IWMI-TATA
Water Policy Program

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***Invited Paper**

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IWMI-Tata Water Policy Program

Annual Partners' Meet 2004

AKRSP (I)'s Experiences in Promoting Micro Irrigation Devices in Saurashtra, Gujarat***

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1.0 BACKGROUND

AKRSP (I)'s work in the semi-arid regions of Saurashtra, Gujarat had largely focused on water harvesting through percolation tanks, checkdams etc till 2001.However field experiences showed that with an increasing population there was no way that supply could always meet the growing demand. In most villages, farmers increased the area under irrigation after constructing water harvesting structures, and hence, water levels came down to the earlier levels. Salinity levels, which had come down, returned and in fact increased as extraction increased. Hence, by 2000-01, the organization felt that there was a need to focus on groundwater management as a whole rather than just promoting community managed water harvesting structures.

In Junagadh district, where groundwater overuse was very high, AKRSP (I) decided to pilot groundwater management with two inter-related objectives:

1) revive the Meghal River which had become dry, by working on groundwater management with the communities in the 64 villages of Malia block which were part of the river basin and
2) arrest salinity ingress along the coast in Mangrol Block, where groundwater overuse was leading to increased ingress annually.

State efforts had only focused on increasing freshwater supply through large dams, tidal regulators etc which had proved inadequate and villagers were facing shortage of non-saline drinking water.

2.0 PROMOTING THE USE OF WATER EFFICIENCY DEVICES

AKRSP(I) looked at various options to reduce the water use in agriculture, which included promoting crops that use less amount of water, adopting appropriate agronomic practices and promoting the use of water use efficiency devices like drip and sprinklers.

AKRSP(I) felt that farmers would be willing to explore options where the current agricultural income would remain the same or increase and where they could see an immediate result in terms of water saving and/or increased productivity.

Research and field trials showed that the most substantial savings in water use can be brought through water efficiency devices like drip and sprinklers. The organization is aware that mere use of such devices by farmers does not reduce groundwater extraction, as the water saved is used to irrigate a larger area and earn more income. However, it feels that if there is widespread adoption of drip and sprinkler by farmers for most of their crops and for their entire farms (for good and bad years), it will lead to an overall decline in groundwater extraction.

3.0 USE OF MICRO-IRRIGATION DEVICES IN 2000-01

The use of drip and sprinkler was low in Junagadh and was only found in Talala block where there were many mango orchards. Many farmers who had access to sprinklers on subsidy were merely using the pipes for conveyance.

Our analysis showed that the major reason for this low coverage was a subsidy policy[1] that leads to extremely high cost of drip and sprinkler devices and an extension approach which is not user friendly but technology intensive. Drip devices in India are produced by private companies which are provided subsidy by the government up to 60% of the total cost. Since farmers have to bear only 40% of the cost and the subsidy provides a regular source of income for the drip companies, there has been little effort to reduce costs. Because of this reason, there has been no market incentive to improve efficiency and quality and reduce costs. Since government subsidy is involved, farmers have to go through time consuming procedures before receiving a subsidized drip system, and the delay in finally getting the system dampens demand. Additionally, as government funding is limited, targets for drip and sprinkler sets are allocated on a district basis. These targets are much less than the potential and therefore the spread of these devices is largely limited .After the farmer goes through the government procedures and gets a "set" allocated, the technical staff of the drip company make a visit to the farm and do a detailed survey and install the drip. Most of this is done in a manner wherein the farmer feels technically inadequate to replace or reuse the installed system. If anything goes wrong, the farmer has to call back the company personnel and get it repaired. This causes delay and therefore only well-off, well connected and risk-taking farmers adopt these systems, thus limiting their spread.

AKRSP (I) reflected on the inherent weaknesses of this approach and felt that the only hope for large-scale extension was to look for alternate low cost drip system which was user-friendly. Fortunately, the International Development Enterprise (IDE), an NGO which works on low cost technical solutions for the poor, had been experimenting with low cost drips in Rajasthan, Gujarat and Maharashtra. AKRSP (I) could access these systems and worked out an informal collaboration with IDE. The Micro tube based system has a total cost of Rs.12000- Rs.16000 per hectare, compared to Rs. 40000/ hectare as cost of the conventional dripper based system. A major technology change in the IDE drip was the use of micro tubes vis-à-vis drippers. In saline

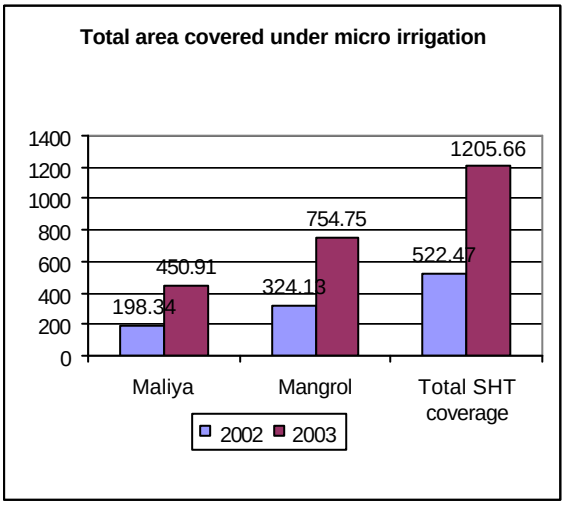
[1] This policy has been changed recently in Gujarat.

areas, farmers had experienced that the salt gets deposited in the drippers and chokes the system. It was difficult to open and clean the dripper on a regular basis. In addition IDE uses material which was available in the market (and therefore cheaper) and also promotes villagers or local entrepreneurs to do the assembly work which has made it technically very simple for them. This system is user friendly and flexible and therefore installation and repairs by farmers on their own is feasible.

However, IDE promotes bucket and drum kit systems only which are useful on small size garden or vegetable plots. Since AKRSP (I)'s main objective is groundwater management, it was interested in using this technology for large farm sizes and crops like groundnut, banana etc which are the main groundwater guzzlers in Junagadh.

Therefore, AKRSP (I) has set up its own system of extension and financial support which is described in this paper.

4.0 STATUS OF AKRSP(I)'S PROGRAMME ON DRIP AND SPRINKLER PROMOTION IN JUNAGADH.



- Over the last 2 years, AKRSP (I) has provided 262 farmers irrigating 208 hectares with micro-tube based drip systems in 37 villages (see Annexure 1).
- AKRSP(I) provides a subsidy for the micro-tube drip system ,which was 50% of the cost in 2002 and 33% in 2003.The total subsidy provided in the 2 years is Rs10.75 lakhs for 208 hectares (Rs5168/hectare) and 262 farmers (Rs 4103/farmer).Farmers pay about Rs10600/hectare and Rs 7500-8000/farmer.

- For drum-kit, bucket and easy drip/tape, AKRSP (I) provides no subsidy. About 300 drum-kits have been promoted in this area while 20 farmers have tried out easy tape for groundnut, castor, pigeon pea and papaya so far.
- There is increasing adoption by farmers of a hybrid system wherein they use the main material from the conventional, government subsidized drip system which was lying idle but replace the drippers with micro-tube. About 30-40 farmers are now reviving their drip systems through this hybridization. These farmers just buy the micro-tubes from the assembler and get them to install the new system. No subsidy is given here.
- Sets of sprinklers (5 sprinklers to a set) have been adopted by 1500 farmers, largely for support irrigation in groundnut. Sprinklers are also subsidized up to 50 and 33%.
- Though 2002 was a low rainfall year where motivation could be easier, the adoption rates have increased in 2003 even though it is a good monsoon year. Also most farmers using drip in sprinkler in 2002 have continued use it in 2003.
- Drips have been tried out successfully for almost the entire range of crops grown in the area (see Annexure 2). This includes a recent experiment of using drip for pre-monsoon sowing of groundnut, the major crop in the area (see Annexure 3). 27 farmers in 3 villages have irrigated 30 hectares of land. Wheat irrigation on 2 bighas (0.3 hectares) also seems to be working out well.
- Studies done by AKRSP (I) staff show water savings of about 65-80% and increased productivity in many crops.
- Recently fertigation is also being tried out with farmers adding liquid fertilizer to the water.
- AKRSP(I) has 2 agriculture graduates working on this programme (one in each block) supported by village level Extension Workers (EWs) who are paid an incentive of Rs200/hectare for motivation, aftercare etc.
- AKRSP(I) has been able to cover a total of 208 hectares and 262 farmers in 37 villages of 2 blocks at a cost of Rs4100/hectare(comparatively the government in 2002-03 has covered 526 farmers at a total cost of Rs.272 lakhs,i.e.Rs43000/hectare)in the district of Junagadh .

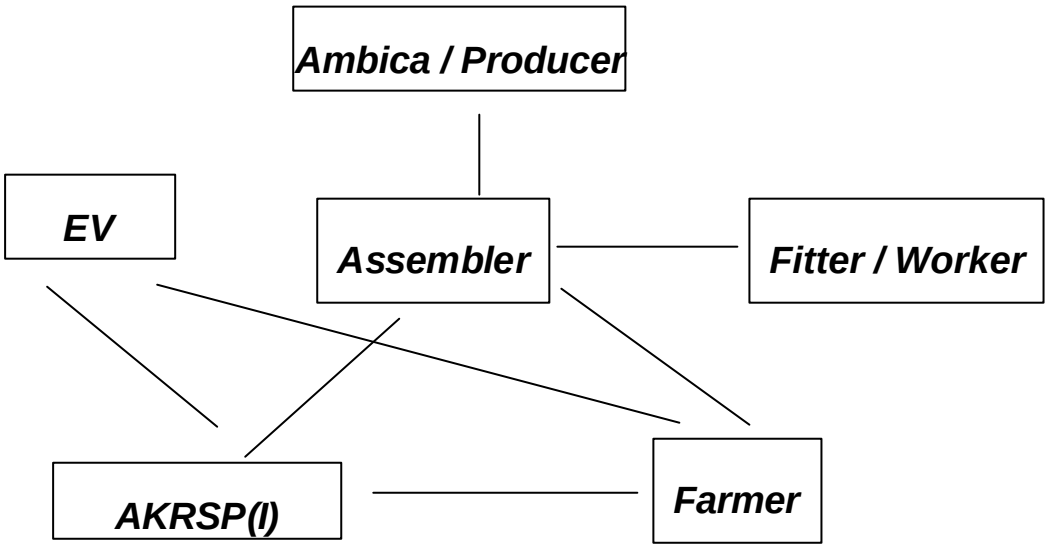
5.0 MICRO-IRRIGATION EXTENSION SYSTEM IN JUNAGADH - THE BEGINNING:

When IDE wanted to initiate work in Talala, AKRSP(I) suggested P.C. Karia as an assembler. P.C.Karia was the secretary of the village organization in Hiranvel village and has been an effective extension agent of biogas programme promoted by AKRSP(I).Karia after getting

training from IDE, has become a successful assembler and became a key part of IDE's work there. He earned good money as incentive and soon became a model for others in the area, as he started employing fitters also. Because the first assembler was a person of credibility, the technology could spread fast and farmers were willing to pilot the new technology. Thus the choice of P.C.Karia and his training by IDE proved critical to the eventual success of the "villager as an assembler/entrepreneur" model, even though he focused only on the bucket drip technology.

6.0 STRUCTURE OF ASSEMBLER / EV MODEL FOR DRIP SYSTEM: -

AKRSP(I) has promoted drip for farmers in the saline block of Mangrol and the non-saline block of Malia .The extension system set up is as below:



The roles of the various players are given below**:-**

1. **AKRSP(I)** :-

   - ? Provides training and exposure to farmers, assemblers, extension worker, fitters etc.
   - ? Finalizes the rate of material with assembler.
   - ? Receives bills of drip system from farmer and disburses subsidy after on field investigation.
   - ? Solves technical problems as and when required.

2. **Extension Worker** (usually a village youth with basic education and good communication skills and credibility) :-

- ? Motivation of farmers, demand collection and submission of farmers' list to AKRSP (I).
- ? Acts as a link between the farmer and the assembler, as well as farmer and AKRSP(I).
- ? Plays a regulatory role, prevents collusion between assembler and farmer (through correct reporting of material) and hence is present during fitting. He represents AKRSP(I) at site, to ensure no misuse of subsidy.
- ? Where there is no subsidy (as in easy tape), he is hired by assembler as motivator and sales agent.
- ? Gets an incentive of Rs200/hectare from AKRSP(I).
- ? Does the follow up and aftercare of the system, and in case of field problems, gets in touch with fitter/assembler for rectification.

3. **Assembler/entrepreneur**(selected from the EWs; hould have basic education and financial skills and willingness to take the risk of running a business):-

   - ? Purchases material on credit from m/s. Ambica or any other supplier.
   - ? Hires a fitter / worker on daily wages and trains him in survey and estimation, fitting etc.
   - ? Collects demand from AKRSP (I), EW and sometimes from farmers directly.
   - ? Surveys and prepares estimate for farmer.
   - ? Looks after installation, bill preparation, recovery of amount from farmers.
   - ? Prepares documents related to the drip system.
   - ? Submits all bills to AKRSP(I) block offices.
   - ? Assembler adds his commission (10%) to the material costs charged to the farmer. Thus on a turnover of about 5-6 lakhs, he makes an income of Rs40-50,000.He also makes payment to the fitters he hires on a daily wages.
   - ? Negotiates with suppliers for better and cheaper material.

4. **Fitters**(local youth, not educated):-

   - ? They do the installation work; get payment for the same from the assembler.
   - ? AKRSP(I) provides training to them on basic knowledge of the system.

5. Ambica / producer company :

   - ? Supply material to assembler on credit.
   - ? Submission of price list to AKRSP(I),

6. **Farmers** :-
   - ? User
   - ? Motivator for others.
   - ? Innovation in terms of use for different crops.

1) AKRSP(I) staff plays a major role in motivating farmers for experimenting with drip, and in the initial stages played a very key role. There is a great focus on trying out drip with

different crops, and to show that this technology could be applied to almost all the crops grown in the area and was not restricted to orchard crops.

2) For each village AKRSP(I) would identify an Extension Worker (a village youth with interest in agriculture, basic literacy, good communication skills and a lower economic status and a desire to earn money. This person was initially placed as a fitter with P.C. Karia who trained him in installation, motivation etc.

3) One of the EWs who is good at his work and fits the criteria (see Annexure 4) is invited to be an assembler by AKRSP(I).The assembler purchases the material from the supplier on credit, employs the fitters and then gets the sets installed on the farmers' fields based on the demand collected from the EWs and AKRSP(I).

4) AKRSP (I) provides a subsidy of its own. This was necessary despite the lower cost of the micro-tube drip (vis-à-vis the conventional drip) because farmers were used to a subsidy from the state and were willing to wait for their turn to get this subsidy rather than opt for a no-subsidy option. Also, though the government system had 40% contribution from the farmer, in actual terms farmers and the company came to an agreement wherein they paid much less.

   In 2002, AKRSP(I) subsidized 50% of the cost of the system and in 2003 ,it provided 33% subsidy (up to a maximum of Rs4000/farmer).The farmer buys material (worth Rs5000 for one hectare of mango etc) directly from the market, while the assembler supplies material and gets the set installed on the field by the fitter. For a total cost of Rs12000, he should get Rs7000 from the farmer. He collects Rs3000 plus a voucher signed for the remaining material (worth Rs4000).This material is checked by the Extension worker and staff at the field and assembler is paid the amount against the voucher. The Assembler's margin is included in the material costs charged to the farmer.

5) Since the assembler is a person of modest means, the supplier (Ambica company, the dealer identified by IDE was the initial supplier) would not give him material on credit. Hence AKRSP (I) stands as guaranteer so that the assembler could access material on credit. Now, the assembler deals with the company directly, and with help from AKRSP (I), has also identified cheaper suppliers with whom he negotiates directly.

7.0 GENERIC LEARNING LESSONS FROM AKRSP (I) S EXPERIENCES

The last 2 years have provided many learning lessons to the organization. The key lessons are summarized below:

1. The Need for Constant Innovation

AKRSP (I) found that every crop requires a different type of application of the technology and therefore there has to be flexibility available to innovate based on the farmer specific conditions and needs. For example, of the farmers who had purchased government subsidized drip earlier, many do not purchase the whole drip set but only the micro tube and the village extension workers help them install this hybrid system. Similarly our experiments in Mangrol showed that instead of using the micro tube if the water cock is used it is cheaper by Rs.7/coconut tree and hence many farmers are demanding cocks instead of micro tubes. Farmers have been encouraged to innovate and therefore cheaper filters have been developed compared to those supplied by IDE (which in itself is much cheaper than that supplied by government). Plastic pegs for the tubes have been replaced by cheaper wire pegs.

2. Focus on Reducing Cost

Throughout these 3 years AKRSP (I) has realized that farmers, like all consumers, do not like to pay more and the less amount they have to pay the easier it is to extend the technology. The study by an IRMA student[2] shows that cost is a major deterrent for adoption of drips by farmers. Due to this continuous focus on reduced cost, innovations have come up and assemblers, extension volunteers and farmers - all strive hard to reduce cost. Another way actual costs have been reduced by AKRSP (I) is by promoting competition amongst suppliers. So instead of buying through the major supplier Ambica Agencies, the companies who supply to Ambica were also contacted and negotiations were done by the assembler and AKRSP (I) staff to reduce cost and get better prices.

3. Balancing Cost vis-à-vis Technical Perfection

When scientists from the Agricultural University were shown the drip installed for beetle wine and other crops, they felt that the lay out was imperfect and therefore the amount of water at the last plant was not the same as at the initial plants. Because of this, the productivity would be adversely affected and this was not therefore a good drip system. However our estimation was that this 10% decrease in water available was more than compensated by the fact that the cost of the systems we had installed was at least 20% less than what a perfect technical system would have cost. Farmers, especially when they are

[2] "Enhancing Entrepreneurship in Micro-Irrigation, mainly in Drip Irrigation" by Sudarsan Panda, an Organisational Trainee from IRMA.

trying out a new technology, are fairly cost sensitive and do not mind foregoing some perfection if it reduces its cost.

4. Drawback of a Standard Unit Costs

Most of the government systems in their effort to have a standard unit cost use hectare as a unit of allotment. In fact in Junagadh the government does not promote drip for beetlewine etc. because it requires high density and the cost per hectare is very high which does not fit into the standard norms of the government. For sappota and mango the cost is Rs.12,000 per hectare which cover 100-150 plants while with the same cost, only half hectare is covered under banana (700 plants), 0.75 hectare under coconut (130 trees) and 0.3 hectares (2 bighas) under beetle wine. This is because the spacing is different. In fact the economic unit is also different. Hence it is essential that a standard unit cost be developed for each crop.

5. The Eternal Dilemma: to Subsidize or not?

The major concern for most development agencies who promote micro irrigation is the need to make this whole technology less dependent on subsidy and therefore sustainable with market forces. There have also been some successes in promoting drip without subsidy. However for AKRSP (I) the major reason of promoting drip technology is to reduce the use of ground water overall and therefore large scale and intensive adoption of drip is essential. We have found that farmers are extremely aware that government is offering subsidy and therefore if one talks of the project without subsidy, even at a reduced cost, the adaptors are few and mainly the better off farmers and risk takers. On the other hand our experience for the last two years shows that if gradually subsidy is reduced then the rate of adoption is much faster. For example, initially AKRSP (I) provided 50% subsidy on micro tube and in the year 2002 it had covered 112 farmers. In the year 2003 subsidy was reduced to 33% and yet the number of farmers went up to 139 farmers. We believe that currently drip is yet at experimental stage for most farmers and for most crops. And therefore like any experiment it needs to go through a period of risk support before farmers will be wiling to invest on it on their own. It would be useful to remember that initially even wells and chemical fertilizers had a subsidy component before they were adopted on a large scale by farmers. For extremely low cost technology like drum kit and easy tape, AKRSP (I) does not provide any subsidy.

6. Extension Approaches

AKRSP (I) has found that a range of extension methodologies have to be tried out to get farmers to adapt this new technology. So in addition to village level extension work, farmers are taken on exposure visits to visit other farmers who are the initial adopters. Targeted training programs have been held in which irrigating farmers have been invited at times with a letter on their name. This ensures high attendance and finally higher adoption.

7. Social Mobilization

Because drip is a part of groundwater management approach promoted by AKRSP (I), Padayatra have been more useful for spreading messages of drip across the villages. The fact that the drip is a part of water management strategy has helped in the extension. Because farmers are concerned about declining ground water levels and increasing salinity levels and the fact that even in good rainfall years there is not enough water in the wells, they are looking for answers. A drip system when it is discussed in conjunction with water harvesting structures makes sense for them. In many cases farmers have contributed substantially towards water harvesting structures and therefore agree with the need to use that harvested water more efficiently.

8. Experimenting on Different Crops

As can be seen from the Annexure 2, AKRSP (I) has tried out the micro drip on a range of crops and through this exploded the myth that drip can only be applied for horticulture crops. Because of this, for example, in coastal saline areas almost all the beetle wine farmers have gone in for drip. Recent experiments show that drip can be applied for pre-monsoon groundnut sowing which has a wide application as most farmers grow groundnut (Annexure-3).

9. Speed of response

There is a peak period when farmers are willing to adopt drip, largely during the summer months of March and April. AKRSP (I) starts the extension work from February. However since farmers usually wake up at the last moment it is essential that the gap between demand and installation is as less as possible. The assemblers and extension volunteer manage to do this in about 7-10 days and hence the farmers see the impact immediately. Feedback from farmers reveals that the delayed response in the government system is a major reason why farmers don't go in for this technology.

10. Aftercare

Because it is a new technology it is essential that there be visits to ensure that the technology is working fine and to support the farmer in case he faces any problem. Because the extension worker belongs to the same village and the farmer has got the drip installed through him the farmer considers it the extension worker's duty to provide aftercare. This pressure ensures that the extension worker and the assembler both visit the farmer after installation. The fact that compared to dripper technology the micro tube is technically user friendly makes a huge difference and in most cases farmers can solve the initial technical problems that they face.

11. Incentives

As has been mentioned in the paper the assembler makes money through the supply of material. He adds the mark up of about 10% to the material cost. Hence on a turn over of about Rs. 4-5 lakhs he makes Rs.40,000-Rs.50,000/- which is reasonably good amount for 4-5 months work. However the extension worker gets an incentive from AKRSP (I). The reason this is being done is because in a way he plays the role of checking whether the area claimed by the assembler and farmer matches with that on the field. This is essential because currently AKRSP (I) is paying 33% subsidy and by inflating the figure the assembler and farmers could come to an understanding and cheat AKRSP (I). Over a period of time the extension worker could be paid by any institution which plays a regulatory role i.e. village committee etc. The EW also listens to AKRSP (I) on after care etc. because he is paid incentive by AKRSP (I). In the initial stage quality control is important. There is not enough competition in the market to enforce quality. If the assembler was to pay the extension worker out of his own finances then he would be far more interested in achieving higher turnover and might not prioritize aftercare. This may lead to a high failure and eventually low credibility of the technology. Hence in the initial stage the incentive to the extension worker is paid by AKRSP (I).

ANNEXURE-1

DRIP IRRIGATION BY AKRSP(I)

	Maliya	Mangrol (saline coast)	Total
No. of farmers	119	143	262
Area (hectares)	95.22 *	113.09	208.31
No. of villages	19	18	37

* Support irrigation for groundnut provided through a combination of micro-tube and easy tape on 30 hectares of land covering 27 farmers.

* Wheat irrigation is being experimented on 0.30 hectares (2 bighas) with easy tape.

ANNEXURE-2

USING DRIP IN DIFFERENT CROPS

	MANGROL (in hectares)	MALIYA (in hectares)	TOTAL
Sapota (chikoo)	18.10	1.92	20.02
Beetle wine	24.00	4.3	28.3
Banana	34.5	13.5	48.0
Coconut	24.00	3.6	27.6
Vegetable	4.55	5.4	9.95
Mango	2.25	33.95	36.20
Garden	2.75	-	2.75
Rose	1.07	0.5	1.57
Drumstick	1.00		1.00
Other	0.90		0.90
Lemon		0.40	0.40
Water melon		0.7	0.70
Custard apple		1	1.00
Groundnut		30.0	30

ANNEXURE 3

Pre monsoon sowing of groundnut:

Pre-monsoon sowing of groundnut is carried out during the second fortnight of May whereas regular monsoon sowing starts during second fortnight of June. Most irrigation wells are either dried up or have little water during the month of May. Pre monsoon sowing is practiced in the area through flood irrigation wherever water is available. The logic is as sowing is done in advance; less water is required during the dry spells in the monsoon. In addition to this, it also helps in pest- control which occurs during various stages of ground development. Along with this due to early sowing, the crop is harvested earlier which results in better market price as it is a cash crop.

Hence looking at the various advantages of drip system it is now being adopted by increased number of farmers who have little water in their wells for pre-monsoon groundnut by traditional means. Moreover, the drip system is designed in such a way that it could initially be installed on 0.16 hectare area of groundnut, and then it can be shifted to rest of the area to be irrigated. This design not only reduces the cost of the system, but also allows farmer to increase the area depending upon the availability of water in the well.

The innovator…

A farmer from Nani Dhanej village Bhikabhai Jiwabhai Zunjia opted for pre monsoon sowing of groundnut through drip irrigation. He has 2.4 ha of land and with furrow irrigation he could irrigate only 0.3 ha of land, which was not sufficient for any noticeable outcome. He then decided to adopt low cost drip irrigation system on his land. The total cost of the set was 5000 out of which 67% (Rs.3350) was borne by the farmer and 33% (Rs.1650) was provided as subsidy. Total increase in production is calculated to be 6 quintal per hectare. Bhikabhai was able to get the crop to the market around one month before other farmers and earned a extra profit of Rs 1000 per quintal. Exposure visits of about 100 farmers were organized to his field to learn and experience the benefits of drip in pre monsoon sowing of groundnut. Out of these, 26 farmers adopted drip sets. The farmer has now decided to make dual use of the drip sets; groundnut in the monsoon and in vegetables in the summer.

Some key benefits of pre-monsoon sowing by drip

? ***Increase in Production***

A study showed that the groundnut production cultivated through monsoon is about 360-400 Kg. / Bigha whereas pre- monsoon farmers got an increased production of about 500-540 Kg/ Bigha, an increase of 25-30% in yield.

? ***Market Value Increase***

Market value of a cash crop generally depends upon the quality of the crop along with timely availability of the same. Pre-monsoon sown groundnut results in good quality crop and according to the farmers they get about 10 % increased market value as compared to monsoon groundnut.

The main reasons for increased market value are:

(1) The harvest comes early to the market as compared to monsoon groundnut and at that time the prevailing market rate is usually higher.

(2) As per farmer's opinion, the kernel to pod ratio is better.

? ***Time saving***

Traditionally in pre monsoon sowing, firstly water is applied to the field and following this the seed is sown in the wet field. It is difficult for the farmer to sow the groundnut in wet field. It increases the time and the water required. In drip method of pre monsoon sowing, first the groundnut seed is sown in the dry field and then it is irrigated, so less time is required for sowing as the field is dry and hence sowing is easy for the farmers. Moreover, the water required is lesser. The table also shows that with the use of drip method the time required for sowing is also reduced.

Table-1 Comparison of the Two Systems for Time Requirement for Sowing and Irrigation

Phases	**Time required by Drip Irrigation Method (Hour)**	**Time required by Traditional Irrigation Method (Hour)**
Sowing	1	2
Irrigation	2.5	5

Source: Analyzing the questionnaire and through group discussions.

? ***Less Seed Requirement for Sowing***

Along with time and water saving, the seed required is also decreased as compared to traditional method. Around 25 Kgs/Bigha of seed are required for sowing by traditional system whereas about 20 Kgs/Bigha of seed are required for sowing by drip method.

? ***Weed control***

Weeding is a major problem in groundnut and other crop. As per farmers opinion less labor is required for weeding when drip irrigation is used. About Rs. 100-150 /Bigha cost reduction is observed in weeding, thereby reducing the total cost of cultivation.

ANNEXURE 4

Assembler Selection Process: Some of the criteria for Selection of the Assembler/Entrepreneur are as follows:

1. Integrity: S/He should have credibility in the area

2. Should be able to read and write, and have some skills in doing financial calculations

3. Should have good communication skills, an extrovert personality

4. Should not be well off and have motivation to work hard

5. Should be free from family /social responsibility

Assembler is usually selected from the Extension Workers. The selected person is given a clear idea about the Assembler's work and benefits. If he is ready to do this work, training is given, largely using the IDE training programs.

IWMI-Tata Water Policy Program

The IWMI-Tata Water Policy Program was launched in 2000 with the support of Sir Ratan Tata Trust, Mumbai. The program presents new perspectives and practical solutions derived from the wealth of research done in India on water resource management. Its objective is to help policy makers at the central, state and local levels address their water challenges – in areas such as sustainable groundwater management, water scarcity, and rural poverty – by translating research findings into practical policy recommendations.

Through this program, IWMI collaborates with a range of partners across India to identify, analyse, and document relevant water-management approaches and current practices.

The policy program's website promotes the exchange of knowledge on water- resources management within the research community and between researchers and policy makers in India.

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