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RESEARCH ARTICLE

Constraints Faced by the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) Beneficiaries in Adoption of Drip Irrigation System in Tamil Nadu

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Abstract

Objective: Tamil Nadu is leading in installation of drip irrigation system among the various states of India The study attempted to identify the constraints in adoption of drip irrigation system among the Pradhan Mantri Krishi Sinchayee Yojana **(**PMKSY) beneficiaries in Dharmapuri, Salem and Erode Districts of Tamil Nadu state. **Method:** The data were collected by personal interview method. The constraints were classified into, technical, infrastructural, financial and educational constraints. The respondents were asked to mention the various constraints faced by them in adoption of drip irrigation system. The constraints were ranked by using Garrett Ranking method. **Findings :** The technical constraints faced by the PMKSY beneficiaries in adoption of drip irrigation technology were 'not suitable for field crops' (74.38), 'clogging of drippers by suspended materials' (62.82), required frequent maintenance (59.71), difficult to maintain optimum pressure to discharge water (50.85) and etc., The infrastructural constraints faced by the PMKSY beneficiaries in adoption of drip irrigation technology were insufficient supply of electricity for irrigation field (72.76), poor after sales service of the companies (62.90), non-availability technical staff (55.65) inadequate distribution network in rural areas (41.56), non-availability of spare parts in time (39.11) and poor quality of pipes and micro-tubes (38.06). High cost of maintenance (89.38), 'high cost of equipment / spare parts' (86.11), requirement of additional tank to get optimum pressure (81.86), provision of poor subsidy (80.75), tedious loaning procedure (77.88) and high cost of liquid fertilizer (72.20) were the financial constraints encountered by the farmers in adoption of drip irrigation system. The Educational constraints faced by the PMKSY beneficiaries were perceived as inadequate awareness about the advantage of drip irrigation technology (73.15). **Novelty:** A unique aspect of the proposed research findings of constraints, use policy-maker based on the research

findings, recommendations for future research management implications are addressed.

Keywords: Drip Irrigation; PMKSY; Constraints; Adoption; Dripper; Micro Tubes; Technical Know How

1 Introduction

Highly the available irrigation water in India is applied through the conventional surface irrigation system. Poor irrigation efficiency of these systems not only reduce the anticipated outcomes from investment in the water resources sector of the country, but also create environment problems, like, lowering of water table due to over exploitation of sub surface water resources, water- logging and soil salinity, thereby adversely affecting the crop yield. Besides government efforts for promotion of micro irrigation in terms of financial assistance in form of subsidy, the adoption is very low as compare to its potential [(1)].

Rajulashanthy stated that half of the respondents felt that clogging in lateral drippers was the main constraint; Even though majority of the respondents were using good quality irrigation water, clogging is inevitable. Presence of certain salts can cause either partial (or) complete blockage of drip system. Respondents felt this as the major constraint due to lack of availability of acid for treatment, lack of knowledge about the acid treatment and iron fertilizer tank provided by some companies were not suitable for acid treatment. Nearly one-third of the respondents 30.00 per cent expressed rat damage as a serious problem in drip irrigation system. Around 43.30 per cent of respondents indicated that damage of laterals during sugarcane harvest was yet another major constraint.

The available practical facts are comparatively limited with respect to its constraint in adoption under different farm categories and what are the interventions needed to upscale MI adoption. Keeping in view the points mentioned above, a study is undertaken with objective to find the constraints in adoption of drip irrigation for the farmers of Dharmapuri, Salem and Erode Distracts of Tamil Nadu state.

The heavy rainfall in short period leads to run off capita water availability was 1544 cubic meter. The anticipated per capita water availability in 2025 will be 1401 cubic meter (167 liter/day) and 1191 cubic meter in 2050, [(2)].The demand for water increases while the supply of water was constant. Water stressed condition was observed in states like Rajasthan and Gujarat because of arid climate in that region and water scarcity in Tamil Nadu, Karnataka and Andhra Pradesh was a consequence of poor aquifer properties in this state. The population of India in 2050 was predicted to be 1.6 billion, subsequently there will be increase in demand for water, food and energy. As per OECD (Organization for Economic Co-operation and Development) environmental outlook 2050, India would face severe water constraints by 2050. Indian farming accounts for 90 per cent water use due to fast-track ground water depletion and poor irrigation system. Irrigation has played a significant role in the food security enhancement and overall economic development of the nation [(3)]. To identify and record of irrigation system about constraints in future sustainable irrigation facility provided by Tamil Nadu state.

1.1 History of PMKSY scheme

In 2006, Micro irrigation started from centrally sponsored scheme (CSS) by Government of India (GoI). In 2010, CSS was amplified in scope and renamed as National Mission on Micro Irrigation (NMMI), which was subsequently brought under the ambit of the National Mission on Sustainable Agriculture. In 2015, NMMI was brought as a scheme under the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) [(4)]. PMKSY was approved by the Cabinet Committee on Economic Affairs (CCEA), chaired by Prime

Minister Narendra Modi, on 15 July 2015, with the motto of "Per drop -More crop". It is being implemented to expand cultivated area with assured irrigation, reduce wastage of water and improve water use efficiency (Press Information Bureau -2021).

1.2 Research Gap

The proposed work introduced a novel feature selection strategy – Adopt to increase drip irrigation system prediction accuracy. The following are the primary achievements of this research task:

- Reason for not adoption of drip irrigation system using -Garret Rank.

2 Methodology

The present investigation was carried out in three districts of Tamil Nadu. Among the 38 districts, three districts viz. Dharmapuri, Erode and Salem were selected purposively as they had maximum number of PMKSY beneficiaries' who installed drip irrigation system during 2019-2020. From each selected districts, two blocks were selected purposively again considering the maximum number of PMKSY beneficiaries who had installation of drip irrigation system. Two villages were selected from each of the selected block based on the presence of higher number of PMKSY beneficiaries. Thus, twelve villages were totally selected. A sample size of 300 PMKSY beneficiaries were selected from those twelve selected villages by using proportionate random sampling method. The beneficiaries were asked to mention the constraints faced by them in the adoption of drip irrigation system. The data were collected by personal interview method. The constraints were ranked by using Garrett ranking method and discussed. Initially the percentage position for each PMKSY beneficiaries was worked out.

Per cent position = 100 x (R-0.5)/N

Where,

R - The rank assigned by the individual respondent

N - The total number of respondents

From the percentage position, the respondents score was worked out with the help of conversion table.

3 Results and Discussion

3.1 Technical constraints

The constraints encountered by the respondents were categorized into four categories namely technical, infrastructural, financial and educational constraints. The constraints have been presented in descending order of the ranks under following sub-sections. The technical constraints faced by the PMKSY beneficiaries are presented in Table 1.

Table 1. Technical constraints faced by the PMKSY beneficiaries in adoption of drip irrigation technology (n=300).

S.NO	Constraints	Garrett Mean score	Rank
1.	Not suitable for field crops	74.38	I
2.	Clogging of drippers by suspended materials	62.82	II
3.	Requires frequent maintenance	59.71	III
4.	Difficult to maintain optimum pressure to discharge water	50.85	IV
5.	Requirement of clean water	47.88	V
6.	Blockage of water pipe line	44.55	VI
7.	Lack of technical know-how	34.95	VII
8.	Damage of micro- tubes by squirrels and rats	32.40	VIII

Table 1 reveals the technical constraints which could be responsible for non- adoption of drip irrigation technology. The constraints viz., 'not suitable for field crops' (74.38) ,'clogging of drippers by suspended materials'(62.82), 'requires frequent maintenance'(59.71) and 'difficult to maintain optimum pressure to discharge water' (50.85) were ranked as the first four important constraints by the respondents. The mean score of these constraints were found to be above 50.00. Whereas, the constraints with mean score of below 50.00 were 'requirement of clean water'(47.88), 'blockage of water pipe line'(44.55), 'lack of technical know-how'(34.95) and 'damage of micro- tubes by squirrels and rats'(32.40).

'Not suitable for field crops' was the most important technical constraint faced by the farmers as it ranked first with the mean score of 74.38. This might be due to the reason that the plant density in field crops was high and hence require more quantity

of water. Also, separate drippers for each plant cannot be installed in such dense crops.

The problem of "Clogging of dripper by suspended materials" was ranked as the second important constraint with the mean score of 62.82. The problem of clogging might be due to the presence of slime, algae, sand and other organic or inorganic materials in the water.

The pipe lines may be frequently blocked by deposition of salts which reduces the speed of water discharge by the sets and unequal distribution of water. Moreover, the micro tubes are often damaged by squirrels and rats. All these would lead to frequent maintenance of overall drip system. Hence, this was ranked as the third constraint.

'Difficult to maintain optimum pressure to discharge water' was the fourth constraint with the mean score of 50.85. Smooth flow of water in drip system depends upon the maintenance of optimum pressure. The pressure should not be neither too high nor too low. The optimum pressure alone ensures smooth flow of water to the plants. But, the maintenance of optimum pressure is quite difficult as perceived by majority of the respondents.

'Requirement of clean water'(47.88) was ranked as the fifth constraint because of the reason that the muddy water obstructs the flow of water in drippers and pipe lines which blocks the drippers, emitters etc. due to which even after high pressure, the water discharge remains very low. Therefore, the clean water was required for effective functioning of drip sets.

'Blockage of water pipe lines' was the sixth constraint with the mean score of 44.55. This may be due to the deposition of salt and mud in the drippers and pipelines.

'Lack of technical know-how' (34.95) among the farmers might be due to the reason that the technical advice regarding adoption of drip irrigation technology was not being provided adequately by Government personnel like Village Extension Workers, Agricultural Officers and Assistant Agricultural officers etc., as expressed by the farmers. Mostly dealers provided this kind of advice at the time of installation only. After that there are no frequent follow up visits were made by the officials to provide technical assistance. The findings are in accordance with the findings of respectively[5].

'Damage of micro-tubes by squirrels and rats' (32.40) was the last constraint faced by the respondents. This might be due to the reason that the micro-tubes or pipe lines are very soft and mostly of poor-quality plastic, hence, may be damaged by rats and squirrels. This needs a proper care and control of rats and squirrels.

3.2 Infrastructural constraints

The infrastructural constraints faced by the PMKSY beneficiaries are presented in Table 2.

Table 2. Infrastructural constraints faced by the PMKSY beneficiaries in adoption of drip irrigation technology(n=300)

S.NO	Constraints	Garrett Mean score	Rank
1.	Insufficient supply of electricity for irrigation field	72.76	I
2.	Poor after sales service of the companies	62.90	II
3.	Non availability of technical staff at the field level	55.65	III
4.	Inadequate distribution network in rural areas	41.56	IV
5.	Non- availability of spare parts in time	39.11	V
6.	Poor quality of pipes and micro-tubes	38.06	VI

The Table 2 reveals that the constraints viz., 'insufficient supply of electricity for irrigation field' (72.76), 'poor after sales service of the companies' (62.90) and 'non-availability technical staff at the field level' (55.65) were ranked as the first three important constraints perceived by the PMKSY beneficiaries with the mean score of above 50.00. Whereas, the constraints viz., 'inadequate distribution network in rural areas' (41.56), 'non-availability spare parts in time' (39.11), and 'poor quality of pipes and micro-tubes' (38.06) were found to be with the mean score of below 50.00.

'Insufficient supply of electricity for irrigation field' was the major infrastructural constraint as it ranked first. This might be due to the fact that the supply of electricity was very poor and erratic in the study area due to which the farmers may not be able to irrigate their fields in time.

The constraint viz., 'Poor after sales service of the companies' with the mean score 62.90 was ranked as second. This might be due to the reason that the agencies do not have adequate number of qualified engineers or experts in irrigation system. This finding is in line with the findings[6].

'Non availability of technical staff at the field level' with the mean score 55.65 has also hindered the adoption of drip irrigation technology. The State Department of Agriculture do not have adequate technical staff to cater the needs of farms in the rural areas. Hence, there is a deficit of technical staff to disseminate the technical knowledge about drip irrigation technology to the farmers. This in turn would lead to poor follow up visits and after sales services.

'Inadequate distribution network in rural areas' with the mean score of 41.56 was ranked as the fourth constraint. This may be due to lack of proper retail out lets, distant location of villages, and lack of adequate transport facilities.

'Non- availability of spare parts in time' was ranked as the fifth constraint. This might have been faced by the farmers due to the fact that the spare parts required for repair and maintenance of drip system were costly and could not be purchased by the farmers frequently, so generally the village shop-keepers did not prefer to keep these spare parts for sale at their shops.

'Poor quality of pipes and micro-tubes' was ranked as sixth constraint. with the mean score 38.06. This may be due to the subsidies are directly given to companies by the Government. The companies provide only poor-quality materials considering the profit for them. As there is no proper quality control system to ensure the quality of pipes and micro tubes, the companies do not consider the quality of material.

3.3 Financial constraints

The financial constraints faced by the PMKSY beneficiaries are presented in Table 3.

Table 3. Financial constraints faced by the PMKSY beneficiaries in adoption of drip irrigation technology (n=300)

S.NO	Constraints	Garrett Mean score	Rank
1.	High cost of maintenance	89.38	I
2.	High cost of equipment / spare parts	86.11	II
3.	Requirements of additional tank to get optimum pressure	81.86	III
4.	Provision of poor subsidy	80.75	IV
5.	Tedious loaning procedure.	77.88	V
6.	High cost of liquid fertilizer	72.20	VI

It could be observed from the Table 3 that the financial constraints viz.,'high cost of maintenance (89.38), 'high cost of equipment/spare parts'(86.11), 'requirements of additional tank to get optimum pressure' (81.86), provision of poor subsidy (80.75) 'tedious loaning procedure' (77.88), and 'high cost of liquid fertilizers' (72.20) were encountered by the PMKSY beneficiaries in adoption of drip irrigation technology. The mean score of all their constraints were found to be above 70.00.

Majority of the farmers reported that 'high cost of maintenance'. as their constraint. It might be due to the reason that the spare parts required for maintenance of drip sets were not available in local markets due to their high cost. So, the farmers had to purchase it from city market, which also added to the cost. Also, after installation of drip sets, the farmers have to devote most of their time and money for maintenance and repair of drip sets leading to high state of frustration among the beneficiaries.

'High cost of equipment/spare parts was ranked as the second constraint with the mean score of 86.11. The spare parts of drip irrigation system are costly and usually not available in local markets. As most of the beneficiaries were small and marginal farmers, they could not afford the high cost of equipment and spare parts. This finding is in line with the findings of respectively [7].

'Requirement of additional tank to get optimum pressure' was ranked as the third with the mean score of 81.86. Due to over pressure, sometimes the main lines are blasted and hence the water flow may be disturbed. An additional tank is required to obtain the optimum pressure in the drip system so as to ensure smooth flow of water. Hence this constraint might have been reported.

The fourth constraint faced by the PMKSY beneficiaries was provision of poor subsidy' 80.75. For installing drip irrigation in one hectare of land, Rs 2.5 Lakhs is required. But the Government provides only Rs.1.75 Lakhs as subsidy. The farmers have to afford the removing installation cost. The subsidy provision is decided by the Government and it is totally depending on their availability of budgets and other economic issues. This finding is in confirmity with the findings respectively [8].

'Tedious loaning procedure' was perceived as the fifth constraint with the mean score of 77.88. Borrowing loan from banks is much tedious and require more formal procedures. Hence the respondents felt much difficulties in getting financial assistance from banks.

'High cost of liquid fertilizer' was perceived as the sixth constraint with the mean score of 72.20. The solid fertilizers cannot be used in drip system. The liquid fertilizer alone can be used through fertigation. But the liquid fertilizer is costly compared to solid fertilizers. Here the respondents might have reported this constraint.

The above findings were in accordance with the findings [9] who also reported that high cost of equipment, requirement of additional tank**,** non -availability spare parts, poor subsidy provision' , and 'high cost of liquid fertilizer' were the major constraints in adoption of drip irrigation technology.

3.4 Educational constraints

The educational constraints faced by the PMKSY beneficiaries are presented in Table 4.

Table 4. Educational constraints faced by the PMKSY beneficiaries in adoption of drip irrigation technology (n=300)

S.NO	Constraints	Garrett Mean score	Rank
1.	Inadequate awareness about the advantages of drip irrigation technology	73.15	I
2.	Lack of direct contact with experts of drip irrigation technology for effective adoption	62.58	II
3.	Lack of knowledge on operation of drip irrigation technology	56.23	III
4.	Aged farmers feel difficulty in using drip irrigation technology	52.10	IV
5.	Lack of training for installation of drip system	43.58	V
6.	Adequate number of demonstrations were not arranged to motivate and develop skills for its adoption	38.65	VI
7.	Lack of systematic campaigns for popularizing the drip irrigation technology	34.70	VII

Table 4 reveals that the educational constraints viz., 'inadequate awareness about the advantages of drip irrigation technology' (73.15) 'lack of direct contact with expert of drip irrigation technology for effective adoption' (62.58). lack of knowledge about operation of drip irrigation technology (56.23), aged farmers feel difficulty in use of drip irrigation technology (52.10). were ranked as the first four important constraints by the respondents. The mean scores of these constraints were found to be above 50.00. Whereas, the constraints viz., ' lack of training for installation (43.58), adequate number of demonstrations were not arranged to motivate and develop skill for its adoption' (38.65), and 'lack of systematic campaigns for popularizing the drip irrigation technology (34.70) were found to be with the mean scores of below 50.00.

The constraint of 'inadequate awareness about the advantages of drip irrigation technology' was ranked first with the mean score of 73.15. This might be due to the fact that most of the respondents in the study area were having only primary education and many of them were functionally literates had poor understanding about operation, maintenance and advancements of drip irrigation technology. Also, there were no special campaigns, trainings or demonstrations for making the people aware about drip irrigation technology.

'Lack of direct contact with experts of drip irrigation technology for effective adoption' was ranked as second constraint with the mean score of 62.58. This could be attributed due to fact that there were no specific Government personnel to provide technical guidance to the farmers at regular intervals. Hence, these problems were encountered by the respondents.

'Lack of knowledge about operation of drip irrigation technology' was ranked as the third constraint. This might have been due to the reason that education plays an important role in eradicating the social prejudices and beliefs hampering the acceptability of the technology. The farmers do not have scientific knowledge due to their medium contacts with extension workers, lack of training and less exposure to information.

'Aged farmers feel difficulty in using drip irrigation technology' was ranked as fourth with the mean score of 52.10. This may be due to reason that they felt much difficulty in learning the technical terms and procedure of operation.

'Lack of training for installation of drip system' was ranked as fifth constraint. The State Department of Agriculture conducts only a smaller number of farmers programme on drip irrigation technology and only limited number of beneficiaries are covered under each training programme due to the budget restrictions.

'Lack of systematic campaign for popularizing the drip irrigation technology' was another constraint faced by the farmers [10]. This might be due to fact that most of the people did not participate in the promotional programmes of drip irrigation technology because they generally regarded it as a government programme and also there was lack of individual contact for effective diffusion of irrigation technology by the extension agents and other Government functionaries.

The findings were in conformity with the findings [11,12] who also concluded that lack of technical knowledge, lack of awareness and training were the major constraints in adoption of drip irrigation technology.

4 Conclusion

The important constraints encountered by the PMKSY beneficiaries in drip irrigation technology were, 'not suitable for field crops', 'clogging of drippers by suspended materials' ,'insufficient supply of electricity for irrigation field', 'poor after sales service of the companies', 'High cost of maintenance', 'high cost of equipment/spare parts', 'Inadequate awareness about the advantage

of drip irrigation technology', Further it can be concluded that among all the constrains, financial constraints were the most important constraints in adoption of drip irrigation system by PMKSY beneficiaries. Hence, the following implication are drawn so as for promote drip irrigation technology among the farmers

1. The Government officials may take necessary steps to ensure the availability of spare parts /equipment in local markets at nominal cost
2. The government has to take efforts to provide more subsidy to the beneficiaries so as to reduce their financial burden
3. The loaning procedure followed by banks should be simplified
4. The liquid fertilizers should be available at government depots at less prices
5. Mass awareness campaigns should be organized at regular intervals to popularize drip irrigation technology
6. State Department of Agriculture should arrange for conducting a greater number of training programmes on drip irrigation technology so as impart knowledge and skill.

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