof	
System / Method of irrigation used	:
Area (ha)	:
Crop covered (ha)	:
Year of installation	:
Crops cultivated	:
Type of system required	:
Name of Crop for which the system is required	:
If the systems for plantation crop, any	:
Intercrop is taken?	:
If, so the type(s) of inter crop	:
Total area covered under irrigation	:
Source of water for irrigation	:
If wells, then open or tube well	:

Depth of the water table in the well (m) :

Depth of the tube well (m) :

Water Quality Analysis report 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 / farm pond (l x b x d) :

Any farm pond available :

If yes the dimensions of the pond (l x b x d) :

If there is no water source

Justification for water to be used for irrigation (Water sharing agreement document) :

Electricity availability (hours) :

Time of electricity available :

Pump Capacity (HP) :

Horsepower (HP) of the diesel engine :

Field / Plot Dimensions for which subsidy has been availed :

Soil type whether problematic or good (Enclose copy) :

Water table depth (m) in the field / plot for which system has been designed :

Signature of Beneficiary

Following certificates are to be attached:

1. Field / design layout / map along with the survey number and area (ha) of field in his / her name.

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

3. Water agreement for sharing water source for irrigation from the neighboring beneficiary from whom he wishes to take water, in case he / she does not have a water source in his / her own field / plot for which the subsidy has been sought.

4. Soil and water test reports

5. Agreement stating that he / she will not either sell or donate or lend his system to anyone for a period of five years from the date of installation.

6. He / she will allow to inspect the system installed in his / her field any time during the five years period by the officers from Agriculture / Horticulture / DRDA or any other Government officials as and when required with prior information to the concerned beneficiary.

Principles for Estimation of Water and Power Requirement for Installation of Drip Irrigation System

A. Estimation of Quantity of Water

To irrigate an area by drip / sprinkler irrigation system sufficient amount of water should be made available at the place where the system needs to be installed. 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

Information on type of water source, crops to be grown, topographic conditions, type and texture of soil and climatological data are essential for designing the drip / sprinkler irrigation system.

Layout of the Field

The design layout of the field / plot by giving appropriate specifications of the lengths of main line, sub main line, lateral lines, distance of water source from Pump station in meters to connect water source with the existing / planned crop in the area must be worked out., discharge of the emitting device used (lph / lps), Number of Control Valves used as per the design layout of the proposed field / plot with area (ha)

Crop Water Requirement

Water requirement of crops (WR) is a function of plants, surface area covered by plants, evapo-transpiration rate. Irrigation water requirement has to be calculated for each plant 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 system design. 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) = $V.R_c \times S_p$

The total water requirement of the farm plot would be V_n x No. of plants per sqm x A Where:

V is the Water requirement (lpd 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 wide spaced crops and 0.9 for close 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 Horsepower (HP) of Pumping Unit

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

The ideal drip irrigation system is one in which all drippers / emitters (or orifices) deliver equal / uniform volume of water in a given irrigation time. The dripper / emitter flow variation caused by water pressure can be controlled by hydraulic design.

Flow carried by each lateral line (d_e) = dripper discharge 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-Williams formula given below :

$h_f = 10.68 \times (Q / C)^{1.852} \times D^{-4.87} \times (L + L_e)$, 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 = Equivalent 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 known and accordingly, the allowable head can be determined 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 1 m / 100 m length of the mainline. Friction head loss for various discharges is given in Table B and equivalent lengths of straight pipe in (m) 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 = h_e 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)

$$HP = \frac{H \times d_m}{75 \times e}$$

Table A: Friction Head Loss (m / 100 m) of Pipe length

Flow	Inside diameter (mm)						
lph	9.2	11.7	12.7	13.9	15.8	18.0	19.0
Head loss in meters per 100 m 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: Friction losses (m / 100 m) for flow of water in smooth pipes (C-140)

Discharge	Bore diameter (mm)									
lps	20	25	32	40	50	65	80	100	125	150
Head loss in meters per 100 m 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: Friction losses (m / 100 m) for flow of water in smooth pipes (C-140)

SN	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 = 0.6)
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 beneficiary proposes to install drip irrigation system for a new citrus plantation on one ha plot.

Basic Data Analysis

1. No. of Plants

Area = 1 ha = 100 m x 100 m

Spacing (m) = 6 m x 6 m

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

2. Estimation of Water Requirement

The irrigation water requirement is determined using Indian Meteorological Department (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	099.2	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

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

SN	Season	Days (Nos)	Total Pan evaporation during the season (mm)	Average Daily Pan evaporation (mm / day)
1	Kharif : June to October	122	585.8	4.80
2	Rabi : October to February	136	497.4	3.65
3	Summer : March to December	107	737.3	6.83

The daily water requirement of plants is given below:

SN	Season	Evaporation Water requirement	lpd / plant	m^3 / 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 pump set is taken as 4 hours per day, the discharge required would be as below :

Pumping rate = 13 litres / hr / plant

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

= 3.6 m^3 / hr / ha

= 0.97 lps or 1 lps

Alternatively, a tank of 14.3 m^3 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 litres / 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 or 3.25 say 3

It is assumed that the filed / plot is having square shape with an area of 1 ha. As such the mainline would be 100 m long and laterals would also be 100 m in length. Plant spacing of 6 m x 6 m, would require a total of 17 lateral lines. Each lateral would serve approximately 16 plants and there would be 3 drippers / emitters per plant. Thus, the total number of drippers / emitters 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 field / 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. Horsepower 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	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 in main pipe	0.67 (m)
b Friction loss in laterals	0.75 (m)
c Minimum head required over drippers	10.00 (m)
	11.42 (m)

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 (0.7)

$$\text{HP} = \frac{1 \times 33}{75 \times 0.70}$$

= 0.63 or say 1 HP

Methodology for Assessment of Water and Power Availability

I. In cases where the water source is an open well or tube well / bore well, 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

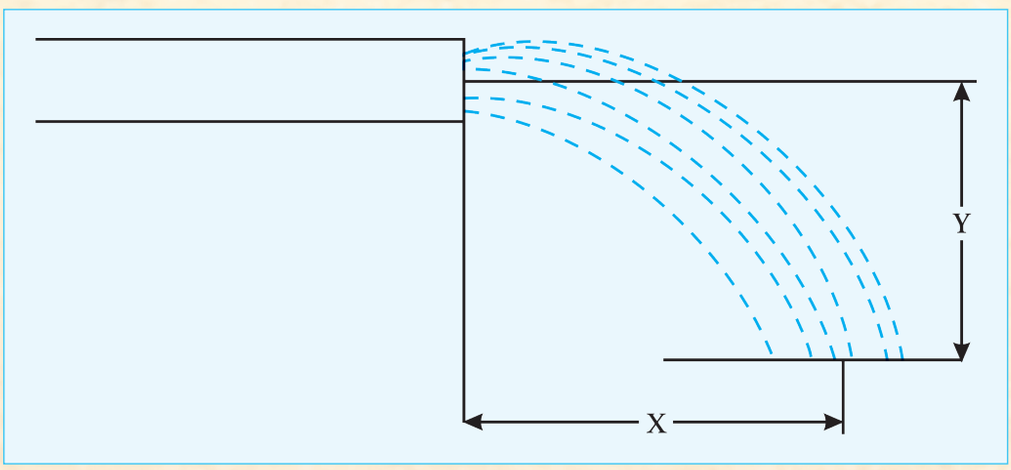
1. The depth of water level below the ground level, before pumping begins, is the depth of the water table. It can be measure by a simple procedure using a rope with a stone tied at one end.

2. The discharge of the well / tube well is measure after running the pump for a period of 30 minutes to 1 hour. It can be measure by adopting volumetric measure. Under this method, the discharge is collected in a container of known dimensions for a certain time interval. The rate of discharge is calculated by dividing the total volume of water collected and the time taken. This method works for low discharge say up to 5 litres per second.

For higher discharges volumetric measurement may be difficult and therefore standard devices like water meter / V-notch / flume may be used. In the case these devices are not available the discharge may be assessed by the co-ordinate method, which is described as below:

CO-ORDINATE METHOD : For measuring the discharge from wells / tube wells 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:

Schematic View for Estimating Discharge by Co-ordinate Method



The discharge is computed using the equation

$$Q = \frac{A \times \sqrt{g}\ (1000)}{\sqrt{2y}}$$

where Q = Discharge (lps)

A = Cross sectional area of the pipe (m^2)

x = X co-ordinate (m)

y = Y co-ordinate (m)

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 / tube well is run for a period of 30 minutes to 1 hour so that constant water level is attained in the well / tube well. 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 head / level is determined, the horsepower can be calculated.

4. Power required by the pump can be determined by the table given below:

Power Requirement for Pump to Operate

Drip Irrigation System for Orchard and Vegetable Crops

SN	Static Water Depth (m)	Orchard Crop (HP / ha)	Vegetable Crop (HP / ha)
1	0 - 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 system can be operated by diverting these streams at

a higher elevation to a small storage tank of approximately 2 cubic meter capacity and it can be directly connected to the drip irrigation system for irrigating fields 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 meters. If micro tubes system is used the elevation difference of 3 m to 4 m would be sufficient to operate the system. The area proposed to be irrigated should 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 method devised as mentioned above.

Annexure

Field Level Questionnaire for Assessment of Water and Power Availability for Installation of Drip / Sprinkler Irrigation System

1.	Name of the Applicant				
2.	Residential Address				
3.	Farm address / location (Sl. No. to be indicated)				
4.	Total farm / plot area (ha)				
5.	Total area proposed to be irrigated under drip / sprinkler irrigation system				
6.	Crop	Plot 1	Plot 2	Plot 3	Plot 4
	Total area under crop (ha)				
	Row to row & plant to plant spacing (m)				
	Total No. of Plants				
	Type of Soil (please specify)				
7.	What is the water source proposed to be used by the beneficiary	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 / survey was made				
	c. Drawdown in meters (Please refer Annexure XIV)				
	d. Height of delivery pipe above ground level				

	e. Assessment of water availability (in litres per second)	
	f. Method used for determining water availability in the source.	
	g. Total duration for which pumping was done or effective pumping hours for irrigating the total field / plot.	
	h. Duration of pumping after which constant water level was obtained (hours / minutes)	
	i. Pump used / Mention make (electric / diesel)	
	j. HP of pump used	
	k. Diameter of delivery pipe	
9.	Tube well / Bore well	
	a. Depth of water table (in metres)	
	b. Date and season during which assessment / survey was made	
	c. Drawdown (in meters) (Please refer Annexure)	
	d. Height of delivery above ground level	
	e. Assessment of water availability (in liters per second)	
	f. Method used for determining water availability (Volumetric / Co- ordinate / Any other). Please specify	
	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. Horsepower (HP) of pump	

	k. Diameter of delivery pipe	
10.	Surface Flow / Stream in Hilly Areas	
	a. Rate of flow of water (in liters / 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 beneficiary's field from canal distribution chhanel	
	b. Whether storage tank has been constructed or is proposed to be constructed by the beneficiary	
	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 beneficiary (electric / diesel) to lift water from canal to water storage tank (mention make)	
	g. Horsepower (HP) of the pump.	
12.	Details of Pump	
	a. Does the beneficiary own a pump	

	b. If so, of what make? (Please specify)	
	c. What is the Horsepower (HP) of the pump?	
	d. In the case of electric pump no. of hours per day for which electricity is generally available.	
	e. In case of diesel pump, name of the nearest diesel station	
	f. Does the beneficiary propose to buy a new pump (if so, specify make and HP)	
	g. Other farm machinery owned by beneficiary (i.e. tractor, cultivator, tiller, thresher *etc.*)	
13.	Nearby Drip Installation	
	a. How many drip irrigation system 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 irrigation system installations?	
14.	Analysis of water and power availability by an authorised officer of Implementing Agency	
	a. Total water requirement for the area proposed to be covered by beneficiary under drip irrigation system (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 (ha) recommended to be brought under drip irrigation system	

	d. Horsepower (HP) of pump available.	
	e. Horsepower (HP) of pump required.	
	f. Recommendations regarding area to be covered under drip irrigation system (also give recommendation regarding up-gradation of pumping capacity, if required)	
	g. Recommendations	

Signature of Authorised Officer
of Implementing Agency

Guidelines for Selection of Filter

Water Quality	Type of Filter	Remarks
Good without any physical and biological impurities	Screen	Screen filters shall be suggested only if the physical impurity do not call for cleaning of filter element more than once a day
Water sources with heavy physical and biological impurities	Only screen filter will not be sufficient	Additional filter is required depending upon the type of water impurity
Water sources with sand and other heavier particles	Hydro Cyclone Separator or Hydro Cyclone of matching flow capacity	Disc / screen filter shall be provided after Hydro Cyclone
Water sources with heavy of Biological impurities such as algae, trash and other debris	Media / sand filter	Disc / screen filter should be provided after Media filter
Water sources with heavy sand and other biological impurities such as algae and trash	Combination of Hydro cyclone followed by a Sand Filter	Screen / disc filter should be after sand filter

Indicative Price of Optional Components

SN	Optional Component		IS No.	Approx. Price (in ₹)
1	**Sand Filter with Back Wash Assembly**			
	a	10 m^3 / hr x 1.5″	14606	8500
	b	20 m^3 / hr x 2″	14606	11500
	c	25 m^3 / hr x 2″	14606	14000
	d	30 m^3 / hr x 2.5″	14606	16000
	e	40 m^3 / hr x 2.5″	14606	18000
	f	50 m^3 / hr x 3″	14606	24000
2	**Hydrocylone Filter**			
	a	20 m^3 / hr x 2″	14743	3500
	b	25 m^3 / hr x 2″	14743	4000
	c	30 m^3 / hr x 2.5″	14743	5500
	d	40 m^3 / hr x 2.5″	14743	6000
	e	50 m^3 / hr x 3″	14743	6500
3	**Fertilizer Tank with Assembly**			
	a	30 liters	Not Available	2800
	b	60 liters	Not Available	5000
	c	90 liters	Not Available	6500

List of BIS Standards

SN	Component Description	BIS
1.	Polyethylene pipes for Irrigation- Laterals with amendment number 5	IS 12786: 1989 (reaffirmed 1998)
2.	Emitters	IS 13487: 1992
3.	Emitting pipes system	IS 13488: 2008
4.	Strainer type filters	IS 12785: 1994
5.	Irrigation equipment rotating sprinkler Part II, Test method for uniformity of distribution (1st revision) (amendment 1) (Including Raingun)	IS 12232 (Part II) 1995
6.	Polyethylene microtubes for drip irrigation system	IS 14482: 1997
7.	Fertiliser and Chemicals Injection system Part I Venturi Injector	IS 14483 (Part 1) 1997
8.	Micro Sprayers	IS 14605: 1998
9.	Media Filters	IS 14606: 1998
10.	Hydro Cyclone separators	IS 14743: 1999
11.	PVC pipes for water supply	IS 4985 – 1999
12.	Irrigation equipment sprinkler pipes specifications Part I Polyethylene pipes	IS I4151 (Part I) 1999
13.	Irrigation equipment sprinkler pipes specifications Part II Quick couples Polyethylene pipes	IS I4151 (Part II) 1999
14.	Quality of Irrigation water	IS 11624 : 1986
15.	HDPE Pipes	IS 4984 : 1995
16.	Moulded PVC Fittings	IS 7834 : 1987
17.	GI and MS Fittings	IS 1879 : 1987
18.	GM Valves	IS 778 : 1984
19.	CI Non Return Valves	IS 778 : 1984
20.	Fabricated PVC Fittings	IS 10124 : 1988
21.	GI Pipes	IS 1879 : 1987

SN	Component Description	BIS
22.	Sluice Valves	IS 780: 1984
23.	PE Fabricated Fittings	IS 8360: 1977
24.	PE Moulded Fittings	IS 808: 2003
25.	PVC Foot Valves and NRV	IS 10805: 1986
26.	Irrigation equipment rotating sprinkler Part I, Design and Operational requirements (1st revision)	IS 12232 (Part I) 1996
27.	Design, Installation and Field evaluation of MIS	IS 10799: 1999
28.	Prevention and treatment of blockages problems in drip irrigation systems	IS 14791: 2000

Source: Online catalog of Bureau of Indian Standards

Proforma for Furnishing Annual Action Plan by Implementing Agency

Year

PART A : Summary Statement

Name of State							
Name of District							
I. Area Covered Physical (ha) and Financial (₹)							
A. Drip Irrigation							
SN.	Crop	Spacing (mxm)	No. of beneficiaries	Area (ha)	Total Cost involved (₹)	Financial Outlay (₹)	
						GoI share	State share
Sub total Drip Irrigation System							
B. Micro Sprinkler Irrigation System							
SN.	Crop	Spacing (mxm)	No. of beneficiaries	Area (ha)	Total Cost involved (₹)	Financial Outlay (₹)	
						GoI share	State share
Sub total Micro Sprinkler Irrigation System							
C. Mini Sprinkler Irrigation System							
SN.	Crop	Spacing (mxm)	No. of beneficiaries	Area (ha)	Total Cost involved (₹)	Financial Outlay (₹)	
						GoI share	State share
Sub total Micro Sprinkler Irrigation System							
D. Portable Sprinkler Irrigation System							
SN.	Crop	Spacing (mxm)	No. of beneficiaries	Area (ha)	Total Cost involved (₹)	Financial Outlay (₹)	
						GoI share	State share
Sub total Portable Portable Sprinklers							
E. Semi-permanent Sprinkler Irrigation System							
SN.	Crop	Spacing (mxm)	No. of beneficiaries	Area (ha)	Total Cost involved (₹)	Financial Outlay (₹)	
						GoI share	State share
Sub total Semi-Permanent Sprinkler Irrigation System							

F. Large Volume sprinkler Irrigation System (Rain-guns)							
SN.	Crop	Spacing (mxm)	No. of beneficiaries	Area (ha)	Total Cost involved (₹)	Financial Outlay (₹)	
						GoI share	State share
Sub total Large Volume Sprinklers Irrigation System							

G. Demonstration- Drip Irrigation System under Drip Irrigation							
SN.	Crop	Spacing (mxm)	No. of beneficiaries	Area (ha)	Total Cost involved (₹)	Financial Outlay (₹)	
						GoI share	State share
Sub total - Demonstration Drip Irrigation System Wide Spaced Crop							

H. Demonstration- Micro Sprinkler Irrigation System							
SN.	Crop	Spacing (mxm)	No. of beneficiaries	Area (ha)	Total Cost involved (₹)	Financial Outlay (₹)	
						GoI share	State share
Sub total - Demonstration Micro Sprinkler Irrigation System							

I. Demonstration-Mini Sprinkler Irrigation System							
SN.	Crop	Spacing (mxm)	No. of beneficiaries	Area (ha)	Total Cost involved (₹)	Financial Outlay (₹)	
						GoI share	State share
Sub total - Demonstration Mini Sprinkler Irrigation System							

PART B: General Details of Districts

1.	Land use			
	SN	Category	Area (ha)	% of total
	1.	Agriculture		
	2.	Forest		
	3.	Wasteland		
	4.	Other		
2.	Average monthly rainfall (mm)			
3.	Average monthly temperature (°C)			

4.	Soil type	
5.	Area under Cultivation (Year)	
	A.	Agriculture
		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
	c)	Minor Irrigation
7.	Source of Irrigation	
	a)	Ground water
	b)	Surface water
8.	Canals in the district (Name & Total Culturable Command area)	
9.	Status of land holding (Number & total area) 1, 1-2, 2-3, 3-4, More than 4 hectare	
10.	Number of Agricultural / Horticultural processing units in the State / District	
11.	Name of PFDCs nearest to the District	
12.	Crops covered under National Horticulture Mission (NHM)	

13.	Name of Industrial units in the District manufacturing drip / sprinkler irrigation system components	
	a.	List of manufacturers / distributors / dealers of Micro Irrigation System in the State / District
	b.	List of liquid fertilizers manufacturers / suppliers in the State / District
14.	Professional Institutes / Organisations / University preferably in Agricultural field availablein the District along with the probable help which may be rendered by them	
15.	Existing Beneficiaries' Associations & their main functions	
16.	KVKs / KGKs in the district	
17.	District taxes & levies on Micro / Sprinkler Irrigation components / systems	
18.	Octroi	
19.	Sales Tax on components	
20.	Sales Tax on systems	

PART C : Details of area covered under MI Scheme

1.	Present area covered under drip / sprinkler irrigation system (year wise / crop wise in the district) (ha)										
2.	Area proposed to be covered under Drip / Sprinkler Irrigation system										
	Scheme Component	**SN.**	**Name of District**	**Crop Name**	**Plant Spacing (m x m)**	**Beneficiaries (No)**	**Area (ha)**	**Total Cost involved (Lakh ₹)**	**Financial Outlay (₹)**		
									GoI share		**State Share**
a	Drip Irrigation System										
b	Micro Sprinkler Irrigation System										
c	Mini Sprinkler Irrigation System										
d	Portable Sprinkler Irrigation System										
e	Semi-permanent Sprinkler Irrigation System										
f	Large Volume sprinkler Irrigation System (Rainguns)										

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

Signature
(Name & Designation)
Authorized signatory of IA

Proforma for Furnishing Progress Report under Micro Irrigation Scheme

Name of State :

Name of District :

Period of Report :

Details of Progress Achieved :

SN	Crop	During the Month						Cumulative Progress				
		Plant Spacing (mxm)	Benefi-ciaries (No)	Target (ha)	Ach. (ha)	Outlay (Lakh ₹)	Exp. (Lakh ₹)	Benefi-ciaries (No)	Target (ha)	Ach. (ha)	Outlay (Lakh ₹)	Exp. (Lakh ₹)
A. Drip Irrigation System												
Sub Total												
B. Micro Sprinkler Irrigation system												
Sub Total												
C. Mini Sprinkler Irrigation system												
Sub Total												
D. Portable Sprinkler Irrigation System												
Sub Total												
E. Semi- permanent Sprinkler Irigation System												
Sub Total												

SN	Crop	During the Month						Cumulative Progress				
		Plant Spacing (mxm)	Benefi-ciaries (No)	Target (ha)	Ach. (ha)	Outlay (Lakh ₹)	Exp. (Lakh ₹)	Benefi-ciaries (No)	Target (ha)	Ach. (ha)	Outlay (Lakh ₹)	Exp. (Lakh ₹)
F. Large Volume sprinkler Irrigation system (Rainguns)												
Sub Total												
G. Demonstration- Drip Irrigation system												
Sub Total												
H. Demonstration- Micro Sprinklers Irrigation system												
Sub Total												
I. Demonstration- Mini Sprinklers Irrigation system												
Sub Total												
Grand Total												

Number and area covered by Small & Marginal Beneficiaries.

Grievance Cell Format

Complaint No : Date : Financial Year :

Beneficiary Name :

Village : Taluka : District :

Area (ha) :

Type of System (Drip / Sprinkler) :

Crop on which system is installed :

Crop Spacing (Specify) : Row to row (mxm) :

Plant to plant (mxm) :

Application Date : Subsidy Approval Date :

System Suppliers Name : System Installation Date:

Total System Amount (₹) : Total Subsidy Availed Amount (₹) :

Fund Source (please tick) : Self ( ) Financial Institution / Bank ( )

Grievances (Specify) :

1. Subsidy Availing :
2. Financial Institute :
3. System Suppliers :
4. Installation Problems :
5. Bill of Quantity / Quality :
6. Any other :

Acknowledgement (office use)

Complaint No. :

Date :

(Signature)
Dist. Grievance Cell

Annexure

List of Precision Farming Development Centres (PFDCs)

SN	Name & Location of PFDCs
1	Water Technology Centre, Indian Agricultural Research Institute, New Delhi
2	Acharya N.G. Ranga Andhra Pradesh Agricultural University, Rajendranagar, Hyderabad
3	Assam Agricultural University, Jorhat, Assam
4	Rajendra Agricultural University, Pusa, Samastipur, Bihar
5	Navasari Agricultural University, Navsari, Gujarat
6	Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana
7	Dr. Y.S. Parmar University of Horticulture & Forestry, Solan, Himachal Pradesh
8	University of Agricultural Sciences, GKVK, Bangalore, Karnataka
9	Kerala Agricultural University, Tavanur, Kerala
10	Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra
11	Indira Gandhi Krishi Vishva Vidyalaya, Krishi Nagar, Raipur, Chhattisgarh
12	Orissa University of Agriculture & Technology, Bhubaneswar, Orissa
13	Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan
14	Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu
15	G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand
16	Indian Institute of Technology, Kharagpur, West Bengal
17	Central Institute of Sub-Tropical Horticulture, Lucknow, Uttar Pradesh
18	University of Agricultural Sciences & Technology, KVK, Regional Agricultural Research Station Leh, Jammu & Kashmir
19	Birsa Agricultural University, Ranchi, Jharkhand
20	Central Institute of Agricultural Engineering, Bhopal, Madhya Pradesh
21	Central Agricultural University, Iroisemba, Imphal, Manipur
22	Punjab Agricultural University, Ludhiana, Punjab

राष्ट्रीय सूक्ष्म सिंचाई मिशन
National Mission on Micro Irrigation

Taaqat Ek Boond Ki

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