Original Research Article

Assessment of Constraints encountered by Banana Growers in Adopting Water Management Practices using Henry Garrett Ranking Technique

ABSTRACT

Aim: To analyze the constraints endured by banana growers in adopting Water Management Practices
Methodology: Vellore district of North Eastern Zone in Tamil Nadu was purposively selected for the study as it had highest number of revenue firkas under critical groundwater explosion. Two villages from Anaicut block namely Melarasampatti and Vananthanghal was selected for the study. Banana is one of the water intensive crops, which has more number of water management practices to be followed, hence banana was selected for the study. Constraints in adopting water management practices were assessed by using Henry Garrett Ranking technique. A total of 80 respondents were selected for the analysis.
Results: Poor quality of drippers (71.68), Physical damage to drippers and micro tubes by rats, squirrels and rodents (63.95), clogging of drippers due to salty water (63.16), non availability of materials for mulching (59.39), insufficiency of drippers for the entire field (54.93), lack of knowledge about tissue cultured banana plantlets (50.86) were the major constraints encountered by the farmers
Conclusion: We are in need of the hour to extirpate these constraints to improve the adoption of water management practices among banana growers.

Keywords: Constraints, Water Management practices, Banana, Henry Garrett Ranking, Vellore.

1. INTRODUCTION

India is a global agricultural powerhouse. With India is growing as the second-largest producer of fruits and vegetables and holding the top position in numerous horticultural crops, the past trend in horticulture development has been positive and this propensity has been well-marked as Golden Revolution (Sarkar, 2015). India's wide range of agro-ecological zones and climatic conditions offer the opportunity to cultivate and produce a wide variety of fruits, vegetables, and other agricultural and horticultural crops. The banana was one of the first crops grown by humans and is currently a staple food crop for millions of people. Banana is a significantly important fruit crop on a global scale with a yield of 97.5 million tones, which provides livelihood for millions of Indian farmers (Gulkari *et al*., 2017). The crop banana does well in humid tropics, humid subtropics, and semi-arid subtropics up to a height of 2,000 m. While the acreage increased from 383.9 to 709 thousand hectares, the banana crop's yield rose from 20.30 to 37MT ha^{-1}. India stands first in worldwide banana production covering about 8,66,000 hectares of land. India accounts for about 26.08% of total world banana production. With 32,05,040 hectares under banana cultivation, Tamil Nadu ranks fourth in the nation, behind Andhra Pradesh, Gujarat, and Maharashtra.

Comment [A1]: delete

Comment [A2]: delete

Comment [A3]: delete

Comment [A4]: delete

Comment [A5]: delete

Comment [A6]: delete

Comment [A7]: delete

Since bananas are a succulent, evergreen, and shallow-rooted crop, they need a lot of water to grow more productively. The estimated water demand for bananas is 1,800–2,000 mm annually. In the winter, irrigation should be applied every 7-8 days, while in the summer it should be applied every 4-5 days interval. However, irrigation is only provided during the rainy season if it is necessary. The crop receives a total of 70 to 75 irrigations in its lifespan. Since, it is a significant source of calorie-dense energy, it plays a significant role in the human diet. To address the dietary needs of the expanding population and to improve employment and income prospects for farmers, the Government of India has placed a strong emphasis on intense year-round production of fruits and vegetables. Government of India initiated a scheme called the National Horticulture Mission to increase output of all horticultural goods and expand horticulture to its fullest extent within the state. But banana is a water intensive crop; hence, Government is taking various steps to improving Water Use Efficiency in its cultivation. Popularizing drip irrigation, mulching technology and other water management practices are being practiced to conserve water. Constraints are impediments, which slow up the adoption process. But the farmers are encountering issues in adopting these technologies. The results won't pull off until these constraints are expunged. Keeping the aforementioned factors in mind, the present study was undertaken with the sole goal of evaluating the constraints banana growers face in implementing suggested water management practices.

Comment [A8]: replace with given

Comment [A9]: replace with on

Comment [A10]: delete

Comment [A11]: delete

2. METHODOLOGY

The study was undertaken in Vellore district of North Eastern Zone of Tamil Nadu which has 7 blocks. Among these 7 blocks, Anaicut block was purposively selected for the study, as it had the highest area under banana cultivation. Two villages *viz.,* Melarasampatti and Vananthanghal were purposively selected from the block as these villages topped in area under banana cultivation. Total number of respondents selected was 80. Meanwhile, the records of the Agriculture Department and the statistics handbooks of the block were used to compile a list of all farmers in each village, who are banana growers.

Comment [A12]: delete

Later, Probability Proportionate to size sampling technique was consummated to select number of respondents from the villages. The formula employed was:

$$ni = [Ni / N] \times n$$

Where,

ni - Number of respondents to be selected from i^{th} district

Ni - Total number of respondents in the i^{th} district

N - Total number of respondents in the three districts

n - Sample size (n = 80)

Finally, from a total of 419 banana growers in Melarasampatti village, about 41 respondents were selected and another 39 respondents were selected from a total of 398 banana growers in

Vananthanghal village, thus constituting a total of 80 respondents. Henry Garrett ranking technique was used to rank the constraints.

2.1 OPERATION OF HENRY GARRETT RANKING TECHNIQUE

Constraints were unveiled to the respondents and were asked to rank the constraints from their perspective. The method was used to rank the constraints perceived by respondents in adopting water management practices in banana. It is used to identify the most important constraint that affected the respondents' adoption. Through the use of Henry Garrett's Ranking Technique, problem rankings can be converted into scores. Hence, each constraint will be assigned a different rank. The Garrett's formula, which was used to convert rank into percent is as follows:

Percent position = $100 * (R_{ij} - 0.5)/Nj$

Where,

R_{ij} - rank given for ith constraint by j^{th} individual

N_j - number of constraints ranked by j^{th} individual

The per cent position of each rank will be converted into scores with the help of the table given by Garrett and Woodworth (1969). For each constraint, the scores of individual respondents will be added together and divided by the total number of the respondents. These mean scores for all the constraints will be arranged in descending order; the constraints will be accordingly ranked. Using the table provided by Garrett and Woodworth (1969), the per cent position of each rank will be converted in to scores. The scores of each respondent will be summed up and divided by the total number of respondents for each constraint. The constraints are will be ordered in accordance with the decreasing order of these mean scores for all the constraints. Table 1. Gives the Total number of ranks provided for constraints by respondents

Comment [A13]: Replace with is

Comment [A14]: Replace with is

Comment [A15]: Replace with is

Comment [A16]: Replace with is

Comment [A17]: Replace with is

Comment [A18]: Replace with is

Table 1. Total number of ranks provided for constraints by respondents

Constraint	Rank														
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th
C_1	18	19	17	18	1	2	4	1	0	0	0	0	0	0	0
C_2	1	12	3	7	10	7	12	11	4	2	2	3	1	0	5
C_3	0	0	0	3	4	12	14	8	14	8	5	3	3	4	2
C_4	0	0	2	2	7	1	0	12	13	11	16	1	3	3	9
C_5	2	3	2	9	9	5	4	3	4	10	9	6	5	9	0
C_6	5	2	2	6	8	7	10	2	7	11	7	1	4	3	5
C_7	0	0	0	0	0	5	2	6	11	5	6	14	10	5	16
C_8	0	0	0	0	2	6	3	4	3	9	9	14	11	9	10
C_9	3	1	0	0	6	5	0	1	0	1	12	10	19	9	13
C_{10}	11	3	5	2	4	5	10	5	1	7	5	7	2	7	6

C_{11}	0	0	6	1	4	4	1	10	9	10	6	6	12	5	6
C_{12}	2	3	3	0	10	6	10	6	3	2	3	6	8	15	3
C_{13}	16	8	10	8	3	3	4	5	4	4	0	5	1	6	3
C_{14}	8	22	13	9	1	8	3	1	5	0	0	4	3	0	3
C_{15}	14	7	17	15	8	3	3	4	2	0	0	0	0	5	2

Table 2. Percent position and their corresponding Garrett value

Rank	$100(R_{ij} - 0.5)/N_j$	Percent position
1	100(1-0.5)/15	3.33
2	100(2-0.5)/15	10.00
3	100(3-0.5)/15	16.66
4	100(4-0.5)/15	23.33
5	100(5-0.5)/15	30.00
6	100(6-0.5)/15	36.66
7	100(7-0.5)/15	43.33
8	100(8-0.5)/15	50.00
9	100(9-0.5)/15	56.66
10	100(10-0.5)/15	63.33
11	100(11-0.5)/15	70.00
12	100(12-0.5)/15	76.66
13	100(13-0.5)/15	83.33
14	100(14-0.5)/15	90.00
15	100(15-0.5)/15	96.66

In order to ascertain their opinion on the constraint, the respondents were asked to rank the fifteen constraints indicated as 1, 2, 3, 4.....15. The calculated per cent position for the rank 1,2,3,.....15 is provided in Table 2. The total score is calculated by multiplying the number of respondents ranking that constraint as 1,2,3…15.

3. RESULTS AND DISCUSSION

From Table 3, it is evident that major constraint faced by banana growers in adopting water management practices was poor quality of drippers. More than half of the respondents (67.50%) of the banana growers adopted drip irrigation. Though Drip Irrigation System is provided at 100.00 per cent subsidy for marginal and farmers and 75.00 per cent subsidy for large farmers, the quality of drippers is suspicious. The respondents mentioned that the Drip Irrigation System last only for 2 years. But the beneficiary can avail the next DIS only after 7 years. So, there is a need for high quality Drip Irrigation System. In this regard, monitoring committee can be appointed and supervision can be done in the 3 rd year. In case, the drippers are damaged; measures can be taken to replace the drippers.

The second major constraints perceived by the respondents were physical damage to drippers by rats, rodents and squirrels with a score of 63.95. Lamm (2020) found that burying the drip tubing under soil or mulch, demonstrated excellent rodent resistance and appears to be a cost-

effective measure. Third main constraint experienced by them was clogging of drippers due to salt water. This can be prevented by regular cleaning of drippers with acid or chlorine, flushing it out at every irrigation, proper maintenance of sub main and main pipes.

Comment [A19]: replace with regular interval

From the study, it was found that only 37.50 per cent of the respondents practiced mulching. The main reason for non-adoption of mulching was non availability of materials for mulching. This was observed as fourth main constraint by the respondents. Government can take measures in providing mulching materials at subsidized rate to the farmers.

Drippers provided by Government is not sufficient for the entire field was the fifth main constraint felt by respondents with a score of 54.93. The main reason behind this was that the farmers avail the DIS for one crop in the first year but they use it for multiple crops in the following years. Due to the fixed spacing of the laterals, they find it insufficient for the entire field. In order to overcome this limitation multipurpose sub mains can be designed, which can be used for various crops.

Comment [A20]: Replace with under the scheme

Tissue cultured banana plantlets saves 4-5 months of cultivation period in the field, which in-turn saves 42.00 per cent of water. Lack of this knowledge was established as sixth main constraints. Measures can be taken by Government to popularize tissue cultured banana plantlets among farmers.

Though only a meagre population of about 2.50 per cent of the farmers had less than one acre of land, unavailability of subsidized micro irrigation System to farmers having less than 1 acre of land was felt as seventh main constraints. From the observation, it was found that they had joint patta of the land with their family members. There were no issues, while getting the subsidies but when they split their portions they fall under this category. Moreover, the process of receiving Small and Marginal farmers certificate from Tahsildar was a tedious process. Hence, policies have to be framed considering small farmers having less than 1 ac of land.

Respondents felt that procedure for availing the subsidy was back- breaking. Thus, it was mentioned as eight important constraints with a score of 48.29. When expressing this constraint with the extension officials, they divulged that ration of extension workers to farmers were less. Thereupon, measures have to be unleashed by Government to increase the Extension personnel: Framer ratio.

Non availability of farm machineries in peak season of the year was endured as nineth constraint. Measures have to be taken to increase the number of required machineries in the custom hiring centres. Additionally, Village Level Workers (VLWs) should be appointed to monitor the hiring properly. This was in accordance with Pandya and Dwivedi (2016).

Lack of knowledge about the schedule of applying liquid soluble fertilizers and Insufficient training with regards to improved water management practices were perceived as tenth and eleventh constraint with a score of 44.90 and 42.54 respectively.

Uncertain interruptions in the power supply were discerned as twelfth constraint with a score of 42.38. They disclosed that due to irregular power supply were more in the morning hours, which is the suitable time for irrigation. Due to this interruption, they were not able to irrigate the field properly. To get over this constraint pre informed scheduled power cuts can be put into action. The findings were in accordance with Verma and Sharma (2017), where 81.20 per cent of the respondents perceived this constraint.

Comment [A21]: delete

From the study, it was opined that around 22. 50 per cent of the respondents were large farmers. They expressed that managing the entire field was difficult, which in-turn resulted in improper adoption of water management practices. Lack of technical guidance from extension officials after adopting water management practices was appraised as fourteenth constraint with a score of 36.39.

During the study, the respondents proclaimed that some portion of their land was in low lying area. They also revealed that during period of heavy downpour they were unaware of the managerial practices. Measures can be taken by Government to provide subsidized water gates, which protects the crop and livestock from flood.

4.CONCLUSION

By 2050, approximately 57.0 percent of the world's population will live in areas that experience a water shortage for at least one month of the year (Mekonnen and Hoekstra, 2016). Water has become the new gold. Since, Banana being a water intensive crop, it is crucial need to adopt water management practices to cut down the extraneous waste of water. But, from the above context, it is clear that farmers are facing various constraints in adopting water management practices. We are in compelling necessity to exterminate these constraints in order to increase the adoption of water management practices by banana farmers.

CONSENT

As per international standard or University Standard written participants' consent has been collected and preserved by the author

ETHICAL APPROVAL

It is not applicable

REFERENCES

1. Garrett, H. E., & Woodworth, R. S. (1969). Statistics in psychology and education, Vakils, Feffer and Simons Pvt. *Ltd. Bombay*, *329*.
2. Gulkari, K. D., Chauhan, N. B., & Onima, V. T. (2017). Constraints faced by the banana growers in adoption of risk management practices in drip irrigated banana cultivation. *Agriculture Update*, *12*(1), 84-88.
3. Mekonnen, M. M., & Hoekstra, A. Y. (2016). Four billion people facing severe water scarcity. *Science advances*, *2*(2), e1500323.

4. Lamm, F. R., Colaizzi, P. D., Sorensen, R. B., Bordovsky, J. P., Dougherty, M., Balkcom, K., ... & Peters, R. T. (2021). A 2020 Vision of Subsurface Drip Irrigation in the US. *Transactions of the ASABE*, *64*(4), 1319-1343.
5. Pandya, P. A., & Dwivedi, D. K. (2016). Constraints in adoption of drip irrigation. *Advances in Life Sciences*, *5*, 2405-2411.
6. Sarkar, J. D. (2015). Correlates of banana growers' characteristics and adoption of recommended banana production technology. *Current Advances in Agricultural Sciences (An International Journal)*, *7*(1), 88-90.
7. Verma, H. L., & Sharma, S. K. (2017). Constraints faced by the farmers in adoption of drip irrigation system in Bikaner district of Rajasthan. *Agriculture Update*, *12*(4), 643-648.