



## Extent of adoption behaviour of true potato seed cultivation technologies of the farmers in Khowai District of Tripura

Garani Debbarma, M.Kunjaraj Singh and Daya Ram\*

Department of Extension Education, College of Agriculture, Central Agricultural University, Imphal-795004, India

\*e-mail: d.dram@rediffmail.com

(Received: April 21, 2015; Revised received: October 19, 2015; Accepted: October 22, 2015)

**Abstract:** Potato is the most abundantly produced edible food in the world, next to cereal. Potato is a wholesome food. Apart from starch of which it is a rich source, it provides essential body-building substances such as vitamins minerals and protein. Potato is one of the richest sources of calories needed to main day-to-day output of human energy. The present study was carried out in Tripura during 2013-14. A Sample of true potato seed farmers comprising 150 respondents was selected on stratified random sampling with proportional allocation method. The primary data was collected using pre-tested structured interview schedule. All of the farmers used treated seeds because tuber lets were already treated by dealers and farmers are also aware of the benefits of treated seed. Majority 50 per cent of the respondents had medium extent of adoption followed by high level of adoption 45 per cent and low 5 per cent level of extension. This indicates that majority of the farmers were in medium and high level of adoption due having good knowledge and aware of high production as compare to tradition potato seed cultivation practices. Correlation coefficients between Family size, Education, Annual income, Operational land holding Cropping intensity Innovation-proneness Economic motivation Risk orientation, Contact with extension staff, Mass media exposure and Sources of information were found to be positive and significant of personal, psychological & communication characteristics with adoption of TPS cultivation technology of the farmers.

**Keywords:** Extent of Adoption, True Potato Seed, Variables and Technologies

### Introduction

Potato is an important crop in the North Eastern Region in India especially the hilly tracts, where the crop is grown under rain fed conditions. The crop is grown throughout the year in one or the other part of the North Eastern region contributing about 10 per cent of the total area under potato in the country Gupta *et al.*, (2004). The said crop forms an important part of prevailing cropping systems Kumar *et al.*, (2006) as well as the dietary food habits of the people of the region. In TPS technique, the seedlings raised in nursery beds are transplanted in the field and grown to maturity. TPS is sown in narrow inter space of 10 cm × 10 cm with 5 cm plant-to-plant distance. A total of 100 plants per m<sup>2</sup> are to be maintained in all cases. Both transplantation method and seedling tuber are used for producing of potato using TPS. In the latter, the TPS seedlings are grown to maturity in nursery beds to obtain seedling-tubers. These seedling-tubers are used as seed for raising normal potato crop in next season. TPS technology is likely to gain momentum in future particularly in states viz; Karnataka, Maharashtra, Madhya Pradesh, Orissa and the states of N-E regions where good quality seed tubers are either not available or are too expensive. TPS can be stored by farmers conveniently and inexpensively from one planting season to another. It is also easy and economical to transport. TPS can be easily introduced into existing farming system because planting time does not depend upon the sprouting stage of seed tubers. It can expand potato cultivation into regions that previously were

unable to produce potatoes, practically warm, humid tropical areas where it is difficult to produce and store high quality seed tubers. As micro tuber-lets are used as seed materials, only 700-750 gm is enough for 1 ha. Area compared to 2.5 q/ha. Moreover, this also substantially reduces handling, labour and storage cost.

The potato area in the state of Tripura is around 5665 hectare, with a productivity of 15 million tonnes per hectare. The per capita availability of potato per annum in the state is around 24 kg, against the national average availability of 18 kg/per annum. However, a comprehensive plan is needed to raise the per capita availability at least 30 kg by increasing the potato production as well as productivity. Though farmers grow potato in some parts of state, the production doesn't meet the requirement Anonymous (2002). Tripura is one of N-E states where this important technology has been under practice since late 1990's. The production of TPS in Tripura is also insufficient mainly due to lack of suitable irrigation methods in one hand and inefficient in production technology used by the farmers. In spite of such comparative advantages of TPS over conventional technique of potato cultivation, there is high degree of variation in terms of its popularity and spread across the state, thereby necessitating due investigation into the situation in relation to farmer's personal, socio economic, psychological, communication characteristics and adoption behaviour of the farmers at the micro level means individual study of the farmer's characteristics in village level.

In view of above facts and notions the present study was carried out with the specific objective viz. to assess the extent of

adoption behaviour of True Potato Seed cultivation technologies of the farmers in Khowai district of Tripura.

**Materials and Methods**

The present study was carried out in Tripura during 2013-14. Out of total eight districts in the state, Khowai district was selected keeping in view of highest population, population density and highest true potato seed growers. Khowai District of Tripura was selected purposively for present study. Ex-post facto research design was employed. Khowai district comprises of 3 blocks. Khowai block was selected purposively since majority of the farmers was cultivating TPS. Three villages were selected randomly in the block for present study. A Sample of true potato seed farmers comprising 150 respondents was selected from each village of the block based on stratified random sampling with proportional allocation method. Structured questionnaire schedule was used to collect data and sixteen scale Pearson's extent of adoption behaviour index Rogers (1962) for individual farmer was computed from the adoption score for the True Potato Seed cultivation technologies. The primary data was collected using pre-tested structured interview schedule. Analysis of primary data was carried out using multidimensional scaling technique of SPSS-16 besides conventional correlation analysis as part of exploratory approach of data analysis.

**Results and Discussion**

**Extent of adoption of TPS cultivation technologies practices of the farmers:** This section deals with the extent of adoption of True potato seed cultivation technology of the farmers and item analysis of adoption of recommended cultivation practices. In total, sixteen selected cultivation practices of True Potato Seed were studied in terms of the number of adopters as well as the extent and nature of adoption of each individual practice.

**Used of Hybrid variety seeds:** Cent per cent of the respondents showed full adoption of hybrid varieties seed. The reason for this is the

**Table-1:** Distribution of respondents based on TPS cultivation technologies practices among the farmers (N=150)

Package of Practices	Extent of adoption		
	Full adopter Frequency	Partial adopter Frequency	Non-adopter Frequency
Used of recommended TPS	150(100)	0(0)	0(0)
Tuberlet seed rate	119(79)	31(21)	0(0)
Seed treatment	150(100)	0(0)	0(0)
Transplanting time	128(85)	22(15)	0(0)
Ridges	88(60)	62(40)	0(0)
Ridges spacing	97(65)	53(35)	0(0)
Spacing	83(55)	67(45)	0(0)
Farmyard manure	93(62)	57(38)	0(0)
N-used	72(48)	78(52)	0(0)
P-used	44(29)	34(23)	72(48)
K-used	58(39)	30(20)	62(41)
Irrigation in furrows	31(21)	99(66)	20(13)
No. of irrigation	54(36)	34(23)	62(41)
Earthing up	66(44)	84(56)	0(0)
Plant protection	82(55)	53(35)	15(10)
Haulm cutting	54(36)	43(29)	53(35)

easy availability of hybrid seeds in the market and aware of high yield of crops Singh (2003), Singh (2004) and Singh & Chauhan (2006).

**Tuberlet Seed rate:** Majority of the respondents used recommended 79 per cent seed rate followed by partial adoption 21 per cent .The possible reason might be that they have proper knowledge about the advantage of planting seed at proper rate and too close planting may cause the seedlings to lanky Kumar (2003).

**Seed treatment:** All of the farmers used treated seeds because tuber lets were already treated by dealers and farmers are also aware of the benefits of treated seed Singh (2003), Singh (2004) and Singh & Chauhan (2006).

**Transplanting time:** Majority of the respondents 85 per cent showed full adoption of recommended transplanting time followed by 15 per cent of partial adoption and non-adoption of the growers found in nil adoption. It can therefore, be concluded that majority of the farmers were aware of right time of planting to get good yield.

**Ridges:** Majority of the farmers 60 per cent adopted recommended ridges fully followed by partial adoption 40 per cent It may be concluded that proper maintain the height of the ridges which can easier of earthing up as well as irrigation.

**Ridges spacing:** Majority of the farmers 65 per cent adopted the recommended ridges spacing followed by 35 per cent of partial adoption. It can be concluded that maintaining of ridges spacing helpful to easier in weed control and earthing up.

**Spacing:** Majority of the farmers 55 per cent were found in full adopted followed by partial adoption in spacing 45 per cent in spacing. The reason for using lesser spacing by 45 per cent of the respondents might be that in less fertile land used more close planting.

**Table-2:** Distribution of respondents based on their extent of adoption of TPS Cultivation technologies practices of the farmers. (Overall) (N=150)

Category	Respondents	
	Frequency	Percentage
Low	8	5
Medium	75	50
High	67	45
Total	150	100

**Table-3:** Correlation of personal, socio psychological and communication characteristics with the extent of adoption of TPS cultivation technologies practices

Characteristics	"r"
Age	.055(NS)
Family size (x <sub>2</sub> )	0.018(NS)
Education (x <sub>3</sub> )	0.830**
Annual income (x <sub>4</sub> )	0.635**
Operational land holding (x <sub>5</sub> )	0.447**
Level of organic manure used (x <sub>6</sub> )	0.368**
Cropping intensity (x <sub>7</sub> )	0.174*
Innovation proneness (x <sub>8</sub> )	0.396**
Economic motivation (X <sub>9</sub> )	0.358**
Risk orientation (x <sub>10</sub> )	0.493**
Contact with extension (x <sub>11</sub> )	0.210**
Mass media exposure (x <sub>12</sub> )	0.157*
Sources of information (x <sub>13</sub> )	0.538**

\*\* Significant at 0.01 level; \*Significant at 0.05 level; NS-Non-Significant

**Table-4:** Regression co-efficient of personal, socio-psychological and communication characteristics of with the extent of adoption of TPS cultivation technologies practices

Characteristics	Beta co-efficient	Regression co-efficient (b)	Std. error(S.E) 'b'	t-value of 'b'
Age	-0.004	-0.001	0.011	-0.082
Family size	-0.014	-0.024	0.076	-0.321
Education	0.711	3.32**	0.293	11.33**
Innovation-proneness	0.057	0.131	0.112	1.171*
Economic motivation	-0.014	-0.008	0.032	-0.259
Risk orientation	0.075	0.031	0.024	1.254*
Annual income	0.167	0.372	0.134	2.772**
Organic manure	0.058	0.131	0.112	1.181*
Operational land holding	0.039	0.138	0.187	2.181**
Cropping intensity	0.048	0.008	0.008	0.093
Contact with extension staff	-0.015	-0.003	0.059	-0.044
Mass media exposure	-0.086	-0.69	0.042	-1.652
Sources of information	0.139	0.055	0.026	2.153**

R<sup>2</sup>= 0.748; F= 31.129; \*\*Significant at 0.01 level; \* Significant at 0.05 level

**Farmyard manure:** Majority of the farmers 62 per cent adopted the recommended farmyard manure in full adoption followed by 38 per cent of partial adoption. The reason is that due to unavailability of farm yard manure. They do not apply recommended doses Singh (2003) & Singh (2004).

**N-used:** Majority of the farmers 52 per cent showed partial adoption of recommended N- fertilizer used followed by 48 per cent full adoption and none of the farmers are in nil adoption. It may be concluded that majority of the farmers had used nitrogenous fertilizer on their crops fully or partially. This might be due to the fact that they could visualize the pronounced effect of nitrogenous fertilizer in the crop Singh (2003) & Singh (2004).

**P-used:** Majority of the farmers 48 per cent are in nil adoption followed by full adoption 29 per cent and partial adoption 23 per cent in phosphate fertilizer used. This might be due to fact that they were not aware about the roles and importance of this recommended dose. Another reason might be its high cost and invisible direct effects Singh (2003) & Singh (2004).

**K-used:** Majority of the farmers 41 per cent were found in nil adoption followed by 39 per cent in full adoption and 20 per cent in partial adoption it might be concluded that adoption of potassic fertilizer used were very low due to the fact that they lacked of knowledge about this recommended doses, low innovativeness. Another reason might be invisible direct effect and high cost Singh (2003) & Singh (2004).

**Irrigation in furrows:** The data revealed that majority of the farmers 66 per cent of farmers were found in partial adoption followed 21 per cent in full adoption and 13 per cent in nil irrigation in furrows. The reasons for deviation from recommended level of water by some of the respondents might be shortage of water.

**No. of irrigation:** Majority of the farmers were 41 per cent in nil adoption followed by 36 per cent in full adoption and 23 per cent in partial adoption. It might be concluded that farmers had low adoption due to lack of knowledge about recommended number of irrigation.

**Earthing up:** Majority of the farmers 56 per cent showed in partial adoption 44 per cent followed by full adoption and non-adoption of

farmers were in nil adoption in earthing up. Most of the farmers were aware of in earthing up which needed in tuber formation and good yield.

**Plant protection measures:** The data revealed that 55 per cent of the respondents showed adopted in full adoption. However, 35 per cent of the respondents were in partial adoption followed by and 10per cent of the respondents were in nil adoption. The probable reason may be due to lack of knowledge, high cost of plant protection chemicals and non-availability of plant protection chemicals. Another reason might be due to less infestation of disease and pest in hybrid T.P.S Singh & Chauhan (2006).

**Haulm cutting:** In haulm cutting practices 36 per cent in full adoption followed 35 per cent in nil adoption and 29 per cent in partial adoption. The recommended haulm cutting practices were not due to lack of knowledge and aware of the practice

Table -2 reveal that majority 50 per cent of the respondents had medium extent of adoption followed by high level of adoption 45 per cent and low 5 per cent level of extension. This indicates that majority of the farmers were in medium and high level of adoption due having good knowledge and aware of high production as compare to tradition potato seed cultivation practices Deb *et al.*, (2013) and Singh *et al.*, (2010).

This section deals with the nature of relationship between dependent variable and independent variables. Correlation between the dependent variable, adoption and the thirteen independent variables were computed separately for the sample farmers. The 'r' values are shown in table-3

Correlation coefficients between Family size, Education, Annual income, Operational land holding Cropping intensity Innovation-proneness Economic motivation Risk orientation, Contact with extension staff, Mass media exposure and Sources of information were found to be positive and significant of personal, psychological & communication characteristics with adoption of TPS cultivation technology of the farmers Mazumder *et al.*, (2011), Singh and Chauhan, Jadav *et al.*,(2010) and Kalita *et al.*,(2005). Whereas age and family size, was found to be negative significance of

personal, psychological & communication characteristics with adoption of TPS cultivation technology of the farmers. All the 13 independent variables were taken for regression analysis. The findings of the analysis are presented in table. Out of 13 independent variables fitted in regression analysis 4 variables namely Education, annual income, operational land holding and source of information contributed significantly to the prediction of adoption of TPS cultivation. These four variables may be termed as good predictor of adoption behavior. The efficacy of the variable, education ( $X_3$ ) had found that one unit change in education had added to the 0.711 unit change in value of adoption by farmers similarly, the efficacy of the variables, annual income ( $X_7$ ) had found that one unit of change in annual income had 0.167 unit change in value of adoption by farmers, the efficacy of the variables, operational land holding ( $X_9$ ) had found that one unit of change in operational land holding had added to the 0.039 unit change in the value of adoption behavior of farmers, and the efficacy of variables source of information ( $X_{13}$ ) had found that one unit of change in source of information 0.139 unit change in value of adoption behavior of farmers. It was observed that education ( $X_3$ ) emerged as the most significant characteristic ( $b = 3.32$ ) in adoption of TPS cultivation followed by annual income ( $X_7$ ) with significant characteristics ( $b = -0.372$ ), operational land holding with significant characteristics ( $b = 0.138$ ) and source of information ( $X_{13}$ ) with significant characteristics ( $b = 0.055$ ) in adoption of TPS cultivation. The value of  $R^2 = 0.748$  suggested that all the 13 variables jointly contributed 74.8 per unit towards the variation in adoption behavior of TPS cultivation. The F value (31.129) was also found to be significant at 0.01 level of probability De (2004).

On the basis of the study conducted, it could be concluded that majority 50 per cent of the respondents had medium extent of adoption followed by high level of adoption 45 per cent and low 5 per cent level of extension. This indicates that majority of the farmers were in medium and high level of adoption due having good knowledge and aware of high production as compare to tradition potato seed cultivation practices. Correlation coefficients between Family size, Education, Annual income, Operational land holding Cropping intensity Innovation-proneness Economic motivation Risk orientation, Contact with extension staff, Mass media exposure and Sources of information were found to be positive and significant of personal, psychological & communication characteristics with adoption of TPS cultivation technology of the farmers. It was found that the variables Education Annual income, operational land holding and source of information contributed significantly to prediction of adoption behaviour and therefore is good predictors for the extent

of adoption behaviour of TPS cultivation technology practices of potato growers Sah (2003) and Kumar *et al.* (2003).

### Acknowledgments

The authors acknowledge the contributions of Miss Garani Debbarma, Dr. M.Kunjaraj Singh and Dr. Daya Ram, of Department of Extension Education, College of Agriculture, Central Agricultural University, Imphal, Manipur for their technical support and valuable contributions to the manuscript.

### References

- Anonymous: Basic statistics of North Eastern Region. Govt. of India, North Eastern Council, Shillong (2002).
- Deb, S., Kumar, S. and Ar. Chowdhary, P.: Production technology of hybrid True Potato Seed. Industrial Biotechnology, Bharath University, Chennai, India. Horticulture Research Complex, Nagicherra, Tripura (west), India (2013).
- De, Dipak: Scientific temperament of potato growers and its correlates. *Indian J. of Ext. Edu.*, **40**: 89-98 (2002).
- Gupta, V.K., Thakur, K.C., Kumar, S., Pandey, S.K. and Sah, U.: True Potato Seed- An alternative technology for potato production in North eastern hill region. Technical bulletin no 64, Central Potato Research Institute, Shimla. p. 1, (2004).
- Jadav, N.B., Viradiya, M.B. and Khunt, K.A.: Adoption of salinity management practices by farmers of coastal area of western Gujarat. *Indian Res. J. Ext. Educ.*, **10**: 37-41 (2010).
- Kalita, Acharya, H.K. and Pradhan, S.K.K.: Adoption behaviour of vegetable growers in relation to their personal characteristics. *Environ. and Ecol.*, **23**: 963-966 (2005).
- Kumar, S., Singh, P.H., Gupta, P.H., Sah, U. and Pandey, S.K.: Integrated development of Horticulture in North Eastern states of India (MMI), Technical bulletin no 76, Central Potato Research Institute, Shimla. p. 4 (2006).
- Kumar, S., Sah, U., Gupta, V.K. and Deka, C.: On-farm evaluation of selected Hybrid TPS in Meghalaya. *J. Indian Potato Assoc.*, **30**: 29-30 (2003).
- Mazumder, G., Das, J.K., Pradhan, K. and Ghosal, R.: Correlates of winter vegetable production in North 24 Paragana district of West-Bengal. *Indian Res. J. Ext. Educ.*, **11**: 27-31 (2011).
- Rogers, E.M: Diffusion of Innovations. The Free Press, New York, Reprinted in 1973 (1962).
- Singh, B. and Chauhan, T.R.: Adoption of mungbean production technology in Arid zone of Rajasthan. *Indian J. Ext. Educ.*, **10**: 73-77 (2010).
- Sah, U.; Kumar Shantanu and V.K. Gupta: Farmers' Perception of TPS Technology: A Study of East Khasi Hills District of Meghalaya. *J. Indian Potato Assoc.*, **30**: 31-32 (2003).
- Singh, B.K., Singh, D.K., Yadav, V.P.S. and Singh, Lotan: Adoption behaviour of commercial potato growers in districts of Ghaziabad (U.P). *Indian Res. J. Ext. Educ.*, **10**: 5-9 (2010).
- Singh, Bhagwan: Adoption behaviour of farmers in arid zone of Rajasthan. *J. of Arid Legumes*, **11**: 46-49 (2003).
- Singh, Bhagawan: Adoption of gaur technology in arid zone of Rajasthan. *J. of Arid Legumes*, **1**: 122-124 (2004).
- Singh, Bhagawan and Chauhan, T.R.: Factors influencing the adoption of moth bean production technology in arid zone of Rajasthan. *J. of Arid Legumes*, **3**: 34-38 (2006).