UNCST

THE REPUBLIC OF UGANDA

Science, Technology and Innovation

Statistical Abstract 2012

Science, Technology and Innovation

Statistical Abstract 2012

December 2012

Published by:

Uganda National Council for Science and Technology
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FOREWORD

The Science, Technology and Innovation (STI) Statistical Abstract is a comprehensive collection of statistics on scientific and technological (S&T) activities, STI productivity and impact indicators. It is a reference document containing statistics and indicators that are necessary for measuring Uganda's achievements in STI. The Abstract brings together key information from all sectors, including government, private enterprise, and non-government institutions. The 2012 STI Statistical Abstract consists of the most recent statistics on research and experimental development (R&D), STI personnel, technological and non-technological innovations, scientific and technological services, scientific and technical education and training capacities, and technological achievement levels.

The information contained in this Abstract is based on the latest available data developed from analysis of both administrative data and national STI surveys conducted by the Uganda National Council for Science and Technology (UNCST) in 2012. The Abstract shows that notable improvements have been registered in scientific and technological development; as reflected in both input and output indices, including Gross Domestic Expenditure on Research and Development (GERD), Government Budget Appropriations or Outlays on Research and Development (GBAORD), S&T human resource capacity building and technological innovations.

The UNCST commends the Uganda Bureau of Statistics (UBOS), especially the Directorate of Statistical Co-ordination and Services and the Inter-Agency Committee (IAC) for the support provided within the framework of the Plan for National Statistical Development (PNSD). Contributions made by Ministries, Departments and Agencies (MDAs) during the 2012 National STI Surveys are also very much appreciated. The UNCST encourages wide dissemination, readership and use of this STI Statistical Abstract.

Dr. Peter Ndemere
EXECUTIVE SECRETARY

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ACRONYMS AND ABBREVIATIONS

ARIPO	African Regional Intellectual Property Office
BERD	Business Expenditure on Research and Development
BOU	Bank of Uganda
COMESA	Common Market for East and Southern Africa
FTE	Full Time Equivalent
ERA	Electricity Regulatory Authority
GBAORD	Government Budget Appropriations or Outlays on Research and Development
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on Research and Development
GOVERD	Government Expenditure on Research and Development
GTER	Gross Tertiary Enrolment Ratio
GUF	General University Funds
HC	Headcount
HERD	Higher Education Expenditure on Research and Development
HRST	Human Resources in Science and Technology
HSI	Human Skills Index
IAC	Inter-Agency Committee
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
ISP	Internet Service Provider
kWh	Kilowatt Hour
MDAs	Ministries, Departments and Agencies
MoES	Ministry of Education and Sports
MoICT	Ministry of Information and Communication Technology
NABS	Nomenclature for the Analysis and comparison of scientific programs and Budgets
NDP	National Development Plan
NEC	Not Elsewhere Classified
NSE	Natural Sciences and Engineering
OECD	Organisation for Economic Co-operation and Development
PhD	Doctor of Philosophy
PNPERD	Private Non-Profit Expenditure on Research and Development
PNSD	Plan for National Statistical Development
R&D	Research and Development
SITC	Standard International Trade Classification
S&T	Science and Technology

SSH	Social Sciences and Humanities
STET	Scientific and Technical Education and Training
STI	Science Technology and Innovation
STS	Science and Technology Services
TAI	Technology Achievement Index
TBP	Technology Balance of Payments
TCI	Technology Creation Index
UBOS	Uganda Bureau of Statistics
UCC	Uganda Communications Commission
UEDCL	Uganda Electricity Distribution Company Limited
UNCST	Uganda National Council for Science and Technology
UNESCO	United Nations Education Scientific and Cultural Organisation
URSB	Uganda Registration Services Bureau
US	United States
USD	United States Dollar
USPTO	United States Patent and Trademarks Office

PRINCIPAL METHODOLOGICAL MANUALS

A. The "Frascati Family" of OECD Manuals

Type of data	Title
The Measurement of Scientific and Technological Activities Series	
R&D	"Frascati Manual: Proposed Standard Practice for Surveys of Research and Experimental Development" - 6th Edition (OECD 2002) "R&D Statistics and Output Measurement in the Higher Education Sector" – Frascati Manual Supplement (OECD 1989b)
Technology Balance of Payments	"Manual for the Measurement and Interpretation of Technology Balance of Payments Data –TBP Manual" (OECD 1990)
Innovation	"Oslo Manual - Guidelines for Collecting and Interpreting Innovation Data, Oslo Manual" (3rd Edition, OECD 2005)
Patents	"Using Patents Data as Science and Technology Indicators - Patent Manual" (2008)
S&T Personnel	"The Measurement of Human Resources Devoted to Science and Technology - Canberra Manual" (OECD 1995)

B. Other S&T Methodological Frameworks

Type of data	Title
High Technology	"Revision of High-technology Sector and Product Classification" OECD, STI Working Paper 1997/2
Bibliometrics	"Bibliometric Indicators and Analysis of Research Systems: Methods and Examples", by Yoshiko Okubo (OECD, STI Working Paper 1997/1) (OECD 1997)
Globalisation	"Handbook on Economic Globalisation Indicators" (OECD 2005)
Productivity	"Measuring Productivity Manual" (OECD 2001)
Biotechnology	"A Framework for Biotechnology Statistics (OECD 2005)
Information Technologies	"A guide for Information Society Measurements and Analysis " (OECD 2005)
Education Statistics	"OECD Manual for Comparative Education Statistics" Technical notes to the annual OECD "Education at a Glance" reports
Training Statistics	Manual for Better Training Statistics – Conceptual, Measurement and Survey Issues (OECD 1997b)

C. UNESCO Methodologies and Frameworks

Type of data	Title
S&T	Recommendation concerning the International Standardisation of Statistics on Science and Technology, 1978
R&D, STS, STET	UNESCO Manual for Statistics on Scientific and Technological Activities ST-84/WS/12, Paris, 1984
Education	"Classifying Educational Programmes", Manual for ISCED-97

ACKNOWLEDGEMENT

The Uganda National Council for Science and Technology (UNCST) acknowledges the various Ministries, Departments Agencies (MDAs) for the cooperation exhibited during the implementation of the 2012 National STI surveys that provided data for this Abstract. The Science and Technology (S&T) Sector Statistics Committee are also acknowledged for their dedication towards the production of the 2012 Science, Technology and Innovation (STI) Statistical Abstract.

Uganda Bureau of Statistics (UBOS) is also recognised for the support rendered under the framework of the Plan for National Statistical Development (PNSD). Acknowledged in equal measure is the UNCST management for their support and guidance during the preparation of this Abstract.

The UNCST would like to express special gratitude to the STI Statistics Unit and the Production Team comprising Ismail Barugahara, Richard B. Lutalo, Catherine Munabi Tukacungurwa, Bashir Kagere, Patrick Mafabi and Suleiman Sebbale for their technical and professional contributions to the compilation of this Report.

GLOSSARY

Business Expenditure on Research and Development (BERD) - accounts for contributions to R&D activity made by firms, organisations and institutes that primarily produce goods and services (excluding higher education) for sale to the general public, as well as the non-profit private institutions that service them. Contributions to R&D by public sector enterprises are also included within this category.

Development - is defined as "the systematic use of scientific knowledge directed toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes."

Diffusion of old innovations index - is a measure of the changes in the number of active telephones (mainline and cellular) per capita and electricity consumption per capita.

Diffusion of recent innovations index - is a measure of changes in the number of Internet hosts per capita and the share of high- and medium-technology exports in total goods exports.

Electricity consumption - comprises total electricity consumed annually plus imports and minus exports expressed in kilowatt-hours. The discrepancy between the amount of electricity generated and/or imported and the amount consumed and/or exported is accounted for as loss in transmission and distribution.

Extra-national contributions - are contributions by organisations and individuals resident abroad. This would include international organisations and any physical assets and activities they may deploy within national borders.

GERD per capita - is the Gross Domestic Expenditure on R&D divided by the total population.

Government Expenditure on Research and Development (GOVERD) - incorporates R&D expenditure by agencies, offices, and other entities that offer public goods and services (excluding higher education), as well as those that oversee governmental, economic, and social policies of the country or community in question. This indicator also includes expenditure by non-profit institutions funded and directed by the government.

Gross Domestic Expenditure on Research and Development (GERD) - is the total intramural expenditure on R&D performed on the national territory during a given period.

Gross tertiary science enrolment ratio - refers to the number of students enrolled in technical and scientific tertiary education as a share of the population in the relevant age range (19-24 years for most countries).

Higher Education Expenditure on Research and Development (HERD) - accounts for R&D expenditure by higher education institutions, including universities and colleges, irrespective of their source of funding, degree of dependence on public policies or legal profile. This is also inclusive of expenditure by research centers, experimental stations and clinics that operate under the wing of higher education institutions or are affiliated with such institutions.

High-technology exports - are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.

Human Resources in Science and Technology (HRST) - are persons that have either successfully completed education at the third level in an S&T field of study or not formally qualified as above, but employed in an S&T occupation where the above qualifications are normally required.

Human Skills Index - is a measure of the changes in mean years of schooling in the population aged 15 and above and the gross tertiary science enrolment ratio.

Innovation - An innovation is the implementation of a new or significantly improved product (good or service), or process, new marketing method, or a new organisational method in business practices, workplace organisation or external relations.

Innovation activities - are all scientific, technological, organisational, financial and commercial steps which actually, or are intended to lead to the implementation of innovations.

Internet hosts - An Internet host is a computer connected directly to the Internet; normally an Internet Service Provider's (ISP) computer is a host. Internet users may use either a hard-wired terminal, at an institution with a mainframe computer connected directly to the Internet, or may connect remotely by way of a modem via telephone line, cable, or satellite to the Internet Service Provider's host computer. The number of hosts is one indicator of the extent of Internet connectivity.

Intramural expenditures - are all expenditures for R&D performed within a statistical unit or sector of the economy during a specific period, whatever the source of funds.

ISCED97 5A - International Standard Classification of Education 1997, Level 5A - includes all Bachelor or Masters degrees. S&T statistics in Uganda up to 2009 capture ISCED97 5A at Masters degree level only.

ISCED97 5B - International Standard Classification of Education 1997, Level 5B - includes shorter occupancy oriented programmes. S&T statistics in Uganda up to 2009 capture ISCED97 5B at Bachelor degree level only.

ISCED97 6 - International Standard Classification of Education 1997, Level 6 - includes all PhDs, Doctorates or similar level

Marketing innovation - A marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.

Mean years of schooling - is the average number of years of school completed in the population of age 15 and older.

Organisational innovation - An organisational innovation is the implementation of a new organisational method in the firm's business practices, workplace organisation or external relations.

Other supporting staff - includes skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with such projects.

Patent - is defined by the Oslo Manual as a legal property right over an invention, which is granted by national patent offices. Patent statistics are increasingly used in various ways by technology students as indicators of the output of invention activities.

Private Non-profit Expenditure on Research and Development (PNPERD) - includes expenditure by non-profit institutions that serve the public sector, as well as those by individual donors to R&D activity.

Process innovation - A process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.

Product innovation - A product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.

R&D personnel - All persons employed directly on Research and experimental development (R&D), as well as those providing direct services, such as R&D managers, administrators and clerical staff. Persons providing an indirect service, such as canteen and security staff, are excluded.

Research - is defined as "systematic study directed toward fuller scientific knowledge of the subject studied".

Research and experimental Development (R&D) - comprises "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications."

Researchers - are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned.

Royalty and license fees, receipts - are payments and receipts between residents and nonresidents for the authorized use of intangible, non produced, nonfinancial assets and proprietary rights (such as patents, copyrights, trademarks, industrial processes, and franchises) and for the use, through licensing agreements, of produced originals of prototypes (such as films and manuscripts).

S&T education and training (STET) - are all activities comprising specialised non-university higher education and training, higher education and training leading to a university degree, post-graduate and further training, and organised lifelong training for scientists and engineers. These activities correspond broadly to ISCED levels 5A, 5B and 6, and may include some ISCED level 4 programmes.

Scientific and technological services (STS) - are activities concerned with R&D and contributing to the generation, dissemination and application of scientific and technical knowledge.

Scientists and engineers - are defined as persons engaged in scientific and engineering work at a level requiring knowledge of sciences equivalent at least to that acquired through completion of a 4-year college course.

Technicians and equivalent staff - are persons with technical knowledge and experience who participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers.

Technology Achievement Index - is a composite index of technological achievement that measures the level of technological progress and thus the capacity of a country to participate in the network age.

Technology Creation Index - used to capture the level of innovation in a society, and measures changes in the number of patents granted to residents per capita and the receipts of royalties and license fees from abroad per capita.

EXECUTIVE SUMMARY

Uganda National Council for Science and Technology (UNCST) monitors scientific and technological activities in the sectors of business, government, higher education, and private non-profit and publishes the relevant STI statistical information in regular publications in Science, Technology and Innovation. This Abstract brings together key facts and figures from these four sectors and provides a statistical compilation of Uganda's science, technology and innovation activity based mainly on the latest available data in 2010.

The gross domestic expenditure on research and development (GERD) is one of the most common and most often quoted R&D indicators, indicating how much a country spends on research and experimental development as a percentage of GDP. Uganda's GERD as percentage of GDP stood at 0.5 percent in 2010 translating into Ushs. 194.8 billion. Total R&D expenditure in the Government sector was Ushs. 75.1 billion, which accounted for 38.6% and thus the largest contributor to GERD in 2010.

In 2010 the Government Budget Appropriations or Outlays on Research and Development (GBAORD) at current prices amounted to UShs.197.5 billion with the recurrent budget and development expenditure accounting for 52% and 48% respectively. GBAORD by socio-economic objective reveals that government did not allocate funds towards research in the following areas: defense; exploration and exploitation of space; production, distribution and rational utilisation of energy; and exploration and exploitation of the earth. The socio-economic objective/area of agricultural production and technology however attracted the majority at 42.8% followed by social structures and relationships (22.3%). Non-oriented research; control and care of the environment; and infrastructure and general planning of land use each attracted less than 1%. GBAORD by field of science and technology indicates that agricultural sciences received the highest budgetary allocation accounting for 42.8%. Medical sciences and natural sciences received the least funding accounting for 2.8% and 0.6% respectively.

Personnel data measure the resources devoted to R&D activities, and includes all persons employed directly on R&D as well as those providing direct services such as R&D managers, administrators, and clerical staff. R&D personnel increased marginally by 6.7% from 4002 in 2009 to 4270 in 2010 with researchers contributing two-thirds of the total R&D personnel in 2010. R&D personnel in terms of FTE were 2006.9 with researchers numbering 1262.7, technicians and equivalent staff (447.9) and other supporting staff (296) in 2010.

Scientific and technological services (STS) are activities concerned with research and experimental development and contributing to the generation, dissemination and application of scientific and technical (S&T) knowledge. Expenditure on STS declined by 15.4% from Ushs. 296.6 billion in 2009 to Ushs. 250.9 billion in 2010. The contribution from abroad amounted to Ushs.34.8 billion (13.9%) in 2010. Spending on S&T services by field of science was mainly toward capital development which accounted for 63.7% of the total expenditure. The field of engineering and technology accounted for the biggest proportion of spending on S&T services (32.7%) in 2010. The fields of science that attracted the least expenditure on S&T services were medical sciences (13.5%) and social sciences and humanities (13.3%).

Scientific and technical education and training (STET) covers specialised non-university higher education and training, higher education and training leading to a university degree, post-graduate and further training, and organised lifelong training for scientists and engineers. The expenditure on STET increased from 58.8 billion in 2009 to Ushs. 88.9 billion in 2010, of which Ushs. 15.1 billion (17%) was financed from abroad in 2010.

Innovation is the implementation of a new or significantly improved product (good or service), or process, new marketing method, or a new organisational method in business practices, workplace organisation or external relations. In the period 2008-2010, 77% of the business enterprises reported undertaking technological innovation activities. Of all the innovative activities, 72.6% had successful technological innovations, meaning that they completed product and/or process innovations during the same period. In addition, 4% indicated that they had 'ongoing only' activities; 0.1% had 'abandoned only' innovation activities, with the remaining 0.4% indicating that they had both 'abandoned and ongoing' activities.

The Technology Achievement Index (TAI) provides useful insight into how best the nation can participate in creating, using and diffusing technology and the necessary human skill base needed to transform into a knowledge economy. Uganda's TAI in 2010 stood at 0.15 indicating a reduction from 0.17 in 2009. Although Uganda's TAI reading has had a slight fall, there has been great improvement in specific areas especially with regard to the diffusion of old technology and human capacity development.

INTRODUCTION

The Uganda National Council for Science and Technology (UNCST) has the responsibility for the collection and publication of science, technology and innovation (STI) statistics for Uganda. In this respect, UNCST monitors scientific and technological activities in the sectors of business, government, higher education, and private non-profit and publishes the relevant STI statistical information in the regular publications in Science, Technology and Innovation.

This publication, the S&T Statistical Abstract, brings together key facts and figures from these four sectors (business, government, higher education and private non-profit) and provides statistical compilation of Uganda's science, technology and innovation activity. This information is based mainly on the latest available data in 2010 (Table 1.1).

Table 1.1: STI indicators at a glance

R&D	
Indicator	**Value, 2010**
GERD (Ushs. million)	194,769.3
GERD as % of GDP	0.50
GBAORD (Ushs. million)	197,462.3
GBAORD as % of GDP	0.51
R&D personnel (HC)	4270
Researchers (HC)	2823
Technicians (HC)	922
Support staff (HC)	525
R&D personnel (FTE)	2006.9
Researchers (FTE)	1262.7
Technicians (FTE)	447.9
Support staff (FTE)	296.0
Total R&D personnel per 1000 total employment (FTE)	0.06
Total researchers per 1000 total employment (FTE)	0.04
Female researchers as % of total researchers (HC)	24.3%
Female researchers as % of total researchers (FTE)	26.3%
Innovation	
Indicator	**Value, 2008-2010**
Enterprises with innovation activity	77%
Product only innovators	9.5%
Process only innovators	11.5%
Product and process innovators	51.6%
Enterprises with 'ongoing only' activities	4.0%
Enterprises with 'abandoned only' activities	0.07%
Enterprise with 'ongoing and abandoned' activities	0.39%
Enterprises without innovation activity	23.0%
Productivity	
Indicator	**Value, 2010**
Technology Achievement Index	0.15
Technology creation index	0.00007
Diffusion of recent innovations	0.00394
Diffusion of old innovations	0.42759
Human skills index	0.16910

1. R&D Expenditure

R&D expenditure data is compiled on the basis of performers' reports of intramural expenditures. Intramural expenditures are all expenditures for R&D performed within a statistical unit or sector of the economy during a specified period, whatever the source of funds. Data on R&D appropriations or outlays is compiled from budget forecasts, budget proposals, initial budget and final budget appropriations.

This section presents statistics on research and experimental expenditure clustered in the following components – Gross Domestic Expenditure on Research and Development (GERD), Government Budget Outlays or Appropriation on Research and Development (GBAORD), Scientific and Technological Services (STS), and Scientific and Technical Education and Training (STET).

1.1. GERD

The gross domestic expenditure on research and development (GERD) is one of the most common and most often quoted R&D indicators, indicating how much a country spends on research and experimental development as a percentage of GDP. Uganda's GERD as percentage of GDP stood at 0.5 percent in 2010 translating into Ushs. 194.8 billion. Total R&D expenditure in the Government sector was Ushs. 75.1 billion, which accounted for 38.6% and thus the largest contributor to GERD in 2010 (Table 1.2). The details on the GERD matrix are indicated in Appendix A-1.

Table1.2: In-house R&D Expenditure by Sector, 2010

Sector	Ushs. million	Percent
Business enterprise	67,722.0	34.8
Government	75,138.9	38.6
Higher education	49,482.0	25.4
Not-for profit	2,426.4	1.2
Grand total	**194,769.3**	**100.0**

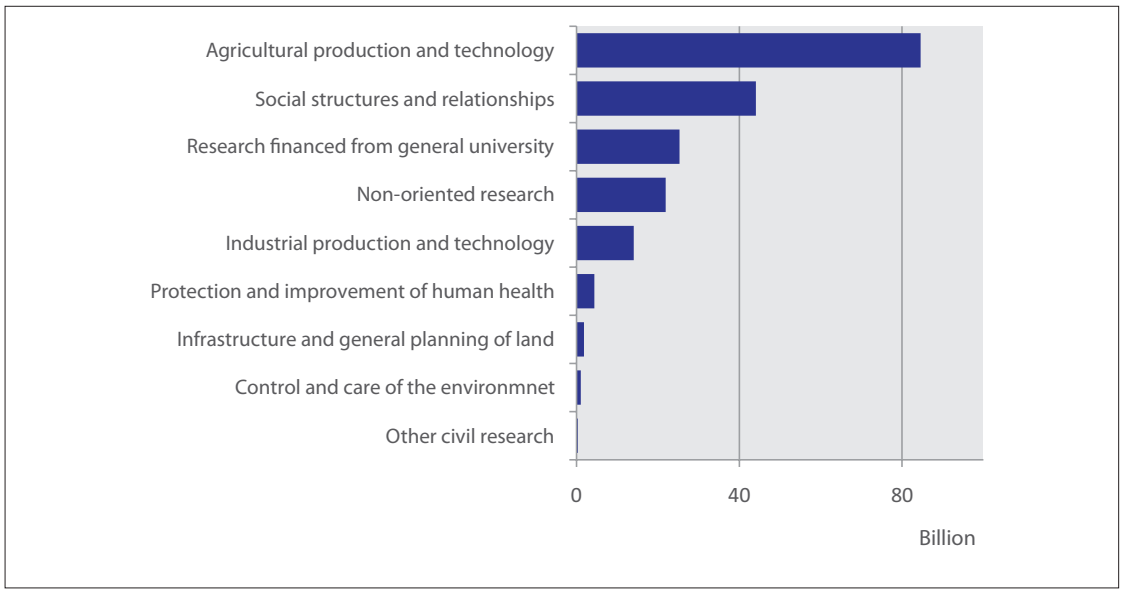
Source: R&D Survey Report 2012

1.2. GBAORD

In 2010 the Government allocated UShs.197.5 billion at current prices on research and experimental development. The recurrent budget and development expenditure accounted for 52% and 48% respectively.

The data on government budget outlays or appropriations on R&D by socio-economic objective reveals that government did not allocate funds towards research in the following areas: defense; exploration and exploitation of space; production, distribution and rational utilization

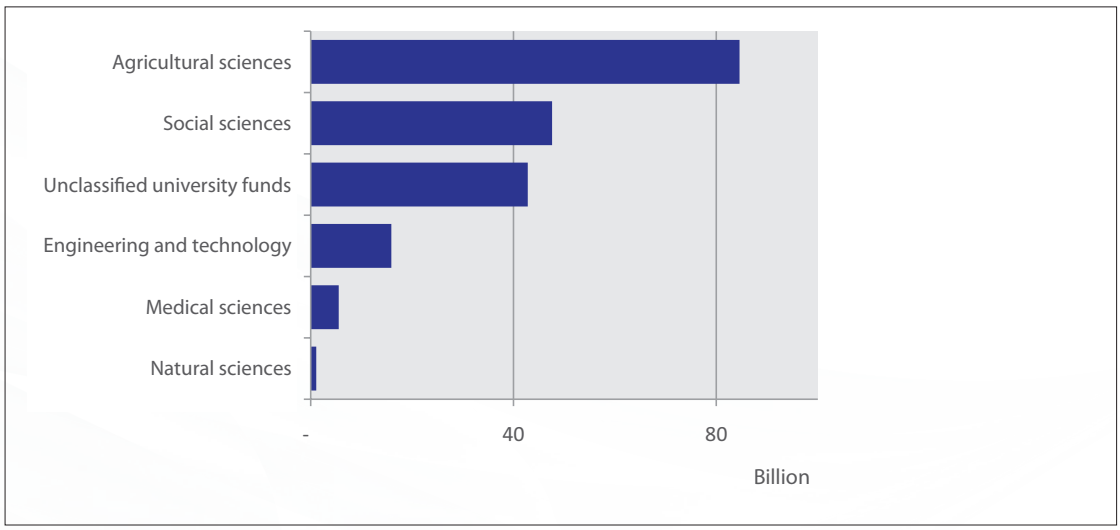
of energy; and exploration and exploitation of the earth. The socio-economic objective/area of agricultural production and technology however attracted the majority at 42.8% followed by social structures and relationships (22.3%). Non-oriented research; control and care of the environment; and infrastructure and general planning of land use each attracted less than 1% (Figure 1.1 and Appendix A-2, Table 5).



Source: UNCST S&T Database

Figure 1.1: GBAORD by socio-economic objective 2010, (Ushs. billion)

GBAORD by field of science and technology indicates that agricultural sciences received the highest budgetary allocation accounting for 42.8% of the total. Medical sciences and natural sciences received the least funding accounting for 2.8% and 0.6% respectively (Figure 1.2 and Appendix A-2, Table 6)



Source: UNCST S&T Database

Figure 1.2: GBAORD by field of science and technology, 2010 (Ushs. billion)

2. R&D Personnel

Personnel data measure the resources going directly to R&D activities, and includes all persons employed directly on R&D as well as those providing direct services such as R&D managers, administrators, and clerical staff.

This section presents statistics on headcount (HC) and full-time equivalent (FTE) of key human resources in research and experimental development by occupation, sector of employment, and formal education attainment. R&D personnel increased by 6.7% from 4002 in 2009 to 4270 in 2010; researchers comprising 2823; technicians and equivalent staff (922) and other supporting staff (525) (Figure 1.3 and Appendix A-3).

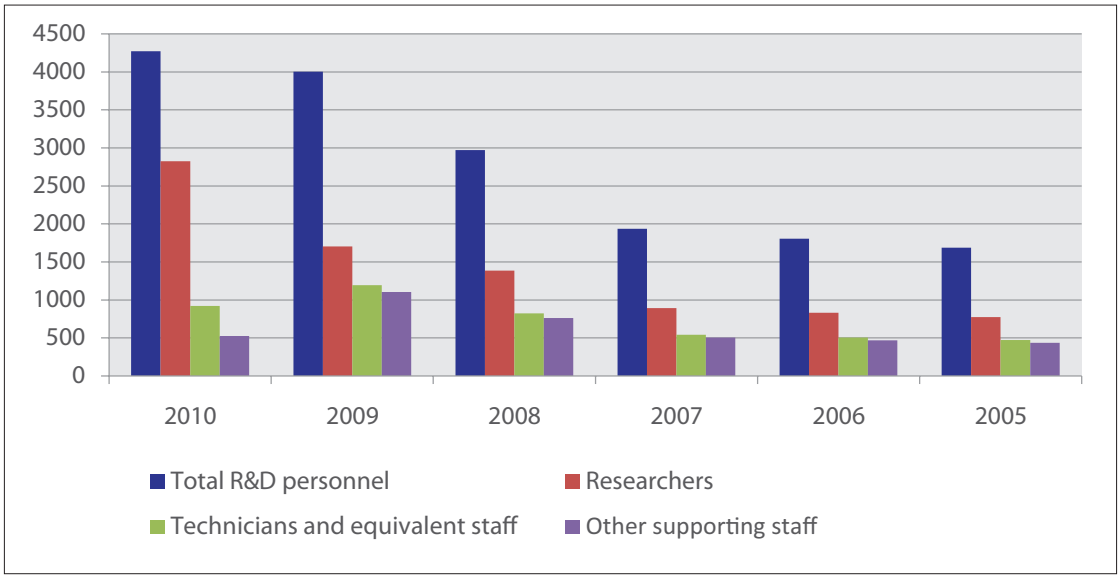


Figure 1.3: R&D personnel by occupation, HC, 2005-2010

R&D personnel in terms of FTE were 2006.9 with researchers numbering 1262.7, technicians and equivalent staff (447.9) and other supporting staff (296) in 2010 (Figure 1.4, Appendix A-3, Table 16).

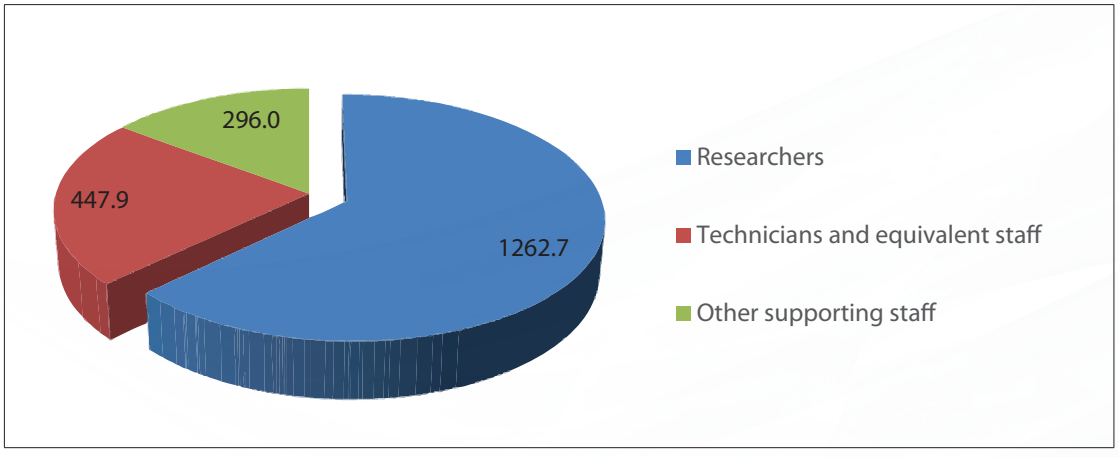


Figure 1.4: R&D personnel by occupation, FTE, 2010

3. Scientific and Technological Services

Scientific and technological services (STS) are activities concerned with research and experimental development and contributing to the generation, dissemination and application of scientific and technical (S&T) knowledge. These services include S&T activities of libraries and museums, translation and editing of S&T literature, surveying and prospecting, data collection on socio-economic phenomena, testing, standardisation and quality control, client counselling and advisory services, patent and licensing activities by public bodies.

Figure 1.5 indicates that expenditure on scientific and technological services declined by 15.4% from Ushs. 296.6 billion in 2009 to Ushs. 250.9 billion in 2010. The contribution from abroad amounted to Ushs.34.8 billion (13.9%) in 2010 (Figure 1.5, Appendix B, Table 22).

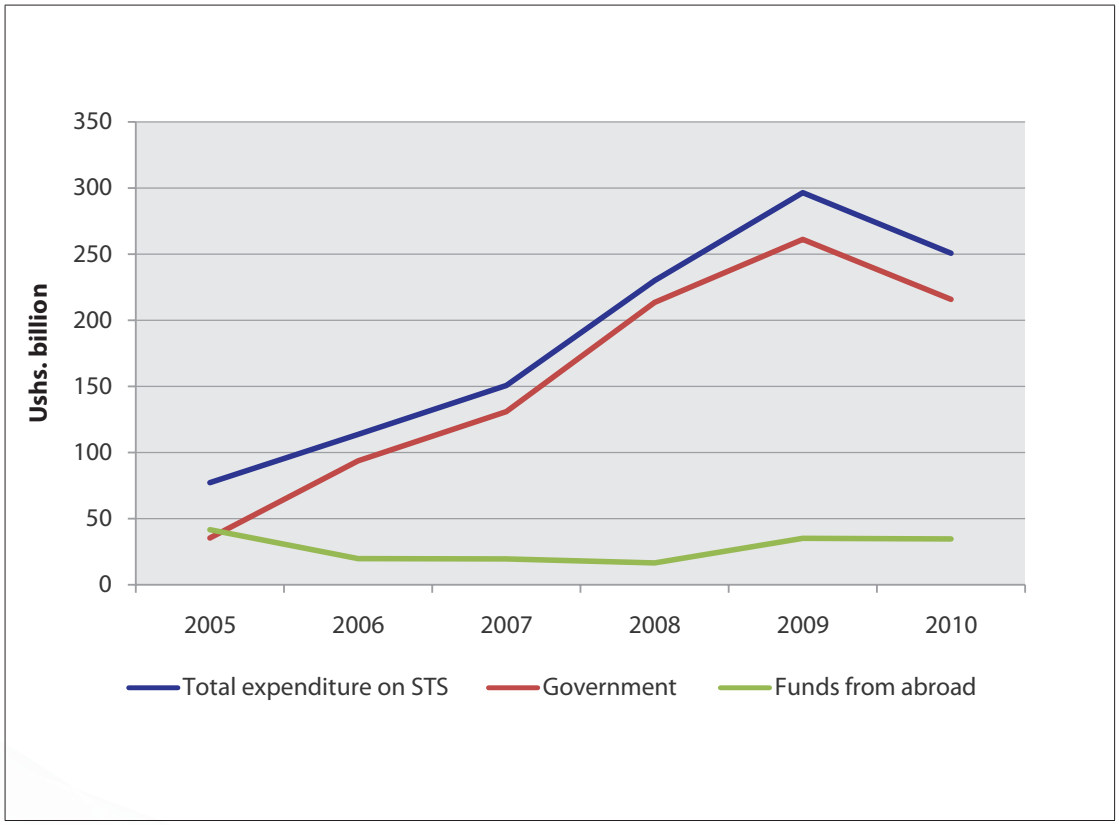


Figure 1.5: Science and technology services expenditure by source of funds, 2005-2010, current prices (Ushs. billion)

Spending on S&T services by field of science was mainly toward capital development which accounted for 63.7% of the total expenditure. The field of engineering and technology accounted for the biggest proportion of spending on S&T services (32.7%) in 2010. The fields of science that attracted the least expenditure on S&T services were medical sciences (13.5%) and social sciences and humanities (13.3%) (Figure 1.6 and Appendix B, Table 23).

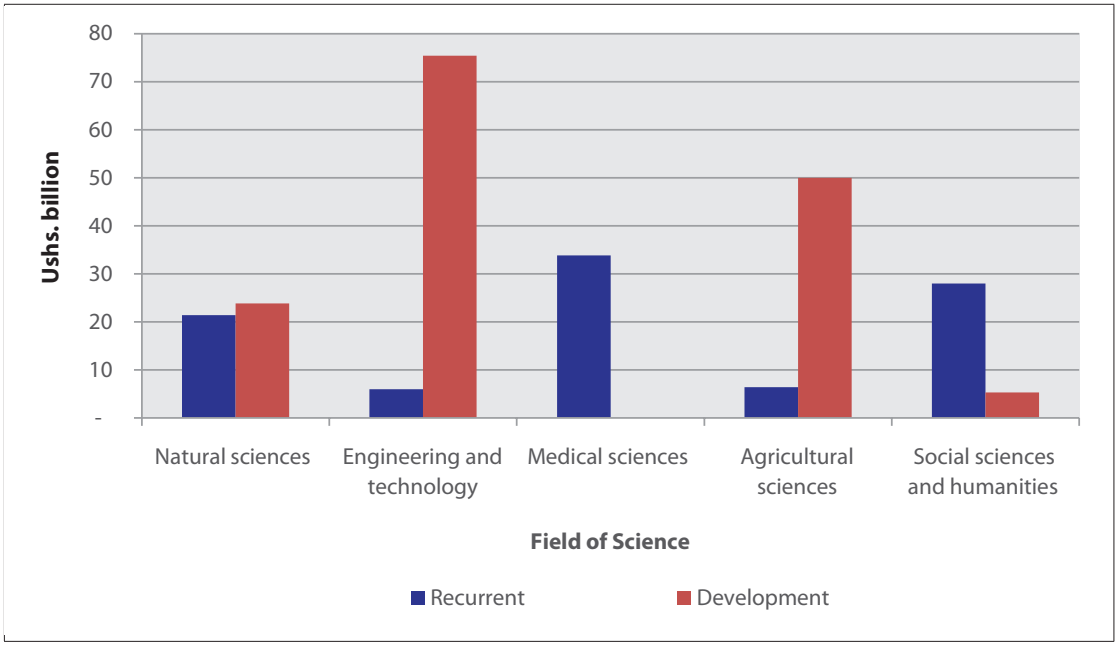


Figure 1.6: Science and technology services expenditure by field of science and technology, 2010 (Ushs. billion)

4. Scientific and Technical Education and Training

Scientific and technical education and training (STET) includes all activities related to specialised non-university higher education and training; higher education and training leading to a university degree; post-graduate and further training; and organised life-long training for scientists and engineers.

The expenditure on training of scientists and engineers increased from Ushs. 58.8 billion in 2009 to Ushs. 88.9 billion in 2010, of which Ushs. 15.1 billion (17%) was financed from abroad (Figure 1.7 and Appendix C, Table 24).

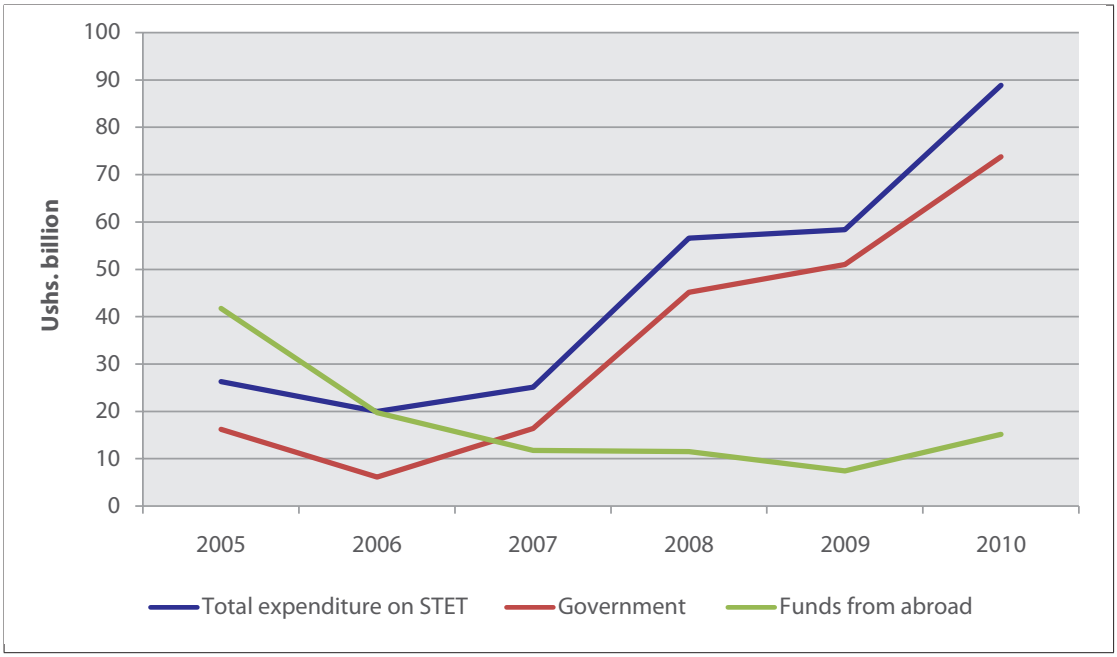


Figure 1.7: Scientific and technical education and training expenditure by source of funds, 2005-2010 (Ushs. billion)

5. Innovation Indicators

In the period 2008-2010, 77% of the business enterprises reported undertaking technological innovation activities. Of all the innovative activities, 72.6% had successful technological innovations, meaning that they completed product and/or process innovations during the same period. In addition, 4% indicated that they had 'ongoing only' activities; 0.1% had 'abandoned only' innovation activities, with the remaining 0.4% indicating that they had both abandoned and ongoing activities.

The technological innovative enterprises comprised 9.5% with 'product only innovations'; 11.5% with 'process only' innovations; and 51.6% with both 'product and process' innovations. Regarding non-technological innovations, 11.9% of enterprises had organisational innovations and 6.8% had marketing innovations. Innovative enterprises in industry and service sectors accounted for 77.8% and 76.5% respectively.

Figure 1.8 shows that the biggest proportion of enterprises with innovation activity were in the medium enterprise group (employing 50-249 persons) at 86.1% compared to an innovation rate of 75% in the very small enterprise category (employing less than 20 persons). Details of innovation indicators are highlighted in Appendix D (Tables 26-39).

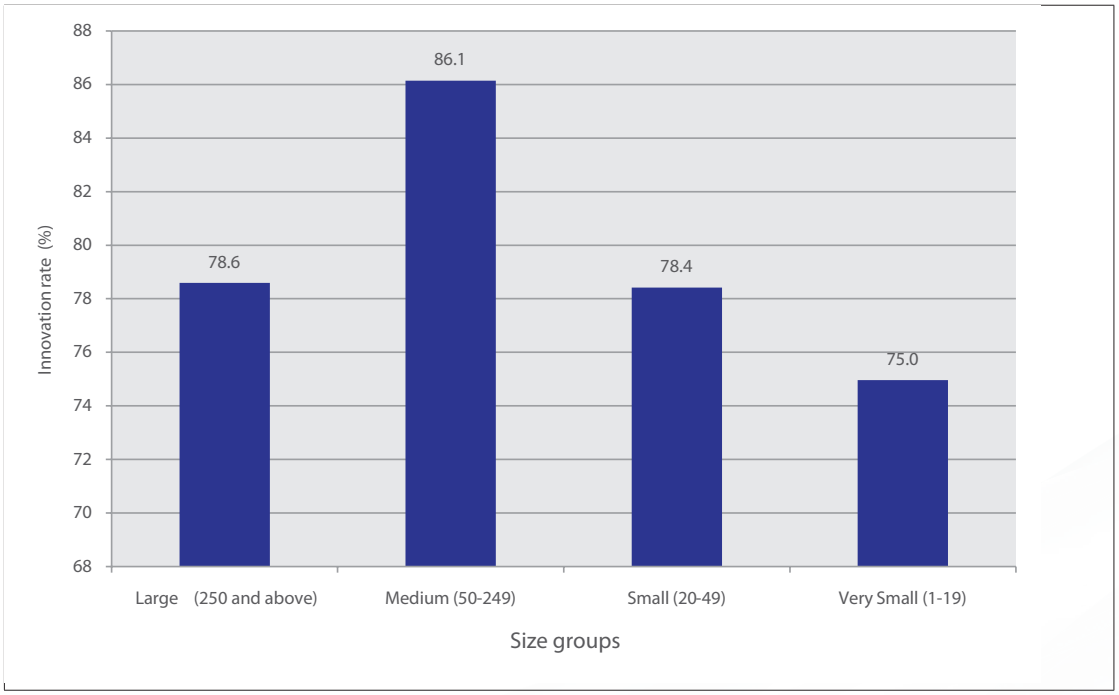


Figure 1.8: Percentage of enterprises with innovation activity, by size class, 2008 - 2010

6. Technology Achievement Index

The Technology Achievement Index (TAI) provides useful insight into how best the nation can participate in creating, using and diffusing technology and the necessary human skill base needed to transform into a knowledge economy. In 2010 Uganda's TAI stood at 0.15 indicating a reduction from 0.17 in 2009 (Appendix E, Tables 40-41).

Although Uganda's TAI reading has had a slight fall, there has been great improvement in specific areas especially with regard to the diffusion of old technology and human capacity development. The technology creation index is still very low owing largely to the lack of new knowledge being created in terms of research and experimental development. This is also expressed by the weak linkage between industry and academia which often creates this technology chasm. As a result, Uganda's earning from royalties is very minimal owing to its apparent absence and lack of participation in global knowledge circuits.

APPENDICES

Appendix A: Research and Experimental Development

A-1: Gross Domestic Expenditure on Research and Development (GERD)

Table 1: GERD by sector of performance 2005-2010 - current prices (Ushs. '000s)

Year	Sectors of performance				
	Total	Business enterprise	Government	Higher education	Private non-profit
2010	194,769,300	67,722,000	75,138,900	49,482,000	2,426,400
2009	123,889,061	10,200,000	79,726,290	21,757,191	12,205,580
2008	79,939,412	3,466,670	61,054,470	-	15,418,272
2007	82,249,000	6,200,000	55,516,787	-	20,532,213
2006	54,688,635	-	32,745,185	5,271,394	16,672,056
2005	34,531,052	573,610	27,594,944	6,362,498	-

Table 2: GERD by source of funds 2005-2010 - current prices (Ushs. '000s)

Year	Source of funds					
	Total	Business enterprise	Government	Higher education	Private non-profit	Funds from abroad
2010	194,769,300	26,632,800	42,724,900	2,019,500	11,780,600	111,611,500
2009	123,889,061	10,200,000	59,548,770	21,757,191	100,335	32,282,765
2008	79,939,412	3,466,670	41,838,750	-	66,590	34,567,402
2007	82,249,000	6,200,000	34,326,786	-	4,947	41,717,267
2006	54,688,635	-	27,396,264	-	4,375	27,287,996
2005	34,531,052	573,610	14,321,776	-	-	19,635,666

Table 3: GERD by field of science and technology 2005-2010 - current prices (Ushs. '000s)

Year	Total	Field of science and technology				
		Natural sciences	Engineering & technology	Medical & health sciences	Agricultural sciences	Social sciences & humanities
2010	136,701,300	17,518,400	23,733,300	35,335,400	32,619,700	27,494,500
2009	123,889,061	402,525	13,079,483	11,590,108	62,672,880	36,144,065
2008	79,939,412	66,510	7,869,578	15,810,112	42,819,780	13,373,432
2007	82,249,000	109,000	4,831,000	19,232,000	50,688,000	7,389,000
2006	54,688,635	365,183	3,265,279	13,294,594	25,673,796	12,089,783
2005	34,531,052	—	—	1,334,518	25,574,254	7,649,280

Table 4: GERD by type of R&D activity 2005-2010 - current prices (Ushs. '000)

Year	Total	Type of R&D activity		
		Basic research	Applied research	Experimental development
2010	194,769,200	67,586,800	83,721,600	43,460,800
2009	123,889,061	42,709,856	72,949,205	8,230,000
2008	79,939,412	19,903,040	55,192,794	4,843,578
2007	82,249,000	14,963,799	65,480,201	1,805,000
2006	54,688,635	8,519,264	45,934,092	235,279
2005	34,531,052	4,089,192	30,441,860	-

A-2: GBAORD

Table 5: GBAORD by socio-economic objectives (Ushs. '000s)

Social economic objectives	Recurrent	Development	Total
Agricultural production and technology	30,161,702	54,389,210	84,550,912
Control and care of the environment	134,265	935,970	1,070,235
Industrial production and technology	5,833,000	8,230,000	14,063,000
Infrastructure and general planning of land use	545,595	1,269,429	1,815,024
Non-oriented research	1,064,919	20,826,964	21,891,883
Other civil research	240,673	72,582	313,255
Protection and improvement of human health	4,386,269	-	4,386,269
Research financed from general university funds	25,300,124	-	25,300,124
Social structures and relationships	26,828,040	17,243,521	44,071,561
Total	**94,494,587**	**102,967,676**	**197,462,263**

Table 6: GBAORD by field of science and technology (Ushs. '000s)

Field of science and technology	Recurrent	Development	Total
Agricultural sciences	30,161,702	54,389,210	84,550,912
Engineering and technology	6,378,595	9,499,429	15,878,024
Medical Sciences	5,537,135	-	5,537,135
Natural sciences	184,248	935,970	1,120,218
Social sciences	29,415,076	18,166,129	47,581,205
Other	22,817,831	19,976,938	42,794,769
Total	**94,494,587**	**102,967,676**	**197,462,263**

A-3: R&D Personnel

Table 7: R&D personnel by occupation - headcount, 2005-2010

Year	Total R&D personnel	Researchers	Technicians and equivalent staff	Other supporting staff
2010	4270	2823	922	525
2009	4002	1703	1194	1105
2008	2973	1387	823	763
2007	1937	891	542	504
2006	1807	831	506	470
2005	1686	776	472	438

Table 8: Total R&D personnel by gender – headcount, 2005-2010

Year	Total R&D personnel				Researchers		
	Total	Female	Male	Unknown/ No data	Total	Female	Male
2010	4270	1096	3174	-	2823	687	2136
2009	4002	1369	2633	-	1703	688	1015
2008	2973	1028	1945	-	1387	549	838
2007	1937	715	1222	-	891	365	526
2006	1807	488	849	470	831	312	519
2005	1686	455	793	438	776	291	485

Table 9: Total R&D personnel by gender and sector of employment - headcount, 2008-2010

Sector	2008			2009			2010		
	Total	Female	Male	Total	Female	Male	Total	Female	Male
Total	2973	1029	1944	4002	1370	2632	4270	1096	3174
Business enterprise	243	107	136	280	124	156	2333	506	1827
Government	1381	461	920	1621	539	1082	744	241	503
Higher education	1051	367	684	1585	537	1048	1027	288	739
Private non-profit	298	94	204	516	170	346	166	61	105

Table 10: Researchers by gender and sector of employment - headcount, 2008-2010

Sector	2008			2009			2010		
	Total	Female	Male	Total	Female	Male	Total	Female	Male
Total	1387	550	837	1703	688	1015	2823	687	2136
Business enterprise	87	41	46	100	49	51	1431	298	1133
Government	742	271	471	808	298	510	404	120	284
Higher education	456	192	264	631	268	363	880	235	645
Private non-profit	102	46	56	164	73	91	108	34	74

Table 11: Researchers by gender and qualification, 2008 - 2010

Qualification	2008			2009			2010		
	Total	Female	Male	Total	Female	Male	Total	Female	Male
Total	1387	550	837	1703	688	1015	2823	687	2136
ISCED 6	429	154	275	519	180	339	616	158	458
ISCED 5A	293	123	170	460	205	255	1926	494	1432
ISCED 5B	660	271	389	719	301	418	24	6	18
All other qualifications	5	2	3	5	2	3	257	29	228

Table 12: Total R&D personnel by occupation and sector of employment - headcount, 2008-2010

Sector	2008			
	Total	Researchers	Technicians and equivalent staff	Other supporting staff
Total	2973	1387	823	763
Business enterprise	243	87	56	100
Government	1381	742	281	358
Higher education	1051	456	385	210
Private non-profit	298	102	101	95
Sector	**2009**			
	Total	**Researchers**	**Technicians and equivalent staff**	**Other supporting staff**
Total	4002	1703	1194	1105
Business enterprise	280	100	69	111
Government	1621	808	371	442
Higher education	1585	631	573	381
Private non-profit	516	164	181	171
Sector	**2010**			
	Total	**Researchers**	**Technicians and equivalent staff**	**Other supporting staff**
Total	4270	2823	922	525
Business enterprise	2333	1431	579	323
Government	744	404	206	134
Higher education	1027	880	108	39
Private non-profit	166	108	29	29

Table 13: Researchers by sector of employment and qualification - headcount, 2008-2010

Qualification	2008				
	Total	Business enterprise	Government	Higher education	Private non-profit
Total	1387	87	742	456	102
ISCED 6	429	6	291	109	23
ISCED 5A	293	16	160	71	46
ISCED 5B	660	65	290	273	32
All other qualifications	5	-	1	3	1
Qualification	**2009**				
	Total	**Business enterprise**	**Government**	**Higher education**	**Private non-profit**
Total	1703	100	808	631	164
ISCED 6	519	7	309	160	43
ISCED 5A	460	23	196	163	78
ISCED 5B	719	70	302	305	42
All other qualifications	5	-	1	3	1
Qualification	**2010**				
	Total	**Business enterprise**	**Government**	**Higher education**	**Private non-profit**
Total	2823	1431	404	880	108
ISCED 6	616	194	88	331	3
ISCED 5A	1926	1038	285	522	81
ISCED 5B	24	-	12	7	5
All other qualifications	257	199	19	20	19

Table 14: Researchers by sector of employment and field of science and technology - headcount, 2008-2010

Field of science and technology	2008				
	Total	Business enterprise	Government	Higher education	Private non-profit
Total	1387	87	742	456	102
Natural sciences	77	6	27	39	5
Engineering and technology	26	5	6	13	2
Medical sciences	532	9	309	165	49
Agricultural sciences	219	-	216	3	0
Social sciences and Humanities	533	67	184	236	46
Field of science and technology	**2009**				
	Total	**Business enterprise**	**Government**	**Higher education**	**Private non-profit**
Total	1703	100	808	631	164
Natural sciences	125	6	38	70	11
Engineering and technology	28	5	7	14	2
Medical sciences	673	15	349	229	80
Agricultural sciences	223	1	216	6	0
Social sciences and Humanities	654	73	198	312	71
Field of science and technology	**2010**				
	Total	**Business enterprise**	**Government**	**Higher education**	**Private non-profit**
Total	2823	1431	404	880	108
Natural sciences	492	304	59	127	2
Engineering and technology	343	187	43	108	5
Medical sciences	284	-	46	230	8
Agricultural sciences	325	106	123	85	11
Social sciences and Humanities	1378	833	133	330	82

Table 15: Researchers by gender and field of science and technology - headcount, 2008-2010

Field of science and technology	2008			2009			2010		
	Total	Female	Male	Total	Female	Male	Total	Female	Male
Total	1387	550	837	1703	688	1015	2823	687	2136
Natural sciences	77	38	39	125	58	67	492	84	408
Engineering and technology	26	6	20	28	7	21	343	80	263
Medical sciences	532	183	349	673	239	434	284	87	197
Agricultural sciences	219	66	153	223	69	154	325	64	261
Social sciences and Humanities	533	257	276	654	315	339	1378	372	1006

Table 16: FTE R&D personnel by occupation and sector, 2010

Sector	Total R&D personnel	Researchers	Technicians and equivalent staff	Other supporting staff
Total	2006.9	1262.7	447.9	296
Business enterprise	1055.6	639	246.6	170
Government	545.9	264.6	171.1	110.2
Higher education	358	325	24	9
Private non-profit	47.4	34.4	6.2	6.8

Table 17: FTE R&D personnel by gender, 2010

Sector	Total R&D personnel			Researchers		
	Total	Female	Male	Total	Female	Male
Total	2006.9	555	1451.9	1262.7	331.6	931.1
Business enterprise	1055.6	264	791.6	639	161.1	477.9
Government	545.9	174.5	371.4	264.6	75.3	189.3
Higher education	358	95	263	325	81	244
Private non-profit	47.4	21.5	25.9	34.4	14.2	20.2

Table 18: FTE researchers sector of employment and qualification level, 2010

Sector	Total	Business enterprise	Government	Higher education	Private non-profit
Total	1262.7	639	264.7	325	34.4
ISCED 6	307.6	112.3	72.4	122	0.9
ISCED 5A	826	427.8	176.2	192	30
ISCED 5B	8.8		5.3	3	0.5
All other qualifications	120.8	99.1	10.8	8	2.9

Table 19: FTE researchers by qualification level, 2010

Sector	Total
Total	1262.7
ISCED 6	307.6
ISCED 5A	826
ISCED 5B	8.8
All other qualifications	120.8

Table 20: FTE researchers by sector of employment and field of science and technology, 2010

Field of science and technology	Total researchers	Business enterprise	Government	Higher education	Private non-profit
Total	1262.7	639	264.6	325	34.4
Natural sciences	189.7	85.3	42.5	61	0.9
Engineering and technology	120.7	55.4	32.3	32	1
Medical sciences	92.4	-	28.1	63	1.3
Agricultural sciences	164.6	26.2	107.1	28	3.3
Social sciences and humanities	695.6	472.1	54.6	141	27.9

Table 21: FTE researchers by gender and field of science, 2010

Field of science and technology	Total	Female	Male
Total	1262.7	331.6	931.1
Natural sciences	189.7	32.9	156.8
Engineering and technology	120.7	22.9	97.8
Medical sciences	92.4	20.2	72.2
Agricultural sciences	164.6	37.1	127.5
Social sciences and humanities	695.6	218.5	477.1

Appendix B: Scientific and Technological Services

Table 22: Expenditure on scientific and technological services by source of funds, 2005-2010, (Ushs. million)

Year	Total expenditure on STS	Government	Funds from abroad
2010	250,863.7	216,054.5	34,809.2
2009	296,618.9	261,349.3	35,269.6
2008	230,006.8	213,547.0	16,459.8
2007	150,589.8	131,031.1	19,558.7
2006	113,580.9	93,900.6	19,680.0
2005	77,148.4	35,430.9	41,717.5

Table 23: Expenditure on science and technology services by field of science and technology, 2010 (Ushs. million)

Field	Recurrent	Development	Total
Natural sciences	21,424.0	23,815.5	45,239.5
Engineering and technology	5,965.7	76,174.9	82,140.6
Medical sciences	29,235.3	4,582.0	33,817.3
Agricultural Sciences	6,392.7	49,973.0	56,365.7
Social sciences and humanities	27,997.9	5,302.7	33,300.6
Total	**91,015.6**	**159,848.1**	**250,863.7**

Appendix C: Scientific and Technical Education and Training

Table 24: Expenditure on scientific and technical education and training by source of funds, 2005-2010 (Ushs. million)

Year	Total expenditure on STET	Government	Funds from abroad
2010	88,850.6	73,735.6	15,115.0
2009	58,361.8	50,977.8	7,384.0
2008	56,574.5	45,084.5	11,491.0
2007	25,058.0	16,329.2	11,728.8
2006	19,921.6	13,844.2	6,077.3
2005	26,232.7	10,053.2	16,179.5

Table 25: Expenditure on scientific and technical education and training by division of science and technology 2010 (Ushs. million)

Division	Recurrent	Development	Total
Natural sciences and engineering (NSE)	6,604.6	8,181.6	14,786.3
Social sciences and humanities (SSH)	38,021.5	36,042.8	74,064.3
Total	44,626.2	44,224.4	88,850.6

Appendix D: Innovation Indicators

Table 26: Innovation profile in the mining, manufacturing and services sub-sectors, 2008-2010

Division[a]	Industry	Number of firms			Percentage distribution		
		Innovative	Non-innovative	Total	Innovative	Non-innovative	Total
05-09	Mining and quarrying	37	18	55	67	33	100
10-12	Food processing	392	108	500	78	22	100
13-33	Manufacturing excluding food processing	631	133	764	83	17	100
35-39	Utilities	63	-	63	100	-	100
41-43	Construction	287	125	412	70	30	100
49-53	Transportation and storage	199	132	331	60	40	100
55-56	Accommodation and food services	820	205	1,025	80	20	100
58-63	Information and communication	155	31	186	83	17	100
64-66	Financial and insurance services	570	117	687	83	17	100
68-82	Real estate and business services	435	169	604	72	28	100
90-96	Recreation and personal services	195	92	286	68	32	100

[a] ISIC Rev4 codes

Table 27: Types of innovation by industry, employment size, turnover, year of establishment and ownership structure, 2008-2010

Industry	Product only		Process only		Product and process		Ongoing and/or abandoned	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Mining and quarrying	-	-	9	1.6	28	1.1		-
Food processing	17	3.7	90	16	243	9.6	41.64	19
Manufacturing excluding food processing	85	18.3	24	4.3	522	20.6	-	-
Utilities	-	-	-	-	63	2.5	-	-
Construction	25	5.4	37	6.7	187	7.4	37.44	17.1
Transportation and storage	33	7.1	66	11.8	66	2.6	33.1	15.1
Accommodation and food services	103	22	103	18.2	581	22.9	34.17	15.6
Information and communication	16	3.3	23	4.1	101	4	15.5	7.1
Financial and insurance services	78	16.7	78	13.8	389	15.3	25.92	11.9
Real estate and business services	52	11.2	97	17.3	266	10.5	19.47	8.9
Recreation and personal services	57	12.3	34	6.1	92	3.6	11.44	5.2
Total	**465**	**100**	**562**	**100**	**2,536**	**100**	**219**	**100**
Employment size								
1 to 19	268	57.6	356	63.2	1,599	63	149	68.3
20 to 49	167	36	77	13.7	568	22.4	49	22.6
50 to 249	30	6.4	113	20	284	11.2	20	9.1
250 and above	-	-	17	3	86	3.4	-	-
Total	**465**	**100**	**563**	**100**	**2,537**	**100**	**219**	**100**
Turnover (million)								
Below Ush.10 Million	70	15	31	5.5	290	11.4	37	16.7
Ush. 10 Million to less than Ush. 50 Million;	166	35.6	260	46.3	987	38.9	75	34.3
50 Million to less than 200 Million	70	15.1	38	6.8	412	16.3	55	25
Ush. 200 Million and above	160	34.3	233	41.4	848	33.4	53	24.1
Total	**465**	**100**	**563**	**100**	**2,537**	**100**	**219**	**100**
Year of establishment								
Prior to 1960	8	1.7	-	-	12	0.5		-
1960-1969		-	-	33	1.3			-
1970-1979		-	13	2.3	51	2		-
1980-1989	7	1.5	19	3.4	189	7.5		-
1990-1999	119	25.5	243	43.2	599	23.6	31	14
2000-2009	294	63.2	242	43	1,458	57.5	144	65.9
2010-2012		-	8	1.4	59	2.3	32	14.8
Missing value	38	8.2	38	6.8	135	5.3	11	5.2
Total	**465**	**100**	**563**	**100**	**2,537**	**100**	**219**	**100**

Table 28: Number and percentage of innovative enterprises having engaged in specific innovation expenditure, 2010 (year specific question)

Type of expenditure	Number of innovative enterprises		
	Total	Industry	Services
Intramural (in-house) R&D in 2010	2,272	787	1,486
Extramural or outsourced R&D	1,306	409	897
Acquisition of machinery, equipment and software	3,783	1,347	2,436
Acquisition of other external knowledge	1,511	552	959
Training	2,787	1,005	1,782
Market introduction of innovations	2,117	721	1,396
Design	2,150	877	1,273
Other activities	1,569	537	1,032
Type of expenditure	**Percentage of innovative enterprises**		
Intramural (in-house) R&D in 2010	60.1	58.4	61.0
Extramural or outsourced R&D	34.5	30.4	36.8
Acquisition of machinery, equipment and software	100	100	100
Acquisition of other external knowledge	39.9	41.0	39.4
Training	73.7	74.7	73.1
Market introduction of innovations	56.0	53.6	57.3
Design	56.8	65.2	52.2
Other activities	41.5	39.9	42.3

Table 29: Innovative enterprises: Responsibility for the development of product innovations, 2008-2010

Responsibility for the development of product innovation	Number of innovative enterprises		
	Total	Industry	Services
All innovative enterprises	3002	1106	1896
Mainly own enterprise	1634	725	909
Mainly own enterprise group	404	68	336
Own enterprise in collaboration with other enterprises or institutions	360	126	233
Other enterprises or institutions	171	50	121
Enterprises which did not respond to the question	434	138	296
Responsibility for the development of product innovation	**Percentage of innovative enterprises**		
	Total	**Industry**	**Services**
All Innovative enterprises	100.0	100.0	100.0
Mainly own enterprise	54.4	65.5	48.0
Mainly own enterprise group	13.5	6.1	17.7
Own enterprise in collaboration with other enterprises or institutions	12.0	11.4	12.3
Other enterprises or institutions	5.7	4.5	6.4
Enterprises which did not respond to the question	14.4	12.4	15.6

Table 30a: Number of innovative and non-innovative enterprises that introduced organisational or marketing innovations, 2008-2010

Organisational or marketing innovations	Enterprises with innovation activity		
	Total	Industry	Services
Organisational innovations			
New business practices or improved knowledge management systems	2793	932	1861
Work responsibilities and decision making	3,085	1037	2048
External relations with other firms or public institutions	1885	568	1317
Marketing innovations			
Design or packaging of a good or service	2440	883	1557
New media or technique for product promotion	1798	575	1223
New methods for product placement or sales channels	1613	653	960
New methods of pricing goods or services	2459	871	1588
Organisational or marketing innovations	**Enterprises without innovation activity**		
	Total	**Industry**	**Services**
Organisational innovations			
New business practices or improved knowledge management systems	365	118	247
Work responsibilities and decision making	494	157	337
External relations with other firms or public institutions	324	106	219
Marketing innovations			
Design or packaging of a good or service	281	112	169
New media or technique for product promotion	173	45	128
New methods for product placement or sales channels	152	65	88
New methods of pricing goods or services	275	101	173

Table 30b: Percentage of innovative and non-innovative enterprises that introduced organisational or marketing innovations, 2008-2010

Organisational or marketing innovations	Proportion of enterprises with innovation activity		
	Total	Industry	Services
Organisational innovations			
New business practices or improved knowledge management systems	73.8	69.2	76.4
Work responsibilities and decision making	81.5	77.0	84.1
External relations with other firms or public institutions	49.8	42.1	54.1
Marketing innovations			
Design or packaging of a good or service	64.5	65.5	63.9
New media or technique for product promotion	47.5	42.7	50.2
New methods for product placement or sales channels	42.6	48.4	39.4
New methods of pricing goods or services	65.0	64.6	65.2
Organisational or marketing innovations	**Proportion of enterprises without innovation activity**		
	Total	**Industry**	**Services**
New business practices or improved knowledge management systems	32.3	30.6	33.2
Work responsibilities and decision making	43.7	40.8	45.3
External relations with other firms or public institutions	28.7	27.6	29.3
Marketing innovations			
Design or packaging of a good or service	24.9	29.3	22.6
New media or technique for product promotion	15.3	11.8	17.1
New methods for product placement or sales channels	13.5	16.8	11.7
New methods of pricing goods or services	24.3	26.4	23.3

Table 31a: Number of enterprises that secured a patent in ARIPO or applied for at least one patent outside ARIPO, 2008-2010

Enterprises that secured and/or applied for a patent	Number of enterprises		
	Total	Industry	Services
Enterprises that secured a patent in ARIPO			
All enterprises	35	35	-
Enterprises with innovation activity	35	35	-
Enterprises without innovation activity	-	-	-
Enterprises that applied for a patent outside ARIPO			
All enterprises	108	58	50
Enterprises with innovation activity	97	47	50
Enterprises without innovation activity	10	10	-

Table 31b: Percentage of enterprises that secured a patent in ARIPO or applied for at least one patent outside ARIPO, 2008-2010

Enterprises that secured and/or applied for a patent	Percentage of enterprises		
	Total	Industry	Services
Enterprises that secured a patent in ARIPO			
All enterprises	0.7	2.0	-
Enterprises with innovation activity	0.9	2.6	-
Enterprises without innovation activity	-	-	-
Enterprises that applied for a patent outside ARIPO			
All enterprises	2.2	3.4	1.6
Enterprises with innovation activity	2.6	3.5	2.1
Enterprises without innovation activity	0.9	2.6	-

Table 31c: Number of enterprises that made use of intellectual property rights, 2008-2010

Type of intellectual property	Number		
	Total	Industry	Services
Enterprises with innovation activity			
Registered an industrial design	404	108	296
Registered a trademark	772	278	494
Claimed a copyright	377	148	229
Granted a license on any intellectual property rights resulting from innovation	368	117	251
Enterprises without innovation activity			
Registered an industrial design	33	33	-
Registered a trademark	116	51	65
Claimed a copyright	33	7	26
Granted a license on any intellectual property rights resulting from innovation	3	3	-

Table 31d: Percentage of enterprises that made use of intellectual property rights, 2008-2010

Type of intellectual property	Percentage		
	Total	Industry	Services
Enterprises with innovation activity			
Registered an industrial design	10.7	8.0	12.2
Registered a trademark	20.4	20.6	20.3
Claimed a copyright	10.0	11.0	9.4
Granted a license on any intellectual property rights resulting from innovation	9.7	8.7	10.3
Enterprises without innovation activity			
Registered an industrial design	2.9	8.7	-
Registered a trademark	10.3	13.3	8.7
Claimed a copyright	2.9	1.8	3.4
Granted a license on any intellectual property rights resulting from innovation	0.3	0.9	-

Table 32a: Geographic distribution of goods and services sold by innovative and non-innovative enterprises (number), 2008-2010

Geographic distribution	Number of enterprises		
	Total	Industry	Services
All enterprises			
Local market (Uganda)	1183	403	780
East African markets	2357	884	1473
COMESA markets	2174	800	1374
Other African markets	2338	859	1478
Europe market	2190	788	1402
The Americas	2246	804	1442
Asia market	2216	792	1424
Other markets (nec)	2031	745	1287
Enterprises with innovation activity			
Local market (Uganda)	912	300	613
East African markets	1832	737	1095
COMESA markets	1671	669	1002
Other African markets	1875	744	1131
Europe market	1700	657	1043
The Americas	1743	673	1071
Asia market	1733	667	1066
Other markets (nec)	1613	636	977
Enterprises without innovation activity			
Local market (Uganda)	271	103	168
East African markets	525	147	378
COMESA markets	503	131	372
Other African markets	463	116	347
Europe market	490	131	359
The Americas	503	131	372
Asia market	483	125	359
Other markets (nec)	418	109	310

Table 32b: Geographic distribution of goods and services sold by innovative and non-innovative enterprises (%), 2008-2010

Geographic distribution	Proportion of enterprises (%)		
	Total	Industry	Services
All enterprises			
Local market (Uganda)	24.1	23.3	24.5
East African markets	48.0	51.1	46.3
COMESA markets	44.3	46.3	43.2
Other African markets	47.6	49.7	46.4
Europe market	44.6	45.6	44.1
The Americas	45.7	46.5	45.3
Asia market	45.1	45.8	44.8
Other markets (nec)	41.3	43.0	40.4
Enterprises with innovation activity			
Local market (Uganda)	24.1	22.2	25.2
East African markets	48.4	54.7	45.0
COMESA markets	44.2	49.6	41.1
Other African markets	49.6	55.2	46.4
Europe market	44.9	48.7	42.8
The Americas	46.1	49.9	44.0
Asia market	45.8	49.5	43.8
Other markets (nec)	42.6	47.2	40.1
Enterprises without innovation activity			
Local market (Uganda)	24.0	27.0	22.5
East African markets	46.5	38.4	50.7
COMESA markets	44.5	34.3	49.8
Other African markets	40.9	30.2	46.5
Europe market	43.4	34.3	48.1
The Americas	44.5	34.3	49.8
Asia market	42.8	32.5	48.1

Table 33: Innovative enterprises that received financial support for innovation activities from government sources, 2008-2010

Source of financial support	Number of enterprises		
	Total	Industry	Services
Central government	244	35	209
Local government/authorities	155	51	104
National funding agencies	142	63	79
Foreign governments	235	70	165
	Proportion of innovative enterprises (%)		
Source of financial support			
Central government	6.5	2.6	8.6
Local government/authorities	4.1	3.8	4.3
National funding agencies	3.8	4.7	3.2
Foreign governments	6.2	5.2	6.8

Table 34: Number and percentage of staff with a degree or diploma, 2010 (year specific question)

Enterprises	Total number of staff		
	Total	Industry	Services
Enterprises with innovation activity	235143	135649	99494
Enterprises without innovation	40415	28024	12390
	Number of staff with degree or diploma		
Enterprises with innovation activity	95932	49412	46519
Enterprises without innovative activity	1488	7491	6697
	Proportion of staff with degree or diploma (%)		
Enterprises with innovation activity	40.8	36.4	46.8
Enterprise without innovation	35.1	26.7	54.1

Table 35: Enterprises with organisational and/or marketing innovations, 2008-2010

Enterprises with organisational and/or marketing innovations	Number		
	Total	Industry	Services
Enterprises with organisational innovation	3865	1308	2557
Enterprises with marketing innovation	3615	1277	2339
Enterprises with organisational and/or marketing innovation	4201	1444	2757
Innovative enterprises with organisational innovation	3316	1132	2184
Innovative enterprises with marketing innovation	3132	1122	2009
Innovative enterprises with organisational and/or marketing innovation	3508	1224	2283
Product Only Innovative enterprises with organisational and marketing innovation	366	87	279
Process Only Innovative enterprises with organisational and marketing innovation	523	147	375
Product and Process Innovative enterprises with organisational and process innovation	2481	937	1543
Non-Innovative enterprises with organisational innovation	549	176	373
Non-Innovative enterprises with marketing innovation	484	154	329
Non-Innovative enterprises with organisational and marketing innovation	693	220	474
Enterprises with organisational and/or marketing innovations	**Percentage**		
	Total	**Industry**	**Services**
Enterprises with organisational innovation	78.7	75.6	80.4
Enterprises with marketing innovation	73.6	73.8	73.5
Enterprises with organisational and marketing innovation	85.5	83.5	86.6
Innovative enterprises with organisational innovation	87.7	84.0	89.7
Innovative enterprises with marketing innovation	82.8	83.3	82.5
Innovative enterprises with organisational and marketing innovation	92.7	90.9	93.7
Product Only Innovative enterprises with organisational and marketing innovation	9.7	6.5	11.5
Process Only Innovative enterprises with organisational and marketing innovation	13.8	10.9	15.4
Product and Process Innovative enterprises with organisational and process innovation	65.6	69.6	63.3

Enterprises with organisational and/or marketing innovations	Number		
	Total	Industry	Services
Non-Innovative enterprises with organisational innovation	48.6	45.8	50.1
Non-Innovative enterprises with marketing innovation	42.8	40.2	44.2
Non-Innovative enterprises with organisational and marketing innovation	61.4	57.2	63.6

Table 36: Collaborative partnerships for innovation activities by type of partner, 2008-2010

Collaborative partnerships	Number of innovative enterprises		
	Total	Industry	Services
Other enterprises within your enterprise group	219	66	154
Suppliers of equipment, materials, components or software	175	67	109
Clients or customers	947	298	649
Competitors or other enterprises in your sector	147	16	131
Consultants, commercial labs or private R&D institutes	136	23	113
Universities or higher education institutions	33	7	26
Government or public research institutes	68	23	45
	Percentage of innovative enterprises		
Collaborative partnerships	**Total**	**Industry**	**Services**
Other enterprises within your enterprise group	5.8	4.9	6.3
Suppliers of equipment, materials, components or software	4.6	4.9	4.5
Clients or customers	25.0	22.1	26.6
Competitors or other enterprises in your sector	3.9	1.2	5.4
Consultants, commercial labs or private R&D institutes	3.6	1.7	4.6
Universities or higher education institutions	0.9	0.5	1.1
Government or public research institutes	1.8	1.7	1.8

Table 37: Innovative enterprises performing specific process innovations, 2008-2010

Process innovations	Number of process innovators		
	Total	Industry	Services
Methods of manufacturing or production	2402	927	1475
Delivery or distribution methods	2248	732	1516
Supporting activities	2254	791	1463
	Percentage process innovators		
Methods of manufacturing or production	48.9	53.6	46.4
Delivery or distribution methods	45.8	42.3	47.6
Supporting activities	45.9	45.7	46.0

Table 38: Responsibility for process innovations, 2008-2010

Responsibility for process innovations	Number of process innovators		
	Total	Industry	Services
Mainly own enterprise	289	71	217
Mainly own group enterprise	139	26	113
Own enterprise in collaboration with other enterprises or institutions	71	39	32
Other enterprises or institutions	16	3	13
Enterprises which did not respond to the question	2584	1000	1584
	Percentage of innovative enterprises		
Total	100.0	100.0	100.0
Mainly own enterprise	9.3	6.3	11.1
Mainly own group enterprise	4.5	2.3	5.8
Own enterprise in collaboration with other enterprises or institutions	2.3	3.4	1.6
Other enterprises or institutions	0.5	0.3	0.7
Enterprises which did not respond to the question	83.4	87.7	80.9

Table 39: Number enterprises that are 'first introducers/implementers' of new or significantly improved products and processes, 2008-2010

Status of innovation activity	Number of enterprises		
	Total	Industry	Services
A first in Uganda	667	326	341
A world first	82	44	39
New or significant changes in external relations with other firms or public institutions	787	279	508
Granted a license on any intellectual property rights resulting from innovation	-	-	-
	Percentage of enterprises		
A first in Uganda	17.6	24.2	14.0
A world first	2.2	3.2	1.6
New or significant changes in external relations with other firms or public institutions	20.8	20.7	20.8
Granted a license on any intellectual property rights resulting from innovation	-	-	-

Appendix E: Technology Achievement Index, TAI

Table 40: TAI dimensions and sub-indicators

Dimensions	Sub-indicators
Creation of technology	***Patents granted to residents (per million people)***: stock of embedded knowledge. An indirect indicator of knowledge that has been developed and could be tapped for future use. It also reflects the current level of inventive activity. ***Royalties and licence fees received (US$ per 1000 people)***: the indicator reflects the stock of successful past innovations that are still useful and hence have market value.
Diffusion of recent innovations	***Internet host (per 1000 people)***: Diffusion of internet is indispensable for participation in the global economic activities. It is one of the most dynamic and powerful tools to access the global information at relatively low cost. ***High technology and medium technology exports (as %age of total goods exports)***: the indicator is the best yardstick for measuring the average annual growth rates (AAGR) in high technology areas of a country.
Diffusion of old innovations	***Electricity consumption (kWh per capita)***: the indicator gives a reasonably accurate idea about the diffusion of electricity within a society. The indicator is important because of its use in new technologies and also for a multitude of other human activities. ***Telephone mainlines and cellular subscribers (per 1000 people)***: this indicator shows the participation of the people in the communication revolution. Countries must adopt this old innovation to participate successfully in the present IT network area.
Human skills development	***Mean years of schooling (aged 15 and above)***: the mean years of schooling is used as a proxy for cognitive skill. ***Gross tertiary science enrolment ratio (%)***: this indicator assesses the skills of a nation in science, mathematics, engineering and construction at the tertiary level.

Table 41: Technology Achievement Index, 2010

Indicator	Observed maximum	Observed minimum	Uganda's value	Index value
Technology Creation Index				***0.00007***
Patents granted to residents/ million people	368.59	0	0	-
Royalties & License fees received (USD/1,000 people)	944277	0.228	124.4	0.00013
Diffusion of recent innovations				***0.00394***
Internet hosts/ 1000 people	80744	0	4.427	0.00005
High and medium technology exports as % of total goods exports	67.8	0	0.53	0.00782
Diffusion of old innovations				***0.42759***
Telephones (mainlines & mobile/ 1000 people	3.467	0.477	2.595	0.70836
Electricity consumption (Kilowatt-hours/ capita)	4.711	1.387	1.875	0.14681
Human skills				***0.16910***
Mean years of schooling (age>=15 years)	12.6	1.2	4.65	0.30263
Gross tertiary science enrolment (%)	0.501822	0.004859	0.022534	0.03557
Technology Achievement Index				**0.15017**

Appendix F: Metadata, Science, Technology and Innovation Indicators

Indicators	Definition & Standard Classifications	Scope and Coverage	Sources of data	Compilation Practices	Computation Method	Accessibility and availability of data	Accounting conventions	Comments and limitations
GERD	**Gross Domestic Expenditure on Research & Development (GERD)** is the total intramural expenditure on R&D performed on the national territory during a given period. Intramural expenditures are all expenditures on R&D performed within a statistical unit or sector of the economy during a specific period, whatever the source of funds. Standard Classifications: International Standard Industrial Classification of Economic Activities (ISIC) for the classification of activities International Standard Classification of Occupations. International Standard Classification of Education GERD is further classified by field of science (FOS) and sector of performance. GERD is also classified by source of funds by sector.	National level. Gross expenditure on R&D covers: Business enterprise expenditure on R&D (BERD), Higher Education expenditure on R&D (HERD), Government expenditure on R&D (GOVERD) and Private Non-profit expenditure on R&D (PNERD).	R&D surveys Institutions in government, Higher education institutions, Business enterprises and private non profit institutions. Administrative records from - MFPED; Office of the Auditor General ; and UNCST	Expenditures on R&D performed by each statistical unit are identified The sources of funds for these R&D expenditures as reported by the performer are also identified Data by sectors of performance and sources of funds is aggregated to derive the significant national totals. Other classifications and distributions are then compiled within the GERD framework For administrative data on treasury records, estimates are made for the sector in question, reference period, or relevant R&D variable, as deemed appropriate, based on budgetary appropriations to the sector, if data are missing. **Data validation** Comparisons with relevant data sources are made to ensure accuracy of the data. This is done through; peer reviews by sector experts, and international benchmarking. **Revision policy** Data revisions are made based on the changes in the International STI Indicator systems.	Summation of intramural expenditure on R&D.	**UNCST website** www.uncst.go.ug National STI Status Report Report on National S&T Expenditure in Uganda, S&T Policy Briefs S&T Indicators Publication GERD is availed to the government and the public before the end of the budgeting cycle of the next financial year in December, 6 months after the end of the fiscal year of the reference period. GERD is availed on request	**Periodicity of production:** Annually *(Fiscal years)* Provisional data on R&D expenditure are released 6 months after the end of the fiscal year of the reference period	The data is collected in basic units, Uganda Shillings Expenditure data is not easily provided by both the public and private sectors due to lack of distinction between the routine S&T surveys and sector audits by Government. While data from public agencies can be obtained through the Treasury Office of Accounts, R&D data from the private sector is rather difficult to obtain.

Indicators	Definition & Standard Classifications	Scope and Coverage	Sources of data	Compilation Practices	Computation Method	Accessibility and availability of data	Accounting conventions	Comments and limitations
STS expenditures	Science and Technology Services (STS) expenditures are costs incurred on activities concerned with R&D and its contribution to the generation, dissemination and application of scientific and technical knowledge	National level.	**Administrative records** from MFPED, Office of the Auditor General, S&T research registration databank, and the Uganda National Bureau of Standards (UNBS)	Data on STS expenditures is obtained through surveys conducted by UNCST on institutions performing scientific and technological services Expenditures on STS performed by each statistical unit are identified. The sources of funds for these STS expenditures as reported by the relevant performer are also identified. Data by sectors of performance and sources of funds is aggregated to derive the significant national totals. Other classifications and distributions are then compiled within this STS expenditure framework **Validation of data** Comparisons with relevant data sources are made to ensure accuracy of the data. This is done through; peer reviews by sector experts, and international benchmarking. **Revision policy** Data revisions are made based on the changes in the International STI Indicator systems.	Summation of expenditures on Science and Technology Services	**UNCST website** www.uncst.go.ug National STI Status Report Report on National S&T Expenditure in Uganda, S&T Policy Briefs S&T Indicators Publication STS expenditures are availed to the government and the public before the end of the budgeting cycle of the next financial year in December, 6 months after the end of the fiscal year of the reference period. STS expenditures is availed on request.	**Periodicity of production:** Annually *(Fiscal years)*. Provisional data on STS expenditure are released 6 months after the end of the fiscal year of the reference period	The data is collected in basic units, Uganda Shillings

Indicators	Definition & Standard Classifications	Scope and Coverage	Sources of data	Compilation Practices	Computation Method	Accessibility and availability of data	Accounting conventions	Comments and limitations
STET Expenditures	Scientific and Technological Education and Training (STET) expenditures are costs incurred on all activities comprising specialised non-university higher education and training, higher education and training leading to a university degree, post-graduate and further training, and organised life-long training for scientists and engineers. These activities correspond broadly to the International System for Classification of Education levels 5, 6, and 7."	National level.	Surveys from S&T training institutions. Administrative records from MFPED, Office of the Auditor General, MoES, S&T research registration databank - UNCST.	Expenditures on STET are collected through surveys conducted by UNCST on training institutions performing scientific and technical education and training Expenditures on STET expenditures performed by each statistical unit are identified The sources of funds for these STET expenditures as reported by the relevant performer are also identified Data by sectors of performance and sources of funds is aggregated to derive the significant national totals. Other classifications and distributions are then compiled within this STET expenditure framework **Validation of data** Comparisons with relevant data sources are made to ensure accuracy of the data. This is done through; peer reviews by sector experts, and international benchmarking. **Revision policy** Data revisions are made based on the changes in the International STI Indicator systems.	Summation of STET Expenditures	**UNCST website** www.uncst.go.ug National STI Status Report Report on National S&T Expenditure in Uganda, S&T Policy Briefs S&T Indicators Publication STET expenditures are availed to the government and the public before the end of the budgeting cycle of the next financial year in December, 6 months after the end of the fiscal year of the reference period. STET expenditures are availed on request.	**Periodicity of production:** Annually *(Fiscal years)*. Provisional data on STET expenditure are released 6 months after the end of the fiscal year of the reference period	The data is collected in basic units, Uganda Shillings

Indicators	Definition & Standard Classifications	Scope and Coverage	Sources of data	Compilation Practices	Computation Method	Accessibility and availability of data	Accounting conventions	Comments and limitations
R&D Personnel	R&D personnel are all persons employed directly on research and experimental development (R&D), as well those providing direct services, such as R&D managers, administrators and clerical staff. **Standard Classifications** International Standard Industrial Classification of Economic Activities (ISIC) for the classification of activities International Standard Classification of Occupations. International Standard Classification of Education Classifications are further by Field of Science and Sector of Performance.	National level. Personnel in R&D comprise all persons in the sectors of government, higher education, business, and private non profit sectors working on research and development.	Research performers in the government, higher education, business, and private non profit sectors. The R&D personnel data is collected through a survey of all R&D institutions and government agencies. Personnel data are also obtained from the UNCST's S&T research registration databank.	Personnel in R&D are compiled basing on the national aggregates, calculated as the sum of data by sector and/or field of science and technology. The R&D personnel in each statistical unit are identified; The personnel data by sector of performance is aggregated to derive the national figures; Other classifications and distributions are then compiled within the R&D personnel framework Headcount (HC) and Fulltime equivalent (FTE) are applied in the compilation of R&D personnel. HC covers the total numbers of persons engaged in R&D activities while FTE comprises the time spent on R&D activities by the personnel. **Data validation** Comparisons with relevant data sources are made to ensure accuracy of the data. **Revision policy** Data revisions are made based on the changes in the International STI Indicator systems.	Summation of R&D personnel by category	**UNCST website** www.uncst.go.ug National STI Status Report Report on National S&T Expenditure in Uganda, S&T Policy Briefs S&T Indicators Publication Personnel data are availed on request.	**Periodicity of production:** Annually *(Fiscal years)*. Provisional data on R&D personnel are released 6 months after the end of the fiscal year of the reference period	The inherent operation of Uganda's S&T/R&D system makes the compilation of the FTE difficult and challenging

Indicators	Definition & Standard Classifications	Scope and Coverage	Sources of data	Compilation Practices	Computation Method	Accessibility and availability of data	Accounting conventions	Comments and limitations
Human Resources in Science and Technology	Human Resources in Science and Technology (HRST) are those that have either successfully completed education at the third level in an S&T field of study or not formally qualified as above, but employed in an S&T occupation where the above qualifications are normally required. **Standard classifications** International Classification of Education (ISCED) International Standard classification of Occupations (ISCO) HRST can be classified as either university level HRST (covering levels 6 and 7) or technician level HRST (covering level 5). ISCED	National level. Covers the number of people currently or potentially available to work at a certain level *(The Qualification Dimension)* and the number of people who are actually required in S&T activities at a certain level *(The Occupational Dimension)*.	Higher institutions of learning, Ministries, Departments and Agencies (MDAs), and private S&T/R&D institutions in the country. UNCST Data on stocks and flows - Ministry of Public Service, Ministry of Gender, Labour and Social Development, Ministry of Finance, Planning and Economic Development, Ministry of Education and Sports (MoES), and the National Council for Higher Education (NCHE).	Data is extracted from the S&T research registration databank at the UNCST and analysed to derive the indicator. HRST data on (stock and flow) in the relevant statistical units is identified, obtained, and aggregated at the centre; Other classifications and distributions are then compiled within this HRST framework	Summation of the Human Resources in Science and Technology National aggregates are calculated as the sum of country data where data is available by sector or other variable.	**UNCST website** www.uncst.go.ug National STI Status Report Report on National S&T Expenditure in Uganda, S&T Policy Briefs S&T Indicators Publication HRST is availed to the government and the public before the end of the budgeting cycle of the next financial year in December, 6 months after the end of the fiscal year of the reference period. Human resources data are availed on request.	**Periodicity of production:** Annually *(Fiscal years)*. Provisional data on HRST are released 6 months after the end of the fiscal year of the reference period	There are inherent challenges in establishing the actual demand for S&E personnel especially those in the private sector.

Indicators	Definition & Standard Classifications	Scope and Coverage	Sources of data	Compilation Practices	Computation Method	Accessibility and availability of data	Accounting conventions	Comments and limitations
Technology Creation Index	The Technology Creation Index (TCI) is used to capture the level of innovation in a society, and measures changes in the number of patents granted to residents per capita and the receipts of royalties and license fees from abroad per capita. **Standard Classifications:** Patents are classified according to the *International Patent Classification* (IPC).	The TCI covers two indicators: The first is the number of patents granted per capita, to reflect the current level of invention activity. The second is receipt of royalty and license fees from abroad per capita, to reflect the stock of successful past innovations that are still useful and hence have market value. Data on patents granted to residents are available for the most recent years Data relate to the TCI at the national level	Patent data - URSB/ ARIPO/USPTO reference database. Data on royalties and license fees - BOU reference database.	Data are extracted from URSB/ ARIPO databases. Reference data are obtained from USPTO reference database. Using these data, UNCST calculates the aggregates and derives the relevant index. **Data validation** UNCST collects data on patents, royalties and license fees which are checked, processed and compared with other relevant data sources. Comparisons are made between the most recent data deliveries and previous data deliveries.	*Calculating the technology creation index*. Patents and receipts of royalties and license fees are used to approximate the level of technology creation. Indices for the two indicators are calculated according to the general formulae. where, *av = actual value,* *omin.v = observed minimum value* *omax.v = observed maximum value* The technology creation index is the simple average of the patent index and the royalty and license fee index	**UNCST website** www.uncst.go.ug National STI Status Report Report on National S&T Expenditure in Uganda, S&T Policy Briefs S&T Indicators Publication TCI is availed to the government and the public before the end of the budgeting cycle of the next financial year in December, 6 months after the end of the fiscal year of the reference period.	**Periodicity of production:** Annually (Calendar years).	Innovation occurs throughout society, in formal and informal settings, although the current trend is towards increasing commercialization and formalization of the process of innovation.

Indicators	Definition & Standard Classifications	Scope and Coverage	Sources of data	Compilation Practices	Computation Method	Accessibility and availability of data	Accounting conventions	Comments and limitations
Diffusion of recent innovations index	This is a measure of changes in the number of Internet hosts per capita and the share of high- and medium-technology exports in total goods exports. **Standard classifications:** The groups classified as high-technology products are aggregated on the basis of the Standard International Trade Classification (SITC Rev. 3).	National level Covers two indicators: the diffusion of the Internet, indispensable to participation, and the exports of high-technology and medium-technology products as a share of all exports.	UNCST UCC and UBOS reference databases	Reference data are extracted from ITU/ UCC/ UBOS databases. UNCST calculates the aggregates and derives the relevant index. **Data validation** UNCST collects data on the Internet and Technology exports which are checked, processed and compared with other relevant data sources.	*Calculating the diffusion of recent innovations index.* Internet hosts and the share of high-technology and medium-technology exports in total goods exports are used to compute the *diffusion of recent innovations*. Indices for the two indicators are calculated according to the general formulae. where, *av = actual value,* *omin.v = observed minimum value* *omax.v = observed maximum value* The *diffusion of recent innovations index* is the simple average of the Internet host index and the High-technology and medium-technology export index.	**UNCST website** www.uncst.go.ug National STI Status Report Report on National S&T Expenditure in Uganda, S&T Policy Briefs S&T Indicators Publication Diffusion of recent innovations index is availed to the government and the public before the end of the budgeting cycle of the next financial year in December, 6 months after the end of the fiscal year of the reference period.	**Periodicity of production:** Annually (Calendar years).	UNCST and other stakeholders make occasional news releases on new and emerging technologies.

Indicators	Definition & Standard Classifications	Scope and Coverage	Sources of data	Compilation Practices	Computation Method	Accessibility and availability of data	Accounting conventions	Comments and limitations
Diffusion of old innovations index	This is a measure of the changes in the number of active telephones ***(mainline and cellular)*** per capita and electricity consumption per capita.	National level Covers two indicators: telephones and electricity, which are especially important because they are needed to use newer technologies and are also pervasive inputs to a multitude of human activities.	UCC, MoICT UEDCL ERA UMEME	Basic and reference data are extracted from UCC/ UEDCL/ERA databases and analyzed by UNCST to derive the index. Data is obtained by UNCST through face to face interviews / telephone interviews or through self-administered mail or online web questionnaires from the respective institutions. All ICT data is validated by the Uganda Communications Commission.	***Calculating the diffusion of old innovations index.*** Telephones (mainline and cellular) and electricity consumption per capita are used to approximate the ***diffusion of old innovations***. Indices for the two indicators are calculated according to the general formulae. The indices are calculated using the logarithm of the value. where, ***av = actual value,*** ***omin.v = observed minimum value*** ***omax.v = observed maximum value*** The ***diffusion of old innovations index*** is the simple average of telephones (mainline and cellular) index and electricity consumption per capita index.	**UNCST website** www.uncst.go.ug National STI Status Report Report on National S&T Expenditure in Uganda, S&T Policy Briefs S&T Indicators Publication Diffusion of old innovations index is availed to the government and the public before the end of the budgeting cycle of the next financial year in December, 6 months after the end of the fiscal year of the reference period.	**Periodicity of production:** Annually ***(Calendar years)***.	It might be subjective to measure technology diffusion within the population as it has inherent pitfalls with regard to population size and distribution of the technologies into the population.

Indicators	Definition & Standard Classifications	Scope and Coverage	Sources of data	Compilation Practices	Computation Method	Accessibility and availability of data	Accounting conventions	Comments and limitations
Human Skills Index	Human Skills Index (HSI) is a measure of the changes in mean years of schooling in the population aged 15 and above and the gross tertiary science enrolment ratio.	National level Covers two indicators i.e. Mean years of schooling which give a good indication of the overall level of basic educational skills in the population, notwithstanding the fact that education quality varies from country to country. Enrolment in tertiary education in science, mathematics and engineering. This measure gives an idea of the current effort in developing advanced skills in science and mathematics.	Universities MoES NCHE.	Data is extracted from the appropriate databases and analyzed to derive the index. **Data validation** UNCST collects both aggregated and disaggregated data which are checked, processed and compared with other relevant data sources.	*Calculating the human skills index.* Mean years of schooling and the gross tertiary science enrolment ratio are used to compute the ***human skills index***. Indices for the two indicators are calculated according to the general formulae. where, *av = actual value,* *omin.v = observed minimum value* *omax.v = observed maximum value* The ***human skills index*** is the simple average of the Mean years of schooling index and the gross tertiary science enrolment ratio National aggregates are calculated as the sum of country data where data is available by sector or other variable.	**UNCST website** www.uncst.go.ug National STI Status Report Report on National S&T Expenditure in Uganda, S&T Policy Briefs S&T Indicators Publication HIS is availed to the government and the public before the end of the budgeting cycle of the next financial year in December, 6 months after the end of the fiscal year of the reference period	**Periodicity of production:** Annually *(Calendar years).* Provisional data on human skills index are released 6 months after the end of the fiscal year of the reference period	Information on vocational training is not readily available.

Indicators	Definition & Standard Classifications	Scope and Coverage	Sources of data	Compilation Practices	Computation Method	Accessibility and availability of data	Accounting conventions	Comments and limitations
Technology Achievement Index	The Technology Achievement Index (TAI) is a composite index of technological achievement that measures the level of technological progress and thus the capacity of a country to participate in the network age. A composite index helps a country situate itself relative to others, especially those farther ahead. The index captures technological achievements of a country in four dimensions of: 1. creating new technology; 2. diffusing recent innovations; 3. diffusing existing technologies that are still basic inputs to the industrial and the network age; and 4. Building a human skill base for technological creation and adoption.	National level	Covers all data sources for TCI, Diffusion of recent innovations, Diffusion of old innovations, and HSI.	Aggregated data is extracted from the relevant institutions and appropriate databases and analyzed to derive the composite index. **Data validation** UNCST collects data on the TAI which are checked, processed and compared with other relevant data sources. Comparisons are made between the most recent data deliveries and previous data deliveries. **Revision Policy** The TAI is compiled annually with revisions allowed for one preceding year.	TAI is the average of the TCI, diffusion of recent innovation index, diffusion of old innovation index, and the HSI. .	**UNCST website** www.uncst.go.ug National STI Status Report Report on National S&T Expenditure in Uganda, S&T Policy Briefs S&T Indicators Publication HIS is availed to the government and the public before the end of the budgeting cycle of the next financial year in December, 6 months after the end of the fiscal year of the reference period	**Periodicity of production:** Annually	

Appendix G: Summary of the Current Production Schedule, Science, Technology and Innovation Indicators

Statistics to be produced	Indicators	Design	Level of disaggregation		Frequency of production	Publication/Report
	S - S&T Sector **O** - Pre-conditioned (for other use)	**A -** Administrative records **B -** Surveys and Censuses	**Administrative** **i.e. –** National, Regional, District, Sub county	**Gender** Yes No		
INPUT (Financial and Human Resources) S&T STATISTICS__						
1. Financial resources: S&T and R&D performance • Business Enterprise R&D expenditure (BERD) • Government R&D expenditure (GOVERD) • Higher Education R&D expenditure (HERD) • Expenditure on S&T services • Expenditures S&T education and training • Total S&T expenditures a. Public expenditure on S&T education as % of GDP b. Public expenditure on S&T education as % of government expenditure c. R&D expenditures as % of GDP d. Percentage change in R&D spending e. Number of R&D institutions f. Number of FTE Researchers	S&O	A&B	National	Yes	Annual	S&T Status Report (Annual R&D Expenditure Report)
2. Human resources: Human resources in Science and Technology (HRST): including the following related measurements a. the percentage of public spending on S&T education in relation to GDP b. No. of S&T graduates c. The human capital engaged in science and R&D including the number of scientists and engineers employed in R&D d. Scientists and engineers in R&D (per million population) e. Gross enrolment ratio (%) at tertiary education f. Share of tertiary students in science, math and engineering f. R&D personnel per 1000 members of labour force • Researchers per 1000 labour force • Technicians & equivalent staff • Other supporting staff						S&T Status Report (Annual S&T Human Capital Report)

Statistics to be produced	Indicators	Design	Level of disaggregation		Frequency of production	Publication/Report
	S - S&T Sector **O** - Pre-conditioned (for other use)	**A -** Administrative records **B -** Surveys and Censuses	**Administrative** **i.e. –** National, Regional, District, Sub county	**Gender** Yes No		
OUTPUT (Economic, Technological and Scientific Performance) S&T STATISTICS						
3. Economic output indicators of S&T a. The percentage of high-technology exports as % total exports. b. Technological. Output indicators of S&T including patents and patent applications c. Scientific Output performance/ technology indicator measured by direct research output of publications produced over a certain period of time (No. of S&T publications)	S&O	A&B	National	Yes	Annual	S&T Status Report (Annual S&T Indicator Reports)
INNOVATION STATISTICS						
a. Product innovations b. Process innovations c. Marketing innovations d. Organisational innovations	S&O	B	National	Yes	Every 2-3 years	Annual S&T Status/ Indicators reports
TECHNOLOGY ACHIEVEMENT INDEX						
Technology Achievement Index	S&O	A	National	Yes	Annual	Annual S&T Status/ Indicators reports
CREATION OF TECHNOLOGY						
a. Patents granted to residents (per million people) b. Receipts of royalty and licence fees from abroad per capita (US$ per 1000 people)	S&O	A	National	Yes	Annual	Annual S&T Status/ Indicators reports

Statistics to be produced	Indicators	Design	Level of disaggregation		Frequency of production	Publication/Report
	S - S&T Sector **O** - Pre-conditioned (for other use)	**A -** Administrative records **B -** Surveys and Censuses	**Administrative** **i.e. –** National, Regional, District, Sub county	**Gender** Yes No		
DIFFUSION OF RECENT INNOVATIONS						
a. Internet hosts (per 1000 people) b. Exports of high- and medium-technology products (as a percentage of total good exports)	S&O	A	National	Yes	Annual	Annual S&T Status/ Indicators reports
DIFFUSION OF OLD INNOVATIONS						
a. Telephones (mainline and cellular combined per 100 people) b. Electricity consumption (kilowatt-hours per capita)	S&O	A	National	Yes	Annual	Annual S&T Status/ Indicators reports
HUMAN SKILLS						
a. Mean years of schooling (age 15 and above) b. Gross enrolment ratio at tertiary level in science, mathematics and engineering (percentage)	O	A	National	Yes	Annual	Annual S&T Status/ Indicators reports

Appendix H: Indicators, Science and Technology Sector

1. S&T Impact Indicators
1.1 Ugandan ranking in technology achievement index
1.2 Technology creation index
1.3 Diffusion of old innovations index
1.4 Diffusion of new innovations index
1.5 Human skills index
1.6 Ugandan ranking in the transformation to a digital economy
1.7 Technology balance of payments
1.8 Attitudes on S&T by scientists, legislators and the public
2. Scientific and Technological Activities (STA)
(a) Research and Development (R&D)
2.1 National R&D personnel by occupation
2.2 National R&D personnel by sex
2.3 National R&D personnel by sector of employment
2.4 National researchers by formal qualification
2.5 National researchers by sector of employment
2.6 National researchers by sex
2.7 National researchers by fields of science
2.8 National R&D expenditures by sector of performance
2.9 National R&D expenditures by source of funds
2.10 National R&D expenditures by field of science
2.11 National R&D expenditures by type of R&D activity
2.12 Number of R&D personnel per million population
2.13 Percent of national R&D expenditures to GDP
2.14 Public sector expenditures for R&D
2.15 Percent of public sector expenditures to national R&D expenditures
2.16 Private sector expenditure for R&D
2.17 Percent of private sector R&D expenditures to national R&D expenditure
2.18 Number of internationally accredited laboratories
2.19 Number of registered scientists and engineers
2.20 Number of scientists and engineers per million population

(b) Scientific and Technical Education and Training (STET)
2.21 Number of S&T human resources by gender, sector, employment and by field of S&T
2.22 Number of student enrolment in Science, Mathematics and Engineering
2.23 Number of graduates in Science, Mathematics and Engineering
2.24 Number of Ugandan PhDs in science and engineering
2.25 Employment of S&T professionals
2.26 Number of publications of Ugandan scientists and engineers included in the International Science Citation Index
2.27 Number of world-class S&T universities
(c) Scientific and Technological Services (STS)
2.28 Patent applications received for inventions, utility models and industrial design
2.29 Distribution of patents granted to local inventors by type
2.30 Distribution of trademarks granted to local registrants by mark
2.31 Number of months an application for patent is approved
2.32 Patent applications arising from UNCST-supported projects
2.33 Number of science centres, libraries, archives, museums, botanical and zoological gardens established/maintained
2.34 Number and kind of S&T standards developed and implemented
3. Scientific and Technological Innovations
3.1 Number of technologies commercialized
3.2 Products and process innovations introduced in the market or in the production process
4. BFP Output Indicators
4.1 No. of products from the private sector
4.2 No. of quality laboratories and other R&D facilities in research institutions
4.3 Level of operationalization of the national science and technology fund
4.4 No. of STI outreach programmes designed and implemented
4.5 Percent increase in commercialization of R&D products
4.6 No. of technology platforms involving academia/research institutions and private sector/industry
5. NDP Indicators
5.1 No. of S&T training centres established and operationalized
5.2 No. of science parks and technology incubation centres operationalized

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