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Final Report: Study on Micro Irrigation in Karnataka (Drip and Sprinkler Irrigation)

Centre for Budget and Policy Studies

Directorate of Economics and Statistics

Department of Planning, Programme Monitoring and Statistics

Government of Karnataka

Study on **Micro Irrigation in Karnataka**

(Drip and Sprinkler Irrigation)

FINAL REPORT

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Executive Summary

Improved productivity and savings in water, energy and labour provide the economic rationale for adoption of micro irrigation. The Micro Irrigation has also emerged as a suitable solution to manage the fast depleting ground water. Research studies have documented water savings of 30% to 69 % in various crops and labour savings of 21 to 42 man days/hectare. Similarly, savings in energy and water were estimated over 7 years (2003-04 to 2009-10) to be of the order of 324 mi Kwh and 120 TMC. There was significant impact on income with increased productivity, uniform growth, and earlier maturity.

In view of the multiple benefits from micro irrigation, both the state and the centre have been quick to launch schemes with incentives for farmers to adopt micro irrigation. Karnataka initiated the micro irrigation schemes as early as 1991 in horticultural crops and for agricultural crops from 2003-04. A centrally sponsored scheme on Micro Irrigation started being implemented from 2005-06 with a subsidy of 50% sponsored by the union and state governments in the ratio of 80:20. The progress of coverage of Micro Irrigation picked up pace after the initiation of this centrally sponsored scheme. It was scaled up and renamed as National Mission on Micro Irrigation (NMMI) in 2010. An area of 69 million hectares was estimated to be covered in the country by 2030. Marginal, small and women farmers were to be covered under the scheme in a priority basis. Of the beneficiaries 16% and 8% were to be covered under SC and ST categories respectively. The present study of Micro Irrigation in Karnataka was undertaken to analyze the implementation of the above scheme in the State on the basis of secondary data.

The NMMI scheme in Karnataka started during the year 2006-07. Unlike in many states where there is a single implementing agency, both Agriculture and Horticulture departments implement the scheme separately. The subsidy is fixed at 75% for all categories of farmers and the beneficiary contribution is 25% (up to 2009-10, the subsidy rates in the districts of Kolar, Bijapur and Chitradurga were 100%). The marginal, small and women farmers are to be covered on a priority basis. The subsidy is back ended and is transferred to farmers in the Horticulture department and to companies/dealers in the Agriculture department.

An area of 4.18 lakh hectares has been covered under the scheme during the period 2006-07 to 2010-11 incurring an expenditure of Rs. 664 crore. The overall utilisation of funds has been 81.5% with the utilisation in Horticulture Department being 100%. Drip irrigation accounted for 1.45 lakh hectares (or 38% of the total area) and 66% of the amount spent. Sprinkler irrigation accounted for 62% of the area and 34% of the expenditure. Micro irrigation as proportion of total area under irrigation from ground water (wells and bore wells) has increased over the three year period of 2006-07 to 2008-09.

In horticulture, ten districts accounted for 70% of area. Bijapur, Tumkur, Chitradurga, Chickmagalur, Davanagere were the top 5 districts under area covered while districts of

Chitradurga, Bijapur, Kolar, Haveri and Davanagere topped in expenditure. The average growth rate of expenditure 11.6%. While Mysore, Gadag Kolar recorded higher than average growth, Raichur, Koppal and Bellary recorded negative growth. Chamarajnagar consistently exceeded the targets for 3 years. Fruits, vegetables, plantations and spices accounted for 45%, 16% 36% and 4% respectively.

Area covered under Agriculture was 2.71 lakh Ha with an expenditure of Rs. 294 crore. The drip irrigation accounted for 4% of area and 14% of expenditure while the sprinkler accounted for 96% of the area and 86% of expenditure. Belgaum, Bijapur, Shimoga, Bidar and Bagalkot accounted for 45% of expenditure under sprinkler irrigation. Groundnut, Maize, Sugarcane, Paddy and Sunflower were chief crops accounting for 70% of the area. Belgaum, Bagalkot, Bijapur, Gulbarga and shimoga account for 74% of expenditure under drip irrigation. Sugarcane, Hybrid maize and Cotton together accounted for 86% of the area under drip.

Although subsidy as per the scheme is 100% (in some districts) the actual subsidy worked out to 59% to 79% of the actual cost during the year 2009-10 and it worked out to 51% to 59% of the actual cost in other districts where the subsidy rates were 75%. This was due to non-revision of unit cost from time to time.

While back ended subsidy and the registering of all interested companies are good initiative of Karnataka, good practices from other States included – a) adoption of single agency (e.g. Andhra Pradesh Micro Irrigation Project (APMIP and Gujarat Green Revolution Corporation) for implementing the project; b) Revision of unit cost and subsidy revisions every year in Gujarat, Tamil Nadu and Andhra Pradesh; c) entrusting the Companies with responsibilities of conducting demonstrations and trainings and d) third party inspections in Andhra Pradesh and Tamil Nadu.

Among the shortcomings in implementation of the Scheme, the significant ones are: a) poor database management where data on a large number of parameters (e.g. beneficiary wise subsidy, total area covered by micro irrigation, etc.) important for monitoring is unavailable; b) absence of strategic plan incorporating scientific estimation of potential for micro irrigation in different districts to guide the implementation; and c) inadequate IEC efforts to educate farmers on the benefits of MI and the proper use of the equipment.

The government proposes to establish a single agency, namely, Karnataka Antaraganga Micro Irrigation Corporation to implement the scheme. Once this gets underway, the implementation would have better focus. Similarly, an on line application for sanctioning the installation and payment of subsidy is under implementation in Agriculture Department. This software application would significantly improve availability of critical data and monitoring the implementation in future should be better.

1.0 Introduction

1.1 Water Use in Agriculture

Water is a vital input for agriculture. The availability of adequate, timely and assured supply of water is an important determinant of agricultural productivity. Irrigation raises cropping intensity (Dingar and Prasad, 1987) and crop yields besides facilitating changes in cropping patterns. The increase in food grain output in the country has come mainly from increase in land productivity. Of the inputs viz. irrigation, high yielding varieties seeds and fertilizer nutrients, irrigation alone is said to have contributed 60 percent to growth in agricultural productivity. However, high level of investment in major and minor irrigation projects has reduced the agriculture from the dependence on monsoon only to a small extent. On the other hand, creation of intensive surface water irrigation facilities and excessive use of canal water has resulted in the problems of water-logging, soil salinity, etc. Also, ground water is declining very fast due to over-exploitation of water resources through increased bore wells and inefficient use of water due to adoption of age old practices in irrigation system. Poor management of water as a resource has lead to scarcity in some places and at times when it is most needed.

Water is a relatively scarce resource in India since we have 16.0 per cent of the world's population and only 4.0 per cent of the usable fresh water. Irrigation is the sector that uses water the most. Nearly 80% of the world's water resources are used in irrigation. In India also irrigation uses more than 80% of the available water. The water resources in India are estimated at 4000 cubic kilometer given the geographical area of 3.3 million square kilometer and an average annual rainfall of 1170 mm (Table 1). Nearly 50 per cent of this water is lost to evaporation, percolation, sub-surface flows to oceans and only 1953 Billion Cubic Meter (BCM) of water is available. The temporal and special variation in the availability of water reduces it further to 1086 BCM (Phansalker and Verma, 2005). It is estimated that the Annual Water Resource that was 2214 cubic meters in 1996 would go down to 1496 cubic meters by 2025. The Developed Water Resource (DWR) is estimated at 25% of the available water resource (Gulati et al, 2005).

Table 1: Water Resources in India

Average Annual Precipitation	4000 BCM (3000 BCM during June to September)
Average runoff in all the rivers	1869 BCM
Utilizable surface water	1122 BCM
(i) By conventional means	690 BCM
(ii) Replenishable groundwater	432 BCM
Present utilization	605 BCM
Demand by 2025 AD	1093 BCM
Demand by 2050 AD	1447 BCM
Possible additional water utilization through Inter Basin Water Transfer Scheme of GOI	170-200 BCM

Source: Ministry of Water Resources, Government of India (GOI) (2003)

Karnataka is unique in respect of its water resources as compared to the rest of the country. Rainfall varies from 400 mm to 4000 mm across different agro-climatic zones. The average normal rainfall of Karnataka is about 1220 mm. About 70% of the rainfall is received during the south west monsoon during the months between June and September. Karnataka is second most arid state after Rajasthan with 19 out of 30 districts being drought prone. Almost entire pulses and minor millet production is under rain fed area. Major surface irrigation is through the water from the Krishna and Cauvery rivers. Systematic efforts have been made to utilize the state's share of these river waters for irrigation by making adequate investments. The efforts to utilize the rain water effectively by restoring the tanks and efficient management of watershed are being undertaken on a large scale. The annual replenishable ground water of the state is estimated at 15.93 BCM with net ground water availability at 15.30 BCM. The irrigation potential by different sources is depicted in the Table 2.

Table 2 Irrigated Areas in India and Karnataka

	INDIA			**KARNATAKA**	
Water Source	**Capacity (million ha)**	**Utilisation (million ha)**	**Ultimate Irrigation Potential* (million ha)**	**Ultimate Irrigation Potential (million ha)**	**Potential created (million ha)**
Major and Medium Irrigation(surface water)	32.69	28.02	58.50	3.50	2.04
Minor Irrigation(Surface water)	10.89	10.12	17.38	1.00	0.96
Minor Irrigation(Ground water)	45.73	42.50	64.05	1.60	1.00
Total	89.31	80.54	139.90	6.10	4.00

**prepared by the Ministry of Water Resources (GOI).*
Source: Gulati et al. (2005) and anonymous report of UAS Bangalore (2005)

Potential of the drip and sprinkler irrigation systems were assessed during the year 2010 by S. Raman using the state wise secondary data like the source wise irrigated area for each state, cropped area, crop wise suitability for different micro irrigation

systems (Table 3). A potential of 11.6 million hectares and 30.6 million hectares under drip and sprinkler respectively was estimated. Of which only 3.8 million hectares has been covered constituting 9.16 % of the potential in the country. States like Andhra Pradesh, Chhattisgarh, Karnataka, Tamil Nadu and Maharashtra have performed better than the other states in implementing micro irrigation in the country. The potential as well as the actual coverage is based on the secondary data available with the governments and the area coverage under the subsidy scheme.

Table 3: Potential and Actual area under Micro Irrigation in selected States (in thousand hectares)

State	Drip Irrigation			Sprinkler Irrigation			Total		
	Potential	Actual	%	Potential	Actual	%	Potential	Actual	%
Andhra Pradesh	730	363.07	49.74	387	200.95	51.93	1117	564.02	50.49
Gujarat	1599	169.69	10.61	1679	136.28	8.12	3278	305.97	9.33
Maharashtra	1116	482.34	43.22	1598	214.67	13.43	2714	697.02	25.68
Karnataka	745	177.33	23.80	697	228.62	32.8	1442	405.95	28.15
Chhattisgarh	22	3.65	16.58	189	59.27	31.36	211	62.92	29.82
Haryana	398	7.14	1.79	1992	518.37	26.02	2390	525.5	21.99
Tamil Nadu	544	131.34	24.14	158	27.19	17.21	702	158.52	22.58
All India	**11659**	**1428.46**	**12.25**	**30578**	**2442.41**	**7.99**	**42237**	**3870.86**	**9.16**

Source : Raman (2010) and Indiastat (2010)

1.2 Groundwater Irrigation and the promise of micro irrigation

In India, 34 per cent of the net sown area is irrigated which amounts to about 80 million ha. Sixty percent of the gross area under irrigation in India utilizes the groundwater. Since 1970, the ground water has been increasingly contributing to agricultural production and income. The contribution of groundwater to agricultural income increased from Rs 2200 crore in 1970 to Rs 13200 crore in 1993 while surface water increased from Rs 7700 crore to Rs 11500 crore (Shah and Deb, 2004). Tube wells are now the largest source of irrigation in the country and their share has increased from 1 per cent in 1960–61 to 37 per cent in 1999–2000 (MoRD, 2006). Since this sector has almost no dependence on the government, it is growing at a rapid rate and it is estimated that one million wells are added every year (Shah and Deb, 2004). According to the Ground Water Report (2010) by the Central Ground Water Board, the ground water utilization for the country as a whole is 58%. The status of ground water exploitation is comparatively high in the states of Delhi, Haryana, Punjab and Rajasthan and UT of Daman & Diu and Pondicherry, where the utilization is more than 100%, which implies that in these states the average annual ground water

consumption is more than average annual ground water recharge. In the states of Gujarat, Karnataka, Tamil Nadu and Uttar Pradesh the average ground water utilization is 70% and above. About 839 blocks accounting for 15% of the assessed blocks were found to be over exploited. Such blocks were found to be highest in states of Delhi (78%), Punjab (75%), Haryana (49%), Rajasthan (59%), Karnataka (37%) and Tamil Nadu (37%) The number of blocks where groundwater utilization is more than 90 per cent is increasing. The number of blocks where ground water is over exploited (i.e. over 90% utilization) is expected to increase to 60 per cent in the next 25 years (MoRD, 2006).

Although the crop yields under the ground water irrigation were found to be 1.2 to 3 times higher than the surface irrigation due to greater control over the management of resource unlike the surface irrigation through canal irrigation, there is an urgent need to improve the efficiency of ground water use. Over exploitation of ground water as pointed out above will be disastrous in the long term. Therefore, increasing water use productivity in agriculture is important so that the resultant savings could be made available to the other high priority or economically more efficient sectors.

Technological interventions like the drip[1] and sprinkler[2] method of irrigation can aid significantly in achieving higher water use efficiency and thereby aiding in bringing more area under irrigation, higher yields because of the efficient and timely use of water by the crop. Researchers have documented the increase in the water use efficiency through micro irrigation to an extent of 40% to 80% apart from increased productivity (Table 4). It can also help in making pragmatic choices of crop diversification based on the water availability and the markets. The micro irrigation technology can also be effectively used under different gradients. Apart from water savings, the weed management will be easier, soil and water pollution is reduced along with the savings in labor cost.

Table 4: Irrigation Efficiencies under Different Methods of Irrigation

Irrigation Efficiencies	Method of Irrigation		
	Surface	Sprinkler	Drip
Conveyance Efficiency	(Canal) 40-50 (Well) 60-70	100	100
Application Efficiency	60-70	70-80	90
Surface water moisture evaporation	30-40	30-40	20-25
Overall efficiency	30-35	50-60	80-90

Source: Sivanappan (1997)

[1] *The drip irrigation refers to providing the irrigation to the root zone of plants through a network of pipes, drippers and emitters that are designed to discharge water at prescribed rates.*

[2] *The sprinkler irrigation system, water is sprinkled under pressure in the form of rainfall over the foliage through nozzles fitted with the network of pipes. The sprinkler is suitable where the cropping density is very high and the drip irrigation is not economical.*

2.0 Micro Irrigation Schemes

Recognizing the importance of micro irrigation in economical use of water, both the state and central government have sought to promote micro irrigation through various incentives. The drip irrigation scheme was introduced in Karnataka during the year 1991-92 under the Department of Horticulture for horticultural crops. An amount of Rs. 450 crore has been spent as subsidy by the end of the year 2004-05 covering an area of 2.27 lakh hectares. The micro irrigation scheme was introduced in agricultural crops during 2003-04 and significant progress has been made after the introduction of the centrally sponsored scheme.

A Centrally Sponsored Scheme was launched during VIII plan (1992-97) to encourage the drip irrigation in the country while the assistance for the sprinkler irrigation was started during the seventh pan (1985-90) itself. Assistance to sprinkler was 50%, 75% and 25% to small and marginal farmers, SC/ST farmers and other farmers respectively during the seventh plan. During eighth plan the assistance was increased to 90 % for small and marginal farmers, SC/ST farmer, women farmers while the assistance was increased to 70% for other farmer category for both drip and sprinkler irrigation systems.

A committee was constituted to look into the assistance for micro irrigation by Government of India under the chairmanship of Commissioner of Agriculture, Government of Maharashtra in the year 1997. The committee recommended the increase in the unit cost by 15% from the unit cost recommended in the year 1994. The committee recommended the lowering of assistance from 90% to 50% for small and marginal farmers, SC/ST farmer, women farmers while the assistance was decreased to 35% for other farmer category for drip irrigation. The assistance under sprinkler was also reduced to 50% and 33% for small and marginal farmers, SC/ST farmer, women farmers and other farmer category subject to maximum assistance of Rs.15000 and Rs. 10000 respectively. The ceiling of assistance was fixed at 4 ha. This pattern continued till the end of ninth plan (1997-2002). During the 10^{th} Plan (2002-07), the assistance was reduced to 25% for all categories both under drip and sprinkler irrigation.

Government of India constituted a task force in June 2003 headed by N. Chandrababu Naidu, the then chief minister of Andhra Pradesh to look into the issues of micro irrigation in India and suggest the strategies to expand micro irrigation, suggest institutional mechanism for promoting micro irrigation, advise on technological support for crop and region specific interventions and to suggest measures to reach the benefits for the target groups. The task force submitted the report in January 2004. It estimated the micro irrigation potential in the country as 69.5 million hectares with 27 million hectares and 42.5 million hectares under drip and sprinkler irrigation systems

respectively. It identified the constraints involved in adoption of micro irrigation systems and reasons for its low adoption to be: a) high initial costs, b) lack of credit facilities, c) technology intensiveness, d) lack of training and information on the benefits and e) micro irrigation being viewed as different from the farm irrigation management.

Taking into account the recommendations of the task force report Government of India launched the centrally sponsored scheme on micro Irrigation during the year 2005-06. Detailed guidelines of the scheme were brought out in January 2006. The subsidy was fixed at 50% with contribution from Government of India and State Governments sharing in the ratio of 80:20. The beneficiary farmer was to share the rest 50% of the cost. Assistance is available to a maximum of 5 hectares. Assistance to drip and sprinkler demonstrations at 75% of cost is also available for a maximum of 0.5 hectare per beneficiary from Government of India.

2.1 National Mission on Micro Irrigation (NMMI)

During the year 2010, the Government of India reiterated the thrust on Micro Irrigation by scaling up the scheme as National Mission on Micro Irrigation (NMMI) with revised guidelines. The NMMI scheme intends to provide benefits to the categories of SC, ST beneficiaries to the extent of 18% and 6% under Special Component Plan (SCP) and Tribal Sub Plan (TSP) respectively. At least 33% of the allocation has to be used for small, marginal and women farmers. The allocation to the SC/ST should be in proportion to the SC/ST farms in the district. The Small and Marginal farmers are provided a subsidy of additional 10% which makes them to get 60% subsidy from GOI.

The revised guidelines also places importance on the preparation of perspective plan for the twelfth plan period (2012-2017) by all the states. This perspective plan and the road map should guide in formulating the Annual Action Plans (AAP) prepared by the districts. The strategic plan should contain potential for micro irrigation and strategy for its adoption in each district with reference to cropping intensity, over all irrigated area, percentage diversification of crops, and gains to farmer's income. AAPs prepared by the districts should contain the impact of micro irrigation interventions in the previous years with respect to crop diversification, crop productivity, etc. Against the task force estimation of potential at 69 million ha, 17 million ha is expected to be covered by the end of 2012 and 69 million ha by the end of 2030.

2.2 NMMI – Prescribed Implementation Process

At the national level National Committee on Plasticulture applications in Horticulture (NCPAH) headed by the minister of agriculture is the apex body to provide overall guidance and review the progress on the coverage of area under Micro Irrigation in the

country. The Executive Committee headed by the Secretary Department of Agriculture and Co-operation will oversee the activities of Micro Irrigation scheme and approve action plans as well as action plans of Precision Farming Development Centre(PFDC).

At the State level, the State Micro Irrigation committee (SMIC) under the chairmanship of Agriculture production commissioner/Secretary of Horticulture or Agriculture department will steer the implementation of the scheme. The functions envisaged of the SMIC are to:

a. organize base line survey and feasibility studies in different parts of the State, covering various crops and technologies;

b. allocate the resources required for implementing the scheme and make it available to the implementing agencies at the district level;

c. finalize and forward the consolidated action plans of districts to Department of Agriculture and Co-operation;

d. circulate the list of suppliers/manufacturers registered with them along with price list to the District Micro Irrigation Committee;

e. indicate the quantum of money to be paid by the beneficiary /bank to the manufacturer before installing the system;

f. mobilize credit requirement of farmers for installing micro irrigation system through financial institutions;

g. facilitate PFDC in organizing various training and extension programmes for farmers, officials, NGOs, entrepreneurs; and

h. host a website indicating the details and status on the progress of Micro Irrigation in different districts of the State;

At the District level District Micro Irrigation Committee (DMIC) headed by Chief Executive Officer (CEO) will oversee the implementation of the scheme in the district. The committee will have members from departments of Agriculture, Watershed, Irrigation, Rural Development, Krishi Vignan Kendra, lead bank of the district, Irrigation Association and others. The PRIs will have to be involved appropriately. The DMIC has to review and forward the action plans to Department of Agriculture and Co-operation through SMIC. The DMIC has to monitor and review the physical and financial progress of implementation of Micro Irrigation scheme in the district and provide feedback to SMIC on a monthly basis. The DMIC has to review the submission of utilisation certificate by implementing agency.

The Implementing Agency (IA) is the department/agency that has been designated for the implementation of the scheme in the district. One percent of the annual outlay of the district is provided for monitoring of the scheme.

The Technical Support Group (TSG) is to be formed both at national level to provide the technical support for the Scheme. Experts from various fields such as Agriculture, Horticulture, water management, information technology, irrigation and plasticulture constitute the TSG housed in NCPAH secretariat. At State level, the TSG can be formed to provide the technical support for the IAs. SMIC can form the TSG involving the experts at the State level. The principal investigator of PFDC can be involved in selection of these experts to form the TSG. TSG at state level would help in

a. monitoring the scheme and providing guidance in technical matters
b. preparation of state level plans and assess the proposals of districts.
c. documentation and dissemination of success stories/ crop wise technologies.

2.3 NMMI – Implementation in Karnataka

The scheme is implemented in all the 30 districts of Karnataka. Unlike in many other states where the scheme is implemented by a single agency, in Karnataka the scheme is implemented by Horticulture and Agriculture departments separately. The Agriculture department implements both the Drip and Sprinkler irrigation, Department of Horticulture implements drip irrigation. All the cereal crops are covered by the Agriculture department including Groundnut, Sunflower and Sugarcane. Horticulture department is implementing the scheme covering all the horticultural crops. There is a state level micro irrigation committee (SMIC) which is headed by the Additional Chief Secretary/Development Commissioner to oversee and review the implementation of the Scheme. The SMIC ensures the allocation of resources to the district level and also finalizes the annual action plan of the districts and forwards it to GOI. Having two agencies implementing the scheme has obviously resulted in certain divergent practices and made coordination difficult. This is likely to be remedied once the proposed single agency for micro irrigation i.e. the Karnataka Antaraganga Micro Irrigation Corporation (KAMIC) is established and starts functioning.

The technical support group (TSG) as envisaged in the scheme offers the technical expertise. This is being provided by the Precision Farming Development Centre (PFDC) which helps in monitoring the scheme including the technical guidance in the technical matters[3]. The PFDC also assess the action plans submitted by the districts for the release

The Precision Farming Development Centre (PFDC) located at University of Agricultural Sciences scrutinizes the Annual Action Plan submitted by the departments to the Government of India for funding under the Scheme. The action plans are revised accordingly and the suggestions are considered in

of funds apart from assisting in updating of BIS standards. At the District level, District Micro irrigation Committee (DMIC) headed by the Chief Executive Officer of the Zilla Panchayat is formed for which Deputy Director of the horticulture is the member secretary. Representatives from the lead bank of the district, nearest Krishi Vignan Kendra, farmers group and Irrigation Association of Karnataka are members of DMIC. The DMIC plans the implementation of the project, reviews the implementation in the districts through regular meetings and provide feedback to the SMIC.

2.3.1 Implementation Process in Horticulture

The Department of Horticulture is mainly implementing the drip irrigation systems covering all horticultural crops except coffee, tea, and rubber. Only in the district of Kodagu, the sprinkler systems are being provided to the farmers under the scheme. Assistance is extended to a maximum of 5 hectares per beneficiary family. The subsidy rates are 75% for first 2 hectares and 50% for the other 3 hectares. The limit is 5 hectares for fruit and plantation crops while it is 2 hectares for flower and vegetable crops.

Registration of Companies: The Department of Horticulture approves the Micro Irrigation companies (that supply/manufacture drip and sprinkler irrigation components of BIS quality) after obtaining a security deposit of Rs. 1 lakh and Rs. 50000 for drip and sprinkler components and a non refundable annual registration fee of Rs. 30000 and Rs. 25000 for drip and sprinkler irrigation systems separately. The companies have to produce the certificates of BIS with respect to drip and sprinkler components valid for the period at the time of registration. The company should furnish a certificate confirming 3 year guarantee for effective working of the system and replacement of defective parts, maintenance and repairs free of cost during the guarantee period. Beneficiary farmer has to give a certificate to the effect that the micro irrigation system installed will be maintained and utilized for a period of minimum 3 years.

Farmers' registration and disbursal of subsidy: Farmers get in contact with the department who registers and guides them to choose the dealer/company for the installation after due verification of the eligibility (regarding the land, crops and water availability) ascertained through Raita Samparka Kendra officers. The seniority list is put up on the office notice board at taluk horticulture office. The registered companies/dealers are then directed to install the drip/sprinkler system in the farmer's field. Farmers have to invest fully or partially (in case of loan from banks) and get the irrigation system installed by paying the dealer (as per the approved prices of each component at the time of registration and approval of companies). Farmers after getting

finalizing the funding to the state. The PFDC also conducts inspection of the micro irrigation plots across the state with the help of the department.

installed the drip irrigation systems have to apply for the subsidy with application complete in all respects. To avail the subsidy, the farmer has to submit to the department the following documents:

a. crop certificate,
b. water analysis certificate,
c. the bills of the installations from the dealer,
d. bank documents in case of loan from the bank,
e. Record of Tenancy and Cultivation (RTC),
f. Photo of the installations
g. Guarantee card for 3 year period by the manufacturer,
h. Design of the installation and
i. Letter to the effect that the dealer/suppler has given the required training to the farmer on the operating the drip/sprinkler system.

The RTC should mention the crop for which the installation is sought and in case it is not mentioned, the farmer has to get the crop certificate duly attested by the village accountant and the Revenue Inspector of the concerned Hobli/village.

The applications received at the taluk level offices are processed after due inspections and farmers receive the subsidy if it is fully paid by him/her to their bank accounts through ECS. The department has put in place an online system for the reporting of progress from the taluks. The subsidy is adjusted to the loan account in case of the loan obtained for installation of the irrigation system. However the subsidy is decided on the basis of the unit cost as per scheme guidelines given by the GOI. According to the guidelines issued the entire process of paying the subsidy should be completed in 20 days.

Funds Flow: The funds from the GOI received by the State at Joint Director (Drip) are sent electronically to the respective bank accounts of the district units to be utilized exclusively for the scheme. The share of the Government of Karnataka is given under district sector (Zilla Panchayats) and the same has to be drawn from the Treasury and put into the bank account. There should be a regular audit for the expenditure on the scheme account. The utilisation certificates and progress reports have to be provided in the prescribed format by the district offices regularly.

Before fifth day of every month, the taluk level officer has to submit the list of applications received for the subsidy along with the list of the applications that has been inspected to the Deputy Director of Horticulture at the district as well as the Joint Director (Drip) at the state level via email. Every week the installing companies have to

provide details of the installation done by them in a prescribed format specifying the area covered, crop, along with the bill number and amount.

The Deputy Director of Horticulture at the district level finalizes the Annual Action Plans for the district and forwards it to the Joint Director (Drip) to be forwarded to GOI. The Deputy Director of Horticulture forwards the progress in the district every month to the State level.

2.3.2 Implementation Process in Agriculture

Registration of Companies: As in the case of Horticulture Department, the Agriculture Department too provides subsidy for installation of both drip and sprinkler irrigation systems for growing agriculture crops. The subsidy is 75% for all the category of farmers. 16%, 8% and 33% of the beneficiaries are to be covered under SC, ST and women beneficiaries. For this purpose it similarly registers and approves the companies manufacturing micro irrigation equipment to supply and install the drip and sprinkler sets in the farmers' fields. The company should furnish a certificate confirming 3 year guarantee for effective working of the system and replacement of defective parts, maintenance and repairs free of cost during the guarantee period.

Registration of farmers and disbursal of subsidy: Farmers interested in availing the sprinkler/drip irrigation system approach the department officers who after due scrutiny of the eligibility requirements (land, water, and crop requirements) direct the approved companies to install the system in the farmers plot. The company collects farmer's application along with RTC, photo, water source paper and an affidavit stating that beneficiary has not availed the subsidy so far and gets the approval of Assistant Director of Agriculture. Farmers pay their share by DD/cheque to the company, which along with the application is submitted to the Assistant Director. The application is scrutinized and at different levels and finally approved by the head office at the State level. Once approved, Assistant Director issues a work order and returns the DD/cheque of farmer's share back to supplier. The Company installs the system and submits bills to Assistant Director along with farmer's 'satisfactory' certificate. The payment of subsidy has to be made to the company within 30 days from the date of submission of bills to the Assistant Director. All cereal crops, groundnut, sunflower, and sugarcane are covered under the scheme.

Sprinkler irrigation: The subsidy is decided by using the lowest cost quote from the price quotes obtained from the companies at the time of approval for the year. A farmer has to incur more in case he wishes to go for a company other than the company that has offered lowest quote. The limit of availing subsidy is fixed for 2 hectares. A farmer is

eligible to avail the subsidy under the scheme for the same piece of land only after 5 years.

Drip irrigation*:* The subsidy is calculated as per the unit cost for different spacing given under the scheme guidelines issued by GOI. However, the spacings considered for subsidy are 2x2, 1.5x1.5 and 1x1 only. Farmer has to incur the extra cost for the installations along with the beneficiary share.

2.3.3 Implementation of Micro Irrigation in other departments

Apart from the NMMI, the drip irrigation systems are adopted under other schemes in Department of Sericulture and Department of Horticulture (Oil Palm) in Karnataka. The department of sericulture has 2 schemes one centrally sponsored under catalytic development programme and one state scheme called Reshme Varadaaan with each extending subsidy up to 1 hectare of mulberry. The subsidy is 75% and the unit cost is fixed at Rs. 50000/hectare. The GOI and GOK contribute 40% and 35% of the subsidy respectively. The Drip irrigation scheme started in 1997 under Catalytic Development Programme with a limit of 1 hectare per beneficiary. About 6300 hectares were covered till the end of 10^{th} plan with a subsidy expenditure of Rs. 2044 lakhs. The details of the physical progress and expenditure under 11^{th} plan (2007-2012) are provided in Annexure 1. The Central Silk Board is the nodal agency for the scheme and responsible for approval of annual plans and release of GOI share. During 2006-07 Government of Karnataka started the scheme called Reshme Varadaan on the similar lines and extended the limit to 2 hectares. The GOI share is deposited to the State treasury and the receipt is conveyed to the State Government. The State government releases the matching share and it is allocated to districts as per the annual plans. The approved companies in the horticulture department are registered with the department after the companies provide a bank guarantee of Rs. one lakh. The farmers approach the sericulture department and they are directed to the company dealers who install the system to the satisfaction of the farmer. The subsidy is released after due verification of the installations by the sericulture officer. The farmers have to obtain No objection Certificate (NOC) from the other departments. The SC/ST farmers are covered under the SCP/TSP plans respectively. The prominent districts include Kolar, Chickballapur, Bangalore Rural, Ramanagaram, Tumkur, Mysore Chamarajanagar, Chitradurga and Davanagere.

The Horticulture department provides the drip irrigation subsidy to oil palm under the Integrated Scheme for Oilseeds, Pulses, Oil Palm and Maize (ISOPOM) for the farmers cultivating the oil palm as a part of Oil palm development programme. The spacing is triangular 9x9x9 and is not covered under NMMI. The subsidy offered is Rs 9600/hectare or 50% for SC/ST farmers and Rs 6300/hectare for other category farmers

at 35% subsidy considering a unit cost of Rs. 18600/hectare. However the unit cost in current prices is about Rs. 35000/hectare. Even under NMMI considering the nearest spacing works out to be Rs. 10400 at 75% subsidy. Subsidy is provided under ISOPOM and Rastriya Krishi Vikas Yojna (RKVY) scheme. Here also the subsidy is back ended and the farmer is paid after due verification by the department officers. As of now the farmers are forced to get subsidy by going for intercrops and obtaining the subsidy for them. Belgaum, Shimoga, Mysore, Haveri and Davanagere are important districts that cover the oil palm area in Karnataka. The details of the physical and financial progress of ISOPOM are provided in the Annexure 2.

Micro Irrigation in Karnataka- A Summary

Departments Involved	Agriculture	Horticulture (NMMI)	Horticulture (Oil Palm)	Sericulture
Type of MI	Mainly Sprinkler and drip	Mainly Drip	Drip	Drip
Crops	Cereals, pulses, oilseeds, cotton and sugarcane	All Horticultural crops	Oil palm	Mulberry
Schemes	NMMI SCP/TSP	NMMI SCP/TSP	ISOPOM, RKVY SCP/TSP	Catalytic Development Programme Reshme Varadaan SCP/TSP
Operated under	State and District sector	State sector	State sector	State sector
Fund flow				
GOI to State (GOI Share)	RTGS to Bank account	RTGS to Bank account	To State Treasury	To State Treasury
GOI Share to Districts	State to Districts through banks	State to Districts through Banks	State to Districts through Treasury	State to Districts through Treasury
GOK Share	Through Treasury (District sector + state sector)	Through Treasury (District Sector)	Through Treasury	Through Treasury along with GOI share
Treatment of year-end balance	GOK share lapses at the end of the year GOI funds in bank account available for next year.	GOK funds are drawn on GIA bill and added to GOI share in Bank accounts Both GOI and GOK funds remain in various bank accounts and available for next year.	GOK share lapses at the end of the year GOI funds needs revalidation	GOK share lapses at the end of the year GOI funds needs revalidation for next year

			for next year spending	spending
Unit cost and Subsidy	Lowest cost is considered for subsidy calculation	GOI guidelines is considered for unit cost and subsidy	GOI guidelines is considered for unit cost and subsidy	Unit cost is fixed at Rs 50000/ha for subsidy calculations
	Farmers pay their share + difference in the amount from the lowest cost	Farmers pay the actual cost	Farmers pay the actual cost	Farmers pay the actual cost
Subsidy rates	75% for all category of farmers	75% for all category of farmers	75% for all category of farmers	75% for all category of farmers
Subsidy limits	2 hectares	2 hectares (75%) and other 3 hectares (50%)		1 hectare under each of the scheme
Subsidy is paid to	Companies	Farmers	Farmers	Farmers
Is there a delay in payment of subsidy	Yes	Yes	No	No
What does Pendency mean	Farmers share paid while the subsidy is yet to be paid to company/dealer by the govt.	Farmer paid the total cost by loan/own funds and waiting for release of subsidy	NA	NA

It may be pointed out that apart from the schemes there is Micro Irrigation market outside the scheme. The Micro irrigation companies also market outside the scheme. There are low cost drip systems promoted by International Development Enterprise (IDE) like the Global Easy Water Products and Driptech which are mainly targeting the small and marginal farmers and offer the drip systems at about one fourth of the cost of standard BIS drip system. This low cost drip system is popular in the vegetable belts of Kolar and Chickballapur districts. Godrej Agrovet is marketing the Driptech systems in Karnataka. The IDE promoted Global easy water Products (GEWP) has also established a market in Karnataka. The local made low cost products without brand name are also available in the market targeted especially the vegetable and flower growers. According to industry experts there is existence of about 15% of the drip systems in the low cost category.

3.0 Objectives and Scope of the Study

Micro irrigation involving drip and sprinkler irrigation has proven advantages in terms not only of saving water but also in saving energy and labour, improved weed management, enhanced productivity, etc. While the micro irrigation scheme was introduced in Karnataka as early as 1991-92 for horticultural crops and from 2003-04 for agricultural crops, significant progress has been made after the introduction of the centrally sponsored scheme in 2005-06 and after it was scaled up as National Mission on Micro Irrigation Scheme in 2010.

Since the implementation of the centrally sponsored scheme on Micro Irrigation, about 4.18 lakh ha have been brought under micro irrigation while incurring Rs. 665 crore on subsidy under the scheme. Given the importance of micro irrigation in creating savings in water, energy and labor, a need was felt to take stock of the progress with a view to assess the not only the achievements but also the problems and issues in the implementation of the scheme as also to understand farmers' perceptions and experiences for improving the delivery under the scheme. Importantly the study seeks to assess the spread of micro irrigation beyond what is impelled by the subsidy scheme. The study is also expected to detail out the issues while also providing insights from the best practices adopted by different states in implementing the scheme.

The scope of the Study includes:

a. Analysis of the district-wise, crop-wise area under the micro irrigation scheme.

b. Analysis of the targeting of subsidy across different beneficiary categories.

c. Documentation of the best practices prevalent across states in the implementation of the micro irrigation scheme, looking at the following:

    i. Technical support provided to farmers

    ii. IEC efforts undertaken – including trainings and demonstrations

    iii. Unit cost and subsidy revisions

    iv. Reporting formats and mechanisms

d. Analysis of the data on sales and installations of micro irrigation equipment from the companies involved in these activities in Karnataka

e. Analysis of IEC efforts through demonstrations, workshops, seminars by the department

f. Documentation of the economics of water, energy, labour savings, and impact on income due to adoption of micro irrigation/implementation of micro irrigation scheme

g. Analysis of the shortcomings of the micro irrigation scheme and policy recommendations for the improvement of the scheme.

h. Suggesting the sample methodology and sample sites for the conduct of field evaluation, develop TOR and draft beneficiary schedules.

4.0 Approach and Methodology

The study is based on the secondary data related to the scheme from the Departments of Agriculture and Horticulture. Apart from the secondary data from the departments, data from the Micro Irrigation companies is to be analyzed. Further, a desk review of best practices in implementation of the scheme across different States is expected. Economics of the micro irrigation across various crops in terms of savings in labor, water, energy as well as impact on the income of the farmer are to be documented from various research studies. The issues and problems in the implementation of the scheme are to be documented by the interaction with the state departments and the Micro Irrigation companies.

As can be seen from the above, the Study is based on analysis of data to be provided by the Departments of Horticulture and Agriculture and the companies. Timely availability of data was thus extremely critical for successful completion of the Study.

5.0 Economic rationale for micro irrigation

The essential rationale for the central sponsored scheme as well as the motivation on part of the farmer for the adoption of micro irrigation is that the drip and sprinkler irrigation provide savings and enhance productivity. The study reviewed a sample of the existing research in this area to assess to what extent the actual experience has borne this out.

A study conducted in Shimoga and Davanagere districts during 2003-04 regarding the use of drip irrigation systems for the crops of arecanut and banana showed that more than 95% of the farmers acknowledged the saving of water, 92% of sampled farmers acknowledged the labour savings and over 70% expressed the increase in quality yield in both arecanut and banana. Drip irrigation had recorded an increase of 5.94% and 3.54% over the surface irrigation compared to the previous year.

The study by the Nabard Consultancy Services (NABCONS) during the year 2009 evaluated the impact of the drip and sprinkler irrigation systems in the districts of Kolar, Chitradurga, and Bijapur as a part of the evaluation of the centrally sponsored

scheme in six states. The NABCONS study found that water saving under different fruit crops, coconut, arecanut and vegetables were to the tune of 21 to 33 percent compared to flood/surface irrigation. Energy savings between 23-32 percent was recorded for fruits, vegetables, coconut and arecanut. Yields were found to have increased in the range of 22 to 52 percent over the surface irrigation. Water use efficiency increase for coconut recorded a highest increase at 188% while the efficiency increase for lime was found to be lowest at 63%. The labour savings at the time of land preparation, irrigation, weeding, and fertigation was calculated for the fruit crops, vegetables, coconut and arecanut. The average savings in labour for various crops ranged from 21 to 42 man days per hectare. The study revealed that there was an increase in irrigated area under drip ranging from 23 % to 170% under different farm categories. All the farm categories recorded the increase in the farm income in the sample districts(Table 5). The additional income from sprinkler was found to be 36%, 39% and 20% in Chitradurga, Bijapur and Kolar districts respectively.

Table 5: Increase in Farm income in drip irrigation across districts

Farm category	Chitradurga	Bijapur	Kolar
Marginal	42%	33%	35%
Small	41%	36%	36%
others	53%	28%	39%

The study estimated that the aggregate benefit accruing due to drip and sprinkler irrigation at Rs. 56950 lakhs and Rs. 14000 lakhs. It also estimated that about 1.87 lakh persons got jobs. The income from per hectare under drip irrigation over the flood irrigation recorded an increase of 60%, 38% and 68% in Chitradurga, Bijapur and Kolar districts respectively. The gains from sprinkler irrigation over the flood irrigation were found to be higher by 36%, 39% and 20% in Chitradurga, Bijapur and Kolar districts.

In the study done by Centre for Sustainable Development in Bidar taluk of Bidar district, 100 percent physical verification of the micro irrigation systems installed in Bidar taluk was under taken. About 95% of the beneficiaries reported the increase in the cropping intensity by using the limited water in summer to grow vegetables/groundnut. About 30% to 40% of water savings were reported while the labour savings was about 50%.

The economics of micro irrigation scheme APMIP in Andhra Pradesh was analysed by Yellareddy and Satyanarayana (2010). They worked out the economics of the implementation of scheme since its inception in 2003-04 till 2009-10. An area of 0.654 million hectares was covered during the period. The total cost of the micro irrigation systems installed was Rs.1962 crore while the beneficiary contribution investment at

Rs. 687 crore. An estimated average increase in income of Rs 15000/hectare has resulted in increase in income by Rs. 981 crore. The average pay back period was calculated as 2.0 years while it was 0.7 years considering only the beneficiary contribution. Every rupee invested in the micro irrigation is calculated to have resulted in additional income of Rs. 2.4. Along with these benefits the project is also estimated to have saved about 120.12 TMC of water, 324 million Kwh of energy apart from labour saving and large scale employment generation.

Narayanamoorthy (1996) documented the water savings and productivity gains through drip irrigation under fruit crops, vegetables, sugarcane, cotton coconut and groundnut. Productivity increase was estimated to be over 40% above the flood method of irrigation for vegetables while it was 70% increase over the flood method of irrigation under fruit crops Sugarcane productivity increased by 33% compared to flood method of irrigation.

The yield of sugarcane under drip irrigation was found to be higher compared with that of the flood method of irrigation across various locations in India. The single cane weight, cane girth, cane length, length of internodes, leaf length and leaf breadth were found to be higher in case of the crop under drip irrigation. The sugar recovery rate was found to be higher in crop grown under drip as moisture stress was less compared to flood method of irrigation. Indian National Committee on Irrigation and Drainage (INCID) report (1998) documented the impacts of sprinkler irrigation method for 15 crops across different locations in India. Higher water savings were observed under cereal crops while the higher yields were observed under the oilseeds. The following table presents the results from a number of studies on water savings and yield impacts of drip irrigation. All studies recorded increase in crop yield and savings in water use.

Table 6: Results available from past studies on water saving and yield impacts of drip irrigation[1]

Name of researchers	Location	Nature of study	Results on	
			Water Saving	Crop Yield
Jadhav *et al.* (1990)	Haryana	Socio-economic	31 per cent saving in water use in tomato	Yield increase by 50 %
Hapase *et al*. (1992)	Maharashtra	Socio-economic	50-55 per cent saving in water in sugarcane crop	Yield increase in the range of 12-37%
Muralidharan and others (1994)	Kolar, Karnataka	Socio-economic	Water-saving benefits highlighted, not quantified	
Narayanamoorthy (1996)	Nashik, Maharashtra	Socio-economic (respondent survey)	41 per cent water saving for banana and 59 per cent for grapes	Productivity higher under DMI for both crops
Reddy and Thimmegowda (1997)	Bangalore, Agricultural University	Experimental farm measurements	Water-saving benefits not quantified	Seed cotton yield increased by 13% under drip tap; 16% under emitter drip
R. L. Shiyani and others (1999)	Four districts of Saurashtra in Gujarat viz., Junagadh, Rajkot, Amreli and Bhavnagar (Cotton)	Socio-economic survey	Water saving not quantified; but estimated reduction in irrigation cost as varying from 25% to 51%; increase in irrigation cost in Bhavnagar	Yield enhancement in cotton in all districts, averaging 22%
Palanisamy and others (2002)	Coimbatore (Coconut)	Socio-economic study (respondent survey)	50 % water saving in coconut	20-30 per cent increase in coconut yield
Kumar and other (2004)	Banaskantha, Gujarat (Alfalfa)	Techno-economic evaluation of drips in demo farms of alfalfa	Reduction in water application in the range of 7-43 per cent	Yield increase in the range of 5-10 per cent
Waykar and others (2003)	Ahmednagar district of Maharashtra (Sugarcane)	Socio-economic survey	Data on water-saving not available	Higher yield of sugarcane (up to 27%) for adopters of drip systems.

Source: Synthesis of various studies

Dinesh Kumar and et.al (2007) studied the water saving technologies and their impact on the productivity enhancement. They found that the documentation by various researches was skewed towards drip irrigation. They also found that the studies very rarely captured the physical, socio-economic and institutional settings that determine the adoption of micro irrigation systems, changes in cropping pattern and thereby influencing the changes at the farm level. Many researches were from the experimental stations which operate at a different situation from the farmers plot in terms of funds, technical input and others.

The study asserts that water savings from the adoption of micro irrigation is very difficult to monetize unless the farmer expands the area under the crop and makes a benefit (Table 7). Since the water pumping from the depths is free of cost or low cost (due to power subsidy in many states), the savings of the water is hardly recognized. On the other hand due to well interference in hard rock areas/shallow alluvial soils the less withdrawal by a farmer do not guarantee him/her water availability during the next season because other farmers would be extracting water from the same aquifer. Only labour savings, higher yields, higher quality produce are the immediate benefits for the farmer. Farmers can also alter the sowing/transplanting by a week or two to suit the market to fetch a better price because of the water management through micro irrigation. The authors also documented the issues with respect to the adoption of micro irrigation technology as a method of water saving, productivity enhancing technology. The authors opine that in long run energy crisis would emerge as the major impediment to the adoption of the pressurized micro irrigation technology especially sprinkler irrigation. While the power of higher quality is required for longer hours to adopt the pressurized micro irrigation systems, power supply is very restricted or erratic due to the power subsidies (free/very low cost power). On the other hand the restricted power supply is also acting as regulator by restricting the pumping in certain areas.

Table 7: Aggregate Saving in Water Possible with Drip Irrigation Systems

Sl. No	Name of Crop	Current Yield (ton/ha)	Expected Yield Coming from the Potential States* (Million ton)	Water Use Efficiency (Kg/m^3)	Modified Water Use Efficiency (Kg/m^3)	Water Saving (BCM)
1	Sugarcane	128.0	170.0	5.950	18.09	31.00
2	Cotton	2.600	4.391	0.303	1.080	10.42
3	Groundnut	1.710	2.840	0.340	0.950	1.453
4	Potato	23.57	34.47	11.79	17.21	0.127
5	Castor	1.260	1.350	0.340	0.670	0.497
6	Onion	9.300	12.20	1.544	2.700	0.963
7	**Total**					**44.46**

Source: Water saving and Yield enhancing technologies, DineshKumar et al.

***States where water-saving technologies are likely to be adopted. This is obtained by multiplying the average crop yield under conventional irrigation with the sum of the estimated area under that crop in each state.*

The researchers opined that the best scenario would be the metered connections to irrigation pump sets and pro-rata based pricing which would force the farmers not only to adopt the micro irrigation technology but also to adopt the suitable cropping systems and crops apart from proper pricing of the irrigation water.

The study by Indian Resources Information and Management Technologies ltd (INRIMT) has indicated that 83% of the sample farmers increased their income by 15-25% with respect to perennial crops and 40-50% with respect to annual crops after installing the drip irrigation system in their fields. About 42% of respondents made use of the drip to mitigate the labour problem. Power problems, need to increase area under irrigation were other criteria for adopting the drip irrigation.

Thus, it is seen from various research studies that micro irrigation has indeed resulted in the anticipated savings in water, energy and labour; and it has led to improved productivity. The promise held out by micro irrigation has proved to be realizable and, it does reinforce the underlying rationale for the continuance and strengthening the further adoption of micro irrigation.

6.0 Advocacy efforts for popularizing micro irrigation

Notwithstanding the undoubted benefits of micro irrigation for the farmers in particular and the society in general, its adoption on a large scale critically depends upon the efforts made to promote micro irrigation through information, education and communication (IEC) by the state agencies. The IEC efforts also are needed to educate farmers on appropriate use of micro irrigation so that the potential benefits such as saving in water are actually realized. A review of the IEC efforts showed that this was inadequate.

The Horticulture Department conducts training in collaboration with PFDC on water use efficiency, management of micro irrigation systems, integrated pest management, integrated nutrient management and post harvest management for the benefit of farmers as a part of their regular trainings of the department (Table 8).

Table 8: Number of Trainings conducted by Horticulture Department

Year	Water use efficiency	Management of MI systems	Integrated Nutrient Management	Post Harvest Management
2007-08	295	283	177	160
2008-09	406	429	311	231
2009-10	364	377	293	249

The Horticulture Department has incidentally had entrusted the task of demonstrations and documenting the case studies to micro irrigation companies. However, only 2-3 companies had responded to it.

The data from the Agricultural Department indicates that the only 6 demonstrations had been carried out spending Rs.0.4 lakhs against the allocation of Rs 106 lakhs during the years 2006-07 to 2010-11 against envisaged 282 demonstrations. Despite the comments made by PFDC on the action plans and suggestion to increase the demonstrations, there

is little effort on part of the departments in this regard. Demonstrations are allowed in 0.5 hectare at 75% subsidy which is equal to the subsidy provided for beneficiary under the scheme. In the event there appears to be no incentive for farmers to come forward to undertake the demonstrations. This is possibly one of the factors responsible for low number of demonstrations.

Trainings were also done by the PFDC as part of the scheme. PFDC also produces literature in the form of books, folders and pamphlets and documentaries for the benefit of officers, farmers and entrepreneurs on a large scale (Table 9). PFDC staff also regularly participates in programs aired on Radio and Television as well as phone-in programs. The PFDC staff regularly attends the phone calls from the farmers/NGO's regarding various technical issues related to the micro irrigation. Despite the PFDC's mandate of 80 percent research and 20 percent extension activities being changed to 80 percent of extension activity and 20 percent of research from 2005, the trainings (particularly demonstrations) conducted by PFDC are highly inadequate considering the overall requirement of educating the farmers of the benefits of micro irrigation.

Table 9: Trainings conducted by PFDC for the year 2009-10

Category of participants	No. of training programs proposed	No. of training programs conducted	Subjects covered	No. of participants trained
Farmers	29	7	Micro irrigation technology, greenhouse technology, plasticulture application, farm pond lining, Precision farming and mulching technology	249
Officers	5	9		408
KVKs/ NGOs'	4	6		497
		2		53
Dealers	4	6		692
Total	42	30		1899

Source: PFDC, Bangalore

To illustrate, the NABCONS Study had found that there was over irrigation to the tune of 68% in coconut, 69% in grapes, 74% in arecanut crops in the sample districts in the drip irrigation systems. The excess irrigation was found to be in the range of 13% to 74% across different crops[4]. The study also indicated that there is further scope to improve the irrigation efficiency by proper irrigation scheduling. This is an area that could have been suitably addressed by IEC efforts.

7.0. Progress of Micro Irrigation Scheme in Karnataka

The progress of the Micro Irrigation scheme was analysed by compiling the expenditures from the Department of Agriculture and Horticulture. An amount of Rs. 664 crore has been spent recording a cumulative expenditure of 95% over the five year

[4] *The efficiency of water use in some crops was worked out by comparing the actual water used with theoretically determined water requirement.*

period. It is seen that the allocations as well as the expenditure recorded a consistent increase during the period 2006-07 to 2010-11 (Table 10).

Table 10: Expenditure under Micro Irrigation in Karnataka (Drip and Sprinkler) (Rs. In lakhs)

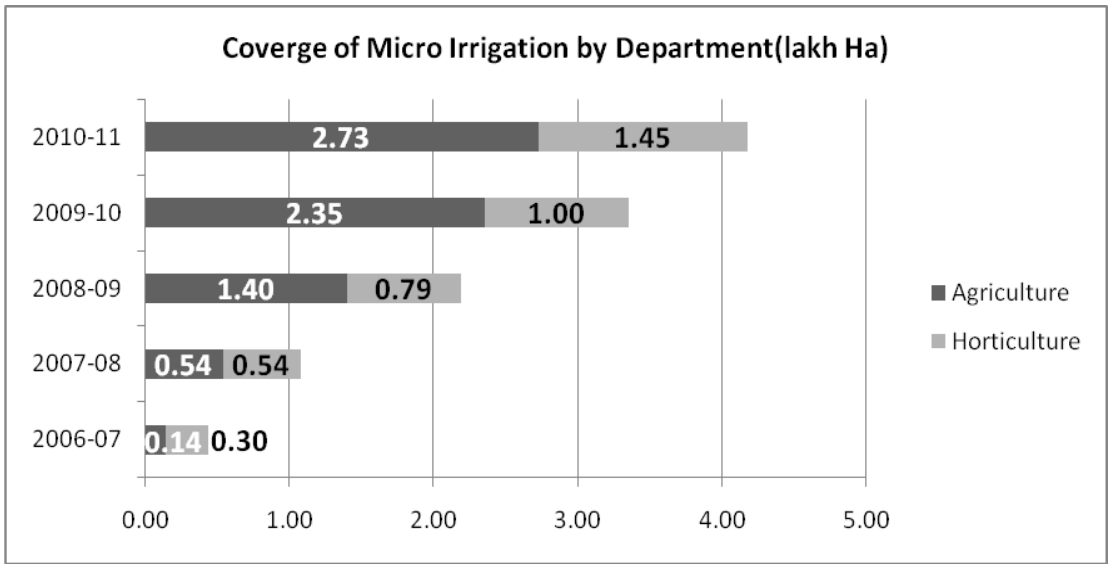
Year	OB*	Releases	Total Available	Expenditure	CB	Utilization to Releases (%)	Utilization to Available funds (%)
2006-07	NA	10435.86	10435.86	6728.87	3706.99	64.48	64.48
2007-08	3473.63	14784.83	18258.46	11480.05	6778.41	77.65	62.88
2008-09	4114.14	14780.90	18895.04	14994.65	3900.39	101.45	79.36
2009-10	3797.55	13606.85	17404.40	16585.90	818.50	121.89	95.30
2010-11	841.37	16209.47	17050.84	16682.90	367.93	102.92	97.84
Total		69817.90		66472.38		95.21	
Growth		8.30		24.41		14.87	13.31

Source: Data from Agriculture and Horticulture Departments

* *The opening balance is less unspent state share which lapses at the end of the year*.

The expenditure under the micro irrigation increased from Rs. 6728 lakh in 2006-07 to Rs. 16683 lakh during 2010-11. The growth of grants was 8.3 % p.a. while the expenditure grew by 24 % annually. The grants decreased during the year 2009-10 by Rs. 11 crore compared to the previous year. The utilization against the allocation increased from 64% during 2006-07 to 102 % percent during 2010-11. However, the utilisation against the total funds available showed a consistent increase from 64% to 98% over the period 2006-07 to 2010-11.

Figure 1: Area Covered under the Micro Irrigation Scheme in Agriculture and Horticulture Departments.



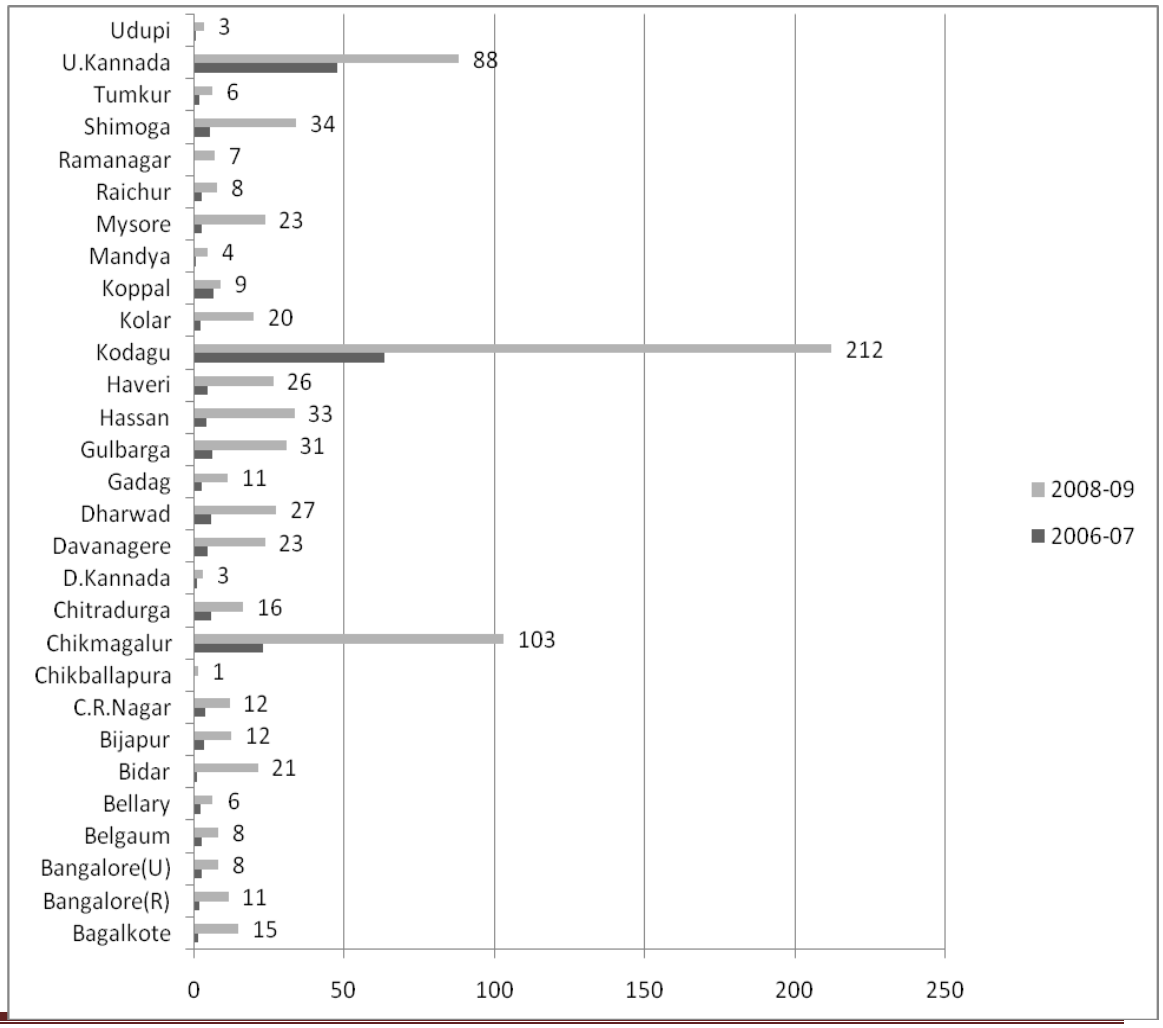
Source: Departments of Agriculture and Horticulture

The cumulative total area which came under Micro Irrigation scheme over the period 2006-07 to 2010-11 was 4.18 lakh hectares (Figure 1). About 55% of this happened between the years 2008-09 and 2009-10. The area additionally brought under the

scheme during the year 2010-11 is less by over 34000 hectares as compared to the previous year. The Agriculture Department accounted for 65% of the area covered while the Horticulture Department accounted for the rest 35% of area.

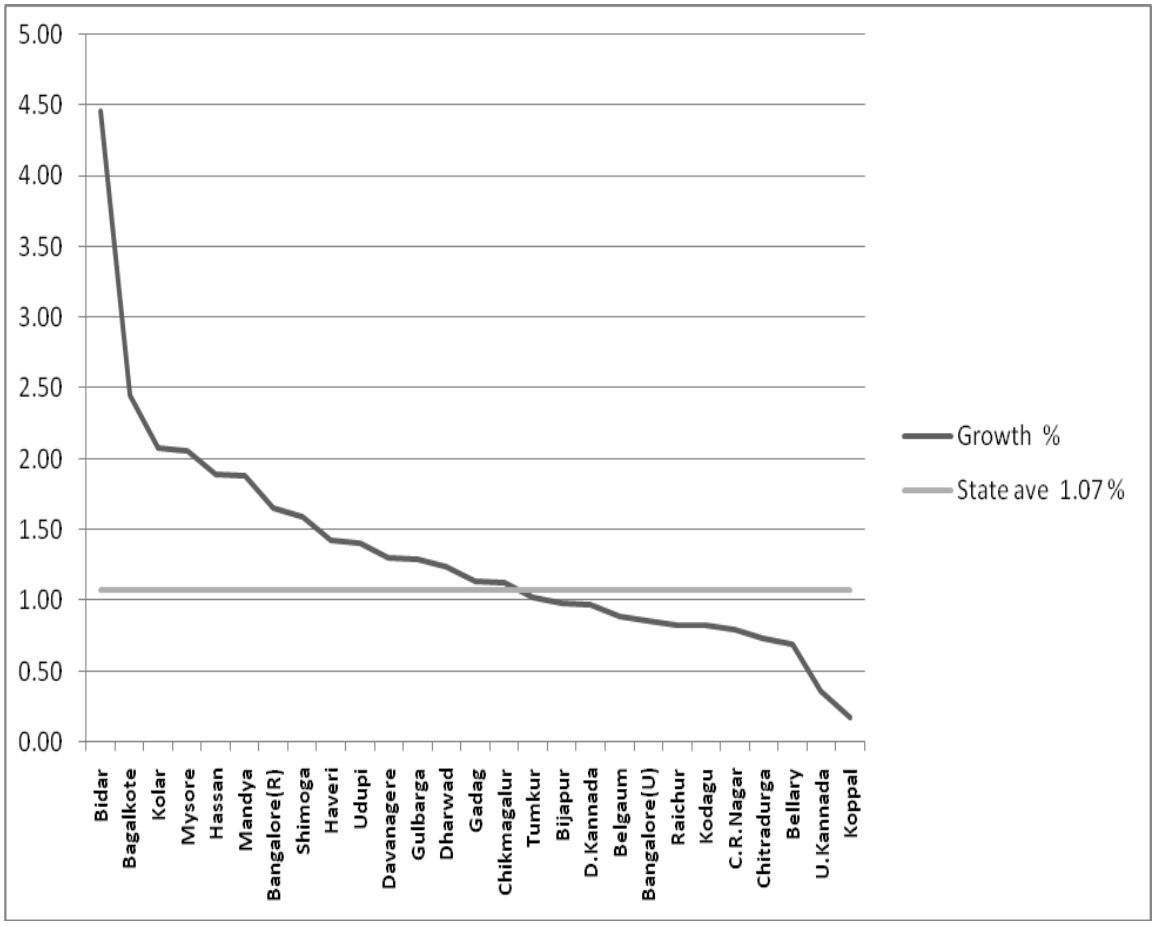
As ground water is the main source of micro irrigation (>90%) the area under the micro irrigation was compared with that of the area irrigated under wells and bore wells in the district. The data was available for only 3 years (2006-07 to 2008-09). It is observed that the area under micro irrigation as a percent to the area irrigated from wells and bore wells in the entire state has increased from 3.29% in the year 2006-07 to 14% in the year 2008-09. The district wise area under Micro Irrigation as a percent to the area irrigated from wells and bore wells is given in the Figure 2. Chickmagalur, Uttarakannada and Kodagu districts show higher area under Micro Irrigation than the area irrigated from the wells and bore wells. This may be due to the substantial use of surface water for micro irrigation which needs to be further explored. Districts like Shimoga, Hassan, Gulbarga, Dharwad, Haveri, Davanagere, Mysore and Bidar had higher coverage of the area under Micro Irrigation.

Figure 2: District wise area under micro irrigation as a % to total area irrigated from wells / bore wells



The growth over the three year period 2006-07 to 2008-09 is given in the Figure 3. Against the average growth of 1.07%, 15 districts recorded higher than the State average while the other 12 districts recorded a growth less than the average.

Figure 3 Growth of Micro Irrigation across districts (2006-07 to 2008-09)



However, the above gives only a partial picture of growth in the absence of data regarding micro irrigation outside the scheme and its application in other crops like mulberry and oil palm. Moreover, even within the districts there are large variations as can be seen from the table 11. The top ten districts account for 66% of the area covered under Micro Irrigation in Karnataka. The top 10 districts under drip irrigation and sprinkler irrigation account for 74% and 71% of the area respectively. Belgaum occupies first place with respect to coverage of sprinkler area while Chitradurga occupies the first place under drip irrigation. The district wise share of the area under drip and sprinkler is provided in the Annexure 3. Not withstanding the variations, it would be instructive to review the districts which have progressed faster which may help in evolving better strategies.

Table 11 - Top Ten Districts with respect to Drip and Sprinkler area covered under the Scheme

Districts	Sprinkler	% share	Districts	Drip	% share	Districts	Drip& Sprinkler	% share
Belgaum	35023	13	Chitradurga	19237	12	Belgaum	44380	11
Bijapur	24531	9	Bijapur	13785	9	Bijapur	38316	9
Shimoga	22898	9	U.Kannada	13245	8	Davanagere	29526	7
Gulbarga	19567	7	Kolar	13207	8	Chitradurga	28867	7
Davanagere	19002	7	Haveri	11591	7	Haveri	25409	6
Bagalkot	18035	7	Davanagere	10524	7	Gulbarga	25205	6
Bidar	15319	6	Belgaum	9358	6	Bagalkot	23750	6
Haveri	13818	5	Chikmagalur	8024	5	Shimoga	23656	6
Chikmagalur	12060	5	C.R.Nagar	6316	4	Chikmagalur	20084	5
Hassan	11851	5	Bagalkot	5715	4	Bidar	16934	4
0thers	69231	26	Others	45536	29	others	141744	34
Total	261334	100	Total	156537	100	Total	417871	100

The foregoing shows that there has been an overall increase in allocations as well as utilization, and with the exception of 2010-11 there has also been an impressive addition to area covered by the MI scheme. However, this does not tell the whole story in the absence of an estimation of area that can be potentially brought under micro irrigation. The State-level Micro Irrigation Committee is required to organize base line survey and feasibility studies in different parts of the State, covering various crops and technologies. The revised guidelines of the Scheme also stipulate that the SMIC formulates a strategic plan and a road map to achieve the goals set therein. The annual action plan is also required to be prepared based on the strategic plan and the road map. However, it is seen that the SMIC has not prepared any such strategic plan and consequentially the action plans are also devoid of any strategic vision.

While the Horticulture Department implements drip irrigation, the Agriculture Department implements both the drip and sprinkler irrigation for agricultural crops. The sprinkler accounted for 63% of the area covered and 37% of the expenditure under the scheme for the period 2006-07 to 2010-11. The drip irrigation covered under the scheme in both the departments together accounted for 37% of the area and 63% of the expenditure under the scheme. The coverage under sprinkler was 0.91 lakh hectares during 2009-10 and it was 0.35 lakh hectares during 2010-11(Figure 4). However, drip irrigation recorded consistent growth in terms of area coverage. While the expenditure during the years 2009-10 and 2010-11 almost remained the same, the expenditure under drip irrigation increased by about 70% during 2010-11 over the year 2009-10(Figure 5).

Figure 4: Drip and Sprinkler irrigation coverage under the Micro irrigation Scheme

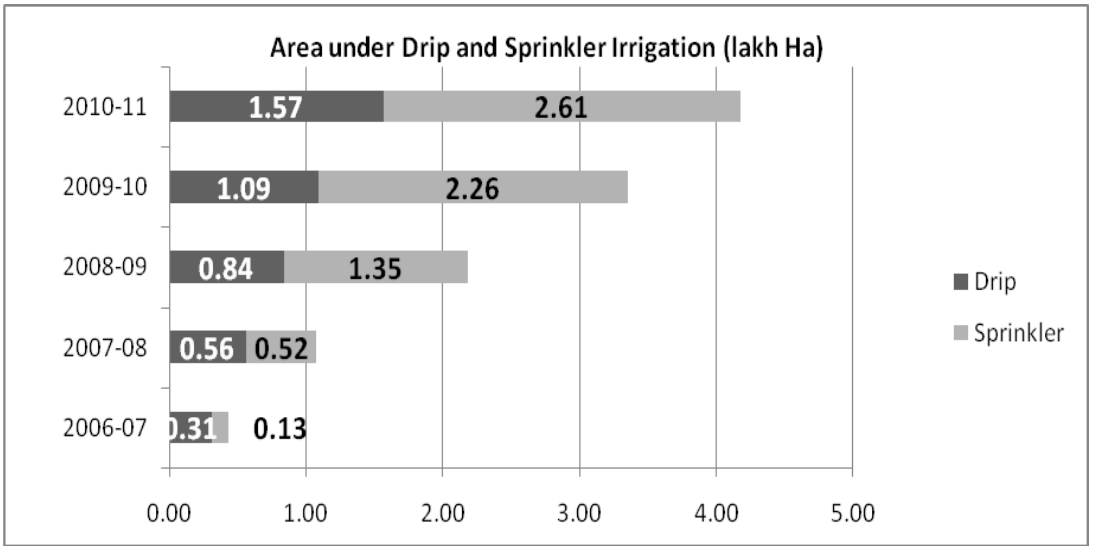
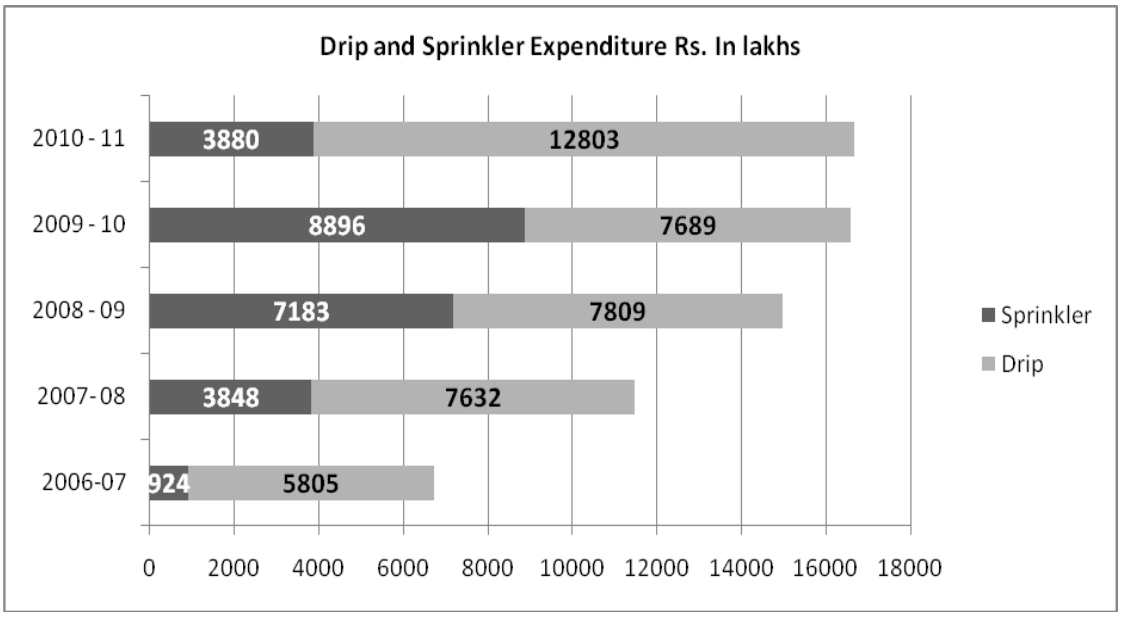


Figure 5: Drip and Sprinkler irrigation expenditure under Micro Irrigation Scheme



Source: Data from Agriculture and Horticulture Departments

7.1 Horticulture

Department wise analysis was also done to understand the expenditure pattern over the study period. The Horticulture Department incurred a total expenditure of Rs.375.48 crore registering 100% expenditure against the allocation. The utilisation percentage recorded a steady increase from 80% in 2006-07 to 100% during 2010-11. The allocation from the GOI and GOK saw a decrease during the period 2009-10. (Table 12)

Table 12: Expenditure under Drip Irrigation in Karnataka (Horticulture Department) Rs. In lakhs

Year	Opening Balance	GOI Releases	GOK Releases	Total Releases	Total available	Expenditure	Balance	Utilisation %	
								Of Releases	Of Available
2006-07	NA	3584.10	3194.46	6778.56	6778.56	5453.72	1324.84	80.46	80.46
2007-08	1324.84	4685.86	3338.30	8024.16	9349.00	6920.72	2428.28	86.25	74.03
2008-09	2428.28	3026.88	3527.50	6554.38	8982.66	7072.50	1910.16	107.90	78.74
2009-10	1910.16	1765.00	2665.99	4430.99	6341.15	6340.55	0.60	143.10	99.99
2010-11	0.60	7254.00	4506.25	11760.25	11760.85	11760.25	0.60	100.00	99.99
Total		**20315.84**	**17232.5**	**37548.34**		**37547.74**		100.00	
Growth Rate (%)		4.43	4.74	5.21		15.60		9.87	7.63

Source: Data from Agriculture and Horticulture Departments

The grants from the GOI decreased by about 40% during 2009-10; however, the expenditure against the total available funds for the year was almost 100%. During the year 2010-11, the GOI grants increased by more than 4 times while the State grants increased by 80%. It appears that the utilization of grant influences the releases in the coming year.

District-wise expenditure under the Horticulture Department (Drip Irrigation) was analysed. The utilisation percentages vary significantly across the districts. The district wise expenditure and utilisation percentages for the five year period are given in the Annexure 4 and 5.Over the period 2005-06 to 2010-11, it is seen that more districts have been able to fully utilize the allocations fully (Table 13).

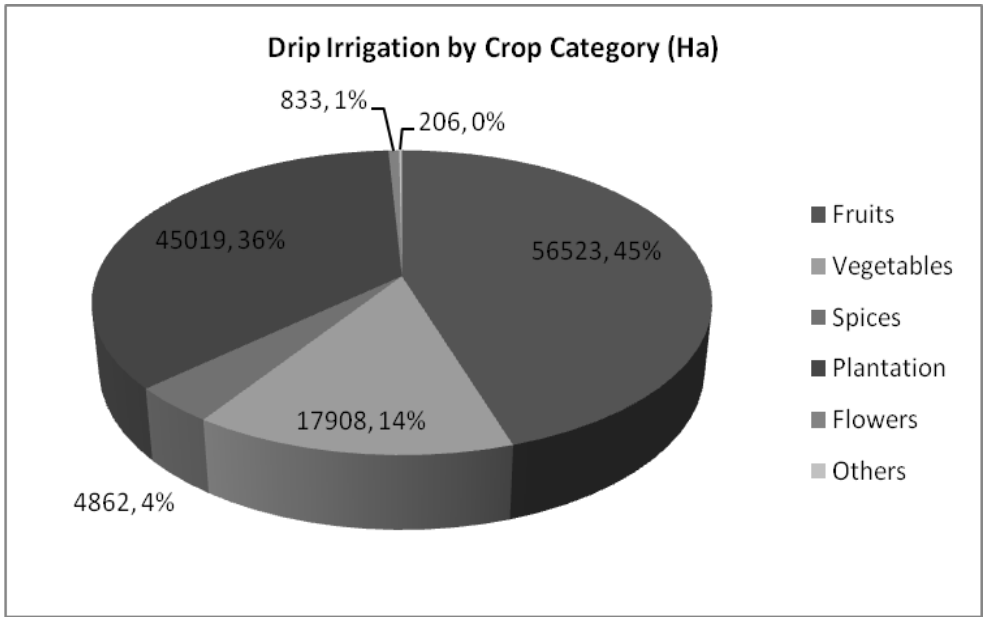
Table 13: Utilisation pattern of Expenditure in Department of Horticulture

Utilisation %	No of Districts				
	2006-07	2007- 08	2008 - 09	2009 - 10	2010 - 11
< 50	2	7	2		
51-90	6	14	10		
91-100	10	6	3	4	30
>100	9		14	26	
Total	**27**	**27**	**29**	**29**	**30**

An analysis of the district-wise crop category wise area coverage under the scheme was analysed. Bijapur, Tumkur, Chitradurga, Chickmagalur, Davanagere, Haveri and Koppal districts form the chief coverage area under the drip irrigation together accounting for 58% of the area covered under drip irrigation. The 20 districts account for 30% of the area while the top 10 districts accounted for 70% of the area coverage. In terms of the crop coverage, fruit crops followed by the plantation crops account for

45% and 36% of the total area covered under drip irrigation respectively. Vegetables accounted for 14% while spices accounted 4% of the total area (Figure 6)

Figure 6: Share of different crop category under drip irrigation through Horticulture Department



Source: Data from Horticulture Department

Bijapur has the largest area of drip irrigation covered under fruit crops followed by Chitradurga, Koppal, Belgaum, Gulbarga and Bagalkot districts. Banana, pomegranate, lime, grapes, sapota and papaya are important crops covered under this category. Tumkur district stands first with respect to the drip area coverage under plantation crops followed by Chickmagalur, Davanagere Chitradurga, Shimoga and Hassan districts. Coconut and Arecanut are the chief crops covered under this category. In vegetable crops Kolar stands first in drip area coverage followed by Haveri, Bijapur and chickballapur districts. Haveri district stands first in the drip area coverage under spices constituting nearly 40% of the total area under drip in spice crops in Karnataka. Chilli is grown under drip in this district. Kodagu district stands second with production of pepper under drip. Flowers are grown under drip mainly in Bangalore rural, Chickballapur, Kolar and Bellary districts due to the proximity to the market as well as the perishability of the produce. The district wise coverage of drip under different crop categories is provided in the Annexure 6.

An analysis of the performance of drip irrigation was done by looking into targets set at the beginning of the year with that of the achievements over a three year period. The district wise performance was analysed with respect to physical targets in hectares over three years 2008-09, 2009-10 and 2010-11(Table 14).

Table 14: Physical achievements as percent of physical targets

		2008 - 09	2009 - 10	2010 - 11
Maximum		226	117	244
Minimum		0	0	26
Median		52	52	101
Districts	More than Median	13	13	15
	Less than Median	13	14	14
	Median	1	1	1
	Zero Utilisation	2	1	0
	Total	29	29	30
	No. exceeded target	5	2	15

Chamarajanagar district exceeded the targets in all the three years. The performance against the target was lowest in the year 2009-10 at 51%. This is the year which had recorded highest utilisation in all the districts with respect to the financial achievements. Thirteen of the 30 districts recorded physical achievements more than the state average. In the year 2010-11, 15 districts exceeded the targets while the financial achievement was at 100% in all the districts. The district wise achievements against the targets are given in the Annexure 7.

The targets and achievements were also compared with the action plans for the years 2008-09, 2009-10 and 2010-11(Table 15). Action plans are prepared by the department at the district level and are compiled and sent to GOI which in turn sends it to the PFDC through NCPAH to assess the plans. The corrections by PFDC are incorporated by the states and GOI considers the recommendations by the PFDC for financial allocations. A comparison has been made with respect to the action plan, revised targets based on the financial allocations received from GOI and the achievements made under prominent crops. It becomes clear that some crops like chilli which has been increasing in area in Haveri and Davanagere districts do not find place in the action plans. Despite covering an area of 950 hectares during 2009-10, it is not included in 2010-11. Similarly the ginger is not covered in the action plans. The lime/lemon crop is under estimated in all the three years 2008-09 to 2010-11. Pomegranate and banana are overestimated in all the three years.

Table 15 Comparison of Action Plan with the Actual coverage (through Horticulture Department)

Crop wise area coverage in Hectares									
	2008-09			2009-10			2010-11		
CROPS	Action plan	Actuals	Difference	Action plan	Actuals	Difference	Action plan	Actuals	Difference
Pomegranate	2645	1465	1181	2149	446	1703	1671	1116	555
Banana	3902	2404	1498	5798	2868	2930	8171	7794	377
Grapes	1748	2111	-364	2014	1437	577	2456	3081	-625
Lime	275	1143	-867	346	1317	-971	350	805	-455
Papaya	1346	793	553	874	515	359	856	1481	-625
Sapota	2263	327	1936	1587	194	1393	3228	136	3092
Mango	2244	617	1627	3262	904	2357	3491	1807	1683
Vegetables	2989	2091	898	3901	1818	2083	4161	8318	-4157
Coconut	2834	2215	619	3685	1675	2010	4149	2316	1834
Arecanut	5518	5790	-272	7751	5673	2078	10412	11282	-870
Chilli			0	0	955	-955	0	1216	-1216
Flowers			0			0	453	274	179
Turmeric			0			0	30	789	-759
ginger			0			0	0	299	-299
others	1537	3354	-1817	1754	1841	-86	2100	2300	-200
Total	**27302**	**22311**	**4991**	**33121**	**18688**	**14433**	**41528**	**43014**	**-1485**

Source: Data from Horticulture Department

The analysis of the physical performance as well as the crop wise performance against targets indicates that the planning and achievements differ significantly and the plans are more of ad hoc in nature. Since district wise allocations are difficult to move across the districts depending upon the demand, the utilisation gets affected which also points to the need for periodical scientific assessment of the potential area that can be brought under Micro Irrigation.

7.2. Agriculture Department

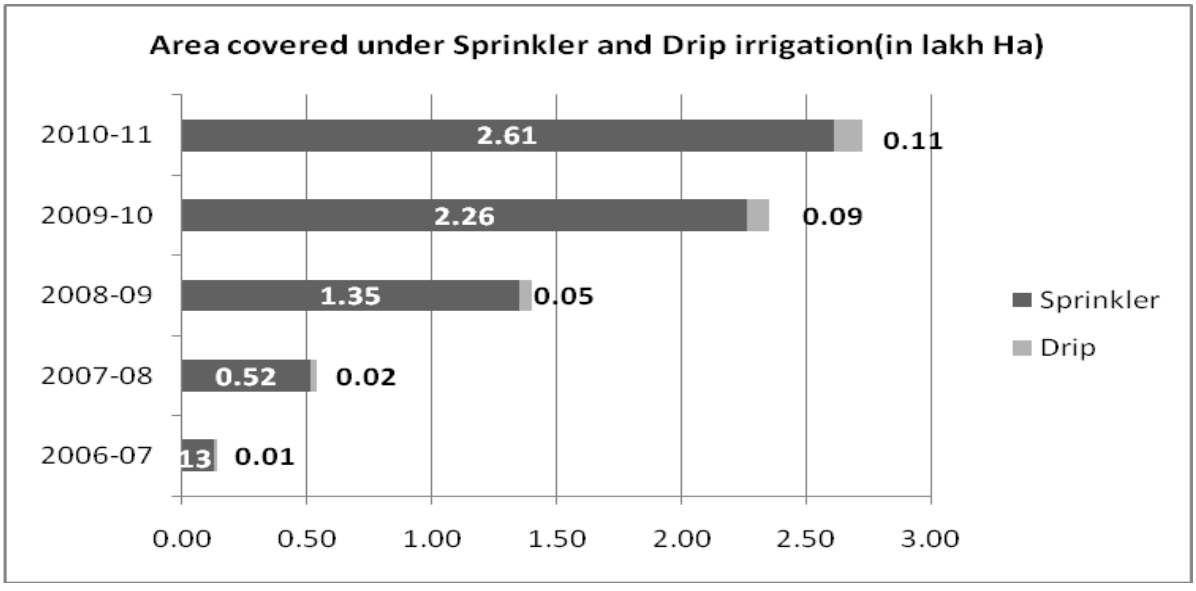
The Agriculture department incurred an expenditure of Rs. 289 crore against an allocation of Rs. 322 crore during the period 2006-07 to 2010-11 registering an utilisation of 89 % (Table 16). As the department provides both drip and sprinkler irrigation systems, the coverage and expenditure was analysed for the same (Figure 7).

Table 16: Expenditure under Micro irrigation in Karnataka (Agriculture Department) in Rs. Lakhs

Year	Opening Balance*	GOI Releases	GOK Releases	Total Releases	Total available	Expenditure	Closing Balance	Utilisation %	
								Of Releases	Of Available
2006-07	0	1200.55	2456.75	3657.30	3657.30	1275.16	2382.14	34.87	34.87
2007-08	2148.79	4582.00	2178.67	6760.67	8909.46	4559.33	4350.13	67.44	51.17
2008-09	1685.86	3934.77	4291.75	8226.52	9912.38	7919.52	1992.86	96.27	79.90
2009-10	1887.39	4559.56	4616.30	9175.86	11063.25	10245.35	817.90	111.66	92.61
2010-11	840.77	2471.84	1977.38	4449.22	5289.99	4922.65	367.33	110.64	93.06
Total		16748.71	15520.85	32269.56		28922.01			
Growth Rate (%)		15.48	3.22	7.22		42.07		32.49	29.13

**Opening balance excludes the unspent state grants that lapses at the end of the year*

Figure 7: Year wise Coverage of Drip and Sprinkler (2006-07 to 2010- 11)



The share of the drip irrigation was 4 percent with respect to area and 14% with respect to that of the total expenditure in the department while the share of sprinkler irrigation was 96% with respect to area and 84% of the expenditure under the scheme. Area coverage was highest during the year 2009-10(Figure 8). The coverage as well as the expenditure dipped during the year 2010-11.

The utilisation against the allocations were analysed for all the districts for the five year period 2006-07 to 2010-11. The number of districts that showed utilisation of over 100% was significant (Table 17). The utilisation has improved significantly over

years. The district wise expenditure and utilisation are provided in the Annexure 8 and 9.

Table 17: Physical achievements as percent of physical targets

	No of Districts				
Utilisation %	2006-07	2007- 08	2008 - 09	2009 - 10	2010 - 11
< 50	17	12			
51-90	9	8	4	5	9
91-100	1	1	9	4	11
>100		7	16	20	10
Total	**27**	**28**	**29**	**29**	**30**

Belgaum occupies first place with respect to sprinkler and drip area coverage as well as the expenditure. The districts of Belgaum, Bijapur, Shimoga, Bidar, Bagalkot and Gulbarga constitute more than 50% of the area under sprinkler irrigation Belgaum and Bagalkot districts account for 60% of the area under drip irrigation (Table 18).

Table 18: District wise area under Drip and Sprinkler Irrigation

Districts	Area under Drip	% share	Districts	Area under Sprinkler	% share
Belgaum	4554	40	Belgaum	35023	13
Bagalkote	2144	19	Bijapur	24531	9
Chamarajanagar	420	4	Shimoga	22898	9
Bijapur	365	3	Gulbarga	19567	7
Bidar	349	3	Davanagere	19002	7
Chickballapura	340	3	Bagalkote	18035	7
Gulbarga	319	3	Bidar	15319	6
Mysore	312	3	Haveri	13818	5
Kolar	298	3	Chikmagalur	12060	5
Shimoga	259	2	Hassan	11851	5
others	1938	17	others	69231	26
Total	11297	100	Total	261334	100

The crop wise area covered under drip and sprinkler irrigation was also analysed for the available data. The data was available only for 3 years 2008-09 to 2010-11 and was not of all the districts (Table 19). Groundnut, Maize, Sugarcane, paddy, Sunflower, and pulse crops accounted for significant area during all the three years. Sugarcane maize and cotton were chief crops even under drip irrigation.

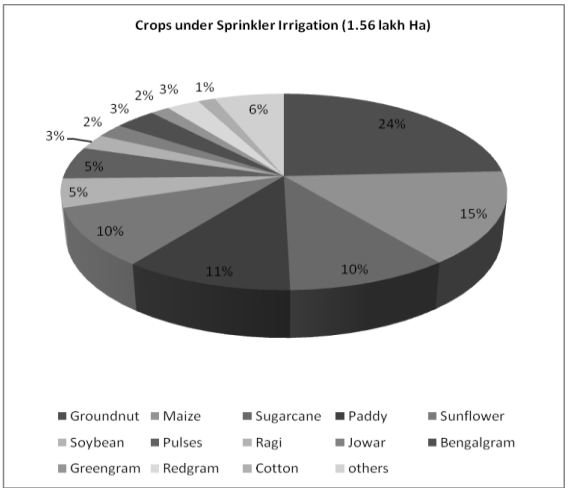
The GOI guidelines clearly say that the sprinkler be used only when the drip is not feasible. However, it is observed from the available data that both drip and sprinkler irrigation systems were being offered for the same crop. In Mudhol taluk both drip and sprinkler systems were installed for sugarcane crop. In the southern districts of Chickballapur, Tumkur and Kolar districts ragi and maize are being grown under drip

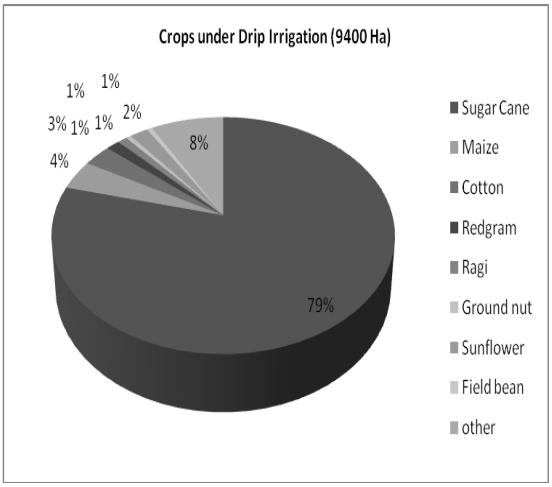
irrigation (although sprinkler irrigation is more appropriate for them) since these crops are grown along with pulses (particularly red gram and field bean which need drip irrigation) as inter crop. Similarly, sunflower when grown as a mono-crop uses sprinkler irrigation but when it is mixed with pulses the farmer uses drip irrigation. In the event, there is a possibility of incorrect admission of subsidy resulting in undermining the scheme's objectives.

Table 19: Crop wise Acreage (in Hectares) covered under sprinkler irrigation in Karnataka

Sprinkler (Ha)				Drip(Ha)			
Crops	**2008-09**	**2009-10**	**2010-11**	**Crops**	**2008-09**	**2009-10**	**2010-11**
Groundnut	15029	19171	3762	**Sugar Cane**	1960	4977	519
Maize	8691	12047	3227	**Maize**	122	263	3
Sugarcane	4782	9221	1955	**Cotton**	107	126	57
Paddy	5388	8378	2824	**Redgram**	74	65	
Sunflower	6470	7577	1194	**Ragi**	53	47	
Soybean	2494	4287	635	**Ground nut**	44	10	
Pulses	3288	2876	2221	**Sunflower**	46	145	
Ragi	1108	2704	121	**Field bean**	29	24	
Jowar	1142	2275	206	**other**	16	13	
Bengalgram	3158	1618	712	**No details**		732	
Greengram	501	1091	929	**Total**	**2452**	**6402**	**579**
Redgram	1646	1002	1725				
Cotton	1100	863	311				
Others	5003	2158	2089				
Total	**59799**	**75269**	**21912**				

Figure 8: Crop wise Acreage (in Hectares) covered under Sprinkler and Drip irrigation





Groundnut, Maize, Sugarcane, Paddy and Sunflower constitute for 80% of the area under sprinkler irrigation while Sugarcane alone accounts for 79% of the area under drip irrigation.

The physical achievements were compared with that of the targets for the year 2008-09 to 2010-11(Table 20). The physical progress during the year 2010-11 has shown reduction compared to the other two years. The median utilisation percentage has reduced during the three year period. The number of districts that exceeded the target is significant in number which points out to the issues of planning and the utilisations. The district wise physical progress against the targets is given in the Annexure 10.

Table 20: Physical achievements as percent of physical targets

		2008 - 09	2009 - 10	2010 - 11
Maximum		514	200	252
Minimum		11	28	0
Median		87	63	52
Districts	More than Median	14	14	13
	Less than Median	14	14	15
	Median	1	1	2
	Zero Utilisation			2
	Total	29	29	30
	No. exceeded target	12	6	7

8.0 Targeting of the subsidy across categories

The guidelines indicate that the SC and ST have to be provided with the subsidy under micro irrigation scheme at 16% and 8% on a priority basis. Women beneficiaries are also to be given priority so that they constitute 30% of the beneficiaries. Similarly, small and marginal farmers have to be given priority so they constitute at least 25 percent of the beneficiaries.

It was seen that the category wise data is not maintained in a uniform manner across the state. Till 2009-10 data on only subsidy disbursed was collected in Horticulture department. From 2009-10, both the cost and subsidy data were collected. Some districts use the castes (e.g. Bellary) while some others use classifications like minority, others, etc. with no reference to male/female. The data for the year 2010-11 and 2011-12 do not have farmer category as there is no provision in the format for collecting this data. The data in agriculture department regarding the beneficiary category is mixed with the farm category. Districts like Gulbarga do not have crop details, but just the name and subsidy amount. The beneficiaries are classified as general or SC/ST or small farmer or marginal farmer or women beneficiaries. The sample sheets of the data are provided in the Annexure 11.

In the absence of the beneficiary data, monitoring of the scheme from the stand point of one of its chief objectives i.e. to benefit disadvantaged sections of farming community was not possible. It was, however, observed during the discussions with JD (Agriculture) that from 2011-12 the collection of beneficiary data in particular and overall monitoring has been streamlined with application of an on-line application. With this the collection of beneficiary data in future as also the monitoring will be much better.

The subsidy availed for prominent crops in the districts were calculated for the year 2009-10 for drip irrigation in Horticulture. Even in year 2009-10, many districts did not have the cost of the installations. The subsidy percent against the actual costs were analysed and a prominent crops in four districts covering 2 each under the different subsidy rates are provided in the Table 21. The subsidy rates were 100% for the districts of Bijapur and Kolar districts while it was 75% for the Tumkur and Raichur districts. The crop wise subsidy in Kolar and Bijapur was in the range of 59% to 83 % of the actual cost whereas the subsidy offered to the farmers in these districts was 100%. The subsidy worked out to 51% to 58% in Raichur and Tumkur districts. The differences with respect to the cost for same crop and area could be due to the customization of the drip system to the plot. The subsidy worked out to be close to 70% under vegetables. The district wise crop subsidy is given in Annexure 12.

Table 21: Comparison of Unit cost and subsidy across districts and crops -2009-10 (Horticulture Department)

District	Crop	Area	Actual cost	Subsidy	Cost per Hectare	Subsidy per hectare	Subsidy %
Tumkur	Arecanut	742.87	32325107	17189248	43514	23139	53
	Coconut	1368.65	30959996	15875783	22621	11600	51
Raichur	Pomegranate	59.88	2408497	1386367	40222	23152	58
Bijapur	Grapes	813.54	34764614	24462152	42733	30069	70
	Banana	145.51	7321048	4326082	50313	29730	**59**
	Leman	127.12	3394209	2369544	26701	18640	**70**
	Pomegranate	43.99	2532925	1754959	57580	39894	**69**
Kolar	Potato	174.49	13504031	9619186	77391	55127	**71**
	Tomato	366.34	25316443	19913622	69106	54358	**79**
	Mango	94.47	2223849	1841467	23540	19493	**83**
	Banana	47.29	3030785	2257530	64089	47738	**74**
	Beans	22.68	1859389	1262573	81984	55669	**68**
	Cabbage	17.81	1270964	967066	71362	54299	**76**
	Capsicum	19.79	1586541	1035788	80169	52339	**65**
	Carrot	28.14	2031878	1584001	72206	56290	**78**

Source: Data from Horticulture Department

The analysis also throws light upon the need for the regular revision of the unit cost for the subsidy calculations to ensure that the subsidy works out to the percent that is targeted by the Government. This is more so because of the back ended subsidy and farmer has to bear the increasing cost under horticulture crops which may act as disincentive to adopt drip systems.

9.0 Spread of Micro Irrigation beyond the subsidy scheme

It is expected that the farmers would be encouraged to adopt micro irrigation beyond the area covered by subsidy as the benefits accruing from it would in themselves be a big inducement. The government departments maintain only the area covered by the subsidy. The picture of the total area covered by micro irrigation would be possible only if the total number of micro irrigation equipment sold in the state by all the companies in a year along with corresponding area is available.

The analysis of data on sales and installations by the micro irrigation companies was expected to give the picture of the coverage under the scheme as well as outside the scheme in the state. The companies were repeatedly approached through the Irrigation Association of Karnataka, which also collects information about the members (companies) sales data every year. However, it was learnt that the Companies have only data of sales turnover in rupees and not in terms of area covered.

A letter was addressed by JD (Drip) to 41 drip irrigation companies and 28 sprinkler irrigation companies seeking data of total number of installations and corresponding area covered under MI scheme and outside the scheme. Only five companies furnished some data. Of these three companies did not provide data of installations outside the scheme.

Since spread of micro irrigation beyond the incentive based scheme is important from the policy perspective, it was necessary that the state government should have prescribed mandatory filing of some vital information such as district-wise number of installations and corresponding area, drip or sprinkler, crops involved and so on. In the absence of this data, the government would now have to estimate the coverage of MI outside the scheme through a sample survey.

10.0 Documentation of Best Practices in Micro Irrigation

The best practices across different states were analysed with the help of desk review, web search and consultation with the companies. Based on the analysis for a number of states, three states are identified as the best practices. These are presented below:

Karnataka

Karnataka has put in place the process of registering the manufacturers/suppliers of Drip and Sprinkler irrigation components who supply and install the products of BIS standards. Every year the both Horticulture and Agriculture departments verify the certificates of standards with validity for the period before approving them to undertake the installations in the field.

The farmers have to pay the amount in full and avail the subsidy for Horticulture crops. This back ended subsidy is another good initiative which ensures that farmers who are interested and willing to make judicious use of water will avail the benefit and not just for the sake of subsidy.

In other states few companies are selected to provide the installations and targets and districts are fixed for the same. Only big companies have chance based on their capacities with respect to supply and installations. In Karnataka all potential companies are registered and approved to enable the small players to get into the market. This also induces price competition actually doing a price negotiation. Farmers can choose the dealer/company to his satisfaction unlike in other states where the supplier is fixed for an area. Decentralised system of functioning has been hailed as another important step in ensuring the scheme benefits to farmers.

Transparency is ensured in the selection of beneficiaries through maintenance of seniority lists.

The state has initiated efforts to establish the Karnataka Antaraganga Micro Irrigation Corporation (KAMIC) and will become the single agency operating the micro irrigation schemes in the state. A portal has been launched in the Department of Agriculture which would enable in better monitoring as well as the database management in the agriculture department.

Andhra Pradesh

The micro irrigation scheme is implemented under a special purpose vehicle launched in the name of Andhra Pradesh Micro Irrigation Project created under the department of Horticulture to guide, supervise and monitor the implementation of project. The project is being coordinated by Andhra Pradesh Micro Irrigation Committee at the State and District levels which has technical persons looking into the design aspects of the micro irrigation systems. Micro irrigation engineer at district is responsible for examining the survey reports and designs. At Mandal level a separate resource centre called bindu mitra coordinates it.

Special project cell team consisting of Agriculture/Horticulture specialist, entomologist and agricultural engineer are provided at the district level who regularly

provide the extension services as well as capacity building programmes in the district. A technical committee of experts looks into all the issues related to the project and advises the State micro irrigation committee. Third party inspection (nominated by the Government) is compulsory for all the installations and release of money to the company made only after the report by the third party inspections. The selected company has to have a district level coordinator in every district and should have a demonstration plot in each mandal. Farmers have to be provided with crop and micro irrigation systems manual. Companies have to organize trainings and field visits by experts. Companies have to emboss Made for APMIP on the components supplied by them and are periodically subjected to quality testing by Central Institute for Plastics Engineering and Technology (CIPET). Micro irrigation has been conferred the status of infrastructure and loans from NABARD has been availed under Rural Infrastructure Development Fund. Sales tax is exempted for Micro irrigation systems. Loans are provided by banks at 9% for marginal and small farmers and while it is at 10% for large farmers. Up to a limit of Rs. 50000/- banks are directed not to insist for collateral security from farmers who opt for loan to install micro irrigation systems.

The prices of the micro irrigation systems are negotiated by the state level committee every year. Subsidy is provided on the rates negotiated every year. There is no ambiguity with respect to subsidy as the ceiling is fixed. Recently the subsidy ceiling was fixed at Rs. 1 lakh or 2.20 acres whichever less for all the categories.

Monitoring and Evaluation consultants regularly monitor by inspecting 10% of the installations every year and evaluate the installations with respect to bench mark survey, design of the system, supply of micro irrigation equipment by the company as per the specifications, installations, Operations and maintenance, and agronomic and extension services. They also collect samples of installations and send it to Central Institute for Plastics Engineering and Technology (CIPET), Hyderabad for inspection. The inputs from Monitoring and evaluation consultants are used by the state committee in planning and implementation. Over 500 case studies of various crops have been documented.

Resource centres at mandal level provide advisory services/training to farmers. They also sell spare parts required for micro irrigation systems for farmers. Local village youth have been trained to create a pool of paraprofessional workers who can provide services to farmers by charging fee from them.

A strong team working in mission mode is expecting to reduce the irrigation water requirement by 10% in the next 7-8 years by adopting the micro irrigation technologies.

Gujarat

A special purpose vehicle called Gujarat Green Revolution Company limited is created for the purpose of implementing the scheme. A dedicated website is launched www.ggrc.co.in .

The website provides the application forms that can be downloaded. It provides the links for the expert advice through email, success stories and other related literature in downloadable form in vernacular language. Transparency is ensured by using on-line MIS in public domain. Applications can be tracked for the status from the website. Periodically the policies, procedures are updated in the website. The rates of the drip and sprinkler components, the subsidy rates, unit costs are regularly notified in the website.

There is no limit for the adoption of micro irrigation system under the scheme. However the subsidy given is 50% of the unit cost. Subsidy is higher for SC/ST farmers. An initiative of installation of Micro irrigation systems in the Sardar Sarovar Neeravari Nigam Limited (SSNNL) command area has been undertaken to evaluate in a pilot area and extend the same to the entire command area. The network of Gujarat fertilizers and state company network is effectively involved in extension activity. Training of ST youth as paraprofessional workers to promote Micro irrigation apart from attending to maintenance of the micro irrigation system has enabled the ST youths to get self employment. Priority is given for provision of electricity to farmers opting for this scheme. A copy of all the documents relating to the installation along with the manual should be given to farmer for his/her reference.

Tamil Nadu

Targets are fixed for companies in terms of the area to be covered. Companies are responsible for identifying the beneficiaries. Companies should also cover small and marginal farmers under the scheme as per rules.

Unit costs are negotiated with the companies. Subsidy is based on the revised cost. Ceilings of subsidy are fixed for different category of farms.

It is seen that the Government of Karnataka is already on the way to adopting some of the best practices such as single agency to implement the scheme and web based application for approving installations and subsidy payment, which incidentally will help collect a large number of important data items. Third party inspections are also being adopted in Agriculture, which may be also replicated in horticulture. Some other good practices that Karnataka may consider adopting are a) companies to be made responsible for carrying out demonstrations; and b) training of rural youth in maintenance and repair of the micro irrigation systems.

11.0 Shortcomings of the Micro Irrigation Scheme implementation in Karnataka and Policy recommendations for improving the same.

The foregoing discussion on implementation of the micro irrigation scheme in Karnataka has helped identify some of the shortcomings which are discussed below. An attempt has also been made to suggest possible policy responses to the identified lacunae.

Horticulture department:

a) Reinforce the role/inputs of SMIC, DMIC and PFDC

The State-level Micro Irrigation Committee is required to organize base line survey and feasibility studies in different parts of the State, covering various crops and technologies. The revised guidelines of the Scheme also stipulate that the SMIC formulates a strategic plan and a road map to achieve the goals set therein. The annual action plan is also required to be prepared based on the strategic plan and the road map. However, it is seen that the SMIC has not prepared any such strategic plan and consequentially the action plans are also devoid of any strategic vision. DMIC is also not effective/non-existent in many districts.

The department should undertake a baseline survey to determine the potential area that can be covered in each district taking into account the agro climatic situation and the ground water availability (based on the Central Ground Water Board data) as well as the exhaustive list of the crops that should be covered under the scheme. This would serve in preparation of strategic plan for a longer period as well as in formulation of proficient annual plans. This will not only help the department at the state level to scrutinize the plans sent by district efficiently but also to evaluate the targets set for different crops in each district.

b) Improve the IEC efforts.

Despite the undeniable benefits of micro irrigation for the farmers in particular and the society in general, its adoption on a large scale still critically depends upon the efforts made to promote micro irrigation through information, education and communication (IEC) by the state agencies. The IEC efforts also are needed to educate farmers on appropriate use of micro irrigation so that the potential benefits such as saving in water are actually realized. It was observed that the IEC efforts were inadequate. The subsidy offered to farmers for the demonstration plots are not encouraging (0.5 ha and 75% subsidy) since it is on par with the subsidy for the crop under the scheme.

There is a need to use the Horticultural farms of the department across the state for the purpose of conducting Micro Irrigation demonstrations on various crops. Farmers should be encouraged to visit the Horticultural farms at their meeting in Raita Samparka Kendras. In addition to augmenting the trainings of famers, the government should consider directing the accredited micro irrigation companies to i) have demonstration plots in taluks so that there is at least one such demonstration plot for every taluk; and ii) organize trainings for farmers and field visits by experts

c) Strengthen the database management:

Periodical monitoring is essential for any scheme so as enable the administration to make necessary mid course corrections. For any monitoring to be meaningful, data on critical parameters is imperative. Even preparation of strategic plan or annual plans will be difficult in the absence of data of past performance. This has been the recurring and persistent issue in the implementation of the MI Scheme. The data on many parameters was insufficient, incomplete, inconsistent or completely unavailable. For instance data on beneficiaries was incomplete and unreliable. Certain data such as crop wise beneficiaries and crop wise area do not tally with the state level data of the same. Data of MI equipment sold and corresponding area in respect of farmers not availing subsidy (that is, outside the scheme) is not available. Non realistic estimation of the area to be covered adds to the problem of pending lists.

Data focus is on the beneficiary while the land details are not given much importance. The computerized land document (RTC- Records of Tenancy and Cultivation-Bhoomi) could be used very effectively to identify the crops, area, etc. This data could be shared across departments of Agriculture, Horticulture and Sericulture so that the issue of no objection certificate could be avoided. This database could also be used in identification of small and marginal farmers in a taluk/district.

Analysis of spread of Micro irrigation outside of the NMMI was not possible because of the reason that the Micro irrigation companies did not share the data with the department/study team stating the non availability of data as the reason.

There is a need to put in place a system to collect the information in a required format from the companies that are registered with the departments. The collection of data on the coverage of Micro irrigation outside the scheme crop wise and district/taluk wise would help the State in better planning of the Micro Irrigation development in the State.

d) Delay in disbursement of subsidy

There is delay in the disbursement of subsidies to the farmers. Though the guidelines stipulate that the entire process be completed in 20 days, delays have been found to be common. NABCONS study pointed out that the time required for scrutiny of applications is one month and about the same time for processing applications from the taluks in the districts. The time taken for sanctioning of subsidy varies from one week to 6 months depending upon the funds availability. In case of the subsidy is to be received by farmers, delays could prove to a major hindrance to adoption of micro irrigation particularly by small and marginal farmers.

The government should review the entire process of application vetting, approval and disbursement of subsidy from the point of view of the recipient of subsidy. While there must be necessary controls to make sure that the subsidy is paid only in genuine cases and after the equipment is duly installed, the process must ensure minimum time lag between installation and payment of subsidy. Government must consider engaging third party inspections for installations, if necessary.

e) Subsidy calculation be made more dynamic

Although on paper subsidy was 100% in the districts of Kolar, Chitradurga and Bijapur, the actual subsidy was found to be as low as 41.91%. In reality this may also be discouraging many farmers from adopting micro irrigation because of their sheer inability to afford the balance cost. It was also found by the PFDC inspections that few farmers would intimate higher area coverage to the department to offset the higher cost wherein the company people as well as officers collude to approve and certify higher area coverage than the actual area.

The government should index subsidy to actual cost in a way that the legitimate increases in the cost are defrayed by the subsidy.

Agriculture department:

a) Strengthening SMIC and DMIC

The NMMI guidelines stipulates the need for a base line survey as well as feasibility studies in different parts of the State, covering various crops and technologies. The revised guidelines of the Scheme also stipulate that the SMIC formulates a strategic plan and a road map to achieve the goals set therein. The annual action plan is also required to be prepared based on the strategic plan and the road map. However, it is seen that the SMIC has not prepared any such strategic plan and consequentially the

action plans are also devoid of any strategic vision. NABCONS study revealed that DMIC was a non starter and is nonexistent in most of the districts. In the absence of strategic plans and road map, it is difficult to say whether or not the achievement vis-à-vis annual plan target is satisfactory. In a sense there is neither a goal post nor are there any mile stones

The capacities of SMIC and DMIC should be suitably augmented so that they are able to undertake the feasibility studies and prepare strategic plans and road maps. This may be entrusted to the proposed Corporation. In any case, it is important that the State has a strategic plan according to which the scheme is implemented. More specifically, there should be an estimation of District-wise Potential area (Drip and Sprinkler) using data (and expertise) from PFDC, Central Ground Water Board, (taluk wise replenishable ground water availability) as well as the state departments. This should form the basis for setting targets and conducting evaluations.

b) **Coordinated and focused IEC efforts**

Despite the undeniable benefits of micro irrigation for the farmers in particular and the society in general, its adoption on a large scale still critically depends upon the efforts made to promote micro irrigation through information, education and communication (IEC) by the state agencies. The IEC efforts also are needed to educate farmers on appropriate use of micro irrigation so that the potential benefits such as saving in water are actually realized. It was observed that the IEC efforts were inadequate. Nabcons study had identified higher water use despite the use of drip/sprinkler irrigation systems.

In addition to augmenting the trainings of famers, the government should consider directing the accredited micro irrigation companies to i) have demonstration plots in taluks so that there is at least one such demonstration plot for every taluk; and ii) organize trainings for farmers and field visits by experts. Farmers have to be educated regarding the optimum use of water through the field demonstrations for various crops.

c) Strengthening Database Management

Periodical monitoring is essential for any scheme so as enable the administration to make necessary mid course corrections. For any monitoring to be meaningful, data on critical parameters is imperative. Even preparation of strategic plan or annual plans will be difficult in the absence of data of past performance. This has been the recurring and persistent issue in the implementation of the MI Scheme. The data on many parameters was insufficient, incomplete, inconsistent or completely unavailable.

For instance data on beneficiaries was incomplete and unreliable. Certain data such as crop wise beneficiaries and crop wise area do not tally with the state level data of the same. Data of MI equipment sold and corresponding area in respect of farmers not availing subsidy (that is, outside the scheme) is not available.

Before any scheme is implemented the project management must identify critical data elements that are required for monitoring the progress of the implementation. In some cases (such as expenditure), the data will automatically be collected and thus be available. In other cases, the management must prescribe the data to be collected, the precautions to be taken to ensure integrity of data and measures for collection, validation and collation at different levels. The new on line system being implemented by Agriculture Department is a step in the right direction. Yet, it is recommended that the systems should be reviewed to ensure that information requirements of monitoring are fully met.

d) Delay in disbursement of subsidy

There is delay in the disbursement of subsidies to the companies. Some are paid partly while some are not paid at all. The delay in disbursement of subsidy could result in the companies compromising on the quality or transferring the cost (interest burden) to the farmers.

The government should review the entire process of application vetting, approval and disbursement of subsidy from the point of view of the recipient of subsidy. While there must be necessary controls to make sure that the subsidy is paid only in genuine cases and after the equipment is duly installed, the process must ensure minimum time lag between installation and payment of subsidy.

Implications common to both departments

a) Single Implementing Agency

Unlike in many other states where the scheme is implemented by a single agency, in Karnataka the scheme is being implemented by Horticulture and Agriculture departments separately. Having two agencies implementing the scheme has obviously resulted in certain divergent practices and made coordination difficult.

This is likely to be remedied once the proposed single agency for micro irrigation, namely, the Karnataka Antaraganga Micro Irrigation Corporation (KAMIC) is established and starts functioning.

b) Dedicated website

There is a need to provide information about the Micro Irrigation scheme through a dedicated website in vernacular language. The prices of various drip and sprinkler

components, the subsidy rates, and unit costs have to be regularly notified in the website. Online application along with the provision for tracking the application for its status should be provided to enhance transparency.

Various studies, success stories classified by crops and region should be made available through the website.

c) Updation and Use of the Computerized Land information database(RTC-Bhoomi)

The state has proposed to link the Bhoomi with the Banks so that creating a charge or releasing it would be done directly and farmer can obtain loan from bank without going to taluk sub registrar office to create charge and get mutations done. The banks could also view the loans obtained by farmer from other banks if any or the extent of land under his/her name by looking into the RTC (Record of Tenancy and Cultivation or Pahani).

Similarly the details of the Micro irrigation coverage can also be linked to the RTC. Linking of the benefits would result in the RTC showing the details of the improvements for that piece of land. Similarly it is possible to link all the developments to a piece of land through various schemes or loans to the RTC and track the same. The regular update and linking of RTC becomes crucial for this purpose.

d) Subsidy to conserve water

Since ground water is the predominant source of micro irrigation, the subsidy rules of providing it to only 2 hectares could be re examined. Farmers with higher landholdings (more than 5 ha) are more likely to go for another bore well in case of a bore well failure which in turn can affect the water availability for others in the same aquifer. Depending upon the water availability, there is a need to formulate different strategies for the region. (Gujarat state extends subsidy @50% with no limit on area coverage)

12.0 Suggested Sample Methodology, ToR and beneficiary schedules

12.1 Sampling Methodology

The sample will be drawn by selecting 2 districts having higher coverage in each of the revenue divisions. The taluks will be chosen based on the micro irrigation area covered. One taluk which is has highest coverage and one taluk which has the lower coverage will be taken. Crop wise samples will be drawn so as to cover the important crops. A total of about 100 farmers per district will be selected to cover all the crops. A total of 800 beneficiary farmers will be chosen for the study.

12.2 Terms of reference for the follow-up study

The preliminary study based on analysis of secondary data shows that the micro irrigation scheme has been successful in so far as incurring of expenditure against the releases by GoI and the state government. While some districts have done relatively better in utilizing the releases, some have lagged behind. There is also a variation among crops in use of micro irrigation. There are critical gaps in secondary data which have imposed limitations on the present study. These gaps can be made good only through a primary survey. While the detailed terms of reference would be prepared based on the foregoing study, briefly the terms of reference for the follow up study would be to:

a. assess the steps of installation and obtaining the subsidy along with timelines, procedures and costs of claiming subsidy.

b. assess the socio economic characteristics of the sample beneficiaries in terms of their farm category (SC/ST women etc) to ascertain compliance with the eligibility criteria.

c. assess the project cost and subsidy percent based on the cost incurred.

d. analyse the problems faced by the beneficiaries in the process of getting the subsidy.

e. evaluate the functioning of the drip units in the field (BIS markings, presence in field with all necessary components like ventury, etc. as per specifications and approval)

f. assess the water savings, labor savings and impact on Income.

g. analyse the role played by the dealer/company in educating the beneficiaries

h. analyse the crop/region wise problems with respect to drip irrigation systems.

i. assess the IEC efforts by the departments and companies

j. assess the process of estimation of targets, action plan, sending of utilisation certificate, fund disbursal from state to beneficiary.

k. assess the use of drip systems after the short duration crops like vegetables and the technical knowhow as well as costs required to adjust it to other crops.

Interview Schedule for the Department

Sl.No.	Particulars	Code
1.	Has the State level Micro Irrigation Committee (SMIC) been formed?	
2.	How many meetings of SMIC were conducted in an year?	
3	Whether the District-wise Action Plan is prepared?	
4	Whether steps have been taken to ensure that eligible farmer gets loan from bank?	
5	Whether the State level Technical Support Group formed? Yes/No	
6	Whether monitoring system is put in place? What are they?	
7	Whether Utilisation certificates are forwarded regularly? When was it done this year? Any delays?	
8	Whether state level workshops, seminars have been organized for officials/farmers/NGO's ?	
9	How are the progress reported by the Districts? Is it followed as prescribed by GOI ?	
10	Whether Manufacturers/suppliers are registered/approved at the State?	
11	Are companies evaluated every year before renewal of their registration?	
12	Is there a charter that details the role of companies/departments/beneficiaries under the scheme?	
13	Is there a provision for taking action against erring suppliers/dealers? If so what action can be taken	
14	What are the publicity measures taken in the state to popularize the scheme? List them.	
15	How is unit cost for the purpose of subsidy determined? GOI indicative costs Revised every Year Use the quoted minimum price	
16	Whether the District-wise potential area under Micro Irrigation is calculated?	
17	Whether the GOI grants under the scheme adequate compared to action plans/ sought funds? If No, give the deviations for last 3 years (in %)	
18	Whether the water requirement of different crops based on the different agro-climatic zones made available to farmers? Yes/No	
19	Whether the step wise process in disbursement of subsidy along with the time lines notified? Yes/No If so how many days?	
20	Are there the pending applications?	

Schedule for gathering information at the district and Taluk levels

Profile of the sample District:

Name of the District	Annual Average Rainfall	
	List Major crops under Drip	
	List the area under Sources of Irrigation 1 well 2. Bore well 3. Canal 4. Others	
	List major crops under Sprinkler	
	Whether potential area has been estimated?	
	Whether Annual Action plan has been prepared?	
	Has the District Micro Irrigation Committee (DMIC) formed?	
	How Many meetings have been done by DMIC in last one year	
	List 5 activities of DMIC	
	Whether case studies on Micro Irrigation has been done on any crops in the district?	
	Whether measures undertaken to ensure the eligible farmer could get loan?	
	Whether trainings and extension programmes conducted by the department?	
	What are the mechanisms to popularize the scheme Pamphlets; 2. News papers; 3. Local TV channels; 4 others	
	Whether the Utilisation certificates (UC) are forwarded regularly?	
	Is there any delay in submission of the UC? If so why?	
	Whether dealers in the district are notified?	
	Whether the details of the approved dealers/suppliers made available to the eligible farmer? if yes How? Any brochure/pamphlet by dealers?	
	Whether the releases from GOI are in time? If yes how many times a year releases are made?	
	Whether the releases from GOK are in time? If yes how many times a year releases are made?	
	How many applications are received in last 2 years?	
	Is there a pendency of applications? Give the number of pending applications	

Year wise scheme implementation in the district (Drip)

Sl.No	Year	Target (Ha)	Target (Rs)	Achievement(Ha)	Subsidy(Rs)

Year wise scheme implementation in the district (Sprinkler)

Sl.No	Year	Target (Ha)	Target (Rs)	Achievement(Ha)	Subsidy(Rs)

Year-wise scheme implementation in Taluk

Sl.No	Taluk	Year	Total cost	GOI Subsidy	GOK Subsidy (Rs)	Number of Beneficiaries
Drip						
Sprinkler						
Demonstrations						

Profile of Sample Taluk

1	Annual Average Rainfall	
2	List Major crops under Drip	
	List the area under Sources of Irrigation 1 well 2. Borewell 3. Canal 4. Others	
3	List major crops under Sprinkler	
4	Whether case studies on Micro Irrigation has been done on any crops in the taluk?	
5	Whether measures undertaken to ensure the eligible farmer could get loan?	
6	Whether the lead banks are identified for the purpose?	
7	Whether trainings and extension programmes conducted by the department?	
8	What are the mechanisms to popularize the scheme Pamphlets; 2. News papers; 3. Local TV channels; 4 others	
8	Whether the Utilisation certificates(UC) are forwarded regularly?	
10	Is there any delay in submission of the UC? If so why	
11	Whether dealers in the taluk are notified.?	
12	Whether the details of the approved dealers/suppliers made available to the eligible farmer? Yes/No if yes How? Any brochure/pamphlet by dealers?	
13	How many applications are received in last 2 years?	
14	Is there a pendency of applications? Yes/No Give the number of pending applications	
15	Whether crop wise requirement of type of system for spacing available?	
16	Whether procedures to verify the eligibility of farmer put in place?	
17	What is the adoption level of Micro Irrigation in the taluk? < 10% 10-20% 20-40% > 50%	
18	How do you rate the scheme in the taluk very good Good Poor	
19	List 5 issues related to implementation of scheme	
20	List 5 suggestions to improve the scheme	

Schedule for interviewing beneficiaries

District……..

Taluk……..

No. of Beneficiaries selected in the Taluk…….

Village……..Hobli…….

Application No in the Office Record……

Drip/Sprinkler

Schedule for interviewing beneficiaries

SL. No.	Particulars	Code
1.	Name and Address of Beneficiary	
2.	Sex (Male-1 Female 2)	
3.	Category SC-1 ST-2 Others-3	
4.	Land Holding Marginal(< 2.20 acre) -1, Small(2.20-5.00 acre)- 2 Others(5.00 acres and above)	
5	Coverage of area Survey Number Total Area Area for which subsidy is availed Crop Spacing	
6	Cost of the unit	
7.	Subsidy Amount	
8	Whether taken loan? Yes/No	
9	Mode of payment Cheque/DD to beneficiary-1 Cheque /DD to Agency-2	
10	Whether subsidy received in time? Yes/No	
11	Whether department provided assistance in obtaining loan? Yes/No	
12	Details of loan Bank Amount of loan Rate of interest	

	No. of Installments Documents submitted 1. 2. 3	
13	How many days were spent to get the loan?	
14	How much money was spent in getting the loan?	

	Details of the Unit	
1	Source of water Well-1, Borewell-2 Surface water-3	
2	Usage of the unit 1-summer 2-rabi 3-Kharif 4- All seasons	
3	Source of power Electricity Diesel pumpset	
4	Date of receipt of application	
5	Date of installation of system	
5	Name and address of Company	
6	Name and address of the dealer	
7	Whether the dealer is approved? Yes/No	
8	Whether the components are of BIS Yes/No	
9	Whether the components as per quotation/specification Yes/No	
10	List the components that are not supplied as per specification	
11	Whether the unit exists? Yes/No	
12	Whether the unit is functioning? Yes/No	
13	What are the reasons for not functioning?	
14	Does the beneficiary has the warranty card? Yes/No	
15	Whether training has been provided to the beneficiary Yes/No	
16	Whether the beneficiary has been provided with manual? In	

	Kannada? Yes/No	
17	Whether the dealer conducted the demo? Yes/No	
18	Whether the unit can be used for other crops?	
19	What are the additional units required to adjust it to other crops?	
20	How many times have you encountered the problems in the unit?	
21	Has the dealer/supplier responded to your call Yes/No	

Impact Assessment before and after the commissioning of the unit(per acre)

Sl.No.	Description	Before	After	Increase or Decrease %
	Area covered			
	Yield			
	Labour consumption(mandays)			
	Use of fertilizer			
	growth			
	Quality of produce			

Opinion of the farmer

About the Unit

About the dealer

About spares and repairs

About department/officers

References

A., N. (n.d.). *Potential for drip and sprinkler irrigation in India.* Retrieved december 2011, from an IWMI website: nrlp.iwmi.org/.../12.%20Water%20Savings%20Technologies%20- ...Similar

Anil Punetha and Yella reddy k. (n.d.). *APMIP - THE FIRST AND LARGEST COMPREHENSIVE MICROIRRIGATION PROJECT IN INDIA.* Retrieved December 2011, from Netafim india: marketing.netafimindia.com/2011-Aug-%2006/118APMIP.pdf

(2010). *Deep Wells and prudence: Towards pragmatic action for addressing ground water exploitation in India.* washington: The world bank.

Dinesh kumar M., e. a. (n.d.). *A NRLP IWMI* . Retrieved December 2011, from IWMI website: nrlp.iwmi.org/PDocs/DReports/.../12-Water%20Saving-Dinesh.docSimilar

(2010). *Dynamic Ground water resources ofKarnataka as of March 2009.* Bangalore: Water Resources Department Government of Karnataka.

(2006). *Dynamic groundwater resource of India as of march 2004.* Faridabad: Central ground water board.

(2010). *Ground water year book 2010.* Faridabad: Central Ground Water Board.

India infrastructure report. (2007). Retrieved December 2011, from IITKanpur website: http://www.iitk.ac.in/3inetwork/html/reports/IIR2007/07-Irrigation.pdf

Karnatkaka at a glance 2009-10. Bangalore: Directorate of Economics and Statistics, Government of Karnataka.

Nabard Consultancy services. (2009). *Evaluation of centrally sponsored scheme on Micro Irrigation.* Mumbai: Nabcons.

(2004). *Report of Task force on Micro irrigation.* Delhi: Department of Agriculture and cooperation, GOI.

Shashidhara K.K., e. a. (2007). Benefits and Constraints in Adoption of Drip Irrigation Among the Plantation Crop Growers*. *Mysore journal of Agric. sciences* , 82-84.

Yella reddy K, S. T. (2010). *MICRO IRRIGATION PAYS RICH DIVIDENTS-EXPERIENCES OF ANDHRA PRADESH, INDIA.* Retrieved December 2011, from www.rid.go.th/thaicid/_6.../3.19-K_Yella_R-TV_Satyanarayana.pdf

Annexure 1 - Coverage of Drip irrigation under Mulberry

Year	Area (Ha)	Exp (lakhs)
2007-08	2504	929
2008-09	1948	695
2009-10	1260	472
2010-11	3503	1009

Annexure 2: Coverage of Drip irrigation under oil palm under ISOPOM scheme

Year	Area (Ha)	Exp (lakhs)
2008-09	463	56.81
2009-10	213	28.74
2010-11	324	41.35

Annexure 3: District wise area covered under Micro irrigation over the period 2006-07 to 2010-11

Districts	Sprinkler	% share	Drip	% share	Drip and Sprinkler	% share
Bagalkote	18035	7	5715	4	23750	6
Bangalore(R)	504	0	3987	3	4491	1
Bangalore(U)	219	0	1070	1	1289	0
Belgaum	35023	13	9358	6	44380	11
Bellary	1157	0	4247	3	5403	1
Bidar	15319	6	1616	1	16934	4
Bijapur	24531	9	13785	9	38316	9
C.R.Nagar	5943	2	6316	4	12259	3
Chikballapura	909	0	4451	3	5360	1
Chikmagalur	12060	5	8024	5	20084	5
Chitradurga	9630	4	19237	12	28867	7
D.Kannada	2060	1	401	0	2461	1
Davanagere	19002	7	10524	7	29526	7
Dharwad	7707	3	847	1	8554	2
Gadag	5068	2	1498	1	6566	2
Gulbarga	19567	7	5638	4	25205	6
Hassan	11851	5	2636	2	14486	3
Haveri	13818	5	11591	7	25409	6
Kodagu	5138	2	190	0	5328	1
Kolar	251	0	13207	8	13458	3
Koppal	3323	1	5417	3	8740	2
Mandya	636	0	549	0	1185	0
Mysore	10222	4	3377	2	13600	3
Raichur	4382	2	1410	1	5792	1
Ramanagar	301	0	2889	2	3190	1
Shimoga	22898	9	758	0	23656	6
Tumkur	7891	3	4348	3	12239	3
U.Kannada	2685	1	13245	8	15930	4
Udupi	989	0	116	0	1105	0
Yadagiri	218	0	90	0	308	0
Total	**261334**	**100**	**156537**	**100**	417871	**100**

Annexure 4: District wise expenditure under Drip Irrigation (Horticulture)

Sl. No	District	2006-07	2007-08	2008-09	2009-10	2010-11	Total	Growth rate(%)	% Share
1	**Bagalkot**	185.12	100.14	258.31	173.26	220.87	937.70	9.43	2.50
2	**Bangalore (U)**	61.00	61.69	32.49	52.25	82.50	289.93	4.47	0.77
3	**Bangalore (R)**	199.00	225.00	160.95	81.90	330.13	996.98	0.02	2.66
4	**Belgaum**	285.86	302.73	148.63	200.63	311.72	1,249.57	-2.35	3.33
5	**Bellary**	258.83	218.67	279.44	190.87	114.64	1,062.45	-16.18	2.83
6	**Bidar**	54.22	0.00	70.69	37.18	169.00	331.09		0.88
7	**Bijapur**	731.23	541.17	892.37	599.02	1040.99	3,804.78	8.41	**10.13**
8	**Chamarajnagar**	305.89	279.75	197.16	181.90	561.23	1,525.93	8.15	4.06
9	**Chikaballapur**			132.00	250.46	757.63	1,140.09		3.04
10	**Chikmaglur**	423.01	216.63	332.83	308.27	639.00	1,919.74	12.50	5.11
11	**Chitradurga**	708.73	759.82	729.35	704.02	1597.59	4,499.51	16.76	**11.98**
12	**D. Kannada**	19.00	13.85	19.61	31.84	7.50	91.80	-9.76	0.24
13	**Davanagere**	766.00	368.76	592.11	670.88	635.00	3,032.75	2.26	**8.08**
14	**Dharwad**	21.50	21.57	20.84	14.68	51.09	129.68	14.41	0.35
15	**Gadag**	71.00	10.82	73.87	39.19	175.86	370.74	36.36	0.99
16	**Gulbarga**	141.13	0.00	227.51	250.01	765.63	1,384.28		3.69
17	**Hasan**	114.21	108.00	164.78	46.39	206.25	639.63	3.43	1.70
18	**Haveri**	602.69	534.34	839.42	523.36	994.03	3,493.84	10.30	**9.31**
19	**Kodagu**	25.00	0.00	0.00	15.04	25.01	65.05		0.17
20	**Kolar**	540.80	371.42	796.11	579.74	1360.00	3,648.07	25.73	**9.72**
21	**Koppal**	415.00	398.49	179.50	153.99	225.00	1,371.98	-19.55	3.65
22	**Mandya**	22.52	0.00	8.07	51.82	48.50	130.91		0.35
23	**Mysore**	80.12	90.38	121.46	146.37	363.13	801.46	41.97	2.13
24	**Raichur**	174.00	224.00	158.39	158.65	65.00	780.04	-20.66	2.08
25	**Ramanagar**			27.99	38.59	57.00	123.58		0.33
26	**Shimoga**	232.66	201.55	214.11	276.51	183.80	1,108.63	-1.54	2.95
27	**Tumkur**	649.41	493.00	340.45	470.35	668.75	2,621.96	0.12	**6.98**
28	**Udupi**	26.83	8.87	0.00	7.45	8.10	51.25		0.14
29	**Uttara Kannada**	65.23	45.27	54.06	85.94	75.90	326.40	9.90	0.87
30	**Yadagiri**					19.40			
	Total								

Annexure 5 : District wise utilisation percentages with respect to the releases under Drip Irrigation (Horticulture)

Sl.No.	Districts	Utilisation Percent					
		2006-07	2007- 08	2008 - 09	2009 - 10	2010 - 11	Total
1	Bagalkot	101.52	42.76	142.41	149.13	100.00	100.29
2	Bangalore (U)	97.38	94.14	76.63	135.71	100.00	99.44
3	Bangalore (R)	99.36	67.05	319.35	100.00	100.00	99.87
4	Belgaum	113.92	99.98	62.63	179.33	100.00	102.88
5	Bellary	103.16	62.46	143.36	132.59	100.00	100.75
6	Bidar	52.72		168.27	212.46	100.00	87.19
7	Bijapur	164.93	61.71	111.14	169.85	100.00	108.19
8	Chamarajnagar	100.43	100.00	100.00	100.00	100.00	100.09
9	Chikaballapur			49.53	216.04	100.00	100.00
10	Chikmaglur	112.70	54.14	110.45	197.25	100.00	102.55
11	Chitradurga	109.52	100.07	99.93	100.00	100.00	101.39
12	D. Kannada	61.86	45.07	98.84	212.27	100.00	88.45
13	Davanagere	97.20	52.66	184.30	109.94	100.00	99.28
14	Dharwad	98.60	66.64	196.05	104.19	100.00	99.76
15	Gadag	69.00	**19.90**	191.82	126.42	100.00	92.08
16	Gulbarga	45.80		86.49	224.77	100.00	89.23
17	Hasan	114.44	67.79	122.20	185.56	100.00	102.31
18	Haveri	100.36	76.84	103.30	134.49	100.00	100.06
19	Kodagu	38.56			752.00	100.00	**62.02**
20	Kolar	109.45	45.71	144.61	150.91	100.00	101.30
21	Koppal	96.78	99.99	85.27	125.20	100.00	99.00
22	Mandya	**33.58**		**34.19**	317.91	100.00	74.61
23	Mysore	98.71	65.49	82.78	199.17	100.00	99.87
24	Raichur	100.00	88.74	62.83	433.71	100.00	99.99
25	Ramanagar			100.00	**99.95**	100.00	99.98
26	Shimoga	99.91	76.26	75.37	192.29	100.00	99.98
27	Tumkur	202.28	76.56	109.56	134.71	100.00	114.32
28	Udupi	54.00	82.51		1490.00	100.00	69.16
29	Uttara Kannada	70.42	100.00	58.10	182.85	100.00	92.25
30	Yadagiri					100.00	
	Total	105.92	69.74	107.91	143.10	100.00	101.07
	Maximum	202.28	100.07	319.35	1490.00	100.00	114.32
	Minimum	**33.58**	**19.90**	**34.19**	**99.95**	**100.00**	62.02
	Median	99.36	67.79	100.00	169.85	100.00	99.98

Source: Data from Horticulture Department

Annexure 6: District wise Area (in hectares) covered under drip irrigation (Horticulture) for 2006-07 to 2010-11

District	Fruits	Vegetables	Spices	Plantation	Flowers	Others	Total	% Share
Bagalkot	3076.28	48.02	98.11	20.10	10.90	18.28	3271.69	2.61
Bangalore (U)	475.20	255.28	3.92	103.85	74.24	0.00	912.49	0.73
Bangalore ®	1703.98	914.33	9.38	676.50	**182.99**	1.31	3488.49	2.78
Belgaum	3355.49	450.28	203.80	43.75	31.81	6.00	4091.13	3.26
Bellary	2702.93	439.37	121.92	142.03	**114.97**	0.48	3521.70	2.81
Bidar	1415.68	229.54	250.70	17.69	7.60	10.44	1931.65	1.54
Bijapur	**12012.06**	2173.59	30.77	11.56	12.48	0.45	**14240.91**	**11.36**
Chamarajnagar	2500.91	537.54	684.03	572.84	4.20	23.47	4322.99	3.45
Chickmagalur	382.36	164.59	63.07	**8783.42**	1.54	0.00	9394.98	**7.49**
Chitradurga	5190.32	197.59	19.51	**6876.22**	35.89	7.60	**12327.13**	**9.83**
Kodagu	51.26	1.32	717.74	68.84	0.00	0.00	839.16	0.67
D. Kannada	8.45	0.90	0.00	342.22	0.12	7.64	359.33	0.29
Davanagere	1207.63	74.97	42.85	**8747.25**	17.71	3.51	**10093.92**	**8.05**
Dharwad	497.95	3.09	4.60	31.70	2.40	4.20	543.94	0.43
Gadag	541.47	265.92	160.91	9.60	19.62	2.80	1000.32	0.80
Gulbarga	3214.87	200.47	91.14	7.00	10.69	42.03	3566.20	2.84
Hassan	577.46	71.93	213.53	2743.97	1.80	0.00	3608.69	2.88
Haveri	1382.09	3780.45	**1915.82**	177.06	28.74	0.00	7284.16	**5.81**
Kolar	1505.66	**5527.37**	41.93	66.33	**130.81**	2.37	7274.47	**5.80**
Koppal	4697.69	292.18	21.65	9.30	13.80	27.27	5061.89	4.04
Mandya	286.03	165.46	3.00	181.16	5.90	0.00	641.55	0.51
Mysore	1033.18	175.34	49.56	204.52	2.06	8.00	1472.66	1.17
Raichur	2333.86	142.66	24.94	0.00	23.15	0.00	2524.61	2.01
Shimoga	959.73	43.75	16.40	4579.13	3.54	20.67	5623.22	4.49
Tumkur	2863.36	78.59	35.60	**9608.75**	25.17	9.00	**12620.47**	**10.07**
Udupi	17.75	0.84	0.00	164.74	0.00	0.00	183.32	0.15
Uttar Kannada	586.19	36.22	1.00	339.82	2.84	8.80	974.87	0.78
Chikkaballapur	1626.69	1603.73	30.64	53.38	56.10	1.80	3372.34	2.69
Ramanagara	256.26	27.31	0.20	211.73	11.80	0.00	507.30	0.40
Yadagiri	60.65	5.21	5.10	224.60	0.00	0.00	295.56	0.24
Total	**56523.43**	**17907.84**	**4861.82**	**45019.06**	**832.87**	**206.12**	**125351.14**	**100.00**

Source: Data from Horticulture Department

Annexure 7: District wise Physical performance under Drip Irrigation (through Horticulture Department)

Physical Achievements(in Percent to Targets)				
SL.No.	**District**	**2008-09**	**2009-10**	**2010-11**
1	Bagalkot	84	61	178
2	Bangalore (U)	35	63	244
3	Bangalore (R)	56	39	131
4	Belgaum	49	52	59
5	Bellary	76	37	33
6	Bidar	36	19	192
7	Bijapur	131	72	158
8	Chamarajnagar	226	117	184
9	Chikkaballapur	27	48	68
10	Chikmaglur	48	49	66
11	Chitradurga	158	41	115
12	Kodagu	0	10	130
13	Dakshina Kannada	52	52	30
14	Davanagere	146	89	53
15	Dharwad	32	35	26
16	Gadag	74	115	98
17	Gulbarga	50	54	120
18	Hasan	42	28	70
19	Haveri	77	34	95
20	Kolar	171	69	154
21	Koppal	23	59	102
22	Mandya	10	86	90
23	Mysore	79	69	109
24	Raichur	33	16	71
25	Ramanagar	53	73	78
26	Shimoga	57	53	106
27	Tumkur	68	34	111
28	Udupi	0	1	99
29	Uttar Kannada	53	66	198
30	Yadgir	0	0	26
	Total	**72**	**51**	**99**

Source: Data from Horticulture Department

Annexure 8 District wise expenditure of Micro Irrigation in Agriculture Department

Districts	2006-07	2007- 08	2008 - 09	2009 - 10	2010 - 11
Bagalkot	129.18	704.94	838.52	858.63	454.31
Bangalore (R)	10.54	7.34	21.08	51.47	4.8
Bangalore (U)	1.65	5.42	8.23	2.81	1.86
Belgaum	192.55	610.71	1139.62	1603.46	1351.27
Bellary	8.31	32.28	49.21	24.52	6.63
Bidar	46.66	119.74	676.42	804.38	163.26
Bijapur	121.73	610.33	512.76	646.62	299.01
Chamarajanagar	6.65	50.72	134.45	167.03	110.59
Chickballapur	0	5.17	11.56	80.86	47.77
Chickmagalur	17.48	177.17	605.45	618.81	245.45
Chitradurga	13.3	71.31	175.95	330.73	43.62
Dakshina Kannada	15.78	32.39	49.29	46.67	15.16
Davanagere	58.42	240.95	581.51	498.98	169.29
Dharwad	77.19	160.11	204.08	319.97	148.2
Gadag	29.29	78.46	130.84	271.91	66.93
Gulbarga	98.81	254.95	826.02	797.63	317.32
Hassan	26.31	170.84	227.6	635.64	100.84
Haveri	25.51	205.56	308.59	617.6	196.93
Kodagu	52.34	97.07	281.35	180.28	94.71
Kolar	30.08	35.99	55.12	36.64	10.61
Koppal	37.26	87.76	100.74	159.74	148.28
Mandya	4.51	18.95	35.75	30.85	8.04
Mysore	49.02	202.32	266.53	328.17	155.1
Raichur	30.62	87.53	85.37	101.64	59.12
Ramanagar	0	3.15	5.3	25.48	10.94
Shimoga	117.94	349.35	310.44	640.39	539.01
Tumkur	21.22	90.25	180.11	268.73	44.87
Udupi	11.22	16.81	33.32	28.71	13.4
Uttara Kannada	41.58	31.76	64.3	66.99	55.51
Yadagiri	0	0	0	0	39.84
Total	**1275.16**	**4559.33**	**7919.52**	**10245.35**	**4922.65**

Source: Data from Agriculture Department

Annexure 9: District wise utilisation % under micro irrigation in Agriculture Department

Districts	2006-07	2007- 08	2008 - 09	2009 - 10	2010 - 11
Bangalore (U)	29	48	205	77	93
Bangalore (R)	28	13	228	1458	89
Ramanagar		8	96	144	88
Kolar	62	31	251	115	52
Chickballapur			98	261	96
Tumkur	36	67	111	107	128
Shimoga	90	196	61	95	99
Chitradurga	11	40	199	145	100
Davanagere	32	60	99	119	118
Mysore	58	112	101	107	113
Chamarajanagar	23	73	107	79	199
Mandya	11	19	203	91	80
Kodagu	100	156	99	140	74
Hassan	27	128	98	103	99
Chickmagalur	30	214	112	101	85
Dakshina Kannada	67	62	103	111	95
Udupi	74	57	110	156	102
Dharwad	89	102	98	82	99
Gadag	51	67	99	99	104
Haveri	34	148	75	121	98
Uttara Kannada	79	35	126	161	94
Belgaum	26	57	73	178	144
Bijapur	45	99	82	112	100
Bagalkot	47	112	95	127	99
Raichur	15	17	249	57	364
Koppal	15	34	264	141	102
Bellary	4	14	197	96	96
Gulbarga	27	62	97	74	94
Bidar	53	17	145	104	132
Yadagiri					86
State	**34.87**	**67.44**	**96.27**	**111.66**	**110.64**

Annexure 10: District wise Physical performance under Micro Irrigation (Agriculture Department)

Physical Achievements(in Percent to Targets)					
Districts	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**
Bagalkote	10	153	100	67	76
Bangalore(R)	16	10	206	48	18
Bangalore(U)	12	71	105	35	0
Belgaum	92	64	80	139	125
Bellary	8	15	25	28	0
Bidar	28	21	108	58	21
Bijapur	63	127	180	118	28
Chamrajanagar	58	196	344	97	138
Chikballapura			87	160	252
Chikmagalur	96	91	83	46	40
Chitradurga	0	83	79	200	16
D.Kannada	83	68	84	128	100
Davanagere	45	124	97	38	70
Dharwad	143	178	38	54	52
Gadag	102	123	117	50	24
Gulbarga	97	91	48	34	18
Hassan	117	153	75	45	19
Haveri	0	253	95	59	78
Kodagu	108	145	29	100	69
Kolar	31	12	11	69	109
Koppal	4	35	82	53	52
Mandya	11	40	74	60	19
Mysore	72	184	124	74	79
Raichur	24	33	258	39	46
Ramanagar			67	81	107
Shimoga	113	363	54	99	72
Tumkur	74	133	178	72	23
U.Kannada	65	42	514	71	150
Udupi	72	61	115	63	73
Yadagiri					3
Maximum	**143**	**363**	**514**	**200**	**252**
Minimum	**0**	**10**	**11**	**28**	**0**
Median	**63**	**91**	**87**	**63**	**52**

Annexure 11: Samples of data sets showing the information gaps

Sample a) No crop details and acreage of farmer's plot

Benificiary name	Village	Crop	Area (Ha)	Drip/Sprikler	General	35% Subsidy	40% Subsidy
C. Gopalappa S/O Krishnappa	Cholagatta, Vemgal	-	1	Sprinkler	13144	7144	6000
Ramachandrappa S/O Sonnappa		-	1	Sprinkler	13144	7144	6000
Ramachandrappa S/O Sonnappa	Baarandalli	-	1	Sprinkler	13144	7144	6000
Hanumappa S/O Mulavagalappa	Patalipura	-	1	Sprinkler	14723	6000	8723
C.M. MarkandappaS/O munishamappa	Sambapura	-	1	Sprinkler	14723	8723	6000
Munichowdappa S/O BasappA	Kenchapura	-	1	Sprinkler	13144	7144	6000

Sample b) No crop and category details (SC ST etc)

ತುಂಪುರು							
ರೈತರ ಹೆಸರು & ತಂದೆ ಹೆಸರು	ಗ್ರಾಮ	ಸರ್ವೆ. ನಂ	ವಿಸ್ತೀರ್ಣ (ಎಕರೆ)	ಅಳವಡಿಸಿದ ವಿಸ್ತೀರ್ಣ (ಹೆ)	ಸಂಸ್ಥೆಯ ಹೆಸರು	ಪೂರ್ಣ ದರ	ರೈತರ ವಂತಿಗೆ
ವೈರಮುಡಿ ಬಿನ್ ತೋಪಯ್ಯ	ಹೊಸವೀಡುಹುಂಡಿ	160	2.07	1	ಕಿಸಾನ್ ಇರಿಗೇಷನ್	18991	5847
ಪುಟ್ಟದೇವಯ್ಯ ಬಿನ್ ಗೋಪಾಲಯ್ಯ	ಹೊಸವೀಡುಹುಂಡಿ	167	3.01	1	ಕಿಸಾನ್ ಇರಿಗೇಷನ್	18991	5847
ಮಹದೇವಯ್ಯ ಬಿನ್ ಮುದ್ದುಮಾದಯ್ಯ	ಹರಗನಹಳ್ಳಿ	186/2	2.12	1	ಕಿಸಾನ್ ಇರಿಗೇಷನ್	18991	5847
ಆರ್.ಸಣ್ಣಮಾದಯ್ಯ ಬಿನ್ ರಾಮಯ್ಯ	ಸಿಂಧುವಳ್ಳಿ	47 294/1	2.34	1	ಕಿಸಾನ್ ಇರಿಗೇಷನ್	18991	5847
ಪುಟ್ಟಮಾದಯ್ಯ ಬಿನ್ ಬಸವಯ್ಯ	ಕಳಲೆ	301/1ಬಿ 301/1ಎ 303/1	2.2	1	ಕಿಸಾನ್ ಇರಿಗೇಷನ್	18991	5847

Sample c) No crop and category details (SC ST etc) and total cost

Gulbarga	Afzhalpur	ಕ್ರ. ಸ ‘Ðõ.	ಫಲಾನುಭವಿ¦ÐÔ ÌÙÊÐ¤ÐÔ	ಅಳವಡಿಸಿದ ವಿಸ್ತೀರ್ಣ (ಎ-ಗು)	ಸಹಾ¦ÐÔ·°Ð¹Ð·Ð ÀÙÖ³Ðê
Gulbarga	Afzhalpur	1	ಮಾಳಪ್ಪ ತ·Ù ›Ð·ÑõÀÐÔ»Ðï	0.86	32432
Gulbarga	Afzhalpur	2	ಕಲ್ಯಾಣಿ ಶಿವರಾ¦ÐÔ	0.4	15975
Gulbarga	Afzhalpur	3	ಅನಿತಾ ಮಹೇಶ	0.7	26663
Gulbarga	Afzhalpur	4	ರೇವುಬಾಯಿ ಮಾಳಪ್ಪ	0.4	19575

Sample d) category details (SC ST etc) wrongly mentioned

Farmers Name and Address	Village	Cast
Sanna Hanumantha Reddy S/o D Thimmappa.	Gollalingammanahalli	Reddy
H.Hanumantha Reddy S/o Thimmappa.	Gollalingammanahalli	Reddy
B.Prakash S/o Anjineya Reddy.	Gollalingammanahalli	Reddy
R.Ranga Narayana Shetti S/o Ranga Gurappa shetti.	Choranuru	Vyashya
Budde Anjineya Reddy S/o Budde Thimmappa	Gollalingammanahalli	Reddy
M.Kumarashwamy S/o Govindappa.	Gollalingammanahalli	Reddy
Gangadharappa S/o Gangappa.	Thimmappana Halli	SC
Kumarashwamy S/o Dyamappa.	Juigena Halli	Veerashaiva
Nagaraju S/o Yallappa.	Gollalingammanahalli	ST
Gangamma W/o Malleshappa.	Yarrangali.	ST
Sandur Chittappa S/o Sanna Rajaiah.	Ankamanala	Golla

Annexure 12: Comparison of Unit cost and subsidy across districts and crops (Horticulture Department)

District	Crop	Area	Actual cost	Subsidy	Cost per Hectare	Subsidy per hectare	Subsidy %
Tumkur	Arecanut	742.87	32325107	17189248	43514	23139	53
	Coconut	1368.65	30959996	15875783	22621	11600	51
Raichur	Pomegranate	59.88	2408497	1386367	40222	23152	58
Uttara kannada	Arecanut	315.05	10107914	4472575	32084	14196	44
	Banana	78.88	2461543	1171326	31206	14849	48
Mysore	Banana	312.24	19515367	10398283	62501	33302	53
	Coconut	35.67	1012443	518836	28384	14545	51
bagalkote	Banana	188.4	12897844	6088464	68460	32317	47
	Pomogranate	108.84	6144892	2691100	56458	24725	44
	Grapes	84.32	6249487	2492363	74116	29558	40
Bellary	Banana	182.43	15615221	5478636	85596	30031	35
	cucumber	50.9	2992577	2091793	58793	41096	70
	Mango	37.8	1232155	665593	32597	17608	54
	Pomegranate	25.63	1197112	516792	46707	20164	43
Dakshina Kannada	Areca	24.024	1308858	726164	54481	30227	55
	Banana	140.15	10033563	5064400	71592	36136	50
	Grape	161.99	10221383	4781807	63099	29519	47
Bijapur	Grapes	813.54	34764614	24462152	42733	30069	70
	Banana	145.51	7321048	4326082	50313	29730	**59**
	Leman	127.12	3394209	2369544	26701	18640	**70**
	Pomogranate	43.99	2532925	1754959	57580	39894	**69**
Chickmagalur	Arecanut	327.21	10809875	5015576	33037	15328	46
	Coconut	323.26	8014706	2937355	24793	9087	37
Haveri	Banana	115.6	9411336	5455700	81413	47195	58
	Chilli	607.6	41599326	28589700	68465	47053	69
	Mango	49.97	1880540	957300	37633	19157	51
	Tomato	289	19530703	13581300	67580	46994	70
	Turmaric	0.8	37626	22000	47033	27500	58
Hassan	Arecanut	47.42	2537568	1107163	53513	23348	44
	Banana	17.99	986794	471264	54852	26196	48
	Cardamum	6.55	328282	177500	50119	27099	54
	Coconut	250.23	7081041	3152334	28298	12598	45
	Ginger	16.46	851701	391595	51744	23791	46
Kolar	Potato	174.49	13504031	9619186	77391	55127	**71**
	Tomato	366.34	25316443	19913622	69106	54358	**79**
	Mango	94.47	2223849	1841467	23540	19493	**83**
	Banana	47.29	3030785	2257530	64089	47738	**74**

	Beans	22.68	1859389	1262573	81984	55669	**68**
	Cabbage	17.81	1270964	967066	71362	54299	**76**
	Capsicum	19.79	1586541	1035788	80169	52339	**65**
	Carrot	28.14	2031878	1584001	72206	56290	**78**
Chitradurga	Arecanut	1821.29		51184254		28103	
	Coconut	275.17		3372939		12258	
	Banana	386.61		11765746		30433	
	Pomegranate	51.38		1084781		21115	
	Mosambi	54.74		910265		16629	
	Sapota	23.96		394055		16446	
	Mango	53.24		751474		14116	
	Papaya	62.13		1697022		27312	
Chamaraja-nagar	Banana	486.05		15713777		32330	
Mandya	Coconut	45.26		564745		12478	
Mandya	Banana	59.86		1988837		33225	