

## SOCIO-ECONOMIC STATUS AND FARMING CHALLENGES OF FARMERS PRACTICING RAIN-FED RICE CULTIVATION IN ARUNACHAL PRADESH

Mimum Modi<sup>1</sup>, Avicha Tangiang<sup>2</sup> and Devegowda S R<sup>3</sup>

### ABSTRACT

A study was carried out in the East Siang and Papum Pare districts of Arunachal Pradesh in the year 2022-23 wherein, data from 200 farmers practicing rain-fed rice cultivation was collected by using a pre-tested schedule through personal interview method. The data obtained was assessed through descriptive statistics involving the use of frequency distribution, mean, standard deviations and percentages. The study revealed that 76.5% of the respondents were male and 90% were married. The average age was recorded to be 48.49 years and a majority of the respondents were educated with at least primary level of education of up to 7<sup>th</sup> standard. Most of the respondents were full time farmers with agriculture as their primary source of income. The study found that majority of the farmers earned a medium annual income of rupees 50,000 – 1 lakh. It was also observed that 57.5% of the respondents possessed medium size farm land between 2 ha-10 ha. A list of fourteen constraints identified through pilot survey were ranked according to Garrett's ranking technique and the farmers reported that the major constraint faced in rain-fed rice production was variability in the amount of rainfall causing the farmers difficulty in planning their agricultural calendar followed by high cost of labour, unavailability of hired labour and high cost of input. Keeping in view the constraints, it is inferred that there is a dire need for the development and implementation of sound policies by the state and the central government that would provide the farmers with a timely aid in the form of weather forecast, standard labour cost, land consolidating programme and training on new technologies. The farmers should also be encouraged transfer risk to institutions by investing in crop insurance and by form co-operative societies to meet their farm needs at reasonable cost.

(Key words: Rice, socio-economic, East Siang, Papum Pare, rain-fed, constraints)

### INTRODUCTION

Rice is the third largest cereal crop and a very important food for the majority of the global poor population (Pathak *et al.*, 2019). Globally, China (144.62 M) is the highest producer of rice followed by India (134 M), (Anonymous, 2024). India approximately contributes 26 per cent of rice production globally while also consumes 22 per cent from the global rice stock. It also exported 22.2 million tons in the year 2022 (Malik, 2023). All the north-eastern states of India grow rice. Agriculturally, North-East India lies in the Southeast Asia rice domain with rice being the principal food crop claiming over 85 % of the cropped area. Farmers of this region practice 'slash and burn' type of shifting cultivation, locally known as *jhuming* and about 12 % of the net sown area is under shifting cultivation, with over 400,000 families engaging in this kind of farming (Dikshit and Dikshit, 2014). Among the Northeast state, Arunachal Pradesh had a production of 265.6 tonnes of rice in the

triennium average of 2012-2014 which was 6<sup>th</sup> in the production among the other 8 north-eastern states (Roy *et al.*, 2015). Although most of the cultivated area of the state are under agronomic crops, 91% of rice cultivating areas in the state were under very low to medium low productivity category (Anonymous, 2020). In Arunachal Pradesh, rice is grown up to an altitude of 2000 m, however, most of the available land races with consumer's preference in regard to eating quality are of low productivity (Konjengbam *et al.*, 2021). This could be due to the various constraints and bottlenecks faced by the farmers in the process of cultivation. Thus, in order to understand the socio-economic and agricultural scenario of the state, the following study was undertaken to analyse the socio-economic conditions and constraints of the farmers so that we can identify the specific problems that can help the policy makers to design specific and effective agricultural policies to address the bottlenecks and aid in better production of rice by minimizing the constraints.

- 
1. P.G. Student, Dept. of Agricultural Economics, Faculty of Agricultural Sciences, Rajiv Gandhi University, Rono Hills Doimukh, Arunachal Pradesh-791112
  - 2\*& 3. Asst. Professors, Dept. of Agricultural Economics, Faculty of Agricultural Sciences, Rajiv Gandhi University, Rono Hills Doimukh, Arunachal Pradesh-791112 (\*Corresponding Author)

## MATERIALS AND METHODS

The districts East Siang and Papum Pare were purposively selected for this study since the districts had the highest productivity of rice in the year 2019-2020 (Anonymous, 2020). Purposive sampling was used for the selection of blocks while simple random sampling was used for selection of villages and the respondents in the study areas. Primary data related to the socio-economic parameters including age, sex, marital status, family size, level of education, occupation, land holding, land-use pattern, annual income and category of farmer were collected through personal interview with the selected respondents using a pre-tested schedule in the study areas. In the course of the research work several visits were made to collect the required information. Every possible care was taken to ensure the accuracy and reliability of the data. The primary data for the study was collected for the year 2022-2023 for rain-fed *kharif* rice.

The socio-economic status of the respondents was assessed through descriptive statistics involving the use of frequency distribution, mean, standard deviations and percentages.

To identify and to compare the constraints faced by rain-fed rice farmers in the study areas, Garrett's ranking technique was adopted to identify and analyse the constraints discern by the respondents in the study area (Jagdish and Prakash, 2008). The respondents were asked to rank the fourteen constraints related to rice production listed through panel selection after pilot survey in decreasing order from most to least difficult. The order of merits that were given by the respondents was converted into ranks using the following formula:

$$\text{Percentage position} = 100 (R_{ij} - 0.50) / N_j$$

Where,

$R_{ij}$  = Rank given for the  $i^{\text{th}}$  constraints by  $j^{\text{th}}$  farmer

$N_j$  = Number of constraints ranked by the  $j^{\text{th}}$  farmer

The percentage position of each rank was converted into scores using Garrett's table. For each constraint, scores of individual respondents were added together and then divided by the total number of respondents for whom scores were added. Thus, mean score for each constraint was then ranked by arranging them in the descending order (Jagdish and Prakash, 2008).

## RESULTS AND DISCUSSION

The socio-economic characteristics of rain-fed rice farmers in the study area are presented in Table 1.

### Age

It was observed that 63.5% of the rain-fed rice farmers belonged to age group of 35-50 years and 27% were below 35 years of age. The majority of the respondents were able bodied and only 9.5% of the farmers were older than 50 years. Ogundele and Okoruwa (2006) explained how

the fact that the operations in rice cultivation includes labour intensive activities like land clearing, tilling, weeding and harvesting, which require lots of manual strength and energy leads to farmers within the age of 20-45 years to be more likely to have the required strength to carry out the operations efficiently. According to Bulus *et al.* (2022) at certain age, a human is mentally and physically alert to take better and impactful decisions which may bring positive result on the rice production by making rational and far sighted decisions.

### Sex

The result revealed that 76.5% of the rice growing farmers were male and 23.5% of the farmers were female. The low participation of female in the farm could be explained by the multiple roles that women have to play both at home and in the field while the reason behind more male participation in the rice cultivation could be due to the fact that ownership of land mostly belongs to the male head of the family. According to Ahmed (2020) intensive labour demand in farming area along with the resilience of male members lead to them working for longer hours compared to the female.

### Marital status

Majority of the respondents were married making up to 90% of the sample and 10% were unmarried. According to Ahmed (2020) married people are more responsible since they have to manage their family alongside the farming activities. Bulus *et al.* (2022) inferred that married people have responsibilities to maintain their family members, hence, rice production becomes an integral part of their income generation.

Similar observations were reported from a study from where more married respondents were farming, compared to unmarried respondents (Alam *et al.*, 2010).

### Family size

It was observed that 70% families were medium sized comprising of 5-8 members, while 22.5% and 7.5% of the respondents belong to small of up to 4 members and large of more than 8 members family respectively.

### Level of education

The study showed that 18.5% of the respondents were illiterate, 30% had primary level education of up to 7<sup>th</sup> standard, 30% had secondary level education of up to 8<sup>th</sup>-12<sup>th</sup> standard and 21.5% of the farmers were graduates and post graduates. This observation sets a positive tone to farmers' readiness to adopt new ideas and technologies. Adamu and Bakari (2015) in their study on profit efficiency among rain-fed rice farmers in Northern Taraba State, Nigeria, reported that the farmers that are educated were more receptive to new ideas and practices of farming.

### Occupation

The results revealed that 82% of the respondents depended on farming as their primary source of income and only a few had other alternate sources of income where 9.5% were in business, 6.5% were in government service and 2% were labourers who also practice rain fed rice farming.

**Land holding**

The study found that 31% of the rain-fed rice farmers had a land holding of 4 ha-10 ha, 26.5% had the land holding of 2 ha - 4 ha, 16.5% had 10 ha and above of land holding, 13.5% of the respondent had the land holding of 1 ha-2 ha and only 12.5% of the respondent had the land holding of 0.50 ha-1 ha. This observation of large land-holdings can be explained by the low population density in the state which is 17 sq km<sup>1</sup> (Anonymous, 2020) and the regulation that bars anyone who does not belong to the Arunachal Pradesh Schedule Tribe from acquiring land in the state. According to Mandal (2016) one reason for such large land holding for the majority of the respondents can be the practice of Jhum or shifting cultivation which is a

common practice by almost all the tribes except apatani and khamti, wherein, the land is left fallow for a number of years for the regeneration thus majority of the landholding is not cultivated for a long time.

**Land use pattern**

The study area reportedly had 1176.27 ha of cultivated area out of which 95.23% was rain-fed and 3.06% was irrigated. 82.33% of the cultivated area was under agronomical crops and 4.36% was under horticultural crops. A smaller portion of the total agricultural land in Arunachal Pradesh is under horticultural crops i.e. out of the total 320.00 ha Agricultural land, 46.877 ha is under horticultural crops (Anonymous, 2020).

**Table 1. Socio-economic characteristics of rain-fed rice farmers of Arunachal Pradesh** n=200

Sl. No.	Category	Frequency	Percentage
<b>Age</b>			
1.	<35	54	27
2.	35-50	127	63.5
3.	>50	19	9.5
<b>Sex</b>			
1.	Male	153	76.5
2.	Female	47	23.5
<b>Marital status</b>			
1.	Married	180	90
2.	Unmarried	20	10
<b>Family size</b>			
1.	Small size family (up to 4 members)	15	7.5
2.	Medium size family (5-8 members)	140	70
3.	Large size family (>8 members)	45	22.5
<b>Education level</b>			
1.	Illiterate (No education)	37	18.5
2.	Primary level (up to 7 <sup>th</sup> )	60	30
3.	Secondary level (8 <sup>th</sup> – 12 <sup>th</sup> )	60	30
4.	College and above(<UG & PG)	43	21.5
<b>Occupation</b>			
1.	None	0	0
2.	Labourer	4	2
3.	Caste occupation	0	0
4.	Business	19	9.5
5.	Independent profession	0	0
6.	Cultivation	164	82
7.	Service	13	6.5

Contd.....

**Land holding**

1.	Less than 0.50 ha	0	0
2.	0.50 ha-1 ha	25	12.5
3.	1.00 ha-2 ha	27	13.5
4.	2 ha-4 ha	53	26.5
5.	4 ha-10 ha	62	31
6.	10 ha-above	33	16.5

**Land use pattern**

1.	Irrigated	36	3.06
2.	Rain-fed	1120.274	95.23
3.	Agronomical crop	968.505	82.33
4.	Horticultural crop	56	4.36
5.	Total cultivated area	1176.274	91.73
6.	Uncultivated area	106	8.266

**Annual Income**

1.	Low annual income	52	26
2.	Medium annual income	115	57.5
3.	High annual income	33	16.5

**Category of farmer**

1.	Marginal	25	12.5
2.	Small	27	13.5
3.	Medium	115	57.5
4.	Large	33	16.5

**Annual income**

The study showed that 26% of the respondents belonged to the low annual income category; 57.5% belonging to the medium annual income category and 16.5% belonged to the high annual income category. The majority of the respondents were observed to possess medium annual income and least number of respondents possessing high annual income. This phenomenon can be explained by the findings of Muthukumar *et al.* (2020) wherein they reported that large number of farmers have farming as their main source of income and lack diversification of sources of income for the family leading to higher risk and low to medium return in farm income.

**Category of farmers**

Categorizing the respondents according to their landholding showed that 57.5 % of the respondents belonged to medium scale farmer category with a land holding of 2 ha – 10 ha, followed by large scale farmer category consisting of 16.5 % of the total respondent with a land holding of 10 ha and above. Paul *et al.* (2021) in their study on strategy for ensuring small farmers income security through Farmer Producers Organizations in North-East India, stated that the agricultural landscape of the N-E region is primarily occupied by the marginal farmers.

**Constraints faced by the rain-fed rice farmers**

Table 2 represents that the major constraint faced by the rain fed rice farmer in the study area. Kalaiarasi *et al.*

(2024) reported that although India has achieved macro-level food self-sufficiency, yet there is still a food shortage due to various problems in the farm and the sector as a whole.

The respondents reported variability in the amount of rain as the major constraint faced by them and thus it was ranked 1. Farmers reported that the uncertainty of rain during the crop growing season made it difficult for the farmers to maintain the crop calendar since water is required from the sowing till transplanting and also for all growth stages. Konjengbam *et al.* (2021) reported how most of the rice production areas in North-East India are dependent on monsoon rains and a shortage of moisture in upland as well as lowland rice paired with erratic monsoon rains due to climate change, with uneven distribution of and unpredictability lead to unprecedented flood and drought causing huge challenge for the farmers. A similar finding was reported by Tiarniyu *et al.* (2017), where they reported that rainfall variability had affected the yield of rice in the Sudan Savana.

High cost of labour was ranked 2<sup>nd</sup> by the respondents, where they reported that hiring labour was a very costly affair. Since most of the farm operations like land clearing, weeding, sowing, transplanting and harvesting are still done manually in the study area and all of this operations requires human labour. Oinam and Sudhakar (2014) also reported that high cost of labour was the major constraint for the respondents and

**Table 2. Constraints faced by the rain-fed rice farmers in the study areas**

Sl. No.	Constraints	Percentage	Garrett's Table	Total no. of respondents	Total score	Total mean	Rank
1	Shortage of labour	3.57	85	200	13264	66.32	3
2	Inadequate farm credit	10.71	74	200	10597	52.98	6
3	High cost of input	17.85	68	200	12849	64.24	4
4	Variability in amount of rain	25	63	200	15237	76.18	1
5	Pest and diseases	32.14	59	200	11184	55.92	5
6	Birds infestation	39.28	55	200	4008	20.04	14
7	Inadequate research and extension support	46.42	51	200	8340	41.7	9
8	Land tenure	53.57	48	200	1595	40.38	12
9	Inadequate storage facilities	60.71	45	200	8947	44.73	7
10	Low price of crop	67.85	41	200	8526	42.63	10
11	High cost of labour	75	36	200	13746	68.73	2
12	Transportation	82.14	32	200	7979	39.89	13
13	Transplanting loss	89.28	25	200	8419	42.09	11
14	Quality seed	96.42	15	200	8904	44.52	8

expressed that agricultural labourers demanded higher wages irrespective of the nature of the work. 77.50 per cent respondents faced the problem of high cost labour in Bishnupur, Manipur. Constraints that were ranked 3<sup>rd</sup> and 4<sup>th</sup> were shortage of labour and high cost of input respectively. Lauren *et al.* (2008) reported that the scarcity of labour and higher labour cost are some of the emerging challenges in rice production system. Kumar *et al.* (2022) reported that scarcity of labour and higher labour cost can hamper the productivity and profitability of the farmers as labour shortage can cause delay in rice transplantation, which may reduce the yield by 30–70% upon delay of 1–2 months.

Pest and disease infestation was also a major problem in the study area expressed by the respondents and it is ranked 5<sup>th</sup> in the Table 2. According to Mondal and Chakraborty (2024) the damage on paddy crop due to insect-pest is of utmost importance with about 100 insect-pests ravaging the rice fields around the world. A study on rice growing farmers in various districts of Tanzania was done by Suvi *et al.* (2020) where they identified the high priority constraints in rice production to be insect and pest, and only 11.7% and 15% of the farmers identified these constraint as moderate and low priority respectively.

Inadequate farm credit was ranked 6<sup>th</sup> and the respondents explained as to how the cost of cultivation in the study area was steadily rising throughout the years while the credit availability and accessibility was facing bottlenecks due to reasons like inability of producing Land Possession Certificate to the lending institutions as ownership documents are not available to most of the farmers for ancestral property in the state. Similarly, Balana and Oyeyemi (2022) reported how poor access to credit is seen as a key barrier to adoption of new technologies in agricultural scenario which causes low productivity and low income.

Inadequate storage facilities was ranked 7<sup>th</sup> in the list as majority of the respondents had traditional storage structures for their rice, although it was not durable and needed regular maintenance. Akinbile *et al.* (2018) reported that respondents having a functional storage facility didn't consider it a major constraint even if the storage facility didn't meet the scientific storage criteria.

Quality of seed was ranked 8<sup>th</sup> in the list as most of the farmers grow traditional rice variety and only a few farmers have adopted high yielding varieties in the study area. Although there was a lack of regular visit by the extension personnel in the study area the inadequate research and extension support constraint was ranked 9<sup>th</sup> and low price of crop was ranked 10<sup>th</sup> by the respondents.

Transplanting loss was at 11<sup>th</sup> rank, followed by land tenure at 12<sup>th</sup> rank; transportation was ranked 13<sup>th</sup> and the constraint that was ranked last was bird infestation.

From the study, we can draw the inferences that the majority of farmers practicing rain-fed rice cultivation in

Arunachal Pradesh are young and able bodied to carry out the labour intensive activities that come with farming. Most of respondents are married making up to 90% of the sample. The farming community of the study area were mostly literate with only 18.5% of the respondents being illiterate. Agriculture was the main source of income for 82% of the respondents and majority of the respondents (31%) had a land holding of 4 ha- 10 ha due to the practice of jhum cultivation in the area. 95.23% of the cultivated area was rain-fed and 3.06% was irrigated area. 57.5% of the respondents reported earning medium annual income of rupees 50,000-1 lakh. The survey reported variability in the amount of rainfall as the major constraints for the respondents in the study areas followed by high cost of labour, unavailability of hired labour and high cost of input. These constraints act as a bottleneck in the improvement of the socio-economic status of the farm family in a long run. Hence, in order to address these concerns, effective policies should be developed and implemented by the state and the central government that would provide the farmers with a timely weather forecast to help the farmers plan their agricultural calendar. The farmers should also be encouraged to participate in policies that transfer risk to institutions in the form of crop insurance. Policies that focus on land consolidating programme can help the farmers to adopt advance and improved agronomic practices resulting in increase of production and productivity of crops and provide the farmers with better and advanced knowledge about the techniques and technology that can be used in the rain-fed rice cultivation based on the socio-economic, climatic and geographical conditions. The constraint of labour shortage and high cost of labour can be addressed by government fixing the labour cost and encouraging the farmers to form co-operative societies to meet their farm needs at reasonable cost.

## REFERENCES

- Adamu, T. and U. M. Bakari, 2015. Profit efficiency among rain-fed rice farmers in Northern Taraba State, Nigeria. *J. Bio. Agri. and Health*, **5**(8):113-119.
- Ahmed, M. A. 2020. Profitability and socio-economic analysis: Evidence from rice production in Lake Geriyo of Adamawa State, Nigeria. *Seeds*, **10**:11-63.
- Akinbile, A.L, O.O. Aminu and I.G. Sokeye, 2018. Constraints encountered in rice production by farmers in Ogun State, *NJRS*, **18**(1):85-92.
- Alam, M. M, C. Siwar, M.W. Murad, R. Molla and M. Toriman, 2010. Socioeconomic profile of farmer in Malaysia: Study on integrated agricultural development area in North-West Selangor. *Agric. Econo. Rural Dev.* **7**(2):249-265.
- Anonymous, 2020. Agricultural statistics at a glance 2020. Government of India, Ministry of agriculture & farmers welfare, Department of Agriculture, Cooperation & Farmers welfare, Directorate of economics & statistics. [https://eands.dagov.in/PDF/Agricultural%20Statistics%20at%20a%20Glance%20-%202020%20\(English%20version\).pdf](https://eands.dagov.in/PDF/Agricultural%20Statistics%20at%20a%20Glance%20-%202020%20(English%20version).pdf)
- Anonymous, 2020. Census 2011, Development of statistics atlas of Arunachal Pradesh - 2020. Directorate of economics & statistics, government of Arunachal Pradesh. <https://ecostatistics.arunachal.gov.in/State%20Publications/4.pdf>

- Anonymous, 2024. U.S. Department of agriculture (2024). Production- Rice. <https://fas.usda.gov/data/production/commodity/0422110>
- Balan, B.B and M.A. Oyeyemi, 2022. Agricultural credit constraints in smallholder farming in developing countries: Evidence from Nigeria. *World Dev Sustainability*,**1**(2022):1-12.
- Bulus, G, F.U. Tikon and H.I. Sangari, 2022. Resource Use Efficiency in Rain-fed Paddy Rice Production: A case study of Donga Local Government area of Taraba state, Nigeria. *JASB*,**4**(4): 1-9.
- Dikshit, K. R. and J. K. Dikshit, 2014. Agriculture in North-East India: Past and Present. In K. R. Dikshit & J. K. Dikshit (Eds.), *North-East India: Land, People and Economy: 587-637*.
- Jagdish, K. and K.K. Prakash, 2008. Contact farming: Problems, Prospects and its effect on Income and employment. *Agri. Eco. Res. Rev.* **21**: 243- 250.
- Konjengbam, Noren S., M. Mahanta and Andrean, Lyngdoh, 2021. Rice Cultivation - A Way of Life for the People of North Eastern Hill Region of India. *Integrative Advances in Rice Res. Ch.* 7.
- Kalaiaarasi, D., A. Premkumar and V. Sivasankar, 2024. Efficiency in agriculture sector of India: A Stochastic Frontier Approach. *J. Soils and Crops*, **34**(1) :97-105.
- Kumar, N, R. S. Chhokar, R. P. Meena, A. S. Kharub, S. C. Gill, S. C. Tripathi and G. P. Singh, 2022. Challenges and opportunities in productivity and sustainability of rice cultivation system: a critical review in Indian perspective. *Cereal Res. Comm.* **50**(4): 573-601.
- Lauren, J.G., G. Shah, M.I. Hossain, A.S. Talukder, J.M. Duxbury, C.A. Meisner and C. Adhikari, 2008. Research station and on-farm experiences with permanent raised beds through the Soil Management Collaborative Research Support Program. In: Humphreys E, Roth CH (ed.) *Proceedings of workshop on Permanent Beds and Rice-Residue Management for Rice-Wheat Systems in the Indo-Gangetic Plain*. ACIAR, Canberra: pp. 124-132
- Malik, D. M. R. 2023. Self-Reliant Framework of India's Foreign Trade: A Theoretical Perspective. *JCIBG* **29**(2):143-155
- Mandal, R. 2016. Jhum cultivation and environment in Arunachal Pradesh. *J. basic appl. Res. Biomed.*,**2**(2):94-101.
- Mondal, E. and K. Chakraborty, 2024. Extent of damage to paddy by Yellow Stem Borer, *Scirpophagai ncertulas* (Walker, 1863) (Lepidoptera: Crambidae) under different doses of inorganic Nitrogenous Fertilizers at Hoogly, West Bengal. *J. Soils and Crops*, **34**(1):116-123.
- Muthukumar, R., R. Sindhuja and R. Jayasankar, 2020. Socio-Economic and Psychological Characteristics Of The Paddy Growers In Nagapattinam District Of Tamil Nadu. *Plant Arch.* **20**(1):1619-1624.
- Ogundele, O.O. and V.O. Okoruwa, 2006. Technical efficiency differentials in rice production technologies in Nigeria. *AERC Research Paper* pp. 154.
- Oinam, T. and B. Sudhakar, 2014. Constraints faced by the farmers in adoption of improved paddy practices in Bishnupur district of Manipur state, *IJEER*, **2**(7):32-37.
- Pathak, H., S.R. Voleti, N. M. Shaik, R. Tripathi, B. Sailaja, A.K. Nayak, L.V.S. Rao, B. Mondal, J.N. Reddy and T. Mohapatra, 2019. Reorientation of All India Coordinated Crop Improvement Projects: The Case of Rice. *NRRI Technical Bulletin No.18*. ICAR-National Rice Research Institute, Cuttack 753 006, Odisha, India: 20+viii.
- Paul, Pampi, N. U. Singh, A. Mukherjee, M. B. Tengli, P. K. Sinha, C. Gowda, A. Roy, A. Yumnam and B.K. Kandpal, 2021. Strategy for ensuring small farmers income security through Farmer Producers Organizations in North-East India. *IJHF*, **34** :195-203.
- Roy, A, N. U. Singh, D. S. Dkhar, A. K. Mohanty, S. B. Singh and A. K. Tripathi, 2015. Food Security in North-East Region of India - A State-wise Analysis. *Agric. Econ.Res.Rev.* **28**(conf): 259.
- Suvi, W. T, H. Shimelis and M. Laing, 2020. Farmers' perceptions, production constraints and variety preferences of rice in Tanzania. *J. Crop. Improv.* **1**: 1-18.
- Tiamiyu, S.A., U.B. Ugalahi, T. Fabunmi, R.O. Sanusi, E.O. Fapojuwo and A.M. Shittu, 2017. Analysis of farmers' adoption of Climate Smart Agricultural Practices in Northern Nigeria, *4<sup>th</sup> ICAF*.**3**: 19-26.

**Rec. on 30.08.2024 & Acc. on 12.09.2024**