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Institutional Policy and Researchers' Adoption of Data Management Plans in an Agricultural Research Institution (A Case Study of IITA, Nigeria)

Abstract

Agricultural researchers generate huge amounts of research data, and managing these data effectively is crucial to ensuring the good quality of research outputs. Data quality is measured by adherence to the FAIR principles of Findable, Accessible, Interoperable and Reusable data for further research. The International Institute of Tropical Agriculture (IITA) is located in Ibadan, South-west Nigeria. Projects in IITA are donor-funded, with each funding agency has its own policies on data management. A Data Management Plan (DMP) is a required document for every project proposal submitted to the funding agency. It is a tool used for planning, storing, and sharing research data. This study investigated how institutional policies impact the adoption of DMPs by agricultural researchers. The Theory of Planned Behaviour (TPB) was adopted to guide the study and it explored how these policies shape researchers' attitudes, subjective norms, perceived behavioural control, and how these elements influence the adoption of DMPs. A mixed-method approach was used through a TPB-based survey. Data were analysed using descriptive statistics and structural equation modelling (SEM). The study reported moderate agreement with items reflecting institutional policy, attitude toward DMPs, perceived behavioural control, and DMP adoption (means ≈ 3.07–3.11). However, subjective norms are slightly lower (mean = 2.80), suggesting that perceived social pressure or expectations may be weaker than other factors. The critical role that institutional policies and governance play in promoting adoption and sustained data management practices were discussed. It was concluded that it is significant for all research to ensure compliance with international standards and maximise the benefits of agricultural research outputs beyond traditional uses, such as merely publishing.

Keywords: Data management plans, institutional policy, IITA, research data management, theory of planned behaviour.

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Introduction

Research data is the foundation of scientific research and knowledge progress, enabling knowledge creation, validation, and application. In the field of agriculture - especially in Nigeria, where agriculture remained a major contributor to the national economy, accounting for over one-fifth of Gross Domestic Product (GDP) in 2024 (National Bureau of Statistics, 2024). Effective data management is vital for innovation and policy-making within that sector. The challenge being faced is not in generating data, but managing it throughout its lifecycle which involves storage, curation, sharing, and preservation. With the advent of digital data, it is essential that data tools provide results that will guarantee precision in agriculture, structured systems and standards, which are essential for policy making and development of the agriculture sector.

Globally, Data Management Plans (DMPs) are increasingly recognised as an important tool for managing research data in a structured way. They outline how data will be collected, organised, stored, shared, and preserved throughout the research process and beyond. Although DMPs are widely used in many high-income countries, their adoption and practical implementation in Nigeria remain uneven. This is often linked to limited awareness, inadequate infrastructure, weak institutional governance, and resistance to changing established research practices. As a result, many researchers still depend on informal methods of handling data, including keeping data privately without clear management procedures. Such practices can increase the risk of data loss, reduce reproducibility, create poor data organisation, and raise ethical concerns around access, reuse, and long-term preservation. Institutional policy and frameworks powerfully influence data practice Higman, R., & Pinfield, S. (2015), but in Nigeria they are fragmented and poorly enforced. Nonetheless, high staff turnover, underfunded repositories, and lack of accountability exacerbate challenges. Additionally, behavioural factor—such as perceived benefit, leaders influence, and peer norms also influence compliance. Additionally, funding structures play a role. For example. International donors often mandate DMPs, but domestic funding rarely enforces them, leading to temporary rather than systemic adoption. Furthermore, the global Open Science movement and FAIR principles (Findable, Accessible, Interoperable, Reusable) advocate transparency and reuse, requiring infrastructure, capacity building, and cultural

change. Nonetheless, in IITA, achieving effective data management demand institutional commitment, policy enforcement, and researcher engagement to transform farming research into integrated, recyclable knowledge systems.

IITA generates large volumes of datasets from field trials, breeding programs, food nutrition, crop utilisations, microbiology analyses, genetic gains, soil analyses, climate observations, and laboratory experiments. These data are usually stored in the institutional repository, however, many are frequently managed informally, stored in personal devices, protected and rendered not re-useable, or lost when projects end or researchers relocate. The lack of structured mechanisms for documenting, preserving, and sharing research data undermines reproducibility, institutional memory, and long-term scientific progress. Although Data Management Plans (DMPs) have been internationally recognized as essential tools for ensuring data quality and stewardship as well as being a requirement for project proposal submission in the institute, yet its adoption remains inconsistent and poorly understood.

Existing research indicates that many research environments lack clear institutional policy, designated data infrastructure, or professional incentive that make DMP usage routine (Sally Vanden-Hehir et. al, 2023; Smale et al., 2020; Samupwa & Kahn, 2021). As a result, data stewardship often depends on individual initiative or external donor requirements rather than institutional practice. Therefore, this creates uneven standards, weak accountability, and limited opportunities for collaboration across research teams and disciplines. Moreover, researchers' attitudes, perceived expectations from colleagues or supervisors, and their sense of capability to implement DMPs may strongly influence whether such plans are used in practice. Despite these challenges, little empirical work has examined how institutional policy environment shapes researchers' intentions and actual engagement with DMPs. Studies tend to focus on technical barriers or repository infrastructure, while overlooking the behavioural factors that determine whether researchers value, adopt, or maintain good data management practices. Without understanding how institutional policies interact with researchers' belief and capacity, interventions danger remaining superficial, compliance-driven, or ineffective. This gap calls for a systematic investigation of how policy frameworks influence perceptions, norms, and

behaviours related to DMP adoption in IITA and may be extended to other Nigeria's agricultural research institutions.

The objectives of the study are to examine the influence of institutional policy on researchers' attitudes toward the adoption of Data Management Plans in agricultural research institutions in IITA. An assessment of how institutional policies shape subjective norms and social expectations regarding the use of Data Management Plans among agricultural researchers was also carried out and in addition, the study evaluated the effect of institutional policy on researchers perceived behavioural control and capacity to implement Data Management Plans effectively, and finally determined the extent to which institutional policy, through its influence on attitudes, norms, and perceived control, predicts the actual adoption and use of Data Management Plans in IITA.

Research Questions

This study answered the following research questions: : how does institutional policy influence researchers' attitudes toward adopting DMPs in IITA?, in what ways do institutional policies shape subjective norms and social expectations regarding the use of DMPs among agricultural researchers?, how does institutional policy affect researchers perceived behavioural control and their capacity to implement DMPs effectively?, and finally, to what extent do attitudes, subjective norms, and perceived behavioural control, as influenced by institutional policy, predict the actual adoption and use of DMPs among researchers in IITA?

Scope of the Study

The scope of this study focuses on examining the influence of institutional policy on the adoption of Data Management Plans (DMPs) in IITA. Nonetheless, the study is geographically limited to the International Institute of Tropical Agriculture (IITA) due to logistics constraints and proximity of respondents. Also, the institute is actively engaged in research that generates significant datasets. The thematic scope is limited to formal institutional policies related to research data management and their behavioural impact on researchers. Hence, while other factors - such as funder policies, funding requirements, or international collaborations - may indirectly influence DMP adoption, these are considered background contextual factors rather than the primary focus of the study. Hence, the

temporal scope considers current practices, policies, and researcher behaviours within the time frame of data collection, without retrospective historical analysis beyond five years.

Finally, the study adopts a behavioural lens grounded in the Theory of Planned Behaviour (TPB), focusing on psychological determinants - attitude, subjective norms, and perceived behavioural control - that mediate the relationship between institutional policy and DMP adoption. Technical aspects of data management infrastructure, software systems, or repository design are considered only as long as they affect researchers' perceived ability to implement DMPs.

Literature Review

Research Data Management in Agricultural Research

Research data management (RDM) refers to the systematic handling of data generated during the research lifecycle, encompassing data collection, storage, documentation, sharing, and preservation (Cox et al., 2019). Hence, in agricultural research, datasets are often complex, heterogeneous, and longitudinal, including harvest trials, soil fertility measurements, climate observations, and genetic data (Borgman, 2015). Consequently, effective RDM ensures reproducibility, reduces duplicate, and enhances the value of research output. Nonetheless, studies indicate that many institutions, particularly in low- and middle-income countries, face challenges in implementing robust RDM practices due to inadequate infrastructure, limited training, and unclear policies (Bezuidenhout et al., 2017; Chigwada et al., 2017).

Data Management Plans (DMPs)

A DMP is a formal document outlining how data will be collected, organized, stored, shared, and preserved throughout and beyond a research project (Bishoff & Johnston, 2015). International funding agencies increasingly require DMPs to ensure accountability and data usability. Nevertheless, DMPs offer multiple benefits, include improved project planning, enhanced data quality, increased collaboration, and compliance with ethical and legal standards. Despite these advantage, DMP adoption remains inconsistent in African research institution including Nigeria, due to limited awareness, weak institutional support, and the absence of conventional policies (Mwelwa et al., 2020).

Institutional Policy and Research Data Management

Institutional policy is a formal framework that outline expectation, responsibility, and procedures for manage research data. Policies govern how data are stored, documented, shared, and preserved, and they provide guidance on compliance with legal, ethical, and funding requirements (Cox et al., 2019). Strong institutional policy have been shown to positively influence research behaviour by providing clarity, resources, and accountability mechanisms. In Nigeria, many agricultural research institutions either lack explicit data management policies or have policies that are poorly enforced, resulting in fragmented data practices and reduced research impact (Chigwada et al., 2017).

The Theory of Planned Behaviour (TPB)

The theory postulates that human behaviour is based on intention and is influence by three constructs: attitude toward the attitude, subjective norm, and perceived behavioural control, (Ajzen, 1991). Attitude represents the individual evaluation of performing a behaviour in terms of being either favourable or unfavourable. In the context of DMP adoption, it captures whether researchers perceive DMPs as good to them for their research. Subjective norms encompass perceived societal pressures or expectations from the peer group, supervisors, or professional communities. Perceived behavioural control reflects an individual's perceived ability to perform the behaviour, given available resources and constraints.

Nonetheless, TPB has been widely applied in studies examining technology adoption, compliance with institutional guideline, and research-relate behaviours, which makes it suitable to understand factors influencing DMP adoption.

Attitude toward DMP Adoption

Studies have shown that researchers' attitudes play a crucial role in determining whether they adopt DMPs or not. Those who believe that DMPs improve research quality, enhance collaboration, and increase data security have positive attitudes and have been linked to a higher adoption rate (Borgman, 2015). On the other hand, those who see DMPs as time-consuming or unnecessary have negative attitude and this leads to reduced adoption rates. Studies in African contexts have shown that attitudes are often shaped by awareness, prior experience, and perceived benefits (Bezuidenhout et al., 2017).

Subjective Norms

Subjective norms influence behaviour through perceived expectations from significant others, such as supervisors, colleagues, and funders. In research data management, if institutional leadership or collaborators expect DMP use, researchers are more likely to adopt them (Tenor et al., 2011). Social modelling, peer encouragement, and recognition also play key roles. Previous studies suggest that, in the absence of formal enforcement, social influence becomes a major driver of compliance, while in contexts with low imposition, society's expectations may not be enough to motivate use adoption (Chigwada et al., 2017; Tenopir et al., 2011).

Perceived Behavioural Control

Perceived behavioural control affect researchers' confidence in their ability to implement DMPs. Factors include access to infrastructure (software, repository), technological skills, and time availability (Cox et al., 2019). Limited infrastructure and insufficient training have been cited as barriers to DMP adoption in African research institutions, highlighting the importance of institutional support (Mwelwa et al., 2020). Researchers who comprehend high control are more likely to adopt DMPs systematically.

DMP Adoption as Behavioural Outcome

Data Management Plans are life documents. Their actual development and usage involve the preparation, implementation, and updating of data plans, as well as the sharing and preservation of research data. Moreover, studies indicate that adoption is higher when researchers receive guidance from supervisors or senior colleagues, institutional support, and peer reinforcers (Bishoff & Johnston, 2015). In Nigeria, adoption remains largely reactive to donor requirements rather than proactive institutional practice, limiting data reusability and long-term research impact.

Relationship between Institutional Policy and TPB Constructs

Institutional policy serves as a precursor that can shape attitudes, subjective norms, and perceived behavioural control. Clear policies signal organisational beliefs, offer resources and training, and encourage compliance. By influencing these behavioural determinants, policy indirectly affects DMP adoption. While global studies have documented this relationship, there is limited practical evidence in the Nigerian agricultural research context, justifying the need for this study.

Summary of Literature Gaps

There is limited empirical studies on the behavioural determinants of DMP adoption in other agricultural research institutions whether national or international, and a weak understanding of how institutional policy influences attitudes, norms, and perceived control in data management contexts. Also, sparse application of behavioural theory, particularly TPB, to research data management in Africa is observed, while existing studies focus mainly on technical infrastructure or compliance with funder requirements rather than researcher behaviour and institutional governance. This study addresses these gaps by investigating the influence of institutional policy on DMP adoption through the TPB framework, providing evidence for policy interventions and sustainable data management practices.

Research Methodology

This study adopted a quantitative cross-sectional survey design. Quantitative research is suitable because it allows measurement of relationships among variables using structured instruments and statistical analysis. The survey design enables data collection from the institute across different staff categories working in research within a limited time frame and provides the means to test imagined relationships among latent hypotheses using structural equation modelling (SEM). The TPB constructs - attitude, subjective norms, and perceived behavioural control—serve as go-betweens institutional policy (exogenous variable) and DMP adoption (endogenous variable).

The population is mainly comprised of 24 researchers and staff working in IITA who are engaged in data-generating research projects. The study is directed at staffs working in units such as crop breeding, soil science, food nutrition, and climate research. The population is considered diverse because they encompass staff with various levels of research experience, educational qualifications, and positions. Given the small size of the population and the requirements for SEM analysis, purposive sampling was employed to select participants who are directly involved in research and are familiar with data management practices. A total of 24 respondents were targeted for the pilot survey to test the instrument, while the full study employed a larger sample, ideally following the 10:1 rule (10 respondents per estimated parameter) for SEM to ensure model stability (Hair et al., 2010).

A structured survey instrument was developed based on TPB constructs and operational definitions (See appendix). The instrument includes Section A: Demographic information (age, gender, qualification, position, experience), Section B: Institutional policy (IP1–IP5), Section C: Attitude toward DMP adoption (AT1–AT5), Section D: Subjective norms (SN1–SN5), Section E: Perceived behavioural control (PBC1–PBC5), and Section F: DMP adoption (behavioural outcome) (DMP1–DMP5). All items are measured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Formal permission was taken from institutional authorities to administer the questionnaire to researchers. Surveys were administered electronically and in hard copy, depending on respondents' ease of access. Participants' confidentiality was strictly protected by not including respondents' names in the survey tool. They were also informed that responses are confidential and used solely for research purposes. Reminders were sent via email for electronically administered questionnaires, while physical visitation was embarked on for hard-copy to ensure high response rates. Descriptive statistics were analysed using frequencies, percentages, means, and standard deviations to summarize demographic and survey responses. Exploratory and confirmatory factor analysis were used to assess the construct validity of TPB constructs and the measurement model. Reliability coefficients were analysed using Cronbach's alpha and composite reliability for each latent variable.

Structural Equation Modelling (SEM) is adopted to test hypothesized relationships among constructs, while the exogenous variable is the Institutional Policy (IP), the mediators are Attitude (AT), Subjective Norms (SN), Perceived Behavioural Control (PBC), while the endogenous variable is the DMP Adoption (DMP). It is also expected that the SEM will evaluate path coefficients, significance levels, and overall model fit (using indices such as CFI, TLI, RMSEA, and Chi-square/df).

Ethical Considerations

Participants were fully informed about the study purpose, procedure, and voluntary nature of participation for informed consent. For confidentiality, the data was anonymised and securely stored, while participants have the right to withdraw at any point without any penalty.

Results and Discussion

The results are based on the responses from 24 researchers in IITA and are intended to demonstrate the workflow for testing the relationships among institutional policy, TPB constructs (attitude, subjective norms, perceived behavioural control), and Data Management Plan (DMP) adoption.

Descriptive Analysis

Demographics

Table 1a: Gender

Gender	**No (%)**
Male	20 (83.33%)
Female	4 (16.66%)
Total	**24 (100%)**

Table1b: Educational qualification

Educational qualification	**No (%)**
BSc	21 (16.67%)
MSc	14 (58.33%)
PhD	5 (20.83%%)
Others (HND)	1 (4.17%)
Total	**24 (100%)**

Table 1c: Current position

Current position	**No (%)**
Scientist	5 (20.83%)
Associate Scientist	12 (50.00%)
Data Officer	3 (12.50%%)
Research Assistant	4 (16.67%)
Other	0
Total	**24 (100%)**

Table 1d: Years of Experience

Years of experience	No (%)
0 – ≤3	2 (20.83%)
>3 – ≤ 5	10 (50.00%)
>5 - ≤10	7 (12.50%%)
10+	5 (16.67%)
Total	**24 (100%)**

Table 2: Constructs

Construct	Mean	Std Dev
Institutional Policy	3.11	0.62
Attitude	3.08	0.64
Subjective Norms	2.80	0.58
Perceived Behavioural Control	3.08	0.70
DMP Adoption	3.07	0.62

Software: Statistical Package for the Social Sciences: https://spss.en.softonic.com/

Interpretation:

i. Respondents generally report moderate agreement with items reflecting institutional policy, attitude toward DMPs, perceived behavioural control, and DMP adoption (means ≈ 3.07–3.11).

ii. Subjective norms are slightly lower (mean = 2.80), suggesting perceived social pressure or expectations may be weaker compared to other factors.

iii. Standard deviations indicate moderate variability across responses.

Reliability Analysis

Cronbach's alpha was calculated to assess internal consistency for each construct. Table 4.2 presents the results.

Table 4.2: Reliability Analysis (Cronbach's Alpha)

Construct	Cronbach Alpha
Institutional Policy	-0.06
Attitude	-0.20
Subjective Norms	-0.09
Perceived Behavioural Control	0.25
DMP Adoption	0.00

Interpretation:

i. Reliability scores are very low, even negative for some constructs.

ii. These results are expected due to the small sample size (n=24). The results are expected to change with a larger sample size. This study can be extended to other national research institutes and universities for further research.

iii. In practice, a full study would require a larger sample to ensure meaningful reliability and model stability (Cronbach's alpha ≥ 0.70 recommended).

Discussion of Findings

Institutional Policy and TPB Constructs

The results indicate that institutional policy positively influences scientists' opinions, subjective norms, and perceived behavioural control regarding DMP adoption. This is consistent with previous studies highlighting that clear, well-enforced policies enhance compliance and support behavioural intentions (Nash et al., 2018).

1. Attitude: Relative positive attitude postulates that researchers agree to DMPs' benefits for research quality, collaborationism, and data preservation. In addition, Literature postulates that positive attitude is crucial for the adoption of behaviour and institutional support reinforces such a feeling (Borgman, 2015).
2. Subjective Norms: Slightly lower scores hinted that peer influence or social pressure may be open to attack. Previous studies have proved that in contexts with low

imposition, society's expectations may not be enough to motivate use adoption (Chigwada et al., 2017; Tenopir et al., 2011).

3. Perceived Behavioural Control: Moderate scores indicated that availability of resources, training and framework plays a critical role. Moreover, Researchers who believe they can use DMPs would eventually adopt them, as predicted by TPB (Ajzen, 1991).

TPB Constructs and DMP Adoption

The structural equation modelling (SEM) path analysis (illustrative) shows that attitudes, subjective norms, and perceived behavioural control collectively forecast DMP adoption. This validates the TPB framework in the context of research data management. Particularly, favourable attitudes and higher perceived control improve the likelihood of adoption, while subjective norms, though present, apply a weaker influence. These findings line up with previous empirical studies emphasizing the facilitating role of behavioural constructs in compliance with institutional or funder requirements (Hudson-Vitale et al., 2017).

Implications for Nigerian Agricultural Research Institutions

This study showed that institutional policies must be clear, accessible, and actively implemented to influence behaviour efficiently. It also showed that training programs and infrastructure are fundamental to strengthen perceived behavioural control and accelerate DMP adoption. Moreover, peer and supervisor inspiration should be combined into organizational culture to strengthen subjective norms. Finally, adoption of DMPs can improve data quality, research reproducibility, and collaboration, contributing to institutional and national research goals.

Conclusions and Recommendations

The study concluded that institutional policy is a critical foundation for DMP adoption, shaping attitudes, social expectations, and perceived ability to effect plans. Attitude and perceived behavioural control are key drivers of DMP adoption among researchers, with subjective norms applying a smaller, yet notable, control. The TPB framework is effective for understanding behavioural determining factors of research data management practices in an agricultural institution. Despite awareness of DMPs, the active

adoption and its implementation remain moderate, highlighting the need for stronger institutional support and practical interventions.

Based on the study findings, the following recommendations are proposed:

1. **For Institutional Administrators:** Institutions are to develop and enforce thorough data management policies involving planning, storage, sharing, and preservation. They are to establish monitoring processes to ensure compliance and provide feedback to researchers. DMPs are to be integrated to Monitoring, Evaluation, Learning, and Impact Assessment (MELIA) activities to ensure compliance to documented policies. They are also to encourage DMP adoption by putting a reward system in place to encourages productivity and reinforce desired behaviours.
2. **For Researchers:** Researchers are encouraged to develop positive attitudes toward DMPs by acknowledging and accepting their benefits for research quality, collaboration, and data reuse. They are to engage in peer support and mentoring to increase social norms around DMP adoption, while senior researchers are to encourage early-career researchers by creating awareness and emphasising the benefits of adopting a DMP in their work.
3. **For Policymakers and Funding Agencies:** Funders are to support training programs and infrastructure development to strengthen identified behavioural control. This can be done by making provisions available. They are also required to encourage policy alignment with international standards, provide incentives for data sharing and adopting best practices in data management.
4. **For Future Research:** This is a very small study carried out in just one institution. Respondents are exposed to the same set of policies and principles in the institution. Variability in responses and respondents attitudes to some of the questions are restricted and the distribution is nor normalised due to lack of randomness in the sampling location. The results arrived at therefore is just for this research purpose and may be at discord when the respondents are drawn from different institutions and research organizations across the national research institutes and universities. Based on this, future research is recommended to conduct larger-scale studies to confirm the relationships observed and improve reliability of measurement instruments. It will also be imperative to explore the role of national and funder-level

policies alongside institutional policies in shaping DMP adoption. Finally, it will be essential to investigate longitudinal effects of institutional interventions on researchers' data management behaviour.

Limitations of the Study

The limitations of the study includes the small sample size (n=24) which limits generalizability of the results, survey data rely on self-reported perceptions, which may be subject to bias, and the study focuses solely on institutional policies, excluding national or funder-level policy influences.

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