Analysis of the relationship between the Socio-Economic Characteristics of Rice Farmers and Soil Management Practices in Abuja, Nigeria

Jegede M. Eunice[1*], Olorunniyi A. Ayo[2], Hauwa Bako[3], Tuedon, A. Omabuwa[4]

Department of Agricultural Extension and Rural Sociology, Faculty of Agriculture, University of Abuja, FCT, P.M.B. 117, Abuja, Nigeria
*Corresponding Author

Received:- 08 September 2021/ Revised:- 15 September 2021/ Accepted:- 21 September 2021/ Published: 30-09-2021

Abstract**—** *The study examined the analysis of the relationship between the Socio-Economic Characteristics of Rice Farmers and Soil Management Practices in Abuja. The study was conducted in rural communities in Abuja, Nigeria. Two objectives guided the study. The study adopted descriptive and logistic regression research design. Multistage sampling technique was employed to select the farming communities for the study. Twelve (12) agricultural wards (Chuwkuku, Gaube, Bamushin, kotunku, Pai, Dafa, Bako, Dobi, Paso, Chibiri, Gadabiu and Paikon) were randomly selected giving a total of thirty-six (36) agricultural wards. Five blocks were randomly picked from each of the agricultural wards making the total of 180. Lastly two (2) circles were randomly selected from each of the blocks resulting to three hundred and sixty (360) respondents who were randomly selected from the chosen circles. The results show that 58.06% of the respondents were male while 36.13% of the respondents were between the ages of 30 and 39years. Also, 47.74% of them were married with 40% of the respondents having an average of 5 people in their households. 61.94 had at most a national certificate of education (NCE). Majority (44.84) of the respondent had a farm size of between half a hectare and two hectares. The study recommended that manual tillage should be mostly carried out by rice farmer to improve the level of production and also soil rotation should be practiced where soil is much available to reduce the level of degradation*.

Keywords— Smallholders, soil management, rice farmers, food security, adoption.

I. INTRODUCTION

Rice is a staple food in Nigeria, and the average consumption is 200kg/capita/year. However, rice productivity has declined dramatically in recent years due to incessant killing of smallholder farmers on the farmland. Food security can be reached by improving the technical efficiency of rice farming, especially in rice farming centers Nigeria. Prokopy *et al*. (2008) and Baumgart-Getz *et al.* (2012) argue that the key capacity variables considered to be important in influencing farmers' adoption decisions include age, education (formal education and farmer [extension] training), income, farming experience, tenure, social networks, labor, capital and information. While both Prokopy *et al*. (2008) and Baumgart-Getz *et al*. (2012) use this concept (capacity) to combine both farmer and farm characteristics, most adoption literature separates them (Reimer *et al*. 2012; Meijer *et al*. 2015). In this study, we chose to adopt the latter categorization since one of the categories (farmer characteristics) relates to the management ability of the farmer, while the other category (farm characteristics) relates to farm resources (Chomba, 2004). Adoption literature of agricultural technologies posits that the decision to adopt technologies including Integrated Soil Management Fertility Management (ISFM) practices, is affected by both farmer and farm attributes (Meijer, *et al.*, 2015). For instance, based on household size, households with more adults are more likely to adopt ISFM since many of the ISFM practices are labour intensive (Kassie, *et al*., 2013). As household size increases, the likelihood of adoption of ISFM practices is expected to be high.

Household heads are the final decision makers regarding choice of soil fertility practices and technologies. While most adoption studies have found a negative effect of age to adoption of soil conservation (Kassie *et al.* 2013) and others have found age to be insignificant. This implies that the influence of age on adoption of technologies is inconclusive and warrants a more nuanced study. In almost every adoption study, education of the farmer is considered to positively influence the

farmer's likelihood of adopting a new technology or practice because farmers with better education have more exposure to new ideas and information, and thus have better knowledge to effectively analyse and use available information (Kassie *et al.* 2011). While most studies consider education in terms of number of years of formal education, the categorization of education by Baumgart-Getz *et al.* (2012) seems more appropriate. In contrast to formal education, it reflects knowledge farmers attain through other means such as extension programs, workshops, and field days.

Important to adoption of soil fertility practices and technologies is farmers' experience. As a farmer grows older, (s) he has generally been exposed to more ideas, information (Prokopy *et al.* 2008) and production practices thereby being more efficient and accurate in judgment of expected benefits (Kassie *et al.*, 2015). This, in turn, facilitates the potential to adopt new technologies. A meta-analysis by Knowler and Bradshaw (2007) found that farmers' experiences positively influence adoption soil conservation practices. However, other meta-analyses on the same parameter have found quite inconclusive results. For instance, Prokopy *et al*. (2008) reviewed adoption literature of best management practices within the US, and found farmers' experience to have mixed results. Baumgart-Getz *et al.* (2012) found farming experiences were not significantly related to adoption, thus calling for further studies (Prokopy *et al.* 2008).

1.1 Household of Adoption of Soil Management for Rice Production

We consider household wealth to include livestock ownership, farm size (acres) farming come and equipment. With respect to wealth, it is regularly theorized that adoption of any new technology requires sufficient financial well-being, particularly if new equipment is needed (Knowler, 2015; Knowler & Bradshaw, 2007). Several analyses of the role of income and farm profitability on adoption have revealed a positive influence (Baumgart-Getz *et al*. 2012; Knowler & Bradshaw 2007; Prokopy *et al.* 2008). In relation to ISFM in many developing countries, the presence of livestock plays a key role in adoption of animal manure since the animals not only contribute synergistic crop-animal production interaction, but, cattle and oxen can also be a source of draft power (Kassie, *et al*., 2013). Size of the farm (acreage) as a measure of physical capital has been found to be a best (financial) predictor of adoption (Baumgart-Getz *et al*. 2012) since it can be used as collateral to access credit for investments in soils.

Labour is a major production cost in agriculture. The lack of sufficient labour on the farm is theorized to impede the use of various soil fertility management practices (Kamau and Ayuo, 2013). In many developing countries, families continue to provide the bulk of farm labour for most farm operations because many households cannot afford to hire wage labourers. This implies that the lack of family labour coupled with family liquidity constraints to hiring labour greatly affect the adoption of ISFM practices. However, when addressing farm labour concerns, it is important to identify other community adaptive mechanisms through which labour is mobilized on farms. Mugwe *et al.* (2009) observed that farmers sometimes trade their labour for food or make reciprocal arrangements in which they pool their labour efforts together through their farmer-to-farmer local network systems and work on each other's fields during peak labour requirement periods. This could help in ascertaining whether such labour arrangements favour adoption of specific soil fertility management practices at the expense of others within the package of ISFM. Therefore, the purpose of this study is to find out the relationship between the Socio-Economic Characteristics of Rice Farmers and Soil Management Practices in Abuja, Nigeria. The specific objectives of this study are to:

- Describes the socio-economic characteristics of rice farmers in the study area.
- Analysis the influence of farm size on effectiveness of soil management practices study area.

II. MATERIALS AND METHODS

2.1 The Study Area

The Federal Capital Territory, Abuja is located in the geographical centre of Nigeria with a land area of 8,000 square kilometres and lies between latitude 9° 10' north of the equator and longitude 7° 11' east (FCT, 2007). It is bounded in the North by Kaduna State, in the West by Niger State, in the East by Nasarawa State and in the South by Kogi State; and is made up of six area councils namely Gwagwalada, Kuje, Kwali, Bwari, Abaji and Abuja Municipal Area Councils. The major communities with high intensity of farming activities are Nyanya, Karu, Gwagwalada, Kuje, Abaji, Karshi, Bwari, Kwali and Garki (AGIS, 2004**).** It had a population of 1,408,239 persons according to 2006 population census but has grown to 2,245,000 in 2010.

Gwagwalada Area Council has an area of 1,043 km² and a population of 157,770 at the 2006 census. Gwagwalada area council lies between latitude 070.57"N and longitude 070.7"E. Kuje area council comprises of 162 communities widely

spread within a land mass of about 1,800 km²and a population of over 420,000 at the 2006 census. Kwali area council has an area of 1,206 km² and a population of 85,837 at the 2006 census. The vegetation of these area councils combines the best features of the Southern tropical rain forest and Guinea savannah of the North (Aiyedun, 2003). This reflects the full transitional nature of the Area as between the Southern forest and Northern grassland which have the woods and shrubs respectively. The soil is reddish with isolated hills filled by plains and well drained sandy clay loams which support farming of rice and other crops. Gwagwalada, Kuje and Kwali area councils have been known for agricultural activities over the years, informed of the areas agro-climatic conditions and rural characteristics with about 85% of the population who are mostly indigenes engaged in farming activities which includes the cultivation of cereals, tuber/root crops and legumes it make the council areas suitable for this study.

2.2 Population of the study and research design

All the rice farmers in FCT, Abuja constitute the population of the study. The research design for this study was descriptive survey method which involves the use of questionnaire and interview schedule to collect information on the soil management practices from rice farmers in FCT, Abuja. Kayode *et al.* (2017) used survey research design to investigate characteristics of population in a study to evaluate a study. It involves Participants answering questions administered through questionnaires, while researchers describe the responses given in order for the survey to be both reliable and valid. These questions are constructed properly and data collected was used to answer specific objectives of the study.

2.3 Sample Size and Sampling Techniques

Multi-stage sampling technique was used to select the sample. Firstly, out of the six area councils of Abuja (Gwagwalada, Kwali, Kuje, Abaji, Bwari and Abuja Municipal).three area councils (Gwagwalada, Kuje and Kwali) were randomly selected. Then from each of the selected Area Councils, twelve (12) agricultural wards (Chuwkuku, Gaube, Bamushin, kotunku, Pai, Dafa, Bako, Dobi, Paso, Chibiri, Gadabiu and Paiko) were randomly selected giving a total of thirty-six (36) agricultural wards. Five blocks were randomly picked from each of the agricultural wards making the total of 180. Lastly two (2) circles were randomly selected from each of the blocks resulting to three hundred and sixty (360) respondents who were randomly selected from the chosen circles.

2.4 Procedure for data collection

Primary information was obtained with a questionnaire by researchers during the survey. The activities covered include; direct personal observation, oral interview and discussion with village heads about farming activities in the area, soil management practices from land acquisition to crops storage, agricultural development of the area among others.

The questionnaire was divided into different sections: 1. Data on the Social-economics characteristics of farmers (gender, age, marital status, name of town, education background, marital status, house hold size, among others); 2. Socio-economic factors that influence the effectiveness of soil management practices in the study area.

2.5 Method of Data Analysis

Both descriptive and inferential statistics were used to actualize the objectives of the study. The data obtained from the field survey was analysed using descriptive statistics like; simple frequency distribution and percentage was used to analyse social economic variables and management practices. Logistic Model analysis observed the relationship between the socio-economic characteristics of rice farmers and their soil management practices as was explained by (Adekayode and Akomolafe, 2011).

Binary responses are commonly studied in many fields. Examples include the presence or absence of a particular event. Often one wishes to study how a set of predictor variables X is related to a dichotomous response variable Y for convenience we define the response to be Y = 0 or 1, with Y = 1 denoting the occurrence of the event of interest. Often a dichotomous outcome can be studied by calculating certain proportions, for example, the proportion of soil management practice among rice farmers. However, in many situations, there are multiple descriptors, or one or more of the descriptors are continuous. Without a statistical model, studying patterns such as the relationship between age and occurrence of a good soil management practice, for example, would require the creation of arbitrary age groups to allow estimation of prevalence as a function of age.

Letting X denote the vector of predictors $\{X_1, X_2, \ldots, X_k\}$, a first attempt at modelling the response might use the ordinary linear regression model

$E\{Y|X\} = X_\beta$, (10.1) since the expectation of a binary variable Y is Prob{Y = 1}. However, such a model by definition cannot fit the data over the whole range of the predictors since a purely linear model $E\{Y|X\} = Prob\{Y = 1|X\} = X_\beta$ can allow Prob{Y = 1} to exceed 1 or fall below 0. The statistical model that is generally preferred for the analysis of binary responses is instead the binary logistic regression model, stated in terms of the probability that Y = 1 given X, the values of the predictors. With aid of Statistical Package for Social Science (SPSS) version 24 the data were analyzed and the descriptive statistics were used to present the results.

III. RESULTS AND DISCUSSION

3.1 Socio-Economic Characteristics of Respondents

3.1.1 Gender Distribution

Table 1 shows that 360 questionnaires were administered from which 180 respondents representing 58.06 % are males while 130 representing 41.94% are females. This trend in gender involvement shows that men (males) are more involved in Rice farming in the Area Councils than women (females). This might not be unconnected with the prevailing Islamic religion practice which forbids women in "pudah" from engaging in any form of work including light Agriculture works s discussed in (Fashola *et al.,* 2007). The difference is not in any way related to preference of men to women in the studies. Although (Gomiero *et al.,* 2011) pointed out those women contribute significantly to observing the soil management practice of rice farming even though their number may not be much compared to that of men.

TABLE 1
SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

Items	Total	%	Mean
Gender:			
Male	180	58.06	
Female	130	41.94	
Age:			
0-19	9	2.90	
20-29	81	26.13	
30-39	112	36.13	36.00
40-49	64	20.65	
50-59	44	14.19	
60 and above	-	-	
Education:			
Primary Cert/SSCE	88	28.39	
NCE	104	33.55	
OND	30	9.68	
HND/B.Sc	28	9.03	
Others	08	0.89	
Adult Education	15	2.58	
M.Sc/Ph.D	17	5.48	
None	20	6.45	
Farm Size:			
Less than half hectare	118	38.06	1.20
Half hectare and two hectare	139	44.84	
Above two hectare	53	17.10	

Source: Field Survey, 2020

3.1.2 Age Distribution

The result in Table 1 shows that the mean age of respondents in the study area was 36years. And from the table we see that majority (36.13%) of rice farmers fall within the age bracket of 30-39 of the total respondents. This followed by age bracket 20-29 representing 26.13%. Thus, it became obvious that the age bracket 20 and 49 formed the largest part of the participants accounting for 82.91% of the total participants. It can be therefore safely inferred that the majority of rice farmer in the study area are youths who are strong enough to carry out the practice. Rice farming is labour intensive and requires much labour which employ the services of many youths. These compromise the views of (Ladha, 2014) which states that age factor determine the rate of farming. But it correlates with the views of assertions of (John *et al.,* 2019) which opine that farming is not gender related.

3.1.3 Education Qualification

The table 1 shows that 5.48% of the respondents were highly educated people and don't engage in farming as observed in the study area by (Adewole and Anyahara, 2010). In Abuja, majority of those that have High qualification engage in administrative work and as such, Secondary School certificate holders recorded the highest respondents in farming accounting for 33.55%, followed by respondents with Primary School Leaving Certificate with 28.39% due to the low level of education of 33.55% of the farmers, the mostly employ traditional means of soil management system which may not be effective as the scientific method as observed by (Alfred, 2018). The NCE and OND had thirty and twenty-eight participants' representing 33.55% and 9.68% respectively are more engaged in teaching work in primary and secondary schools, though few of them go to farm after their teaching work and other businesses they may be engaged in. Respondents with HND/BSc have 9.03% and it make up full administrative workers in most off the government agencies and private offices in Abuja. 6.45% of them are into businesses, this agrees with the views of (Kayode *et al.*, 2017). Other qualifications making up 0.89% are those with Islamic certificate and other skill acquisition certificates who have also impact majorly in the farming of rice in the study areas. Participants having adult education and other education represented 5.48% and 2.58% respectively as this have little impact on the farming in the area and those don't have education (20) accounted for 6.45% of the total respondents and Given this educational qualification distribution, 33.55% of respondents in the sampled areas are literates low academic qualifications.

3.1.4 Farming size of the Respondents

Small farm size is mostly observed in the study area 44.84 of the farmers are subsistence farmers. As shown in the table, of farmland between half hectare and one hectare. 38.06% had less than half hectare while the remaining 17.10% cultivates above one hectare of land. The result further reveals that the mean farm size of respondents is 1.2 hectares. From the analysis, one can easily infer that these farmers will not only feed themselves total respondents.

3.2 Socio Economic Factors that Influence the Effectiveness of Soil Management Practices in the Study Area

Table 2 shows the result of the logistic regression analysis on the influence of socio economic variables on effectiveness of soil management practices in the study area. The result shows that Cox and Snell R^2 have a value of 0.154 which means that 1.54% of the variations in the dependent variable can be predicted by the independent variable. The remaining 44.9% was due to error or variables not captured in the model. The result shows that Gender, age and education were all significant at 1% while farm size was significant at 5%.

TABLE 2
LOGISTIC REGRESSION SHOWING INFLUENCE OF SOCIO-ECONOMIC VARIABLES ON EFFECTIVENESS OF SOIL MANAGEMENT PRACTICES

Variable	B	S.E.	Wald	P value (Sig.)
Gender	.912	.287	10.136	.000**
Age	-.686	.159	18.733	.000**
Education	-.367	.210	12.732	.000**
Farm Size	-.152	.131	.342	.011*
Marital status	.180	.208	.746	.388
Household size	-.124	.089	1.928	.165
Constant	-.616	.622	.981	.322

significant at 5%
****significant at 1%***
R^2 = 0.154
Source: Field Survey, 2020

3.2.1 Influence of Gender on the Effectiveness of Soil Management Practices

The regression result reveals that Gender was positive (.000) and significant at 1% probability. Hence, for a unit increase in Gender, if every other variable is constant, there will be a 0.91 unit increase in the effectiveness of soil management practices in the study area. This implies that the effectiveness of soil management practices in the study area is directly influenced by the Gender of the farmers. The result shows that soil management practices are more effective among male farmers in the study area.

3.2.2 Influence of Age on Effectiveness of Soil Management Practices

The result in Table 2 showed that age was negative (.000) and significant at 1% probability. The result shows that for a unit increase in age, assuming all other variables remain constant, there will be a 0.68 unit decrease in the effectiveness of soil management practices in the study area. This implies that younger farmers tend to effectively soil management practices more than the older farmers. This is probably due to the fact that younger farmers are more open to adopting new farm practices than the older farmers. The older farmers tend to stick with practices they are already familiar with, rather than try out new ideas (Fashola *et al.,* 2007).

3.2.3 Influence of Education on Effectiveness of Soil Management Practices

The regression result reveals that education was negative (.000) and significant at 1% probability. This means that education has an inverse relationship with the effectiveness of soil management practices in the study area. Hence, for a unit increase in education, if every other variable is constant, there will be a 0.36 unit decrease in the effectiveness of soil management practices in the study area. This could be a result of the fact that most of the respondents in the study area had at most a national certificate of education (NCE), with only a few of the respondents possessing higher educational qualifications. This is probably why the effectiveness of soil management practices reduces with increase in education, since most of the respondents possess lower education qualifications.

3.2.4 Influence of Farm Size on Effectiveness of Soil Management Practices

Farm size was significant at 5% but had a negative relationship with the effectiveness of soil management practices in the study area. This shows an inverse relationship between farm size and the effectiveness of soil management practices and this implies that for a unit increase in farm size there will be a 0.15 decrease in the effectiveness of soil management practices in the study area. This implies that the more the farm size of the respondents, the less they are effective with soil management practices. This is probably because larger farm sizes require more energy. While farmers may be able to effectively adopt soil management practices for small farms, it becomes more tedious and drudgery sets in with larger farms.

3.3 Test of Hypothesis

From Table 2, the level of significance is considered to be (P-value =0.05) and from the Logistic regression view, if the P-value is less than or equal to 0.05 (P-value $\leq$ 0.05).the test is significant we accept the alternate hypothesis. And if the P-value is >0.05, the test is not significant we accept the null hypothesis. Since the soil management is regressed by the repressors (gender, age, education, farm-size, marital status and household-size). The p-values of Gender, age, education and farm size are less than 0.05, therefore the test is significant, and therefore we reject the null and accept the alternate hypothesis for the significant variables in the study area. The p-values for marital status and the household size are higher than 0.05; this means that they do not significantly influence the effectiveness of soil management practices among respondents in the study area, therefore we accept the null hypothesis for these variables.

IV. CONCLUSION AND RECOMMENDATION

Considering the soil management practice of rice farmers in FCT, Abuja, there is the need to adopt good soil management measures like manual tillage and mechanical tillage that will improve the rice production. Minimum and zero tillage which preserve the land are not very advisable for rice production. The research has been able to identify gap and area of agreement, the finding of the study shows that the physical and chemical fragility is observed in some areas, minimum tillage was practice in some places where surface hoeing involving manual stirring of soil surface with hoe to the depth of about 4cm is normally done to conserve soil water, improve macro porosity, reduce bulk density and give better yield. In other places, Row (strip) tillage is done to improve on-zero tillage and control some problems associated with it, this is also done to conserve soil water. Manual heaping or ridging to conserve soil fertility and maintain high yield. In some areas the return of plant residues and mulching are used in place of fertilizer to increase the soil nutrients by farmers in Kuje, Gwagwalada and Kwali Area Council.

V. RECOMMENDATION

Base on the peculiar soil management problems of the tropical soil, experience have shown that most soil have lost their fertility and better soil management of rice farming, the following recommendations are made:

1. Manual Tillage should be mostly carried out by rice farmer to improve the level of production.
2. Soil rotation should be practiced where soil is much available to reduce the level of degradation.

3. Organic farming should be practiced to reduce the application of chemical that will constitute hazard to the soil.
4. Cover cropping should be practiced to reduce the water loss from the soil surface and to prevent the direct effect of solar radiation the soil organic component.

REFERENCES

[1] Adekayode, F.O. & Akomolafe D.T. (2011). Department of Crop, Soil and Pest Management, Federal University of Technology, Akure, Nigeria. *European Scientific Journal,* 10(3), 17-38.

[2] Adewole, M.B. & Anyahara, U.C. (2010). Adoption rate of land clearing techniques and their effects on some soil fertility parameters of an Alfisol in South-Western Nigeria. *African Journal of Agricultural Research,* 5(23), 3310-3315.

[3] Aiyedun, A. (2003). Determinants of technology adoption decisions among farmers in the Federal Capital Territory, Abuja. *The Nigerian Economic Society,* 1(3), 186-198.

[4] Alfred, E.H. (2018). Soil Fertility Decline: Definitions and Assessment. *ISRIC–World Soil Information, Wageningen, The Netherlands*

[5] Baumgart-Gertz, A., Prokopy, L.S. & Floress, K. (2012). Why farmers adopt best management practices in the United States: A meta-analysis of the adoption literature. *Journal of Environment Management,* 96, 17-25.

[6] Chomba, G.N. (2004). Factors affecting smallholder farmers' adoption of soil and water conservation practices in Zambia. Michigan State University. Department of Agricultural Economics.

[7] Fashola, O.O., Oladele O.I., Alabi M.O., Tologbonse D. & Wakatsuki, T. (2017). Socio-economic factors influencing the adoption of Sawah rice production technology in Nigeria. *J Food, Agric & Environ Finland*, 5(1), 239–242.

[8] Gomiero, T.M., Pimentel D. & Maurizio G.P. (2011). "Environmental Impact of Different Agricultural Management Practices: Conventional Versus Organic Agriculture *Critical Reviews in Plant Sciences* 30(1) p. 95-124

[9] Kassie, M., Jaleta, M., Shiferaw, B., Mmbando, F. & Mekuria, M. (2013). Adoption of interrelated sustainable agricultural practices in smallholder systems: Evidence from rural Tanzania. *Technological forecasting and social change,* 80(3), 525-540.

[10] Kayode, A.O., Oladipo, F.O. & Daudu, A.K. (2017). Determinants ofadoption of land management practices in Kogi State Nigeria.*Journal of Agroscience,* 16(2).

[11] Knowler, D. (2015). Farmer Adoption of Conservation Agriculture: A review and update. *Conservation Agriculture,* 621-642.

[12] Knowler, D., & Bradshaw, B. (2007). Farmers' adoption of conservation agriculture: A review and synthesis of recent research. *Food Policy*, 32(1), 25-48.

[13] Ladha J. K. (2014). Integration of conservation agriculture with best management practices for improving system performance of the rice-wheat rotation in eastern Indo-Gangetic plains of India. *Agric Ecosys Environ,* 195, 68-82.

[14] Meijer, S.S., Catacutan, D., Ajayi, O. C., Sileshi, G.W., & Nieuwenhuis, M. (2015). The role of knowledge, attitudes and perceptions in the uptake of agricultural and agroforestry innovations among smallholder farmers in sub-Saharan Africa. *International Journal of Agricultural Sustainability*, 13(1), 40-54.

[15] Mugwe, J., Mugendi, D., Mucheru-Muna, M., Merckx, R., Chianu, J., & Vanlauwe, B. (2009). Determinants of the decision to adopt integrated soil fertility management practices by smallholder farmers in the central highlands of Kenya. *Experimental Agriculture,* 45(1), 61-75.

[16] Prokopy, L.S., Floress, K., Klotthor-Weinkauf, D., & Baumgart-Getz, A. (2008). Determinants of agricultural best management practice adoption: Evidence from the literature. *Journal of soil and water conservation,* 63(5), 300-311.

[17] Reimer, M.E., Bulgarini, G., Akopian, N., Hocevar, M., Bavinck, M.B., Verheijen, M.A. & Zwiller, V. (2012). Bright single-photon sources in bottom-up tailored nanowires. *Nature Communications*, 3(1), 1-6.