Adoption Consistency of Climate Smart Agriculture Practices among Farmers of Vulnerable Areas to Flood in Assam

S. Barman[1], P.K. Neog[2], P.K. Pathak[3], P. Mishra[4] and H. Saikia[5]

1. Asstt. Prof. (Ext. Edu.), COA, 2. Director, Extension Education Institute (NER),
3. Director, Extension Education, 4. Prof. and Head, Department of Extension Education, COA,
5. Asstt. Professor (Agri. Statistics), College of Sericulture, Assam Agricultural University, Jorhat, Assam

Corresponding author e-mail: sundar.barman@aau.ac.in

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ABSTRACT

Agriculture has become a high-risk profession towards climate change and weather variability, which have direct impact on farmers' socio-economic condition, and at the same time has to face challenge to provide food security for ever increasing population. So, there is a need to study the different aspects of climate smart agriculture and the present study is an attempt to assess the adoption consistency of farmers about CSA practices and factors likely to influence thereon. The adopters of overall selected practices were 79.85 per cent. The adoption consistency for overall selected CSA practices was of medium level for majority of respondents (58.25%). The LMR model showed that adoption consistency was expressed variation by selected explanatory variables with 23 per cent (R^2=0.23). 'Age' (X_1), 'dependency ratio of family' (X_3), 'proportion of low land' (X_4), 'market accessibility' (X_7) and 'cropping intensity' (X_9) were found to have positive and significant influence on adoption consistency. In order to increase adoption consistency, extension agencies, both in public and private sectors, should put forward strategic effort to make farmers aware of climate change and its impact on food production. Regular extension and technology backstopping is very important for increasing adoption consistency of farmers. The different stakeholders (both public and private) in input and output chains should work in convergence mode as a common entity so that farmers get necessary environment for adoption of technologies

Key words: *Climate change; Weather; Food security; Adoption;*

Climate change poses a threat to food access for both rural and urban populations by reducing agricultural production and incomes, increasing risks and disrupting markets. Poor producers, the landless and marginalized ethnic groups are particularly vulnerable (*Olsson et al., 2014*). Climate change is estimated to have already reduced global yields of maize and wheat by 3.8 per cent and 5.5 per cent, respectively, and many researchers warn of steep declines in crop productivity when temperatures exceed critical physiological thresholds (*Lobell et al., 2011; Battisti and Naylor, 2009; Wheeler et al., 2000*). However, the country faces major challenges to increase its food production to tune of 300 million tonnes by 2020 in order to feed its ever-growing population. Per capita availability of arable land has been declining and by 2020 it will be 0.08 ha. Agriculture, which accounts for nearly 14 per cent of greenhouse gas emissions, also contributes to climate change, and it is projected to increase emission along with increase in agricultural productivity. Climate-smart agriculture (CSA) can avoid this 'lose-lose' outcome by integrating climate change into the planning and implementation of sustainable agricultural strategies. The World Bank proposed "climate-smart agriculture" or "triple wins": attaining higher yields, placing more carbon in the soil, and achieving greater resilience to heat and drought for addressing the issue of food security and climate change (*FAO, 2013*). So, flood and drought tolerant varieties, integrated nutrient management, integrated pest management, minimum tillage, organic farming, vermicompost preparation and application are some of the important practices which fulfil the triple wins of climate smart agriculture. As an approach for transforming and reorienting agricultural development under the new realities of climate change, the Indian Council of Agricultural Research (ICAR) launched a country wide programme entitled National Initiative on Climate Resilient Agriculture (NICRA) during February 2011. On-farm participatory demonstrations of available technologies are being implemented in 100 most vulnerable districts of India (*Rama Rao et al. 2013*). Climatic vulnerabilities addressed are drought, flood, cyclone, heat wave, cold wave etc. In Assam, four districts *viz*., Cachar, Dhubri, Dibrugarh and Sonitpur are such vulnerable districts to flood where on-farm participatory demonstration program under NICRA project were implemented during 2011. On-farm participatory demonstrations along with training session, farmer to farmer learning on various climate smart technologies like Stress tolerant varieties of rice, Integrated pest management, Integrated nutrient management, vermicompost preparation and application and minimum tillage were organized in the NICRA villages of respective district from 2011 to 2013.These technologies are considered as climate smart as they fulfil at least two pillars of climate smart technology (*Boto et al., 2012; Bedmar et al., 2016; Deng et al., 2016; Saravanan, 2013; Thierfelder et al., 2015; FAO, 2012; CIAT, 2017; Aryal et.a., 2018*). The studies conducted by *Long et al., 2016* and *Mutoko et al., 2015* revealed that a range of factors influence the adaptation of climate smart agriculture practices i.e., farm size, farm income, use of credit and subsidies. It was also found that wider policy, institutional and social structures and processes may affect adoption. The main constraints to adopt of CSA practices include unpredictability of weather, high farm input cost, lack of access to timely weather information and water resources. A clear understanding of the factors that influence farmers' adaptation decisions is essential to the designing of appropriate policies to promote effective adaptation in the agricultural sector. Adopting multiple CSA techniques helps in building a sustainable agricultural production system, well resilient to climate related shocks. Therefore, all the relevant stakeholders should strive to guide and facilitate farmers for adoption of climate smart agriculture. Farmers' ability to adapt to climate change and weather variability is determined by many predictor variables which are social, cultural, economic and institutional in nature. Thus, understanding and analysing the determinants of farmers' decision to adopt a particular practice among the available choices may provide insights into the factors that enable or constrain adaptation. Such investigation provides useful knowledge on the dynamics of adoption of the CSA practices. Keeping the above point in view the present study was carried out to assess the adoption consistency of farmers regarding CSA practices in vulnerable areas to flood in Assam and their socio economic factors influence on it.

METHODOLOGY

The present study was carried out in four districts of Assam representing four agro climatic zones Upper Brahmaputra valley zone, North Bank Plain Zone, Lower Brahmaputra Valley Zone and Barak valley Zone. The districts were Dibrugarh, Sonitpur Dhubri and Cachar where Krishi Vigyan Kendras of respective district implemented NICRA Project since 2011. From each district one village was selected purposively where activities of NICRA project were implemented. The four villages namely Namtemera missing gaon, from Dibrugarh district, Punioni Baghchung from Sonitpur District, Udmari part IV village from Dhubri district and Salchapra-I from Cachar district were selected for the present study. Altogether 400 participating farmers of NICRA Project were selected as sample respondents by following proportionate random sampling methods from each village.

Adoption consistency regarding a technology refers the decision to make use of it as the best course of action and to continue. Five practices namely 'vermicompost preparation and application', 'integrated nutrient management', 'minimum tillage', 'integrated pest management' and 'stress tolerant varieties' which fulfil the triple role of climate smart agriculture (*Boto et al., 2012; FAO, 2012.; CIAT, 2017; Aryal et.a., 2018*) were demonstrated in the selected villages by the respective KVKs. Then, a set of items on different aspects of selected CSA practices were screened through consultation with concerned KVK scientists and experts from Assam Agricultural University, Jorhat. Thus the structured schedule was constructed which constituted the recommended practices of selected CSA practices.

The adoption consistency score of each CSA practices was calculated out by considering area covered either by full adoption or adoption with modification to the total potential area and expressed in percentage and number of year continued. In the present study, adoption consistency score was calculated by using the following formula-

$$AC_{xi} = \frac{AAxi}{PAxi} \times 100 + T_{xi}$$

Where,

AC_{xi} = Adoption consistency for x^{th} respondent in i^{th} practices

AA_{xi} = Actual area covered for x^{th} respondent in i^{th} practices

PA_{xi} = Potential area of x^{th} respondent for i^{th} practices

T_{xi} = Number of year used of i^{th} practices by x^{th} respondent

Then score was assigned to the percentage of area covered as score 1 for 10 per cent area covered, score 2 for 20 per cent area covered. Likewise, score for continuation of a practice was assigned against the number of year continued as 1 score for one year, 2 scores for two years and 3 scores for three years and so on. In the present study, the reference years for collection of response regarding continuation of a practice were 2013 to 2017. Thus maximum obtainable score for a respondent in a CSA practices was 15. The adoption consistency for each selected CSA practices namely 'vermicompost preparation and application' (VC); 'integrated nutrient management' (INM); 'minimum tillage'(MT); 'integrated pest management'(IPM) and 'stress tolerant varieties'(STVs) were analysed.

In order to get adoption consistency score of a respondent on overall CSA practices Euclidian distance was measured for better representation in regression analysis. The Euclidean distance was measured by using following formula-

$$d = \sqrt{\sum_{i=1}^{p} (v_{1i} - v_{2i})^2}$$

Where,

d = Euclidean distance

V_1, V_2= variables

Based on the total scores obtained, the respondents were classified into three categories, keeping the mean and standard deviation as check.

Again, in order to depict detail picture about adoption of CSA practices, respondents were categorized based on adoption as recommended, adoption with variation and non adoption in each important aspect of selected CSA practices. The frequency and percentage of adopters of five reference years i.e. .2013, 2014, 2015, 2016 and 2017 were calculated for highlighting the pattern of adoption.

All total 12 independent variables namely age, educational experiences dependency ratio of family, proportion of low land, annual farm income, market accessibility, farm experience, cropping intensity, degree of commercialization, degree of innovative proneness, level of knowledge on CSA practices were selected after review of literatures and consultation with experts for analysis of influence on adoption consistency of farmers. Multiple linear Regression (MLR) model was used for analysing the influence of selected socio economic characterises on adoption consistency relating to CSA practices. The formula for MLR model is as follows

Multiple Linear Regression analysis was used to study the effect of independent variables on dependent variables. The following multiple linear regression equation was fitted to the data

$$Y=a+b_1x_1+ b_2x_{2+} b_3x_3+ \ldots\ldots\ldots\ldots+ b_{14}x_{14}$$

Where 'a' was the intercept or constant and bi's are partial regression coefficients. The regression coefficient bi's were tested for their significance with the following formula

$$t_{(n-k-1)} = \frac{|b_i|}{S.E(b_i)}$$

Where :

n = Number of sample respondents

k = Number of independent variables

S.E (bi) = Standard error of i^{th} partial regression coefficient

bi= i^{th} Partial regression coefficient

t = Test for significance

df = Degree of freedom

Coefficient of multiple determinations (R^2) was given by

$$R^2 = \frac{\text{Regression sum of squares (RSS)}}{\text{Total sum of squares (TSS)}}$$

Where :

RSS = $b_1Sx_1y + b_2Sx_2y + b_3Sx_3y + \ldots\ldots\ldots\ldots + b_{14}Sx_{14}y$

TSS = Sy^2

R^2 value is less than unity where it was expressed in percentage. It measures the extent of variation in dependent variable (y), which can be explained by the independent variables (x_i) together.

RESULTS AND DISCUSSION

Adoption consistency of farmers relating to selected CSA practices : The findings presented in the Table 1 reveals that 46.75 per cent of the respondents belonged to medium level of adoption consistency in vermicompost preparation and application, followed by low level with 32.50 per cent respondents. The remaining 20.75 per cent of respondents were found in the category of high level of adoption consistency. This indicates that distribution of respondents was skewed toward lower category. This may be due to complexity in vermicompost preparation a structure like tanks of concrete or bamboo had to be prepared and the cost for that purpose had to be borne by the farmers themselves, which hindered the adoption. Preference of farmers was also important factor for continuous adoption of technology. Lack of ideal sites for vermicompost preparation in flood affected area was an important hurdle in adoption

In case of INM majority of the respondents (65%) had high level of adoption consistency, followed by respondents with medium (23.5%) and low level (11.5%). This indicates that distribution of respondents was skewed towards high category, might be due to KVK's endeavours in the villages about INM.

The adoption consistency about minimum tillage operation was found in medium level for majority of the respondents (49%), followed by low level for 38 per cent respondents (Table 1). The remaining respondents (13%) belonged to high level of adoption consistency. This indicates that though majority had medium level of adoption consistency in terms of minimum tillage operation, but distribution of respondents was inclined towards lower level. The mean value (3.61) also indicates that average adoption consistency was of medium level. The CV value of 0.89 indicates high degree of variation among the respondents. The findings are supported by *Aryal et al., (2018)* and *Tiamiyu et.al.,(2017).* This may be inferred that minimum tillage was not a good choice for the farmers because of high weed infestation during vegetative growth period. Again, minimum tillage operation was practiced in some selected crops, like pulses, which were cultivated in a small plot of land in patches and preferred to cultivate pulses like green gram and black gram where siltation had occurred due to flood leading to low adoption consistency. Lack of suitable variety with high production potential was another reason for low level of adoption consistency.

Table 1. Distribution of respondents according to adoption consistency relating to selected CSA practices

Category	VC	INM	MT	IPM	STVs	Over all
Low	130	46	152	49	61	96
	(32.5)	(11.50)	(38.00)	(12.25)	(15.25)	(24.00)
Medium	187	94	196	278	293	233
	(46.75)	(23.5)	49.00	(69.50)	(73.25)	(58.25)
High	83	260	52	73	46	71
	(20.75)	(65.00)	(13.00)	(18.25)	(11.50)	(17.75)
Mean	3.53	3.31	3.61	4.06	6.48	28.93
SD	2.87	2.91	3.2	2.49	2.49	9.65
CV	0.81	0.88	0.89	0.61	0.38	0.33

Low= < x-σ, Medium = x-σ to x+σ, High = > x+σ,

*Figure in parenthesis indicates percentage

VC= Vermicompost preparation and application,

INM= Integrated Nutrient Management,

MT= Minimum Tillage, IPM= Integrated Pest Management,

STVs= Stress Tolerant Varieties

It is observed from the Table 1 that majority of the respondents (69.5%) belonged to medium level of adoption consistency in terms of IPM, followed by high and low level of adoption consistency with 18.25 per cent and 12.25 per cent respondents, respectively. This indicates the normal distribution of respondents with respect to adoption consistency of IPM. This finding is corroborated with the findings of *Mahalakshmi et al., (2018).* The mean value of 4.06 implies that average adoption consistency of farmers about IPM was of medium level with moderate degree of variation among respondents (CV, 0.61. It may be inferred that IPM practices specifically cultural and mechanical control measures were followed as a tradition for cultivation practices of crops. Again, government stressed on organic cultivation since last three years in the state and accordingly government and nongovernment organizations put their efforts to make the farmers aware of benefits of IPM, and made arrangement for supply of organic pesticides either free of cost or on subsidized rate in their locality

In case of stress tolerant verities (STVs) majority of the respondents 73.25 per cent had medium level of adoption consistency. This was followed by low and high level of adoption consistency with 15.25 per cent and 11.50 per cent respondents, respectively. The average adoption consistency of STVs of rice at 6.48 indicated medium level of adoption consistency of the respondents, but it was towards the lower end of the range of medium category. The CV value (0.38) indicates weak variation among the respondents. Inference may be drawn that farmers adopted STVs of rice either in small areas or not consistently adopted by the varieties. Available varieties might have not fulfilled the need of the farmers, and might not be suited to their land situation. Again, flood events in terms of frequency, intensity and time varied with location/region/districts.

The adoption consistency in case of selected CSA practices, majority of the respondents (58.25%) were found in medium level, followed by low and high level with 24.50 per cent and 17.25 per cent of respondents, respectively. The mean value 28.93 indicates average adoption consistency of selected CSA practices was of medium level. The low CV value of 0.33 implies weak degree of variation among the respondents.

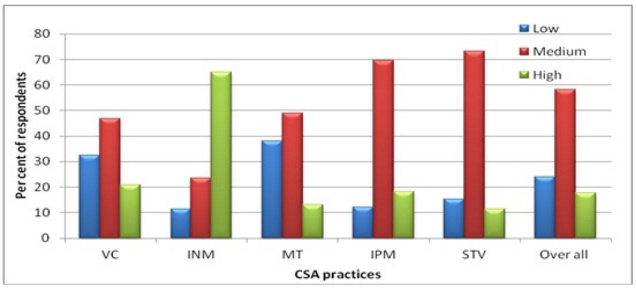

Fig. 1. Distribution of respondents according to adoption consistency relating to selected CSA practices

The Fig. 1 reveals that majority of the respondents with respect to adoption consistency of five selected CSA practices were in medium level of adoption consistency, except INM, where majority was found in high level of adoption consistency.

This finding is supported by the findings of *Kumara et al. (2014); Tiamiyu et al., (2017); Aryal et al., (2018); Mahalakshmi et al., (2018).*

Distribution of respondents based on adopter and non adopter category : The Fig. 2 reveals that out five selected CSA practices STV was adopted by 93.50 per cent of respondents followed by INM and IPM with 88.50 per cent and 87.50 per cent respondents respectively. The vermicompost preparation and application and minimum tillage operation were adopted by 67.50 per cent and 62.00 per cent respondents respectively.

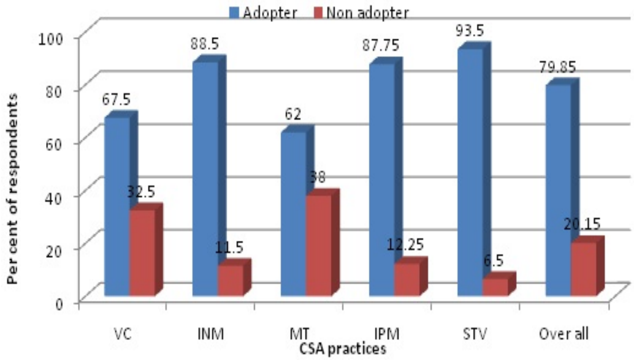

Fig. 2. Distribution of respondents according to adopter categories of selected CSA PRA

Inference may be drawn from this data set that STVs was adopted almost by all of the respondents due to its relevancy and adaptability to their situation. The INM and IPM were next important CSA practices adopted by majority farmers probably due to compatibility to their existing practices.

Distribution of adopters of CSA practices over the last five years (2013 -2017) : The Table 2 reveals that in case of vermicompost preparation and application, the adopters in 2013 were only 5.00 per cent which increased to 16.00 per cent in 2014 and 22.50 per cent in 2015. The proportion of adopters in 2016 was found 20.00 per cent which was almost similar to the year of 2015. But rate of adopters decreased up to 4.00 per cent in 2017. It may be interpreted that rate of adopters increased up to 2015 and then decreased in 2017. The Fig. 3 evidence that distribution of adopters over the years created a bell shaped curve. The initial three years showed in increasing rates. This may be assigned to the fact that farmers adopted the vermicompost technology

Table 2. Year wise distribution of respondents according to adopters of selected CSA practices (N=400)

CSA	2013		2014		2015		2016		2017		Total	
practices	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
VC	20	5.00	64	16.00	90	22.50	80	20.00	16	4.00	270	67.50
INM	19	4.75	12	3.00	110	27.50	171	42.75	42	10.50	354	88.50
MT	00	0.00	00	0.00	00	00.00	192	48.00	56	14.00	248	62.00
IPM	04	1.00	31	7.75	176	44.00	126	31.50	14	3.50	351	87.75
STV	24	6.00	48	12.00	118	29.50	168	42.00	16	4.00	374	93.50

only after observing the profitability and relative advantage earned by fellow farmers. In the initial year farmers sold their produce either in the locality or used in their farm. But once the produce became huge in volume local markets got saturated in terms of demand. Again, infrastructure created by the implementing agency might have been used properly for initial years but later on it might have been required renovation which was not done properly. Since the technology was new for the majority of farmers, so it was attracted the farmers to go for adoption in trial basis in the initial period. Lack of market access might be another reason for reduction the numbers of adopters in later stages.

In case of Integrated Nutrient Management (INM) practices, the highest number of adopters (42.75%) was found during 2016. The trend over the last five years i.e. 2013 to 2017 recorded sharp increase in number during 2015 and 2016 and a decline thereafter, during 2017 (Table 2). The curve created by the distribution of adopters over last five years was inverted "V" shaped (Fig. 3). This may be due to government policy for promotion of organic farming in North East India. The less numbers of adopters were found during initials years i.e. 2013 and 2014, might be due to non-availability of organic inputs in the local market or lack of efforts from the concerned department. The sharp increase of adopters of INM practices during 2015 and 2016 may be due supply of inputs free of cost or with subsidized rate to the farmers from the state department of agriculture.

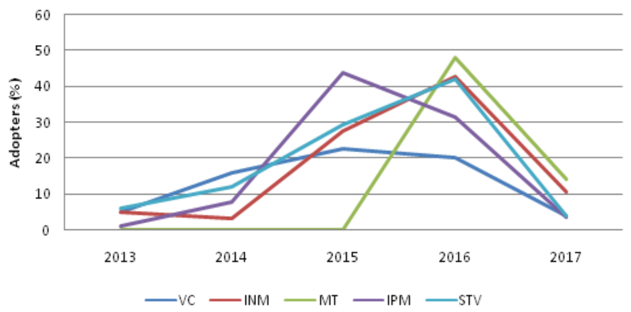

Fig. 3. Year wise distribution of respondents according to adopters of selected CSA practices

In case of minimum tillage operation, the adopters during 2016 and 2017 were distributed as 48 per cent and 14 per cent, respectively (Table 2). The adoption of minimum tillage operation was a bit late as compared to other four practices. This may be due to low level of acceptability of farmers or suitability of farmland situation of the farmers. But constant advisory services of KVKs and linkages with other institution and awareness building about climate change through mass media farmers adopted the technologies on trial basis in small scale area.

The distribution of adopters in regards to Integrated Pest Management (IPM) practices created a bell-shaped curve (Fig. 3). The adopters during 2013 and 2014 were 1 per cent and 7.75 per cent, respectively but that increased to 44 per cent in 2015, and again decreased to 31.5 per cent during 2016. By 2017, the percentage of adopters was reduced to 3.15. From this distribution of adopters, it may be interpreted that maximum horizontal spread was found during 2015, which might be attributed that the farmers adopted this technologies only after evaluation of its results on the demonstrated plots or continuous efforts of KVKs for popularizing of organic pesticides or their consistent endeavours for popularizing IPM practices among farmers by the state department of agriculture through supply of organic pesticides, or private organization who made available these products synchronizing to government's policies.

In case of Stress Tolerance Varieties (STVs) of rice, the adopters were normally distributed over the last five years. This indicates that STVs of rice were adopted by farmers with increasing rate up to 2015 when reached a pick of 44 per cent, and then steadily decreased during 2016 and 2017 with diminishing rate (Fig 3). Since the STVs of rice were introduced in the demonstration program organized by KVKs during 2011-12 onwards, the adoption of these varieties slowly increased reaching its maximum during 2015. But it reduced in 2016 and 2017 that might be due to replacement of varieties or try new varieties instead of existing STVs of rice. Though adoption of STVs of rice was declined by 2016 and 2017, but still few farmers followed the practices.

Correlation between independent variables and adoption consistency : It is observed from Table 3 that age (X_1), educational experience (X_2), proportion of low land (X_4), annual farm income (X_5) institutional contact (X_6), market accessibility (X_7) and farm experience(X_8) were found to have significant and positive relationship with adoption consistency. The correlation coefficient (r) values indicate moderate to weak relationship of these variables with adoption consistency.

Age (r = 0.279) was found to have significant positive relationship with adoption consistency of farmers. It may be interpreted that aged farmers are more likely to adopt CSA practices as compare to young or middle age farmers. The reason may be old aged farmers had more experience towards changes of climate and its adverse effect on their farm and thus they may be more inclined towards adoption of climate smart agriculture practices.

The educational experience (r= 0.109) of farmer was recorded to have positive and significant relationship with their adoption consistency relating to CSA practices. Farmers with more formal education had more adoption consistency. The farmers with more education appear to have better access to information about CSA practices which may have created greater interest among such farmer about the technology resulting in adoption of CSA practices.

Again, farmers with more low land area had more adoption consistency as positive and significant relationship was recorded in between proportion of low land (r=0.115) and adoption consistency. This may indicate towards the fact that the farmers might have been experiencing adverse effect of climate change more severely in the lowland situation than in upland and as such farmers are more motivated to adopt CSA practices in this situation. Moreover, the CSA practices promoted are more specifically suited to lowland condition than in upland condition.

Annual farm income (r= 0.134) was found to have positive and significant relationship with farmers' adoption consistency relating to CSA practices indicates that farmers who have more farm income have more adoption consistency because of farmers who earn more income from their farm and their livelihood is solely depend on farm income may adopt CSA practices for sustaining production and income from their farm.

The positive and significant relationship was recorded between farmers' institutional contacts (r=0.224) and adoption consistency. Hence, farmers with more institutional contact had more adoption consistency relating to CSA practices as because farmers who had more contact with different institutions got a chance to change their cognitive and affective domain. This might have led to take favourable decision towards adoption of CSA practices.

Market accessibility (r=0.223) of farmers had positive and significant relationship with adoption consistency. It indicates that farmers who have more frequency of visit to market or the market agent visit to his farm adopted CSA practices in more areas and for more years. This might be due to being well aware of consumers demand and preferences as well as easy available of required inputs through market agent.

Farmers who have more farm experiences had more adoption consistency as farm experience and adoption consistency are positive and significantly correlated (r=0.163). It may be due to the fact that experience in farming help in identifies the relative advantage of CSA practices and help to choose technology suitable for their situation. The findings are in line of finds reported by *Alam(2015), Moyo et al.,(2007), Reddy (2016), More (2004)* and *Mahalakshmi et al.,(2018).*

Table 3. Relationships of independent variables with adoption consistency

Independent variables	r	ρ value
Age (X_1)	0.279**	0.000
Educational experience (X_2)	0.109*	0.029
Dependency ratio of family(X_3)	-0.077	0.122
Proportion of low land (X_4)	0.115*	0.022
Annual farm income (X_5)	0.134**	0.008
Institutional contact (X_6)	0.224**	0.000
Market accessibility (X_7)	0.223**	0.000
Farm experience (X_8)	0.163**	0.001
Cropping intensity (X_9)	0.072	0.150
Degree of commercialization(X_{10})	0.076	0.128
Degree of innovative proneness(X_{11})	0.058	0.248
Knowledge on CSA practices (X_{12})	-0.032	0.520

* Significant at 0.05 level of probability

** Significant at 0.01 level of probability

r = Correlation coefficient, $\rho < 0.05$

Relative contribution of independent variables to Adoption consistency : The Table 3 reveals that the explanatory variables 'age'(X_1), 'dependency ratio of family'(X_3), 'proportion of low land'(X_4), 'market accessibility'(X_7) and 'cropping intensity'(X_9) were found positive and significantly contributed for expressing the adoption consistency about CSA practices. These five variables together explain the variation of 23 per cent (R^2=0.23) of the adoption consistency of farmers relating to CSA practices. (Table 4)

It implies that young farmers had more adoption consistency of CSA practices. Farmers' family with more numbers of dependent members had more adoption consistency of CSA practices. The farmers with high degree of commercialization and innovative proneness had more adoption consistency of CSA practices.

The age of respondents had positive and significant contribution to the adoption consistency. The coefficient

Table 4. Regression analysis with predictor variable Adoption consistency with selected explanatory variable (N=400)

Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	S E	Beta		
Intercept	-9.999	6.412	-	-1.559	.120
Age (X_1)	.435*	.065	.396	6.658	.000
Educational experience (X_2)	.348	.192	.104	1.812	.071
Dependency ratio of family (X_3)	-4.218*	1.953	-.108	-2.160	.031
Proportion of low land (X_4)	.086*	.027	.213	3.128	.002
Annual farm income (X_5)	.009	.023	.019	.388	.698
Institutional contact (X_6)	.965	.625	.096	1.542	.124
Market accessibility (X_7)	1.740*	.428	.254	4.062	.000
Farm experience (X_8)	-.104	.080	-.118	-1.297	.195
Cropping intensity (X_9)	.032*	.016	.129	1.965	.050
Degree of commercialization (X_{10})	.002	.019	.006	.115	.909
Degree of innovative proneness(X_{11})	.122	.128	.043	.951	.342
Level of knowledge on CSA practices (X_{12})	-.059	.143	-.019	-.416	.678

R^2=0.23 Adjusted R^2= 0.21 F= 9.568* $p< 0.05$

value of age is 0.435 indicates that the increase of age of respondents by one year will increase 0.435 times of adoption consistency on CSA practices. Likewise, unit change of dependency ratio of family will lead to decrease of 4.218 times of adoption consistency. The unit change of proportion of low land will increase 0.086 times of adoption consistency. Likewise, changes of one unit of frequency of market accessibility will increase 1.740 times of adoption consistency of CSA practices. The findings is supported by the findings of *Alam (2015), Moyo et al., (2007)* and *Mahalakshmi et al.,(2018).*

CONCLUSION

Farmers' adoption consistency was found to be moderate for more than 60 per cent farmers in case of STVs, INM and IPM, while it was moderate for less than 50 per cent farmers in case of VC and MT. There is scope and convenience to popularize the former three practices in similar environment. On the other hand, more extension effort will be needed for popularization of VC and MT among the farmers of similar situation. In order to increase adoption consistency, extension agencies, both in public and private sectors, should put forward strategic effort to make farmers aware of climate change and its impact on food production. Regular extension and technology backstopping is very important for increasing adoption consistency of farmers. The different stakeholders (both public and private) in input and output chains should work in convergence mode as a common entity so that farmers get necessary environment for adoption of technologies. Farmers' age, dependency rate, market accessibility and cropping intensity are important factors for adoption of CSA practices. Hence, to increase adoption consistency of farmers towards CSA practices KVKs or other extension system should consider these factors while selecting farmers.

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