

Use Of Urea Deep Placement Technology Among Rice Farmers In Kwara State, North Central Nigeria

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Abstract

Assessing the level farmers' usage of fertilizer deep placement is important to improve the efficiency of soil nutrient. Extension organisations responsible for the dissemination of the technology will immensely benefit by knowing the level of usage of the technology for future extension programme implementation. In light of this, we examined the use of urea deep placement technology among rice farmers. Frequency count was used to identify rice farmers that use Urea Deep Placement technology and Pearson Product Moment Correlation (PPMC) was employed to determine factors associated to use of the technology. The study found that majority (85.8%) were aware of UDP technology between the year 2012 to 2013 (61.6%) mainly through agricultural extension agents (55%) and fellow farmers (25%). Majority (81.7%) tried it but few (11.7%) adopted it. Labour intensiveness (58.3%) is one of the reasons for non-adoption while the few adopters (10%) adopted because the technology increases productivity. Age of farmers is positively related the use of UDP technology. The study focuses on the use of urea deep placement technology provided by extension services among farmers; however, these farmers may have an interest in other types of fertilizer and methods of application that have not been investigated. The study provides an insight to show the usage of UDP among farmers engaged in rice production as a means to improve the efficiency of soil nutrient.

Key words: *Constraints, Information sources, Usage, Urea Deep Placement technology*

Penggunaan Teknologi Deep Urea Placement oleh Petani Padi di Negara Bagian Kwara, Nigeria Tengah Utara

Abstrak

Menilai tingkat penggunaan pupuk dalam penempatan petani adalah penting untuk meningkatkan efisiensi nutrisi tanah. Organisasi penyuluhan yang bertanggung jawab atas penyebaran teknologi akan sangat diuntungkan dengan mengetahui tingkat penggunaan teknologi untuk implementasi program penyuluhan di masa depan. Mengingat hal ini, kami meneliti penggunaan teknologi penempatan urea dalam di antara petani padi. Penghitungan frekuensi digunakan untuk mengidentifikasi petani padi yang menggunakan teknologi Urea Deep Placement dan Pearson Product Moment Correlation (PPMC) digunakan untuk menentukan faktor-faktor yang terkait dengan penggunaan teknologi. Studi ini menemukan bahwa mayoritas (85,8%) menyadari teknologi UDP antara tahun 2012 hingga 2013 (61,6%) terutama melalui agen penyuluh pertanian (55%) dan sesama petani (25%). Mayoritas (81,7%) mencobanya tetapi sedikit (11,7%) yang mengadopsinya. Intensivitas tenaga kerja (58,3%) adalah salah satu alasan untuk tidak diadopsi sementara beberapa pengadopsi (10%) diadopsi karena teknologi meningkatkan produktivitas. Umur petani secara positif terkait dengan penggunaan teknologi UDP. Studi ini berfokus pada penggunaan teknologi penempatan dalam urea yang disediakan oleh layanan penyuluhan di kalangan petani; namun, para petani ini mungkin tertarik pada jenis pupuk lain dan metode aplikasi yang belum diselidiki. Studi ini memberikan wawasan untuk menunjukkan penggunaan UDP di kalangan petani yang terlibat dalam produksi beras sebagai cara untuk meningkatkan efisiensi nutrisi tanah.

Kata kunci: Kendala, Sumber informasi, Penggunaan, teknologi Penempatan Urea

INTRODUCTION

In many countries, rice (*Oryza sativa*) has a long history of regular increase in consumption and steady importance in planning strategic policies for food security (Norman and Otoo, 2006). Rice production is high and second to maize production (FAO, 2006). Farmers can grow the monocot seed of rice either in paddies or on upland field, the choice depend on rice variety. The use of fertilizers to grow rice is considered expensive for rural farmers in African countries. Notwithstanding, the use of organic fertilizers (green manure) is not widely practiced couple with the fact that it is time consuming.

Fertilizer deep placement is a technology practiced by placing granulated fertilizer directly in the root zone (IFDC, 2013). The ultimate aim of the technology is to improve the efficiency of soil nutrient available for uptake by rice crop. Study by FABIYI et al. (2006) affirms that the use of

Urea Deep Placement (UDP) highly increase Nitrogen Use Efficiency (NUE) and as a results, the technology increases yields, reduces quantities of urea applied, increases farmers' production, and produces national savings due to reduction of urea imports. According to IFDC (2013) the technology supports rice plant to absorb more nutrients in the soil and also stop the fertilizer being eroded during rainfall. The fertilizer used in this technology (Urea Super Granule) by rice farmers is cost effective and environment friendly (IFDC, 2013). The advantage of fertilizer deep placement is that it requires less quantity of fertilizer usage and minimizes Nitrogen losses due to less absorption of it by soil and ammonia changing to vapour when compared to surface broadcasting method. Hence, Urea deep placement (UDP) technology is widely accepted for use in lowland paddy rice production systems in some part of the world. The rate of worldwide acceptance

of UDP technology as a result of its advantages has scale up the interest of adoption in African counties (IFDC, 2013).

The implementation of the adoption process of UDP technology called Guti Urea Technology Extension Programme started in November, 2007 by the Federal Ministry of Agriculture in collaboration with the International Fertilizer Development Center. Despite the advantage of this technology over the traditional broadcasting of fertilizer application, studies have shown some constraints that limit the use of UDP technology to include improper demonstration in application resulting to difficult application process of farmers, high cost and lack of subsidy of the urea super granule fertilizer, requires high cost of labour, non-availability of the Urea Deep Placement (UDP) applicator that is user friendly and poor communication gap between farmers and extension officials (Chikoye 2010; Mustapha *et al.*, 2012).

Fertilizer is an important input resource needed in rice production. Fluctuations in the availability of required nutrient, poor climatic conditions, world market prices and weed disturbances at the early stage of planting have caused discontent in rice production. These have called for the need to apply soil amendments (fertilizer) which brings about the adoption of urea deep placement (UDP) because of its high yielding value. Although, previous study by Ajibola (2017) had highlighted factors affecting the adoption of the technology in the study area, however it is important to further investigate the extent of use of the technology for effective agricultural policy implementation that aim to improve rice production in the study area. The broad objective of the study is to assess the use of

urea deep placement technology among rice farmers in Edu local government area of Kwara State, Nigeria. Specifically, the study aimed to examine the (i) socio-economic characteristics of respondents; (ii) information sources for UDP technology among respondents; (iii) use of UDP technology among respondents; and (iv) factors that influences the use of the UDP technology among respondents.

MATERIALS AND METHODS

This research was carried out in Edu Local Government area of Kwara State, Nigeria. The local government cover about 2,542 km² areas and a population of 201,469 at the 2006 census. It consists of more than 20 communities who are mostly farmers. The local government is known for its commercial rice production and marketing activities.

Five (5) communities in (Lafiagi, Patigi, Tsaragi, Ndeji, and Isanlu-esa) were purposively selected on the premise that rice farmers are mostly available. Twenty four (24) respondents were selected randomly from each community chosen to give an aggregate sample size of one hundred and twenty (120) respondents. Questionnaire was used to collect data. Data collected was coded so as to facilitate easy analysis. Data were analysed with frequency count, percentage, mean score, and Pearson Product Moment Correlation.

RESULTS AND DISCUSSION

Socio-Economic Characteristic of Respondents

Results presented in Table 1 indicate the socioeconomic characteristics of the respondents. All (100%) of the respondents were male which implies that more male were engage in rice farming activities than female rice farmers. This is agree with the

report by Velu *et al.* (2009) who stated that women were not major players in agricultural production in the northern part of Nigeria. This age distribution of the respondents shows that a most (85%) of the respondents aged between 26 to 55 years. This age distribution of the respondents shows that a vast majority of the respondents may have more leverage in farming activities as they generally fall within their active and more productive years. This finding is corroborate Ogunniyi *et al.* (2015) who similarly found 48 years as age bracket of majority rice farmers in Kwara state. On marital status, majority (85.8%) were married. This finding agrees with studies by Oyetoro and Akinboye (2010) and who similarly reported that larger population of farmers were married.

Most (63.3%) of the rice farmers had tertiary education. High level of literacy is believed to enhance innovation as well as enhance proper documentation in farming business (Abdullah, and Samah, 2013). This implies that the respondents are not likely to have much difficulty in understanding and adopting the UDP technologies and innovation. Also shows that majority (61.7%) of the rice farmers were engaged rice farming because of the interest they have in it. Also 25.0% of the respondents had between 1-5ha of land to plant rice, 23.3% had 6-10, 33.3% had 11-15ha, and 18.3% had 16ha and above. This implies that majority of the farmers had farm size range of 11-15ha and this justifies their scale of production is medium.

Table 1 shows that all the respondents in had their own individual farm. This implies that since all the respondents owned plot of land themselves. Majority (99.2%) of the farmer plants annually. This implies that irrigated

rice farming is likely not to be common among rice farmers in the study area. The table also shows that most (79.2%) of the respondents were planting the long grain variety of rice. This implies that long grain variety is the best variety of rice in the study area. Most of the farmers plant the long grain because of its high yield rate. The best variety of rice in the study area is the long grain with 79.2%. This implies that the best grain in the study area is simply the long grain since it has the highest percentage and it's the grain in which the farmers were planting the most. Long grain varieties were mostly planted with UDP technology (85.8%), both short grain medium grain 7.1%. This implies that the adopter plants long grain variety mostly with the new technology since it is their best yielding variety. The adopters of the technology among the respondents take the long grain as the variety which gives the best yield with the technology with 85.8%. This implies that the long grain is the best variety for the technology among the respondents because it gives the best yield with the newly introduced technology.

Table 1: Socio-economic characteristic of rice farmers

Variables	Frequency	Percentage (%)
Gender		
Male	100	100
Age (years)		
≤ 25	9	7.5
26-40	56	46.7
41-55	46	38.3
≥ 56	9	7.5
Marital status		
Single	11	9.2
Married	103	85.8
Divorced	4	3.3
Widowed	2	1.7
Educational qualification		
No formal education	12	10.0

Primary school	4	3.3
secondary school	21	17.5
tertiary school	76	63.3
Quranic education	3	2.5
Adult education	4	3.4
Motivation		
Interest	74	61.7
Family demand	41	34.1
Supportive	5	4.2
Do you have a rice farm of your own?		
Yes	120	100
How often do you plant?		
Annually	119	99.2
Bi-annually	1	0.8
Rice farm size (hectares)		
1-5	30	25.0
6-10	28	23.3
11-15	40	33.3
≥16	22	18.3
What variety of rice do you plant?		
Long grain	95	79.2
Short grain	23	19.2
Medium grain	2	1.6
Which variety of rice is the best?		
Long grain	95	79.2
Short grain	23	19.2
Medium grain	2	1.6
Where do you obtain rice seed?		
Directly from the market	14	11.8
Import	1	0.8
Directly from the farm	104	87.4
Do you make use of labourers on your rice farm?		
Yes	103	86.6
No	16	13.4

Source: Field Survey, 2016

Source of Information of Respondent about UDP technology

Table 2 presents the sources of information of the respondents as regards UDP technology. It shows that majority (85.8%) of the respondents had knowledge of technology in deep placement urea. This implies that the rate of UDP innovation

dissemination in this local government is high. About 33.3% of the respondents heard of it in 2012, 28.3% in 2013, 10.8% in 2011, 6.7% in 2010, 4.2% in 2015, 1.7% in 2014 and 0.8% before 2010. Of the 6 sources of information presented to the respondents, extension agents (55.0%) and family/fellow farmers (25%) have the highest. This implies that face to face contacts of sources of information seems to be the major sources and preferred means of acquiring information in the study area. This could be as a result of the ability of these farmers to have face-to-face contact with these sources. This is in consonance with the report of Abiona et al. (2016) who affirmed that a common generality of social communication is more efficient. When people engage in interpersonal communication with one another; their fields of experience begin to overlap.

Table 2: Awareness and Sources of information of UDP technology among respondent

Information sources	Frequency	Percentage
Have you heard of UDP		
Yes	103	85.8
No	17	14.2
If yes, when?		
Before 2010	1	0.8
2010	8	6.7
2011	13	10.8
2012	40	33.3
2013	34	28.3
2014	2	1.7
2015	5	4.2
Sources of information about UDP technology		
Newspaper	2	1.7
Radio	2	1.7
Television	1	0.8
Letters	1	0.8
Family and Fellow farmers	30	25.0
Extension agent	66	55.0
Others	1	0.8

Source: Field Survey, 2016

Adoption of UDP technology among Respondents

As presented in Table 3, majority (81.7%) of the respondents already tried the UDP technology on their farm. This finding may be attributed to the fact that most of the respondents who were literate. Nevertheless, only 11.7% further adopted the technology while majority (88.3%) did not adopt the method. This implies that the method was not suitable with their farming practices. Majority (66.7%) of the respondents shows that the method is labour intensive. Most of the respondents (10%) who adopt the technology feels that it increases their production level compare to other methods. This finding corroborates previous study that the use of UDP increase productivity (Rahman and Barmon, 2015). This is in consonance with the work of Rogers (2003) in his publications that satisfaction should be derived from adoption and could further influence the adoption of innovation. The aforementioned factors are one of the key factors influencing the adoption of innovation according to Rodgers.

Data presented in Table 3 reveals that majority (90.0) of the respondents did use UDP while only 10.0% of them had adopted the technology immediately after they were informed. According to Rodgers (2003) satisfaction should be derived from adoption. About 88.3% of the adopters were not prefer the use of UDP while only 11.7% had no preference for the use of the technology. Furthermore, high percentage (21.7%) indicated that the UDP requires more capital than other methods while 66.7% of the respondents indicated that UDP requires more labour than other method. Also, 41.7% of the respondents

indicated that UDP requires more time than other method.

Table 3: Use of UDP technology among farmers

Variables	Frequency	Percentage
Have you tried UDP on your farm?		
Yes	98	81.7
No	22	18.3
Have you adopted UDP technology?		
Yes	14	11.7
No	106	88.3
If no, why?		
It requires more capital than other methods	36	30.0
Labour intensive	70	58.3
If yes, why?		
Increase productivity	12	10.0
Readily available	2	1.7
Do you adopt UDP immediately you have the knowledge?		
Yes	12	10.0
No	108	90.0
Do you prefer the use of UDP to other method?		
Yes	14	11.7
No	106	88.3
Does UDP require more time than the other methods?		
Yes	50	41.7
No	70	58.3

Source: Field Survey, 2016

Constraints to Adoption of UDP technology among Rice Farmers

Table 4 shows the factors that negatively affects the adoption of the method among the respondents in the study area. The table shows that land availability (14.7%) had the highest influence, followed by awareness and knowledge (13.7%), socio-economic characteristics and farming practices (12.7%), variety of rice grown (10.8%), water (9.8%), capital and labour (8.8%), and the least which is the climatic factor (7.8%). This implies

that land availability and awareness and knowledge negatively influenced the adoption of the technology.

Table 4: Constraints to use of UDP technology among rice farmers

Factors	Yes	
	Frequency	Percentage
Socio-economic factor	13	12.7
Capital	9	8.8
Water	10	9.8
Farming practice	13	12.7
Land availability	15	14.7
Variety of rice rown	11	10.8
Climatic factor	8	7.8
Labour	9	8.8
Awareness and knowledge	14	13.7

Hypothesis testing

The result of the Pearson product moment correlation reveals that out of the selected socioeconomic characteristics presented (farm size, marital status and age), only age was significant. This implies that only the afore-mentioned variables have decisive influence on the use of UDP technology among rice farmers. This simply shows that the majority of the respondents are in their active and productive year. This finding supports the finding of Oladele and Kolawole (2013).

Table 5: Effect of age, farm size and marital status on use of UDP technology among rice farmers

Variables	Use of UDP technology		
	r-value	Sig. (p-value)	Remark
Age	0.210	.022	Significant
Farm size	0.057	.539	Not significant
Marital status	0.039	.675	Not significant

Decision rule: reject H_0 for p-values less than 0.05

CONCLUSION

Based on the findings, it can be concluded large proportion of rice farmers in study area had long years of knowledge about urea deep placement technology through agricultural extension agents and tried it but only few of continue use of the technology. Several factors hindered the wide range use of UDP technology in Edu Local Government Area.

To further encourage more use of UDP technology in the study area, it is recommended that;

1. The government should create more awareness and encouragement so that more people will know everything about urea deep placement technology and fertilizers should be readily available and affordable to the farmers.
2. Governments should make funds available through Agricultural cooperative banks to assist the farmers on their production.
3. Farmers should also be encouraged to join the various farmers group or associations available around them.
4. Lastly, the study recommends that the public and Non-Government Organizations (NGO's) should endeavour to sponsor the extension agents to enlighten the farmers on the use of urea deep placement technology.

REFERENCES

- Abdullah, F.A. and Samah B.A. (2013). Factors impinging farmers' use of agriculture technology. *Asian Social Science*. 9(3): 120-124.
- Abiona, B.G., Fakoya, E.O., Adeogun, S.O. and Blessed, J.O. (2016). Effect of Communication Pattern on Agricultural Employees' Job Performance. *Journal of*

Biology, Agriculture and Healthcare. 5 (3): 1-6.

Ajibola, B.O. (2017). Factors affecting adoption of urea deep placement technology by rice farmers in Kwara State, Nigeria. *Journal of Agricultural Research and Development.* 6 (1): 1-11.

Chikoye, O., Kamara, A. and Omoigui, O. (2010). Response of upland rice cultivars to Nitrogen fertilizer in the Savanna of Nigeria. *Agronomy Journal.* 4: 56-67.

FAO (2006). Agriculture towards 2015/30 Technical Interim report, Rome 2006. <https://www.worldcat.org/title/agriculture-towards-201530-technical-interim-report/oclc/500984315>

International Fertilizer Distribution Center (2013) International Fertilizer Distribution Center Projects 2013 in Nigeria. [Online]: Available at: <http://www.ifdc.org/Nations/Nigeria>[accessed on January 7, 2018]

Fabiyi E.F., Kushwaha, S. and M. Auwall (2006). Adoption of technology for rice production: A case study of Bauchi Local Government Area Bauchi State, Nigeria. *Global Journal of Agricultural Science.* 5 (2): 57-82.

Mustapha, S.B., Undiandeye, U.C., Sanusi, A.M. and S. Bakari (2012). Analysis of adoption of improved rice production technologies in Jeer local government area of Borno State, Nigeria. *International Journal of Development and Sustainability.* 1(3): 1112-1120.

Norman, J.C. and Otoo, E. (2006). Sustainable rice production for food security. Preceding of the 20th session of the International Rice Commission Bangkok, Thailand, 23 – 26, July 2006. <http://www.fao.org/3/y4751e00.htm>

Oladele, O.I. and Kolawole, A.E. (2013). Ex-ante adoption of Sawah rice production technology in Kwara State Nigeria. *Life Sci. J.* 10(2): 2740- 2745.

Ogunniyi, L.T., Komolafe O.D., Fanifosi, G.E. and Rasaki, W.A. (2015). Production Efficiency of Rice Production in Kwara State, Nigeria. *International Journal of Agriculture and Crop Sciences.* 8 (3): 339-345.

Oyetoro, J.O. and Akinboye, O.A. (2010). Farmers' provision of Feedback on fishery technologies in Epe Local Government Area of Lagos State. *Continental Journal of sustainable Development.* 2010; 1:51 –56.

Rahman, S. and Barmon, B.K. (2015). Productivity and efficiency impacts of urea deep placement technology in modern rice production: An empirical analysis from Bangladesh. *The Journal of Developing Areas.* 49(3): 119-134

Rogers, E.M. (2003). Diffusion of innovations, 3rd edition. Rev. ed. of: Communication of innovations. The Free Press 2003, New York, USA.

Veliu A, Gessese N, Ragasa C. and Okali C. (2009). Gender Analysis of Aquaculture Value Chain in Northeast Vietnam and Nigeria. Agriculture and Rural Development Discussion Paper 44 The World Bank, Washington (2009). http://siteresources.worldbank.org/INTARD/Resources/Gender_Aquaculture_web.pdf