

# Agro-Related Policy Awareness and Their Influence in Adoption of New Agricultural Technologies; A Case of Tissue Culture Banana in Uganda

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## Abstract

Adoption of banana tissue culture in Uganda still remains low despite the availability of policies geared to enhancing agriculture. A survey was carried out on 115 smallholder farmers in Central Uganda to establish the influence of agro-related policies in tissue culture banana adoption between January and July 2018. Results from the study indicated that 83.8% of the respondents were aware about the Plan for Modernization of Agriculture policy as compared to National Agricultural Policy (5.5%), National Development Plan (13.12%) and Agricultural Sector Development Strategy and Investment Plan (3.3%). Age, gender and education level all exhibited weak correlations in relation to policy awareness while generally, the study found out that awareness of the of the policies did not significantly influence farmer's adoption of tissue culture banana in central Uganda ( $P>0.05$ ). We conclude that most of the agro-related policies were on paper and minimal efforts were in place to enhance their awareness amongst small holder farmers. We therefore recommend that increased awareness of agro-related policies to the farmers as well as integration of farmer interests in policy formulation are paramount in order to achieve wide uptake of agro-technologies like banana tissue culture.

**Keywords:** Tissue culture banana; Agro-related policy; Agro-technology; Adoption; Food security.

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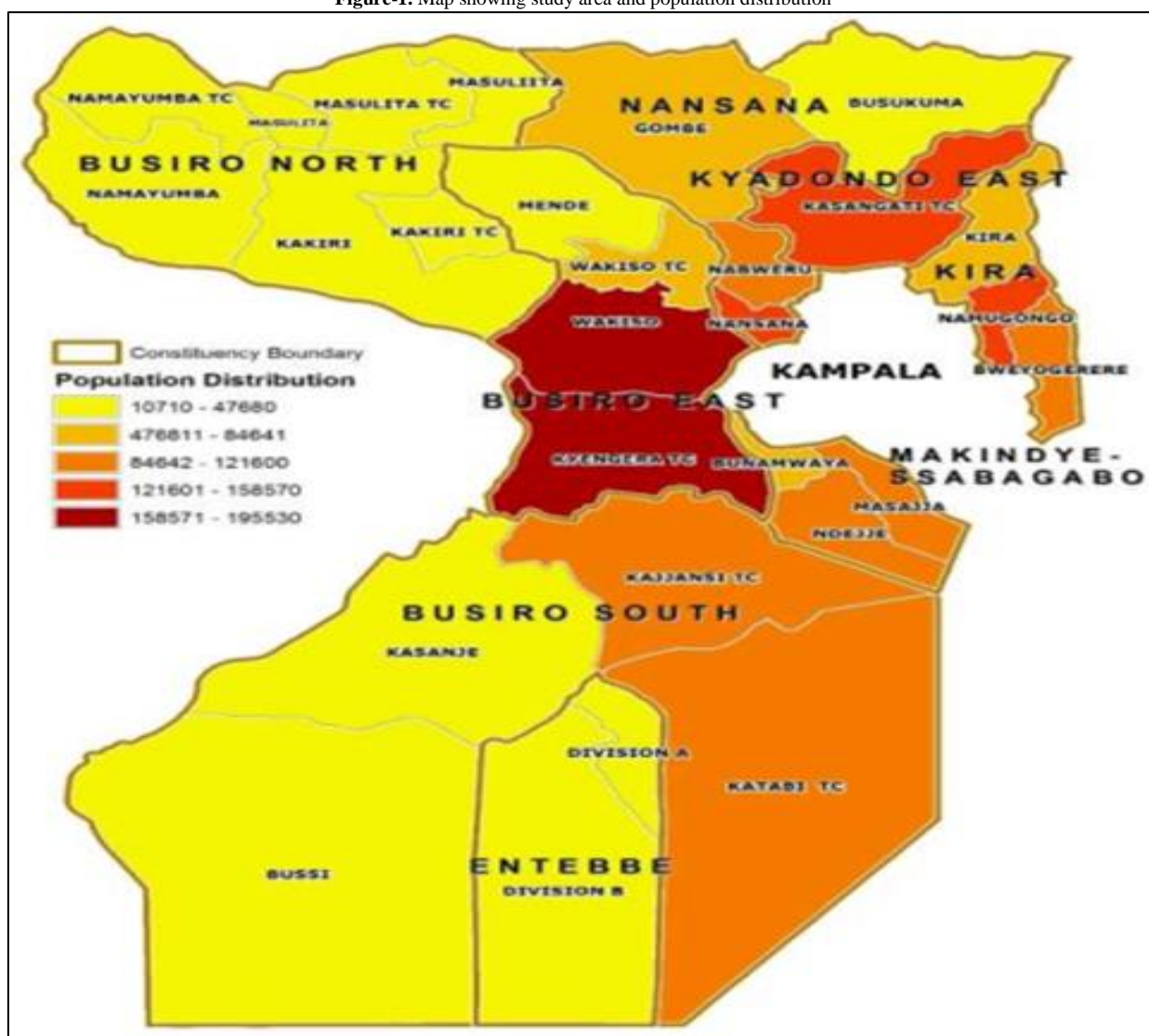
## 1. Introduction

Policy is a key factor in terms of accelerating adoption of new agricultural technologies and particularly in addressing concerns such as food security, income generation, poverty and employment [1]. A number of agro-related policies have over the years been introduced in Uganda with an aim of accelerating uptake of agricultural technologies as well as enhanced food security through increased agricultural production. Such policies include; Plan for Modernization of Agriculture (PMA), National Agricultural Policy (NAP), National Development Plan (NDP), Agricultural Sector Development Strategy and Investment Plan (DSIP) amongst others. According to [Monitoring African Food and Agricultural Policies](#) [2], PMA was developed in 2000 as a framework and was composed of seven implementation areas which included research and development, NAADS, agricultural education, rural financial services, marketing and agro-processing, sustainable use and management of natural resources as well as physical infrastructure. Its major objective was accelerating agricultural growth in Uganda through the introduction of profound technological change throughout the sector by supporting the dissemination and adoption of productivity-enhancing technologies. DSIP focused on four broad and mutually reinforcing investment programs namely enhanced agricultural production and productivity, improved access to and sustainability of agricultural markets, creation of an enabling environment for investment in agriculture as well as institutional strengthening in the agriculture sector. National development plan was formulated in 2010 according to [Monitoring African Food and Agricultural Policies](#) [2] and it comprised of interventions and strategies to address various agricultural constraints and such strategies included improving agricultural technology development, ensuring effective delivery of advisory services, improved technology in controlling pests, vectors and diseases as well as enhancing productivity of land through sustainable land use and management of soil and water. The National Agriculture policy (NAP) was specifically designed to actualize an agricultural revolution in Uganda [3].

Banana (*Musa spp*) is an important starchy food and cash crop in Uganda with potential for food and livelihood security [4]. Banana is traditionally a woman's crop as compared to other typical cash crops such as coffee, tea and cotton [5]. Production of banana in Uganda is highest in the western region particularly Isingiro district followed by

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A survey was carried out amongst smallholder farmers in Wakiso district, central Uganda (Figure 1). The district lies between coordinates 00°24'N and 32°29'E and neighbors Mpigi, Luwero, Nakaseke and Kiboga districts in the North, Mukono in the East and Kalangala to the South. The district covers a total area of 2807.7 square kilometers with lakes and rivers covering 52% of the total area, crop lands covering 42% and forests taking up 4%. The area lies in the Lake Victoria crescent agroecological zone and receives bi-modal rainfall with an annual average of 1320mm received in the months of April, May, October and November. The temperatures annually vary from 19°C to 27°C and relative humidity varies from 57% to 97%. The soils are generally of high productivity and are mainly sandy clay soils. The district is characterized by isolated flat-topped hills with steep slopes often merging abruptly into long and gentle pediments, which are usually dissected by relatively broad valleys. Generally, climate in Wakiso is warm and wet with relatively high humidity which favors rapid plant growth. Republic of Uganda [7] Wakiso district has a population of 1,997,418 accounting for about 6% of the total population with 69% of the households deriving their livelihood from subsistence farming [8].



Wakiso District is one of Uganda's major agricultural production areas with 12.1% of its population growing bananas [8]. The study area is also a beneficiary of the National Agricultural Advisory Services program (NAADS) as well as Operation Wealth Creation program (OWC). These programs are mandated to support management of agricultural input distribution chains and strategic interventions for value chain development focusing on the upper end of the commodity chains. These programs supply selected agricultural inputs to farmers such as seeds, fertilizers, pesticides amongst others. Through these programs, small holder farmers are supplied with tissue culture banana plantlets in a bid to increase banana production. In addition, the farmers receive free agricultural advisory services from the agricultural service providers in relation to banana production.

### 1.2.2. Study Design

An explanatory research design was used for this study. This type of approach uses qualitative data to back up explanations on quantitative data. This research design offers flexibility thus providing an opportunity for considering different aspects of the problem under study [9]. Self-administered questionnaires were used to obtain respondents' demographic characteristics, general information regarding production of tissue culture banana, farmers' awareness of the various agro related policies in Uganda, their contribution to the adoption of banana tissue culture and suggested amendments needed to boost adoption.

### 1.2.3. Unit of Analysis and Target Population

The unit of analysis for this study was the small holder farmer. A small holder farmer in this work is described as a farmer who is involved in production of tissue culture banana on less than an acre of land for a period of not less than three years under various production systems. The study population was comprised of farmers growing tissue culture banana in Wakiso district while small holder farmers who had obtained tissue culture banana plantlets under NAADS/ OWC programs were highly considered for this study because they could easily be accessed. Extension workers aided in providing information regarding to the beneficiaries of tissue culture banana plantlets under these programs.

### 1.2.4. Sampling Procedure and Sample Selection

A sample of respondents for the study was obtained using purposive sampling. According to Maina [10], purposive sampling allows the researcher to use cases that have the required information with respect to the objectives of the study. Thus, in this case, the researcher obtained lists of farmers who had obtained tissue culture banana plantlets under OWC / NAADS program from various sub counties within Wakiso from 2014 to 2016 with the help of the respective agricultural officers (Table 1).

**Table-1.** Beneficiaries of tissue culture banana per Subcounty

Subcounty	Population	Sample
Division A-Entebbe	34	10
Division B-Entebbe	40	12
Busukuma S/C	33	10
Kyengera Town Council	51	16
Katabi Town council	49	15
Kasanje Town council	18	6
Kasangati Town Council	43	12
Namayumba S/c	65	20
Wakiso Town council	30	9
Kajjansi Town council	17	5
<b>Total</b>	<b>380</b>	<b>115</b>

Source: Office of the subcounty Agricultural Officers.

The respondents were then sampled randomly in order to eliminate bias and a total of 115 respondents were obtained. According to Mugenda and Mugenda [11], a sample size of 10%-30% is considered adequate for a descriptive study, thus considering the upper limit of 30% against the accessible population of 380, this gives a sample size of 115 respondents.

### 1.2.5. Data Collection

The survey was conducted between January and July 2018 from ten sub-counties in Wakiso district. The study used semi- structured questionnaires to obtain information on the variables in question. These were self-administered to 115 respondents by the help of enumerators. Timothy [12], notes that questionnaires play a central role in data collection during surveys, census, case studies, experiments and document analyses. The questionnaires enabled the researcher to collect in-depth information and as well allow for further probing and building rapport with the respondents.

### 1.2.6. Data Analysis

The data collected was processed manually, edited, coded and entered in to Microsoft excel spread sheets. The data was then subjected to analysis using Statistical Package for Social Sciences (SPSS version 16.0) and Microsoft

excel (version 2013). Excel was used to obtain frequencies of various demographic characteristics as well as frequencies in farmers' awareness of agro-related policies. Correlational analysis was done to obtain the relationship between various demographic characteristics like gender, age, education level and policy awareness. Chi-square tests were made to ascertain the influence of agro-related policies on tissue culture banana adoption and results were considered significant at  $P > 0.05$ .

## 2. Results and Discussions

### 2.1. Demographic Characteristics of the Respondents

Results from the study revealed that 55.7% of the respondents were male while 44.3% were female (Table 2). This implied that more men adopted TC banana as compared to the women in Wakiso district. The high uptake of TC banana by more men than women is attributed to the increased access to information, land, credit and extension services. Reveals that male have more power to make decisions regarding the factors of production on the farms as compared to women. Faith [13], further states that despite women being the main food producers, they lack access to and control over the means of production such as secure land tenure, information, credit and control of labour which could result in limited uptake of agricultural technologies.

**Table-2.** Demographic characteristics of the respondents

Research Parameter (N=115)		Frequency	Percentage
<b>Gender</b>	Male	64	55.7
	Female	51	44.3
<b>Age</b>	15-25	14	12.2
	26-35	29	25.2
	36-55	34	29.6
	56-65	26	22.6
	Above 65	12	10.4
<b>Education background</b>	No formal training	1	0.9
	Primary level	20	17.4
	Secondary level	61	53.0
	Tertiary level	33	28.7
<b>Main occupation</b>	Farming	62	53.9
	Business	30	26.1
	Civil service	17	14.8
	Other (student)	6	5.2
<b>Household headship</b>	Male headed	89	77.4
	Female headed	26	22.6

Source: Primary data 2018

Furthermore, the various gender variations cut across the different age groups with 29.6% of the respondents being between 36 and 55 years of age, 25.2% between 26-35 years, 22.6 % between 56-65 years, 12.2% of the respondents between 15-25 years, while the least percentage of 10.4% were attributed to respondents above 65 years of age (Table 2). Thus, respondents aged between 36 and 55 years were more interested in TC banana technology adoption as compared to other age groups. This is attributed to their enhanced knowledge and experience in banana farming and specifically banana tissue culture. Older farmers are assumed to have gained knowledge and experience over time and are better able to evaluate technology information than younger farmers [14, 15].

From this study, majority of the respondents had attained some degree of education with the majority having attained a minimum of secondary education ,28.7% tertiary level, 17.4% having attained primary level, while 0.9% had not received any formal training (Table 2). Attainment of formal education by majority of the respondents implies that education plays a role in adoption of TC banana. This is attributed to the increased access to free education through the universal primary and secondary programs in Uganda. Educated farmers are likely to adopt banana tissue culture as compared to non-educated farmers Kabunga [16]. Education level of a farmer increases his ability to obtain; process and use information relevant to adoption of a new technology [15] For instance a study by Charles [1] on the factors affecting adoption of Tissue culture bananas in the semi-arid areas of lower Eastern Region of Kenya found that education significantly affected adoption of tissue culture bananas.

Farming is the major economic activity of the people of Wakiso (53.9%) followed by business (26.1%) then civil service (14.8%) and other who mainly constitute of students (5.2%), (Table 2). Hence, respondents whose major occupation was farming had higher chances of adopting tissue culture banana because they could easily experiment new agro-technologies like banana tissue culture as compared to other respondents who are preoccupied with other activities.

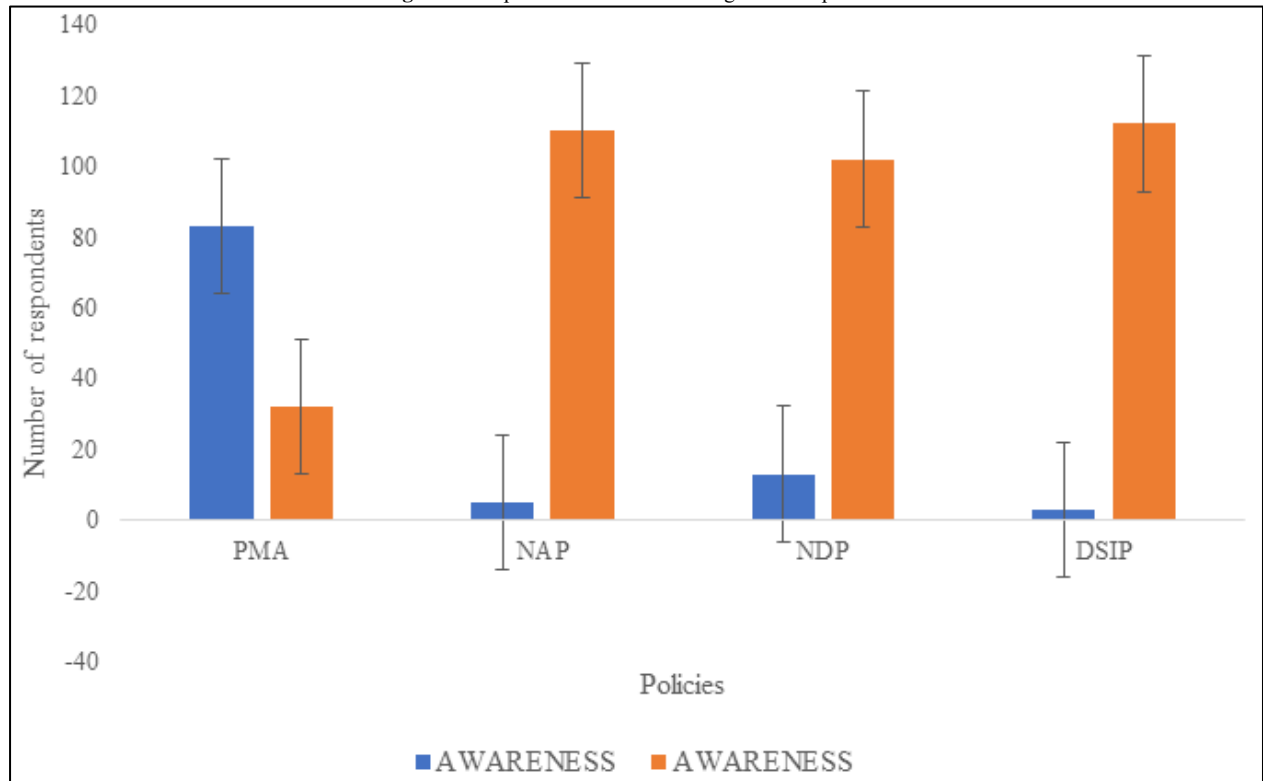
77.4% of the households were male headed as compared to 22.6 % which were female headed (Table 2). The study was dominated by male headed households because of easy access to resources such as land, credit, information and extension services which are vital in adoption of agro-technologies. Reports that male headed households adopted the tissue culture banana less than female headed households because male headed household were likely to have more access to resources and information than women household heads due to traditional and cultural gender roles which tend to discriminate against women. He further argues that male headed households have

mobility, participate in different meetings and have more exposure to information related to tissue culture banana than women headed households

### 2.1.1. Policy Awareness of the Respondents

The results of the study revealed that 72.2% of the respondents were aware of Plan for Modernization of Agriculture policy (PMA), 11.3 % were aware about National Development Plan (NDP), 4.3 % were aware of National Agricultural Policy (NAP) while 2.6% were aware of Agricultural Sector Development Strategy (DSIP) (Figure 2).

Figure-2. Respondents' awareness of Agro related policies



Source: Primary data 2018

The wide awareness of PMA in Wakiso District is attributed to one of its pillar programs known as NAADS. Through the NAADS program which later transformed into Operation wealth Creation, farmers were able to access free improved crop and livestock technologies in order to boost agricultural production as well as increased contact hours with extension workers. Ibrahim [17], reports that the NAADS program which was part of the wider Plan for Modernization of Agriculture replaced the supply led extension system which mainly focused on promoting cash crops for export in 2001. Hence, since this program delved mainly into food crops aiming at improving food security, many farmers benefitted which resulted into wide awareness of PMA. Joughin and Kjaer [18], further state that the qualified success and awareness of the PMA/NAADS occurred because there was no apparent contradiction between the political and the technocratic agendas which resulted into the president directly backing up PMA and putting it at the forefront of the National Policy. Reports by Samuel [19] indicated that the NAADS program resulted into substantial positive impacts on the availability and quality of advisory services provided to farmers, promotion of adoption of new crop and livestock enterprises as well improved adoption and use of modern agricultural production technologies and practices. Awareness of NAP, DSIP and NDP remained relatively low as compared to PMA probably because these policies remained on paper and there was less involvement of farmers in policy formulation yet they are the final beneficiaries. Thus, this inhibits the realization of the policy's overall objectives which are mainly geared towards sustainable agricultural productivity.

### 2.1.2. Relationship Between Demographic Factors and Agro-Related Policy Awareness

Whereas the study hypothesized that age greatly impacts on policy awareness with the young having exposure to more information compared to the older ages, a correlation analysis revealed a weak positive relationship between age and awareness of NAP ( $r = 0.038$ ) while a weak negative relationship is obtained for PMA ( $r = -0.034$ ), NDP ( $r = -0.208$ ) and DSIP ( $r = -0.076$ ), (Table 3). This implied that age had minimal influence of awareness of agro-related policies. This could be attributed to limited exposure to policy information across the different age groups as well as minimal interest in searching for information. This disagrees with most studies which reveal that younger farmers have a longer planning horizon, hence vibrant in searching for information [20].

**Table-3.** Correlational analysis for demographic factors and agro-related policy awareness

Correlations		Gender	age	Education level	NAP	PMA	DSIP	NDP
Gender	Pearson Correlation	1	-.079	-.022	.104	-.164	.031	-.013
	Sig. (2-tailed)		.402	.815	.266	.080	.738	.891
	N	115	115	115	115	115	115	115
Age	Pearson Correlation	-.079	1	-.167	.038	-.034	-.076	-.208*
	Sig. (2-tailed)	.402		.074	.690	.721	.422	.026
Education level	Pearson Correlation	-.022	-.167	1	-.032	-.057	-.046	-.148
	Sig. (2-tailed)	.815	.074		.735	.543	.627	.115
NAP	Pearson Correlation	.104	.038	-.032	1	-.248**	-.008	-.076
	Sig. (2-tailed)	.266	.690	.735		.007	.936	.419
PMA	Pearson Correlation	-.164	-.034	-.057	-.248**	1	.179	.038
	Sig. (2-tailed)	.080	.721	.543	.007		.055	.688
DSIP	Pearson Correlation	.031	-.076	-.046	-.008	.179	1	-.013
	Sig. (2-tailed)	.738	.422	.627	.936	.055		.894
NDP	Pearson Correlation	-.013	-.208*	-.148	-.076	.038	-.013	1
	Sig. (2-tailed)	.891	.026	.115	.419	.688	.894	

\*correlation significant at 0.05 level (2 tailed) \*\*Correlation significant at 0.01 level (2-tailed)

Source: Primary data, 2018.

Furthermore, a weak positive relationship was obtained for gender of the respondents and awareness of NAP and DSIP while weak negative relationships are obtained for PMA and NDP (Table 3). This implied that gender of the respondents had minimal impact on creating awareness about the agro-related policies in Uganda. This is because access to information is not dependent on gender attributes but on individual's willingness to search for information. This could equally be attributed to the limited social groupings that bring together male and females and the lack of organized farmer groups where agro-related policy issues can be discussed. This disagrees with a study by Simtowe [21] that showed that women had more awareness on improved pigeon pea varieties due to their higher propensity to being exposed to improved agricultural technology than men.

This study further hypothesized that education level of the respondent played a great positive role in creating awareness of the agro-related policies because of increased exposure to information, however, a weak negative correlation was obtained between education level and awareness of PMA, DSIP, NAP and NDP (Table 3). This implied that education level of the respondent played no great role in creating awareness of agro-related policies. This differs with reports of various studies that reveal that a higher level of education increases farmers ability to process and use information [22, 23]. This equally disagrees with the findings of Irene [24] who reports a positive effect of formal education on the awareness of extension devolution.

### 2.1.3. Influence of Agro-Related Policy Awareness on Tissue Culture Banana Adoption

Results from the study revealed that awareness of PMA, DAP, DSIP and NDP had tolerance levels above 90% and acceptable Variance inflation factors ( $VIF < 2$ ). The significance level for the various policies were; PMA ( $P = 0.432$ ), NAP ( $P = 0.187$ ) DSIP ( $P = 0.093$ ) and NDP ( $P = 0.872$ ) (Table 4). All the stated P-values were greater 0.05. This therefore implied that awareness of the different agro-related policies was not statistically significant in the adoption of banana tissue culture as farmers who had no prior information of such agro-policies had adopted banana tissue culture. This implies that in as much as the agro-related policies were in existence, farmers decision to adopt tissue culture banana was not influenced by their awareness of such policies. This is probably because many of the policies were on paper but limited efforts were in place to draw farmers towards them. James and Anne [25] reported that initial political intentions to promote agriculture in Uganda were strong rhetorically, and the policies looked good on paper yet implementation often failed due to reasons such as insufficient resource allocations to the sector among others. Thus, this greatly impeded farmers' awareness and interest in such policies.

**Table-4.** Correlation analyses for policy awareness and tissue culture banana adoption

Coefficients <sup>a</sup>										
Model	Unstandardized Coefficients			Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Collinearity Statistics	
	B	Std. Error		Beta			Lower Bound	Upper Bound	Tolerance	VIF
(Constant)	1.131	.353		3.205	.002	.432	1.831			
PMA	-.044	.056	-.077	-.789	.432	-.154	.066	.906	1.103	
NAP	-.160	.121	-.128	-1.328	.187	-.400	.079	.933	1.072	
DSIP	.166	.098	.161	1.693	.093	-.028	.361	.966	1.035	
NDP	-.012	.075	-.015	-.162	.872	-.161	.137	.994	1.007	

Dependent variable: Adoption of tissue culture banana

Source: Primary data 2018

### 3. Conclusion

This study established that most of the respondents were aware about the Plan for Modernization of Agriculture policy as compared to other policies. This is because this policy was designed for the rural communities to enhance poverty eradication through the transformation of the agricultural sector. Further, the study revealed that age, gender and education level of the farmer did not influence policy awareness and that awareness of the agro-related policies was insignificant in tissue culture banana adoption in Uganda. This information is crucial towards various policy makers and researchers in developing policies for farmers as well as accelerating uptake of new technologies. The study thus recommended a need to increase farmers' awareness of the various agro-related policies so that they can benefit them in increasing technology adoption. It also recommended integration of agro-related policy issues within the education curriculum for the benefit of various people. Furthermore, limitations such as difficulty in accessing extension services, agricultural credit, land and high cost of the technology need to be addressed in order to increase uptake of new agro-technologies in Uganda.

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### References

- [1] Charles, N. T., 2017. "Factors affecting adoption of tissue culture bananas in the semi-arid areas of lower eastern region of Kenya." *International Journal of Recent Research in Life Sciences (IJRRLS)*, vol. 4, pp. 1-26.
- [2] Monitoring African Food and Agricultural Policies, 2013. *Review of food and agricultural policies in Uganda. MAFAP country report series*. FAO: Rome, Italy.
- [3] Ministry of Agriculture Animal Industries and Fisheries, 2013. "National agriculture policy."
- [4] Nyombi, K., 2013. "Towards sustainable highland banana production in Uganda: Opportunities and challenges." *African Journal of Food, Agriculture, Nutrition and Development*, vol. 13, pp. 7544-7561.
- [5] Qaim, M., 2014. "Evaluating nutrition and health impacts of agricultural innovations. Transformation of Global Agri-Food Systems: Trends, Driving Forces, and Implications for Developing Countries. Global Food Discussion Papers No. 46."
- [6] UBOS, 2016. "Uganda bureau of statistics; statistical abstract."
- [7] Republic of Uganda, 2009. "Higher local government statistical abstract-wakiso."
- [8] UBOS, 2017. "Uganda bureau of statistics; statistical abstract."
- [9] Kothari, C. R., 2004. *Research methodology: Methods and techniques*. 2nd Ed. New Delhi: New Age International (P) Publishers Limited.
- [10] Maina, J., 2012. *Qualitative and quantitative research methods simplified*. Nairobi: Fragoza Printers mall.
- [11] Mugenda, O. M. and Mugenda, A. G., 2003. *Research methods: Quantitative and qualitative approaches*. Nairobi: African Center for Technology studies.
- [12] Timothy, W., 2007. *Essentials of research methodology in human and social sciences*. Kampala: Bow and Arrow publishers Ltd.
- [13] Faith, N. N., 2007. *Adoption of Agricultural innovations by smallholder farmers in the context of HIV/AIDS: The case of tissue-cultured banana in Kenya. PHD Thesis*. Wageningen University.
- [14] Kariyasa, K. and Dewi, A., 2011. "Analysis of factors affecting adoption of integrated crop management farmer field school in swampy areas." *International Journal of Food and Agricultural Economics*, vol. 1, pp. 29-38.
- [15] Mignouna, B., 2011. "Determinants of adopting imazapyr-resistant maize technology and its impact on household income in Western Kenya." *AgBioforum*, vol. 14, pp. 158-163.
- [16] Kabunga, N. S., 2011. "Yield effects of tissue culture bananas in Kenya: Accounting for selection bias and the role of complementary inputs." In *Proceedings of the German Development Economics Conference, Berlin No. 43*.
- [17] Ibrahim, K., 2013. "Constraints to agricultural technology adoption in Uganda: Evidence from 2005/06-2009/10. Uganda national panel survey. Research series, no 102."
- [18] Joughin, J. and Kjaer, A. M., 2010. "The politics of agricultural policy reforms: the case of Uganda. Article in Forum for development studies." Available: <https://www.researchgate.net/publication/237218155>
- [19] Samuel, B., 2007. "Assessing the impact of the national agricultural advisory services (naads) in the Uganda rural livelihoods. IFPRI discussion paper."
- [20] Faye, I. and Deininger, K., 2005. "Do new delivery systems improve extension access? Evidence from rural Uganda. American agricultural economics association annual meeting, Providence, Rhode Island. Gautam." Available: <https://ideas.repec.org/p/ags/aeaa05/19405.html>
- [21] Simtowe, F., 2012. "Technology awareness and adoption: the case of improved pigeon pea varieties in Kenya." In *International Association of Agriculture Economists (IAAE) triennial conference Brazil*.
- [22] Saikia, P., 2013. "Delivery competence and penetration of extension services among fish farmers of Assam." *Indian Journal of Agricultural Economics*, vol. 86, pp. 402-411.
- [23] Turyahabwe, N., 2017. "Awareness, perceptions and implementation of policy and legal provisions on wetlands in Uganda." *African Journal of Rural Development*, vol. 2, pp. 161-174.

- [24] Irene, T. M., 2017. "Determinants of smallholder farmers' awareness of agricultural extension devolution in Kenya." *African Journal of Agricultural Research*, vol. 12, pp. 3549-3555.
- [25] James, J. and Anne, M. K., 2010. "The politics of agricultural policy reforms: the case of Uganda. Article in Forum for development studies."