Perceptions on Liking and Disliking Public Agricultural Research Institutes in Uganda: A Case of Abi, Bulindi, Ngetta, Mbarara and Mukono ZARDIs

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Abstract

A ZARDI wide study project 'Harnessing the domino effect for transformative technology promotion and outreach' was carried in three different phases starting from 2018/19, 2019/20, 2020/2021. A multi stage qualitative studies were done through Focus Group Discussions, Key Informant Interviews, and observations in addition to employing the use of Social Resource Maps. Quantitative study carried from the five ZARDIs drew a total of N=1093 respondents. The study was subjected to two different tests carried to confirm; the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) and Bartlett's test of Sphericity (df) for factors explaining the liking and disliking of the PARIs. The study findings revealed two important factors for liking (Positive PARIs image); reliable and trusted source of technology and information, and exhibits good community relations. Factors explaining disliking (Negative PARIs image) include; Limited access to information, technologies and markets and in-adequate community outreach programs. This study concludes that, Public Agricultural Research Institutes are not just perceived by their managerial practices nor just defined by its programs and mandates, but they are functions of at least interrelated positive and negative factors.

Keywords: Public perceptions, technology, likes and dislikes, image and ZARDIs.

Introduction

Public are the most important audience to an organization (Azmi *et.al*, 2016). Organizational image and identity, are powerful concepts in terms of understanding behaviors and beliefs, (Eunju Rho, Taesik Yun, Kangbok Lee, 2015). Organizational image refers to people's global impressions of an organization and is defined as people's loose structures of knowledge and beliefs about an organization. Barich and Kotler (1991) establish that an image, whether true or false, real or imagined, can be constructed by a public, given that it is the representation of all impressions, attitudes, and beliefs of a public in regard to an organization. Wilkins and Huisman (2013) add that it is the responsibility of managers to observe how the signs of corporate identity are transmitted and decoded by interested parties in the form of an attractive organizational image. An organization's image is not a clear, concise concept but rather a set of an individual's perceptions about the institution (Dawn Geronimo Terkla and Marian F. Pagano, 1993). In this regard, Azoury et al (2014) note that there has been disagreement when attempting to define it. However, despite the various conceptions of image, there is consensus in considering it an impression (Tubillejas, Cuadrado & Frasquet, 2011; da Costa & Pelissari, 2016), multidimensional (Dowling, 1986; Barich & Kotler, 1991; Palacio, Meneses & Perez, 2002; Cervera, Schlesinger, Iniesta and Sánchez, 2012; Azoury et al, 2014), and based on interactions with the organization (Polat, 2011; da Costa & Pelissari, 2016). The National Agricultural Research Organization (NARO) is a semi-autonomous agency of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) with the mandate to coordinate and oversee all aspects of public funded agricultural research in Uganda. Established as a body corporate by the National Agricultural Research Act of 2005, NARO comprises a Governing Council, a Secretariat and 16 Public Agricultural Research Institutes (PARIs) spread across the country (NARO Act. 2005). To ensure a resilient agricultural sector guided knowledge, evidence and information and enhance food security and improve livelihoods in Uganda through research for development (R4D), NARO has continued to avail reliable agricultural inputs in all aspects of agriculture including crops, livestock, fisheries, forestry, agro-machinery, natural resources and socio-economics (MAAIF, 2018).

The evolution of agricultural research is intimately linked to the overall history of agricultural research in Sub-Saharan Africa (NARs Act. 2005). The particular characteristics of agricultural research means that typically basic research is considered as a public good and that a class of research products tend to be non-saleable. Public sector provision of non-saleable technologies may provide competition to saleable research products (Ray and Echeverria (1990). Hence, (UNDP, 2011) maintains that, there are two types of institutions;

Positive and negative institutions. Positive institutions are those that increase human capabilities…citing Rodrick's *metainstitution (1990)* and negative institutions are institutions that restrain human choices. Agricultural research have so significantly produced technologies that have attracted both liking and disliking for the PARIs. NARO research agenda, guided by its 10 years strategic plan [2018/19 to 2027/28] has spelt out research priorities premised on the theme 'Market Oriented Research Spurring Agro-Industrialization', aimed to draw increased utilization of improved technologies and innovations in agriculture (NARO Strategic Plan, 2018/2019).

NARO in 2018/19 FY, occasioned a ZARDI wide study project 'Harnessing the domino effect for transformative technology promotion and outreach'. The qualitative and quantitative study carried from the five ZARDIs drew (N=1093) respondents. The study findings revealed two important factors for liking (Positive PARIs image) respectfully; reliable and trusted source of technology and information; and exhibits good community relations. Factors explaining disliking (Negative PARIs image) include; Limited access to information, technologies and markets and in-adequate community outreach programs. The table below presents two different tests carried to confirm; the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) and Bartlett's test of Sphericity (df) for factors explaining the liking and disliking the PARIs.

Table 1a: Showing KMO and Bartlett's Test for liking the PARIs

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.916
Bartlett's Test of Sphericity	Approx. Chi-Square	4937.580
	df	45
	Sig.	.000

Table 1b: Showing KMO and Bartlett's Test for disliking the PARIs

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.909
Bartlett's Test of Sphericity	Approx. Chi-Square	11922.937
	Df	253
	Sig.	.000

From the KMO test conducted to examine the strength of the partial correlation above (Table 1a,b) between the variables, KMO values closer to 1.0 generally indicate that a factor analysis may be useful with your data. If the value is less than 0.50, the results of the factor analysis probably won't be very useful. Should be significant (less than .05), p<0,000 indicating that the correlation matrix is significantly different from an identity matrix, in which correlations between variables are all zero. Hence, since the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Tests of Sphericity (df) and all the pvalues are significantly zero (p<0,000), (Meseguer-Artola A, A., Aibar, E., Llados, J., Minguillon, J., & Lerga, M. 2016), this means, sufficient items for each factor in this study were highly correlated.

Methodology
Research design
The study adopted a sequential mixed-methods research strategy to test the theoretical framework to generate evidence to develop an empirical views on perceptions of the public on the PARIs. This research strategy of inquiry combined both qualitative and quantitative approaches in the research design to take advantage of the strengths of both approaches. A combination of quantitative and qualitative approaches was used in which qualitative data provided in-depth explanations regarding quantitative data results. Both approaches were key in drawing compelling conclusions and recommendations in line with the study objectives (Mugenda & Mugenda 2003; Amin 2005).

Study Area
This study was conducted in five ZARDIs spread across the entire country namely; AbiZARDI, BuZARDI, MbaZARDI, MuZARDI and NgeZARDI. Whereas all researchers at each ZARDI were involved in this study, there was a core research team formed at each ZARDI.

Sampling Procedure
A random stratified sampling procedure involving probability proportionate to population of zone of influence was used to identify the respondents in a four staged sampling process. The study sites were placed in nine blocks/strata ($L = 9$) based on the NARO agricultural research zones which include: MUKONO, ABI, BUGINYANYA, RWEBITABA, NABUIN, NGETTA, MBARARA, KACHWEKANAO, and BULINDI. The first stage involved stratifying districts with their respective population based on national census data (UBOS, 2015) and then population clustering under the NARO agro-ecological zones (AEZ/ ZARDI). Then, probability

weights were computed for each zone based on total number of districts in each ZARDI to determine the proportionate number of districts to be sampled per ZARDI area of influence. After determining the number of districts per ZARDI, simple random sampling was applied to select specific districts for the survey leading and the district sample size is calculated at 24 with a distribution per ZARDI based on the weighted probabilities which leads to unequal sample sizes per ZARDI. Stratified sampling with unequal proportion was used due to significant difference in size of the stratum/ZARDIs. Proportional allocation was adopted because it minimizes the variance of the estimates and thus zones with larger populations which may be associated with higher variability which would require more sample units to attain same degree of precision just as in zones with smaller populations. Thus, the larger the stratum population N_h, the larger the required sample n_h.

In each selected district, a minimum of 66 farmers was interviewed from two randomly selected sub counties (that are opposites) and two parish per Sub County. In the final step, a minimum of 25 farmer's respondents were randomly selected and interviewed. However, selection of sub counties were restricted within a 30KM radius from the ZARDI. Overall, the 1337 respondents were visited considering a farmer the sampling unit. The number of households per districts was fixed at 66 while the number of districts per zone is based on probability weights. The number of parishes is derived by dividing sample size per ZARDI by a required fixed sample of 33 per parish.

Table 1: Sample size distribution of the respondents

Agricultural research zone	Total districts per ZARDI	District sample per ZARDI	Sample size (n_h)	Number of parishes
BUGINYANYA	23	4	249	8
ABI	8	2	115	3
BULINDI	5	1	97	3
KACHWEKANO	4	1	73	2
MBARARA	11	2	153	5
MUKONO	21	3	216	7
NABUIN	16	2	139	4
NGETTA	15	2	162	5
RWEBITABA	9	2	132	4
Totals	**112**	**24**	**1,337**	**41**

Sampling was done based on the districts as per 2015

The sample size was calculated following the expression in Equation 1.

Equation 1:
$$n_h = \left(\frac{N_h}{N}\right) n$$

Where: n_h is the sample size per stratum h and $h = 1, 2, \ldots, L$ while N_h is the population size of the stratum h. N denotes the total population size which is a summation of the population size per stratum ($N = \sum_{h=1}^{L} N_h$) and n is the total sample size ($n = \sum_{h=1}^{L} n_h$). Considering a z score of 1.96, margin of error $d = 0.05$ (at 95% confidence level), the strata number $L = 9$ and the stratum populations obtained from the UBOS census report (2015), the total sample size needed with proportional variation is derived from the expression in Eq.2 while the variance of stratum σ_h^2 is derived from the formula $\sigma_h^2 = \frac{N_h}{N_h - 1} p_h (1 - p_h)$.

Equation 2:
$$n = \frac{Z^2}{d^2} \sum_{h=1}^{L} \left(\frac{N_h}{N}\right) \sigma_h^2$$

Data collection and analysis
Both quantitative and qualitative data was analyzed after completion of data entry and cleaning processes.

Qualitative data procedure
The Research project was conducted in three phases. The first phase was an exploratory study that was conducted in the five ZARDIs data was collected using a focus group discussion and key informant interview methods. This was aimed to identify factors influencing perception of the public on NARO as a source of technologies by communities surrounding PARIs. Participants in the focus group discussions were selected randomly from three layers of communities surrounding the research institutes. Key informants included some research scientists from the institutes, farmers from the communities who adopted and those that had not adopted

research technologies. The data from exploratory phase was transcribed, coded and analyzed using Atlas TI qualitative data analysis software to establish emerging themes. Results (emerging themes) generated in this phase guided development of a theoretical framework from which a questionnaire was developed and used in phase 2.

Quantitative data procedure

In the second phase a quantitative study was conducted among 1187 respondents. Respondents were randomly selected from research scientists and from farmers in the communities. The study aimed to identify factors that promote or hinder farmers to learn from research institutes and from each other. Researcher-administered questionnaires (Online data collection using KOBO collect) were used in phase 2 to collect quantitative data among farmers and scientists in participating ZARDIs. Statistical Package for Social Scientists (SPSS) programme was used in the analysis of quantitative data to establish the correlations and significance of the identified factors by running descriptive and inferential statistics, factor analysis and principal component analysis.

Univariate Analysis

This type of analysis involved the description of a single variable and its attributes. Descriptive statistics was performed as the basic way of conducting univariate data analysis particularly through creation of frequency distribution of individual cases and percentage distribution. The results were presented using frequency distribution tables. Principal axis factoring is technique that explains the maximum amount of common variance in a correlation matrix using the smallest number of explanatory constructs. The factors identified represent cluster variables that correlate highly with each other. Principal component analysis (PCA) is a technique that explains the maximum amount of total variance (not just common) in correlation matrix by transforming the original variables into linear components. Both techniques look for variables that correlate highly with a group of other variables, but do not correlate with other variables outside of that group. The techniques were used because they are used in real-world phenomena to; understand the structure of a set of variables, construct a questionnaire to measure underlying variables and to reduce a data set to a more manageable size while retaining as much the original information as possible. A principal axis factoring and PCA were conducted on 1093 respondents with oblique rotation (direct oblim). The Kaiser-meyer-olkim measured and verified the sampling adequacy for analysis; KMO=0.958 this was marvelous according to Hutcheson & sofroniou, 1999 and all KMO values for individual items greater than 0.5 which is well above the acceptable limit 0.5 (Field, 2013). An initial analysis was run to obtain eigenvalues for each factor. Factors that had eigenvalues over Kaiser's criterion of 1 and in combination explained a high cumulative variance. The scree plots showed inflexions that would justify retaining the factors. Several factors were retained because of the large sample size and the convergence of the scree plot and Kaiser's criterion on this value. Different tables show factor loading after rotation. The items that that cluster on the same factor suggest that conceptual names or themes where constructed.

Results and discussion
Gender
Findings from this study indicate that majority of the respondents were males (52%, 568 out of N= 1093) and 528 were females out of 1093 (48.3%) who participated in the study.

Age
The results show that most of the respondents were aged above 20-40 years (47.5%) followed by those who were aged above 40-60 years (36.8%) and above 60 years (13.9%) respectively. Only a few respondents were less than 20 years (1.5%). The majority of participants in the study were not so old implying that they were more open minded and willing to respond positively to factors that promote and hinder farmers learning from the research institute and each other.

Education level
The study findings show that majority of the respondents had attained primary education (48.6%, 532 out of 1093) followed by those that had attained Secondary Education (29.8%, 326 out of 1093, No schooling (8.1%, 89 out of 1093), University/Tertiary Certificate (5.4%, 60 out of 1093) University/Tertiary Diploma (4.1%, 45 out of 1093) University/Tertiary Degree (3.3%, 37 out of 1093) and) respectively. Only 4 respondents had other education (0.4%). This implies that majority of the respondents had attained some level of education which made it easy for them to comprehend and respond to questions on factors promote and hinder farmers learning from research institute and fellow farmers. They were also able to suggest or identify different strategies that could be used mitigate factors that hinder learning but also those that could promote learning.

Experience

It can be observed that majority of the respondents had engaged in agriculture for not less than 10 years (29.2%), followed by those who had spent above 10-20 years (28.7%) , above 20-30 years (21.8%), above 30-40 years (11.8), above 40-50 years (5.6%) respectively. A few respondents had spent over 50 years (2.6%). A long time spent in engagement of agriculture implies that majority of the smallholder farmers were familiar with the factors that promote and hinder learning from research institute and fellow farmers.

Distance categorized

The findings observed that majority of the respondents came from above 10-20kms (40.2%, 439 out of 1093) followed by 0-10km (38.3, 419 out of 1093 and above 20-30km (21.5, 235 out of 1093).

Land tenure system

It was observed from the findings that the most dominant land tenure system from the study among respondents was Customary (41.2%) followed by Freehold (33.6%) , Milo (18.1%) and Lease land (2.7%) respectively. 47 respondents had other Land tenure system (4.3%)

Land Holding

Findings show that majority of respondents had landholding between 0-2acres (45%, 492 out of 1093) followed by 2-5acres (34.5%, 377 out of 1093), 5-10acres (13.4%, 146 out of 1093) and above 10acres were the least (7.1%, 75 out of 1093).

Reasons for Liking the Public Agricultural Research Institutes (PARIs)
The Scree Plot for Liking the PARIs

From this study the descriptive statistics, the mean and standard deviations for factors explaining the positive PARIs image, Principle Axis Factoring extraction method was used to generate Eigenvalue against factor number presented on a Scree Plot with the most correlated total variance on factors for liking the PARIs. The confidence intervals reveal 10 determinants that are positively related to the liking of the PARIs, with the most two of the factors extracted in 7 iterations; reliable & trusted source of technology and information and exhibits good community relations as the reasons for liking the PARIs.

The Figures 1 Showing: Reliable and trusted source of technology and information
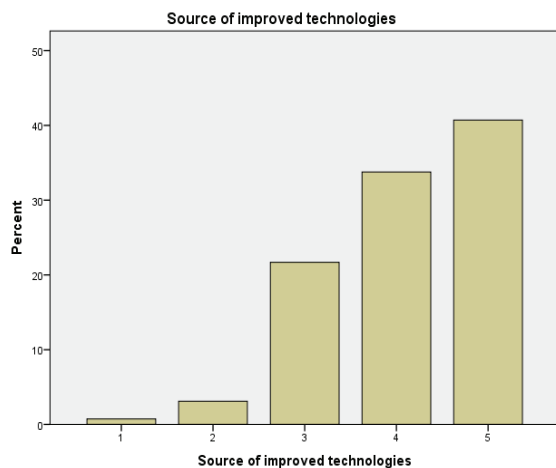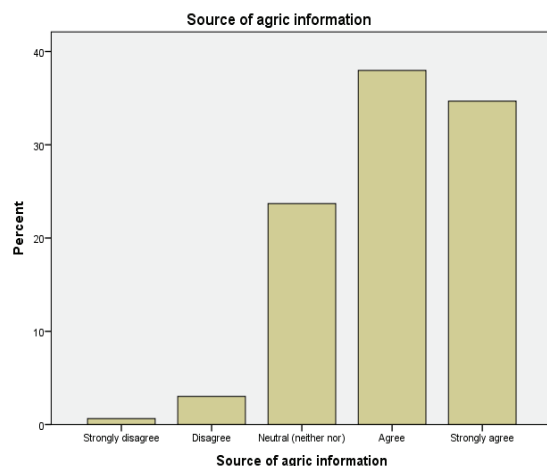
Figure 2 a, b: Source of improved technologies and agric information

From the two figures above on source of improved technologies and agricultural information, it has been clearly been observed that, 814 (84.5%) majority of the respondents agreed, and a proportion of 237 (21.7%) were undecided. Where else, only 41 (3.8%) disagreed from the total number of respondents (N=1093) interviewed to the views. PARI's agric training facility, demos on good agricultural practices, source of improved technologies and carrying out problem solving research were cited among the reasons associated with liking the PARIs in this analysis. This is further confirmed from the responses got from the qualitative study conducted within 0-30Kms radius from the PARI that generated various similar responses with similar views as; 'PARIs have good source and quality seeds like cassava that are high yielding, we also hear about good pigeon pea varieties and see good dairy breeds and mango varieties as we pass along the main road, good crop management practices make us like the institutes the FGDs maintained. Land preparation practices in those demonstration gardens are very impressive including line planting of crops. The PARIs offer learning opportunities for our school children and all knowledge on farming for school going children including farmers is found there.

They exhibit good community relations is also a major factor for liking the PARIs

In relation to this, 632 (71.1%) of the study respondents contend that, the PARIs do problem-solving research; about 57.8% of the respondents agreed that, the PARIs offer employment opportunities to the people and 291 (26.6%) were neutral and only 49 (4.9%) % disagreed. This finding conforms to Focus Group responses that 'PARIs serve as an employment source for casual labour. The PARIs also play a lot of social responsibilities, majority 512 (46.9%) maintained that, PARIs organize learning exchange visits and in addition, in salvaging the image of the institutes 39% of the respondents maintain that, field work exposes them as sub county councilors to research institutes. Where else 155(14.2%) disagreed and maintained neutral position; this makes them identify with the PARIs. From the qualitative study finding (FGDs, KIIs and Observations) made, 'PARIs with the support of their existing good trainers, teach them about how to grow crops and rear good quality animals'. The analysis also revealed further that, PARIs also serve as a source of mechanization; 572 (52.3%) agreed to this view, 417(38.2%) remained neutral, and only 104 (9.5%) disagreed. Not limited to but also PARIs unites different tribes and helps maintaining social needs such as support during funerals, parties and different seed variety sourcing. This finding is in tandem with the view held by SHREE LAHIRI, 2018, that, when organizations extend support through goods, services, or time, they are strengthening the community – making it a better place to live and do business. In turn, businesses earn some plus points: like they will stand out from competition, their product or service will be showcased prominently before the public, and definitely, they will gain visibility. Community relations literature reflects general agreement that effective community relations programs make it easier to hire the better workers in a community, help to get more confidence in local plant management from communities and provide better understanding between the organization and local officials.

Reasons for Disliking the Public Agricultural Research Institutes (PARIs)

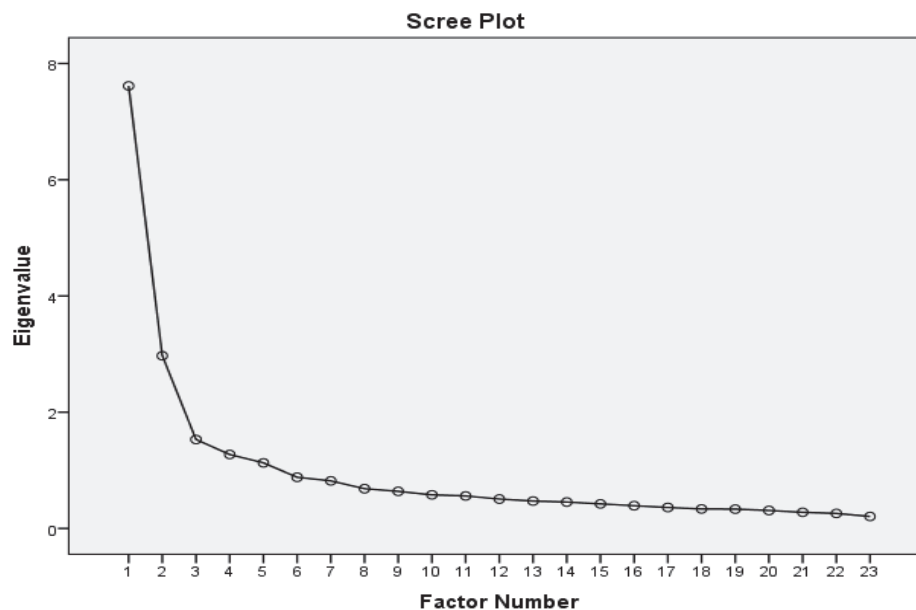**The Scree Plot for Disliking the PARIs**

Figure 3: Scree Plot for Disliking the PARIs

From the scree plot and factor correlation matrix for the dislike of the PARIs, Limited access to information, technologies and markets as the major reasons for not liking (Negative PARI Image) and Inadequate community outreach (Barriers to the institute), were cited to be the most factors contributing to the disliking the PARIs.

Limited access to information, technologies and markets as the major reasons for not liking (Poor Image) of the PARIs

Access and knowledge about something make it easy for one to appreciate, associate or vis-versa (CEP et.al, 2018). Inadequate awareness is one of the critical element impending access to information about the PARIs. The study findings revealed that, 628 (57.4%) agreed, 248 (22.7%) were neutral, where else 217 (19.8%) disagreed to this contention. This finding is in line with the qualitative study response conducted from FGDs that, 'we don't know where to start from to get support when at the PARIs." On Technologies and markets; the respondents maintained that not linking them (farmers) to the market makes them dislike the PARIs, the responses indicated that; 593 (54.2%) agreed to this view, 270 (24.7%) remained neutral, 230 (21%) however disagreed to this view. In a similar study conducted by Yiga. M, *et al,* 2010, they maintained that, farmers need information on generated technologies from the research system to apply them for agricultural production. This kind of information not only helps farmers make profitable decisions in the short term on when and where to market produce and what price to expect, it also sometimes helps farmers decide on what to produce (Kaaya, 1999).

Where else others maintained that not distributing free technologies has also negatively affected the perceptions the public have about the PARIs; 43.5% are in support of this view, 25.6% remained neutral, 13.8% disagree and only 5.0% strongly disagreed; implying this is not important factor for disliking the PARIs. The qualitative responses captured from study conducted, some respondents argue that; new promising crop and animal varieties are not given free as samples for those who even work within the institute. On technologies lacking guiding user information, 43.0% agreed, where else 40.0% neutral, and 36.0% disagree. The Focus group responses also had it that, not providing free inputs and expensive NARO technologies are among the reasons for their disliking the PARIs. 'Some of the technologies prices are so high to be afforded by the local people' maintains one of the respondents in Key Interview Informer. Availing technologies in small quantities was equally cited as facilitating dislike to the PARIs also.

Inadequate community outreach (Barriers to the institute) is also cited as being one of the important factor for disliking the PARIs

Community outreach in agricultural community can help to cultivate allies and build support and providing services to any population that might not otherwise have access to those services. Community outreach also allows us to influence and play a critical role in improving and extending the reach with critical services (Alexus Ruckle, 2018). Inadequate community outreach is not only a dis-services but also bars the population and critical

services intended to serve the populace. From this study, various factors became responsible for the dislike of the PARIs. The presence of the Askaris at the gate and unfriendly Askaris contributes to inadequate community outreach. The findings revealed that small proportion of the respondents; 5.9% strongly agreed, 9.3% agreed but a bigger section of the respondents 45.5% remained neutral, where else 26.2% disagreed and 13.2% strongly disagreed to this view. Implying that, the presence of the askaris is a factor but may not be the most significant contributing factor to disliking the PARIs. Similarly the gates always been locked is viewed as a barrier to accessing services from the PARIs. This view was supported by only 8.6% of the respondents, 41.9% remained neutral, and 39.5% all disagreed. Other responses include; Charge of entrance fees, PARI's been perceived for big Government officials only, the staff not ordinary people and speaking largely English.

Others maintained that; Poor wage pay and delayed wage payment, undesirable technology attributes; such as poor taste, not replanting seeds, technologies susceptible to pests & diseases.

Conclusions

The Public Agricultural Research Institutes are not just perceived by their managerial practices nor just defined by its programs but they are functions of at least interrelated positive and negative factors. The study demonstrates the multidimensionality of the image and that the studied institutions' global image is associated most strongly with their affective image. Furthermore, the results show that the amount of time that a member of the public interacts with an organization does not affect her perception of that organization's image (Fabio R. da COSTA, *et. al*, 2018). He continues to maintain that, there are few studies that aim to analyze how public institutions are viewed by their public. This research corroborates other studies that demonstrate the multidimensionality of image and the fact that it is being formed by cognitive and affective aspects that are both associated with the institution's GI. It shows that the image is a snapshot, generated according to the current stimuli projected by the organization and translated by the public, based on relevant cognitive and affective aspects, according to the individual's manner of observing the environment. Such impressions are affected by internal and external elements, both of the individual who observes and of the organization being observed. The image of any organization out to serve people is important for its growth. It must be noted that, organizations spend a lot of money restructuring and maintaining image to build and retain public trust. Agricultural R&D is a crucial determinant of agricultural productivity and production and therefore food prices and poverty. Public investment in agricultural research and development (R&D) is important for global food security and environmental sustainability (Stuti Rawat, 2020). Hence, public institutional brand image determine the consumer purchase behavior toward a company and the margin of profitability. Keller, 1993b, maintains that, a positive brand image will create a good reputation that generates huge amounts of profits for the company nonetheless the negative brand image will lead consumer to boycott the product or services, (Gan Teck Sing, 2014).

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