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Research Paper

Determinants of brand preference in drip irrigation system with special reference to coconut farmers

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ABSTRACT : Agricultural sector is the largest water user of the country accounting 70 per cent in world water use, the growing challenge for agricultural development is how to produce more food for increasing population with less water. The estimated land area with irrigated potential in Tamil Nadu is 5.65 million hectares but only 3.19 million hectares of area are irrigated. Continuously, uncontrolled use of water resource leads to exploitation of ground water levels have gone down to uneconomic levels due to over extraction. There are different ways and means of advanced technologies to produce more food with less amount of water. One such technology is drip irrigation. The government also implemented subsidy schemes to encourage the farmers to adopt irrigation technologies. This gives a greater opportunity to drip irrigation companies to market their products by improving their brand image. Brand preference has become pivotal point of differentiation in the market. The present study would focus on determinants of brand preference in drip irrigation system among coconut farmers. Pollachi taluk of Coimbatore district was purposively selected because of coconut crop contributes two third of cultivated area. Data collected from 100 randomly selected farmers those exclusively growing coconut using pretested interview schedule. Percentage analysis, Factor analysis, Logit regression, Garrett ranking and likert scale analysis methods were used to analyze the data. The study revealed that water saving and labour cost were the most influencing factor for the adoption of drip irrigation system. Immediate response by sales executives, market promotion, peer group influence, quality of materials and price were the major determinants of brand preference of farmers. Awareness adoption ratio of subsurface drip and inline drip system was 1:0.50 and 1:0.72, respectively and none has adopted automation technology. The farmers were satisfied with the price, availability of spare parts and government subsidies but highly unsatisfied with after sales service provided by the marketers of drip system.

KEY WORDS : Drip irrigation system, Awareness, Adoption, Brand

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INTRODUCTION :

Diminishing water resources resulted in adoption of modern technologies which are supportive in achieving resource use efficiency in agriculture. Land and water are indispensible resources for agricultural production and

these resources should be precisely managed for economic upliftment of farming community. Urbanization and industrialization causes reduced per capita availability of land and water (FAO, 2011). The large scale exploitation and indiscriminate use of water resources is common problem in across the country. Adoption of resource conserving technologies for efficient utilization of land and water along with improved management practices are vital to achieve sustainable growth in agriculture. The crisis in water sector both has made explicit the inherent inadequacies of dealing water management in agriculture (Amarasinghe *et al.*, 2007). The water saving micro irrigation technologies is promoted by both Central and State Governments of India by providing more than 70 per cent subsidy on installation costs. Because of the benefit water saving and availability of subsidy component, more number of farmers were practicing micro irrigation technologies in their farms to improve the resource use efficiency and also improve the revenue of the farm (Narayanamoorthy, 2005). Area covered under micro irrigation was around 0.55 million hectares in India (Anonymous, 2011). The reduced availability of the water and the government intention to promote judicious use of irrigation water through various subsidy schemes leads the micro irrigation industry in to growth phase. Under this condition the company's which markets drip irrigation products were having good scope and also facing tough competition in the industry. So, the companies should give special attention on farmers' expectations and their preferences on drip irrigation systems (Saksena, 2002). In this context, a study was undertaken with an overall objective of analyze the farmers' expectations and their brand preferences towards drip irrigation systems. The specific objectives of the study are i) to study the awareness and adoption level of advanced technologies in drip irrigation systems ii) to identify the factors influencing the adoption of drip irrigation systems iii) to analyze the determinants of brand preference in drip irrigation systems and to study the satisfaction level of the farmers towards drip irrigation companies.

MATERIALS AND METHODS :

Sampling design :

This study would focus on determinants of brand preference in drip irrigation system among coconut farmers. In first stage Pollachi taluk of Coimbatore district was purposively selected since the coconut crop accounts two third of cultivated area. In second stage two blocks namely Anaimalai and Pollachi North block was selected and in third stage 100 coconut farmers was randomly identified to collect various information for our study. Thus, three stages purposive random sampling method was adopted for the study. Data were collected from respondents through personal interview method with the help of comprehensive pre-tested interview schedule.

Tools of analysis:

Percentage analysis:

Tabular methods were employed to analysis the data pertaining to age, education, occupation, size of holdings, gross cropped area, gross irrigated area, etc by computing simple average, ratios and percentages.

Logit analysis:

The logit analysis was carried out to quantify the relative importance of factors influencing farmers' decision on brand preference on drip adoption. In that micro irrigation technology adopters was a dichotomous dependent variable. Its determinants were assessed using logit model based on logistic cumulative distribution function (McFeddan, 1974 and Maddala, 1983). The logit technique allowed examination of the effects of a number of variables on the underlying probability of adopting micro irrigation technologies.The behavioral model used to examine the factors influencing using bio pesticide was:

$$Yi = g(Zi) \quad \text{.....(1)}$$

$$Zi = a + \sum b_k X_{ki} \quad \text{.....(2)}$$

where,

Y_i = The observed response of the i^{th} respondent (*i.e.* the binary variable Y_1 = 1 adopter and Y_2= 0 for non- adopter)

Z_i = An underlying and unobserved index for the i^{th} respondent (when Z exceeded some threshold Z*, the farmer was observed to be adopter otherwise non-adopter)

X_{ki} = The k^{th} explanatory variable of i^{th} respondent, i = 1, 2… N, where, N was the number of respondent's k = 1, 2… M

M was the total number of explanatory variables a = Constant and b = Vector of co-efficients

The logit model postulated that P_i, the probability that i^{th} respondent selling of, was a function of an index variable Z_i summarizing a set of the explanatory variables.

In fact, Z_i was equal to the logarithm of the odds

ratio, *i.e*. the ratio of probability that the respondent adopting micro irrigation technologies it could be estimated as a linear function of explanatory variable (Xki). This could be mathematically expressed as:

$$Zi = \ln\left\{\frac{Pi}{1-Pi}\right\} = \alpha + \sum_{K=1}^{M} b_k X_{ki} \quad .....(3)$$

Eq. (3) is the logit model and once this equation is estimated, P_i could be calculated:

$$P_i = f(Z_1) = f(a + \sum bX_i) = \left(\frac{1}{1+e^{-zi}}\right) \quad .....(4)$$

The goodness of fit of the model was tested by three approaches.

Firstly, predictions were compared with the observed outcomes and expressed in percentage of correctly predicted.

Secondly, 2-times the log of the likelihood (-2LL) estimate was used as a measure of how well the estimated model fitted the data. A good model was one that resulted in a high likelihood of the observed results.

Empirical model :

Adoption of micro irrigation technologies is dependent on a variety of factors such as number of age, experience, size of land holding etc. In this regard logit analysis can provide better explanation by identifying the determinant factors of micro irrigation technologies. The model is fitted taking into account several explanatory variables. The index variable Z_i indicating whether a respondent or not, was expressed as a function of the above listed variables as:

$$Z_i = a + b_1AGE + b_2EDU + b_3\ FE + b_4LHS + b_5\ DIS + b_6AAAI + b_7\ TCROP + U_i$$

where, U_i is the disturbance-term.

The independent variables used in the model are:

AGE (Age of the respondent):

This is a continuous independent variable indicating the age of the respondents in years. Age hold farmers mostly have not interested in modern technologies. Therefore, *a-priori* expectation was that the probability of adopting drip irrigation was indirectly related to age of the respondents.

EDU (Year of schooling):

Education increased the ability of respondent to interpret, understand and modify new information. Thus, it was treated as a proxy for farmer's managerial ability. It was, therefore, hypothesized that the probability adopting drip irrigation by a farmer was directly related to the farmer's education.

FE (Experience in farming):

Continuous independent variable it was hypothesized that the probability adopting drip irrigation by a farmer was directly related to the experience of the farmer.

LHS (Land holding size):

Farm-size is one of the important factors influencing adoption of modern technology. The total operational holding was likely to affect the probability of adoption of drip irrigation technology because of utilizing the available resources efficiently. Therefore, *a-priori* expectation was that the probability drip adoption was directly related to the size of farm.

PNC (Proportion of non-crop land to total land owned):

The non-crop land area is most influencing in selling of agricultural land. Therefore, expected *a-priori* that farmer with high proportion of non-crop land area was relatively more likely to selling of agricultural land.

AAAI (Access to assurance of irrigation) high assurance-3; moderate assurance -2; low assurance -1; Rainfed -0):

Access to assurance and adequate irrigation help to better farming practices and adopt more commercial crops and maintain subsistence farming. Therefore, *a-priori* expectation was that the probability of adopting drip irrigation was inversely related to the access to assured and adequate irrigation.

TCROP (Type of crop cultivated in the farm):

A-priori expectation of probability of adopting drip irrigation was inversely related to type of crop cultivated in the farm.

Likert scaling technique:

In this approach, the sample respondents were asked to indicate on a five point scale whether they were highly satisfied, satisfied, neutral, dissatisfied, highly dissatisfied with the various attributes of micro irrigation. The responses were recorded and the scores were added to obtain the mean score towards the satisfaction level of the sample respondents. The score for each factor

Table A : Five point scale used for the satisfaction level					
Particulars	Highly satisfied	Satisfied	Neutral	Dissatisfied	Highly dissatisfied
Scale	5	4	3	2	1

responses is given in the Table A.

Garrett's ranking technique:

Garrett's ranking technique was adopted to find the relative importance of various factors as revealed by the respondents in use of drip irrigation in coconut. The conversion method used was as follows. As a first step, the per cent position of each rank was found out by the following formula:

$$\text{Per cent position} = \frac{[100(R_{ij}-0.5)]}{N_j}$$

R_{ij} = Rank given for i^{th} item by the j^{th} individual

N_j = Number of items ranked by j^{th} individual

The per cent position of each rank, thus, obtained was then converted into scores by referring to the table given by Garrett and Wood Worth (1971). The respondents were requested to rank the opinions/reasons relevant to them according to the degree of importance. The ranks given by each of the respondents was converted into scores. Then for each reason, the scores of individual respondents were added together and divided by the total number of respondents. These mean scores for all the reasons were arranged in the descending order and ranks were given. By this method

RESULTS AND DATA ANALYSIS :

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Demographic details of the sample respondents:

The demographic details of the sample respondents were presented in the Table 1 revealed that most of the farmers were large farmers (46%) coming under the age group of 36 to 45 years (46%), completed high school level of education (40%), doing agriculture (64%) as the

Table 1: Demographic characteristics

	Characteristics	Number of respondents	
		100	In (%)
Age (Years)	25-35	9	9.00
	36-45	46	46.00
	46-55	26	26.00
	> 55	19	19.00
Education	Illiterate	10	10.00
	Primary	10	10.00
	High School	40	40.00
	Higher secondary	18	18.00
	Graduate	22	22.00
Occupation	Agriculture only	64	64.00
	Agriculture and business	24	24.00
	Agriculture and private job	5	5.00
	Agriculture and Govt job	7	7.00
	<5	4	4.00
Farming experience (Years)	5-10	26	26.00
	11-15	33	33.00
	>15	37	37.00
Size of land holding	Upto 2.50 (marginal)	6	6.00
	2.50-5.00 (small)	19	19.00
	5.01-10.00 (medium)	29	29.00
	> 10.00 (large)	46	46.00

main occupation with more than 15 years of experience (37%).

Source of information about micro irrigation technologies:

Source of information plays a critical role in the purchase of drip irrigation systems and also influence the brand preference. It could be observed from the Table 2 that private dealers (37%) were the major source of information, followed by friends and relatives (20%), company representative (17%), department of agriculture and agricultural university (10%) and finally the sugar factory extension workers (3.33%) and others contributed 9 per cent. These results indicated that private dealers were the major source of information for the sample respondents.

Awareness and adoption ratio:

Awareness indicates the familiarity and popularity of the product among the sample respondents. The details of the number of farmers who were aware of advanced technologies of drip irrigation systems were presented in Table 3. The results showed that 46 per cent of the sample respondents were aware of subsurface irrigation technology and 66 per cent of the farmers were aware of inline drip system and 55 per cent of the farmers were aware of automation technology. This indicates a huge scope for these technologies by creating awareness through proper marketing initiatives. Regarding inline drip system the awareness adoption ratio was 1:0.72 and subsurface system was 1.0.5. Even though 55 per cent of the farmers were aware about drip irrigation and none of the respondents use the automation technology in drip irrigation.

Demographic factors influencing the adoption of micro irrigation technologies:

The logit model was used to identify the demographic

Table 2: Source of information on the drip irrigation system **(n=100)**

Sr. No.	Source of information	Number of farmers	Percentage to total
1.	Department of agriculture/TNAU	10	10.00
2.	Company representative	17	17.00
3.	Private dealer	37	37.00
4.	Friends and relatives	20	20.00
5.	Sugar factory extension workers	7	7.00
6.	Others	9	9.00
	Total	100	100.00

Table 3 : Awareness bout the advanced technologies of drip irrigation systems

Technology	Awareness level (%)		
	Subsurface drip	Inline	Automation
Aware	46	66	55
Unaware	54	34	45
Awareness level (%)	46	66	55
Awareness to adoption ratio	1:0.50	1:0.72	1:00

Table 4 : Demographic factors influencing the adoption of micro irrigation technologies

Variables	Estimated co-efficient	T-Ratio	Odds ratio	Probability
Age (Years)	0.046	1.138	1.047	0.51
Education (Years)	0.122	2.051*	1.129	0.53
Farming experience (Years)	-0.045	-1.092	0.956	0.49
Size of land holding (acres)	0.013	0.388	1.014	0.50
Access to assured and adequate irrigation	-0.180	-1.985*	1.197	0.54
Occupational status of farmers	0.250	0.503	1.284	0.56
Type of crop cultivated	0.590	1.944**	1.803	0.64

-2 log likelihood 69.13 (Note: * and ** indicate significance of values at P=0.01 and 0.05, respectively)

factors which influenced the adoption of micro irrigation technologies and the maximum likelihood technique was used for the estimation. From the model summary -2 log likelihood was got as 69.13 which indicated that the model is good fit because higher the value of -2 log likelihood better the model fit. The results of the logistic regression analysis suggested that education and type of crop cultivated by the respondents make positive impact in adoption of drip irrigation system. Conversely the variable access to assure and adequate irrigation discriminate the adoption with negative sign was, as shown by the respective t-ratio. From the results of logistic regression analysis it could be inferred that with one unit increase in education of the respondents, the probability of adopting drip irrigation was increased to 53 per cent. Type of crop cultivated greater was the chance of adopting drip

Table 5 : Reason for adoption of drip irrigation system

Sr. No.	Reasons	Score	Rank
1.	Water saving	72.29	I
2.	Labour cost reduction	63.79	II
3.	By observing success in nearest field	49.30	III
4.	Increase in yield	48.24	IV
5.	Large farm size	45.46	V
6.	Availability of subsidy	36.79	VI
7.	Fertigation possibility	35.14	VII

Table 6: Result of rotated component matrix

Variables	Components					Communalities
	1	2	3	4	5	h^2
Price	-.813	.053	.099	-.034	.209	.718
Proper design	.010	-.104	.376	.560	.353	.591
Brand image	-.165	.622	-.353	.102	.028	.550
Good quality materials	.739	-.126	-.351	.146	.127	.723
Proper after sales service	.520	.172	.238	.043	.450	.562
Guarantee period	.315	-.109	.015	.562	.153	.450
Peer group influence	.087	-.174	.024	-.793	.257	.733
Local manufacturing facility	-.636	.014	-.438	.041	-.117	.612
Market promotion	-.107	-.117	.870	.131	-.134	.817
Easy approachability of sales force	.051	.711	-.140	-.371	-.176	.696
Recommended by Government	.005	-.752	-.191	-.152	-.251	.688
Immediate response	.019	-.064	.173	-.001	-.898	.841
Variance explained	19.25	15.12	13.20	9.56	9.33	66.50 (Total)

(Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser Normalization)

Table 7: Satisfaction level of the farmers towards drip irrigation companies

Sr. No	Particulars	Mean score	Satisfaction level
1.	Price	3.86	Satisfied
2.	Availability of spare parts	3.44	Satisfied
3.	Government subsidies	3.17	Satisfied
4.	Technical assistance	3.13	Satisfied
5.	Quality of the product	1.80	Unsatisfied
6.	Proper installation	1.11	Unsatisfied
7.	Agronomy support	1.05	Unsatisfied
8.	After sales service	1.00	Highly unsatisfied

irrigation. The probability of adopting drip irrigation has increased by 64 per cent. In other words, the farmers with diversified crop cultivation that were more interested in adoption drip irrigation.

Factors influencing the adoption of drip irrigation system:

The major factors influencing the purchase of drip irrigation system in the study area were collected, analyzed and the results are furnished in Table 5. Among the various factors identified, water saving was the most influencing factor (72.29) for the adoption of drip irrigation system followed by labour cost reduction with a mean score of 63.79, followed by observing success in neighbour field and increase in yield with the mean score of 49.30 and 48.24, respectively. Large farm area operation was a moderate influencing reason with the mean score of 45.46, followed by availability of subsidy and possibility of fertigation were the lowest influencing factors with the mean score of 36.79 and 35.14, respectively.

Determinants of brand preference in drip irrigation system:

The major factors determining the preference of a particular brand of drip irrigation system in the study area were collected, analyzed and the results are presented in Table 6. Factor analysis is a multivariate statistical technique used to reduce the large number of variables in to smaller number of variables called factors or components. The twelve variables have been grouped into five factors based on component matrix, eigen values and communalities. The results indicate that first five components explained 66.49 per cent of the variability in the original twelve variables. So, we can reduce the original data in to five factors (Eigen values greater than one) with minimum loss of information (33.6%).

Results of rotated component matrix:

The factors are rotated with the Varimax with Kaiser Normalization rotation method. We have used principal component analysis method for factor extraction and considered only those factors whose values more than 0.50 for the purpose of interpretation. From the Table 6 it shows that factor 1 explained about 19.25 per cent of total variation and heavily loads on price, good quality materials, local manufacturing facility and proper after sales service. The factor 2 explained about 15.12 per cent of the total variation and this factor loads heavily on recommended by government, easy approachability of the sales force and brand image. The variable market promotion have high loading on factor 3 and it explained about 13.20 per cent of the total variation. From the table we find variables like peer group influence, guarantee period and proper design have high loading on Factor 4 and this explained about 9.56 per cent of the total variation. Factor 5 explained about 9.33 per cent of the total variance and this factor heavily loads on the variable immediate response.

Satisfaction level of the farmers towards drip irrigation companies :

The satisfaction was an important factor which played a major role in decision making for the purchase. It is evident from the above table that major share of farmers in the study area were satisfied with the price of drip system followed by availability of products, government subsidies and technical assistance. At the same time, the farmers were not satisfied with the quality of materials, agronomy support and proper installation. They were highly unsatisfied with the after sales services offered by the drip marketing companies.

Conclusion:

From the above discussion it could be concluded that the drip irrigation marketing companies should increase the awareness level of subsurface drip system, inline drip system and automation technology among the farmers to improve their brand image and market share. Water saving and labour cost reduction were the most influencing factors for the adoption of drip irrigation system among the farmers. Hence the drip marketing companies must concentrate the areas where the water scarcity and labour shortage was the major problem. Immediate response by sales executives, market promotion, peer group influence, quality of materials and price were the major determinants of brand preference of farmers. The drip marketing companies should improve their after sales services to build brand image among the farmers.

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