The State of Science and Technology in Africa (2000-2004): A Scientometric Assessment

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Abstract

This article reports for first time the state of science and technology in the African Continent on the basis of two scientometric indicators - number of research publications and number of patents awarded. Our analysis shows that Africa produced 68 945 publications over the 2000-2004 period or 1.8% of the World's publications. In comparison India produced 2.4% and Latin America 3.5% of the World's research. More detailed analysis reveals that research in Africa is concentrated in just two countries – South Africa and Egypt. These two counties produce just above 50% of the Continent's publications and the top 8 countries produce above 80% of the Continent's research. Disciplinary analysis reveals that few African countries have the minimum number of scientists required for the functioning of a scientific discipline. Examination of the Continent's inventive profile, as manifested in patents, indicates that Africa produces less than one thousand of the world's inventions. Furthermore 88% of the Continent's inventive activity in concentrated in South Africa. The article recommends that the African Governments should pay particular attention in developing their national research systems.

Keywords: Africa; Science; Technology; Research; Patents; Publications

Introduction

Monitoring and evaluating the various facets of the scientific enterprise is a necessary and integral part of science policy. Rising costs of research and development and competing disciplinary claims for financial resources require intelligent allocation of resources, which presupposes knowledge of the activities and performance of the innovation system.

The development of science, technology and innovation (STI) indicators has grown substantially internationally during the last twenty years. Their ability to enlighten political choices, by informing and allowing decisions to be objective and depersonalized, has been the main force behind their popularity.

Additional factors enhancing the importance of STI indicators have been the central role assumed by science and technology as a social resource; the continuing expansion of knowledge and globalisation; and the magnitude of the challenges undertaken, in terms of research, technology and investment.

Many countries and international organizations have established bodies specifically dedicated to the analysis and production of information on, and the development of, indicators for science, technology and innovation. Examples of this are the OECD based Network of Experts on Science and Technology Indicators (NESTI); the European Union's Eurostat; UNESCO's Institute of Statistics; the Network on Science and Technology Indicators (RICyT) in the Ibero-America and the Asia-Pacific Economic Cooperation and Pacific Economic Cooperation Council for the Asia-Pacific countries.

Those agencies provide services and conduct studies requiring the coordination of interdisciplinary teams under conditions encouraging a flexible mode of operations, the necessary academic independence, and the capacity for planning medium- and long-term activities.

The importance of indicators has been recognised also in the African Continent in the first NEPAD Ministerial Conference on Science and Technology.

The NEPAD Declaration (NEPAD, 2003) commits to "develop and adopt common sets of indicators to benchmark our national and regional systems of innovation" (paragraph 12).

The Declaration suggests that the system of indicators will "track the development and functioning of the African national systems of innovation" and it will constitute the mainstay for the production of the "Annual African Innovation Outlook". The Outlook "will report on the developments in science, technology and innovation in Africa at national, regional and continental level and will be produced by the NEPAD Secretariat under the mandate of the Steering Committee and transmitted to the Ministers Council for consideration".

Furthermore, the indicators will inform the African Peer Review Mechanism which among others will monitor the success of the African countries in the "effort to commit 1% of Gross Domestic Product (GDP) in public funds to research and development".

However, up to date the African continent is the only Continent without an organisation/agency responsible to promote and assist in the development of STI indicators and with scant scientometric coverage in the open literature. Lack of scientometric's expertise, disinterested science authorities and lack of financial resources may account for this phenomenon.

This document aims to report the state of science and technology in the African Continent as it is represented by two of the commonest used scientometric indicators internationally - research publications and awarded patents. These indicators are probably the first to be included in an African monitoring system as they are easily and reliably available and they do not require expertise in the African Continent.

Approach

One of the most efficient and objective methods of assessing research and innovation performance is through scientometric indicators. An indicator is defined (DHEW, 1970) as "statistics of direct normative interest which facilitates concise, comprehensive and balanced judgments about the condition of major

aspects of a society. It is in all cases a direct measure of welfare and is subject to the interpretation that, if it changes in the "right" direction, while other things remain equal, things have gotten better or people better off."

Scientometric analysis, the quantitative study of the innovation system, is based mainly on bibliometric and patent indicators. In bibliometrics the number of publications in a field is considered as an indicator of research activity. Similarly in patent analysis the number of patents awarded to an institution or a country is used as an indicator of technological activity. Patent indicators – within the science and technology (S&T) context – are used to measure inventive performance, diffusion of knowledge and internationalization of innovative activities – across countries, firms, industries, technology areas, etc.

The philosophy underlying the use of bibliometric indicators as performance measures has been summarized in De Solla Price's statement that "for those who are working at the research front, publication is not just an indicator but, in a very strong sense, the end product of their creative effort." (DE SOLLA PRICE, 1975)

We should emphasize that there are many trained scientists who are not required to publish. They may perform managerial or administrative functions, teach available knowledge apply existing knowledge in making new products and in providing services. However, the common characteristic of all these scientists is that they are far away from the research front. They provide the infrastructure for the producers of knowledge and they exploit the end results of research and development. In any case, however, they cannot be considered as "knowledge" producers.

The importance of research publications lies among others in the fact that they are proxies of scientific manpower available in different countries. (SCHUBERT ET AL 1986). This is a particular useful characteristic for African countries which are lacking relative monitoring mechanisms of science, technology and innovation.

The same way, in which scientific articles are accepted as a legitimate reflection of scientific research, patents are accepted as a reflection of technological achievements. GRILICHES (1990) has pointed out that "Patent statistics remain a unique source for the analysis of the process of technical change. Nothing else even comes close in the quantity of available data, accessibility, and potential industrial, organizational, and technological detail."

Bibliometric indicators and patent analysis possess a number of strengths that facilitates their universal use. They are highly reliable because they are well defined and unambiguous. They facilitate detailed categorisation and hence make possible the study of scientific and technological fields and sub-fields and they make possible international comparisons. In the context of developing countries scientometric indicators can provide unique insides of the strengths and weaknesses of the STI systems as other sources of information are usually lacking.

Scientometric indicators are used internationally for monitoring purposes. In the USA the National Science Foundation (NSB, 2004) is using bibliometrics and patent analysis to monitor the health of American science and technology on a continuous basis; in Europe the European Commission (EC, 1997) is using similar approaches in order to monitor the health of the European innovation system and the OECD (2003) (is using the indicators for monitoring and comparative purposes).

For the bibliometric analysis we utilise the databases of the Institute for Scientific Information (ISI) – Science Citation Index, Social Science Citation Index and Arts and Humanities Citation Index. The National Science Indicators database is used for this investigation. ISI currently indexes more than 6000 of the world's leading scholarly scientific and technical journals, approximately 1800 social sciences journals, and 1150 titles from the arts and humanities journals. All journals indexed by ISI are peer reviewed. As a group, the ISI indexed set of journals represents an elite body of internationally influential research publications. In these databases, ISI includes articles, notes, reviews and proceeding papers but not items such as editorials, letters, corrections and abstracts. There is a substantial number of

articles using the databases (BRAUN ET AL., 1997; KING 2004; MOLATUDI et al 2006; POURIS, 2007). An important advantage of the ISI databases is that they provide information (affiliation) for all co-authors in the indexed articles. Hence, papers can be attributed to all co-authors equally. A paper is attributed to a country if it carries at least one author address of that country.

For the purposes of the patent analysis we are utilising patents awarded by the United States Patents and Trade Office (USPTO) to residents of African countries. Although most countries in the world have their own patent authorities, the use of the USPTO provides a number of advantages. First in the majority of the patent offices, patents are not examined for originality, usefulness and novelty. Consequently counting and comparing patents awarded by different patent offices in different countries may be misleading because of differences in the criteria used and the easiness of awarding patents, bias towards local patents etc. The obvious solution in order to avoid the above-mentioned shortcomings is to use a common denominator such as an external patent system with an objective approach in its awarding patents approach (i.e. the USPTO). The USPTO examines claims according to a number of criteria. These are (FORDIS ET AL., 1995):

- Subject matter: an invention must fall into one of the categories the patent law divides patentable subject matter into.

- Utility: An invention must fulfil the substantive requirement of "utility". An invention must perform a designed function or achieve some minimum human purpose.

- Novelty: an invention has to be novel.

- Non-obviousness: the knowledge in the technological field at the time of invention must not make the invention obvious to one of ordinary skill in that area.

- Definiteness: one skilled in the art must understand the limits of the invention based on the claim language.

Second, the US represents the most important single market for technological sales and hence is a key drawing card for technology-based products. Owners of important commercial inventions will make sure that they are protected in the USA market. Third, the costs involved and the complexity of filing foreign patents in the USA tend to screen out trivial patents. These characteristics make the approach appealing and a large number of investigations are reported internationally annually. (HICKS ET AL., 2001; POURIS 2005)

It should be mentioned that although patents facilitate the development of a number of useful indicators they have a number of drawbacks. Patented inventions are not necessarily all the inventions produced in a country or organization. Many inventions are not patented because there are other barriers to entry (e.g. lack of brand names among the competitors), because inventors may undertake other measures of protection (e.g. the encapsulation of products in epoxy resin to deter imitation) or because inventors consider that the invention will be profitable even if imitators may appear in the foreseeable future. Similarly high costs for application or monitoring infringement as well as lack of appreciation are additional reasons that may limit the number of patents from a particular country or organisation.

The State of S&T in Africa

Table 1 shows the number of publications produced by researchers in different regions of the world and the relevant shares during the five year period 2000-2004. The European Union and USA appear at the top of the list producing 38.8% and 33.6% of the world publications respectively. Africa produced during the period 68.945 publications or 1.8% of the world total. Africa produces half as many publications as Latin America and substantially less than what India is publishing.

TAKE TABLE 1

Table 2 shows the number of publications and country shares in the Continent.

TAKE TABLE 2

South Africa and Egypt appear on the top of the list with 20.762 and 13.942 publications respectively. The last column in the table shows that the top two counties in the Continent produce just above 50% of the Continent's publications and that the top 8 countries produce above 80% of the Continent's research.

Table 3 shows the number of publications per discipline produced by the various African countries. If we assume a-priori that a country needs approximately 300 publications over a 5-year period in order to be considered as having some minimal expertise in the field (i.e. approximately 50 to 60 publishing researchers), it becomes apparent that the majority of the African countries are well below the set standards. It should be emphasised that this figure is well below a theoretical "threshold" level that would trigger a virtuous interaction between science and technology (BERNARDES, ET AL., 2003). This "threshold level" for 1998 data was in the neighbourhood of 150 papers per million people and was increasing.

TAKE TABLE 3

The vertical sums in the table identify the disciplinary concentration of research in the Continent. The disciplines of clinical medicine, plant and animal studies and chemistry are those with the largest number of publications - 12.998, 8.546 and 8.317 publications respectively.

In the field of ecology (a discipline necessary for environmentally friendly and sustainable development) only four countries (South Africa, Egypt, Nigeria and Kenya) produce 300 or more publications. On the other hand "land and primary resources" sciences (i.e. agriculture, ecology, geosciences and plant and animal sciences) occupy 26.4% of the research in Africa while the relevant figures for USA and India are 13.5% and 19.5% respectively. The challenge appears to be size of the research system and not disciplinary adjustments. This conclusion is supported further by the findings of the Latin American and Caribbean Regional Workshop (UN, 2003) on Science and Technology for Sustainable Development (STSD) which state that "new critical knowledge is needed in all areas….The knowledge required to solve these problems relate to a range of areas and disciplines. In general, this knowledge concerns the

study of society-nature interactions" (p15) and that sustainable development requires "methodologies relating to supra-disciplinary approaches" (p18)

Analysis of the concentration of disciplinary research in the Continent shows that South Africa is producing above 70% of the Continent's space science and psychology and above 50% of the Continent's research in education, economic sciences and neurosciences. Egypt is producing above 40% of the Continent's research in chemistry, and materials science and just below forty percent of the Continent's research in engineering. Nigeria is the main producer of agricultural research in the Continent (18.9%).

Table 4 shows the number of patents awarded to inventors with African addresses during the 2000-2004 period. The whole Continent produced 633 patents during the period. In comparison the rest of the World received 817197 patents. The African Continent produces less than one per thousand of the inventions which are protected in the largest economy of the World. It is interesting that while the Continent produces 1.8% of the World's knowledge (as it is manifested in research publications) it produces less than 0.1% of the World's inventions.

TAKE TABLE 4

Table 4 further shows that 557 out of the 633 utility patents (88%) are produced by South Africa. South Africa produces 30% of the Continents publications and 88% of the Continents patents.

Discussion

This article reports the results of an effort to develop the scientometric indicators –research publications and patents- of the African Continent, compare them with those of other regions and discuss their implications.

Identification of the world share of publications by different regions shows that Africa produced only 68 945 publications over the 2000-2004 period or 1.8% of the World's publications. In comparison India produced 2.4% and Latin America 3.5% of the World's research. More detailed analysis reveals that research in Africa is concentrated in just two countries – South Africa and Egypt. These two counties produce just above 50% of the Continent's publications and the top 8 countries produce above 80% of the Continent's research.

Disciplinary analysis reveals that few African countries have the minimum number of scientists that may be required for the functioning of a scientific discipline. For example, in the field of ecology (a discipline necessary for environmentally friendly and sustainable development) only four countries (South Africa, Egypt, Nigeria and Kenya) produce 300 or more publications. Furthermore it is identified that African research over-emphasises "land and primary resources" sciences (i.e. agriculture, ecology, geosciences and plant and animal sciences). While "land and primary resources" research occupies 26.4% of the research effort in Africa, the relevant figures for USA and India are 13.5% and 19.5% respectively.

Examination of the Continent's inventive profile, as manifested in patents, indicates that Africa produces less than one thousand of the world's inventions. Furthermore 88% of the Continent's inventive activity in concentrated in South Africa.

It may be interesting to speculate on the forces creating the big difference between research publications and patent contribution of the African Continent. International collaboration may be one such force. International donors and collaborators may be prepared to work with their African colleagues when the output will in the public domain but may refrain to do so when the output of the collaboration is proprietary knowledge. Innovation (patent) take-off may require a minimum capability threshold in research; high costs of patenting in USA and Europe and isolationism (the "we don't need to" syndrome) may be additional factors.

The African Continent is lagging substantially behind the rest of the World both in science and technology. However, a number of developmental reports argue that "science, technology and innovation underpin every one of the Millennium Development Goals" (UN Millennium Project, 2005) (p16) and hence science, technology and innovation become prerequisites for development.

In the same vein with the findings of the Latin American and Caribbean Workshop on STSD we argue that the main concern in the Continent should be how to develop research capacity across the board (and not in particular disciplines) and we suggest that African countries have to do two things simultaneously if they wish to do so. More research-trained students have to be graduated and graduates have to be enticed to remain in their countries.

Finally we suggest that it is time that the African Continent joins the rest of the world through the production of national and Continental science and technology indicators reports. Such reports will be produced regularly and they will include additional indicators (e.g. educational statistics) monitoring progress in science and technology in the Continent. NEPAD and UNESCO may be the natural candidates to undertake such an effort.

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Tables

Table 1: Number and share of world publications-Selected regions 2000-2004

Country	Number of Publications	World share of publications
European Union	1,461,813	38.8%
USA	1,267,203	33.6%
China	175,522	4.7%
Latin America	130,569	3.5%
India	89,976	2.4%
Africa	68,945	1.8%
Other	574,406	15.2
World total	**3,768,434**	**100.0%**

Table 2: Number and share of publications of the most prolific African countries: 2000-2004

Country	Number of Publications	Share in Continents' publications	Cumulative share
South Africa	20,762	30.1%	30.1%
Egypt	13,942	20.2%	50.3%
Morocco	5463	7.9%	58.2%
Nigeria	4040	5.9%	64.1%
Tunisia	3930	5.7%	69.8%
Kenya	3231	4.7%	74.5%
Algeria	2766	4.0%	78.5%
Tanzania	1368	2.0%	80.5%
Ethiopia	1321	1.9%	82.4%
Cameroon	1301	1.9%	84.3%

Table 3: Number of publications per discipline produced by the various African countries - Life Sciences

	Biology & Biochemistry	**Clinical Medicine**	**Immunology**	**Microbiology**	**Molecular Biology & Genetics**	**Neurosciences & Behaviour**	**Pharmacology**
South Africa	1,112	3,684	298	545	328	334	364
Egypt	455	1,542	55	202	63	56	538
Morocco	160	878	21	70	50	73	132
Nigeria	183	846	18	88	42	21	229
Tunisia	238	753	34	102	61	32	40
Kenya	114	769	227	139	56	18	53
Algeria	57	85	1	16	27	10	25
Tanzania	42	501	69	49	11	11	24
Ethiopia	33	397	56	37	25	6	19
Cameroon	50	264	60	78	13	5	54
Zimbabwe	40	253	64	36	4	10	27
Uganda	29	406	131	53	7	6	11
Ghana	31	309	54	43	23	4	27
Senegal	49	307	88	63	10	6	6
Cote Ivoire	45	252	60	41	6	8	26
Malawi	15	371	71	28	2	0	1
Botswana	7	55	9	14	1	0	10
Burkina Faso	27	184	32	29	13	3	15
Sudan	13	154	30	31	4	1	6
Zambia	7	150	51	17	4	1	1
Gambia	14	214	78	13	5	1	2
Benin	15	61	8	7	3	2	12
Gabon	11	119	55	44	19	3	7
Libya	9	57	3	7	3	2	7
Namibia	6	8	1	3	1	0	0
Mauritius	23	17	2	3	7	2	6
Nigeria	14	52	3	4	3	0	1
Mozambique	4	71	7	7	0	0	0
Congo Peoples Rep	7	73	5	4	1	0	6
Eritrea	0	10	0	1	0	0	1
DRC	2	40	6	3	2	1	8
Mauritania	3	15	0	1	0	2	1
Cent Afr Republic	0	38	10	8	0	0	0
Swaziland	1	8	0	0	0	1	1
Angola	2	15	2	1	0	1	0
Rwanda	0	18	7	2	1	0	1
Lesotho	1	6	0	0	0	0	0
Burundi	0	6	1	0	0	2	0
Liberia	0	7	1	0	0	0	1
Somalia	0	3	0	0	0	0	0
Senegambia	0	0	0	0	0	0	0
TOTAL	**2,819**	**12,998**	**1,618**	**1,789**	**795**	**622**	**1,662**

Table 3: Number of publications per discipline produced by the various African countries - Traditional Sciences and Technology

	Chemistry	Physics	Materials Science		Engineering	Mathematics	Computer Sciences	Space Science
South Africa	1,744	1,101	402		915	275	122	427
Egypt	3,579	1,827	1,193		1,812	177	92	62
Morocco	1,023	1,010	249		422	345	23	27
Nigeria	192	80	77		234	35	11	10
Tunisia	640	623	189		376	249	58	2
Kenya	50	36	12		69	0	1	0
Algeria	614	786	252		412	111	28	6
Tanzania	11	8	5		31	4	0	2
Ethiopia	35	15	5		13	0	0	1
Cameroon	48	86	11		64	16	5	0
Zimbabwe	16	7	6		41	5	1	1
Uganda	1	4	4		3	2	0	1
Ghana	25	27	8		21	0	3	1
Senegal	51	28	16		16	9	0	0
Cote Ivoire	46	8	7		10	8	0	2
Malawi	1	1	0		9	0	0	0
Botswana	69	28	2		24	21	3	0
Burkina Faso	14	11	4		7	4	0	0
Sudan	17	21	4		14	1	0	4
Zambia	3	4	0		4	2	0	3
Gambia	0	0	0		0	0	0	0
Gambia	11	21	0		11	8	0	1
Gabon	2	1	0		1	6	0	0
Libya	48	14	4		52	2	0	1
Namibia	4	5	1		3	0	1	3
Mauritius	31	1	3		29	4	0	14
Nigeria	6	7	5		2	1	1	0
Mozambique	0	1	0		5	1	1	0
Congo Peoples Rep	4	5	1		0	1	0	0
Eritrea	1	5	0		4	0	0	1
DRC	7	1	1		1	0	0	0
Mauritania	9	2	3		5	8	0	0
Cent Afr Republic	2	4	0		0	0	0	0
Swaziland	2	7	0		4	3	2	0
Angola	6	0	0		0	0	0	0
Rwanda	1	0	0		1	0	0	0
Lesotho	2	2	0		0	0	0	0
Burundi	2	8	0		1	2	0	0
Liberia	0	1	0		1	0	0	0
Somalia	0	0	0		0	0	0	0
Senegambia	0	0	0		0	0	0	0
TOTAL	**8,317**	**5,796**	**2,464**		**4,617**	**1,300**	**352**	**569**

Table 3: Number of publications per discipline produced by the various African countries - Land and Primary Sciences

	Agricultural Sciences	**Ecology/ Environment**	**Geosciences**	**Plant and Animal Sciences**
South Africa	500	1,187	1,302	3,621
Egypt	477	316	363	705
Morocco	188	157	238	301
Nigeria	665	293	84	537
Tunisia	87	62	98	224
Kenya	306	315	61	700
Algeria	65	56	102	91
Tanzania	88	100	69	223
Ethiopia	139	70	73	298
Cameroon	141	65	62	190
Zimbabwe	128	98	96	232
Uganda	75	79	10	157
Ghana	120	58	20	116
Senegal	68	85	24	133
Cote Ivoire	59	32	17	105
Malawi	48	8	7	47
Botswana	54	46	76	90
Burkina Faso	41	40	15	88
Sudan	53	17	3	79
Zambia	36	18	21	62
Gambia	7	6	2	34
Gambia	42	24	4	122
Gabon	13	16	4	25
Libya	5	11	18	14
Namibia	0	38	31	106
Mauritius	13	25	4	31
Nigeria	43	18	21	34
Mozambique	12	10	7	44
Congo Peoples Rep	12	12	6	40
Eritrea	12	5	26	20
DRC	4	2	3	6
Mauritania	9	6	3	12
Cent Afr Republic	1	3	1	12
Swaziland	4	4	3	10
Angola	1	0	11	10
Rwanda	1	2	0	9
Lesotho	0	1	1	9
Burundi	1	1	1	9
Liberia	0	1	0	1
Somalia	0	0	0	0
Senegambia	0	0	0	0
TOTAL	**3,518**	**3,287**	**2,887**	**8,547**

Table 3: Number of publications per discipline produced by the various African countries - Social Sciences, Multidisciplinary and Country Totals

	Economics & Business	**Education**	**Law**	**Psychology/ Psychiatry**	**Social Sciences, General**	**Multi-disciplinary**	**Country Total**
South Africa	257	151	5	440	989	659	14,461
Egypt	17	3	1	35	93	279	11,569
Morocco	9	0	1	8	22	56	4,211
Nigeria	24	8	11	49	200	103	2,842
Tunisia	29	0	0	1	12	22	2,712
Kenya	42	7	1	17	161	77	1,908
Algeria	1	0	0	1	6	14	2,570
Tanzania	5	2	1	10	90	12	685
Ethiopia	32	2	1	12	43	9	767
Cameroon	8	0	0	0	47	34	831
Zimbabwe	18	2	0	11	94	14	797
Uganda	4	6	0	11	89	6	463
Ghana	10	4	1	4	86	10	541
Senegal	1	1	0	1	40	1	480
Cote Ivoire	8	0	0	2	17	2	349
Malawi	5	3	0	0	25	3	158
Botswana	12	18	1	7	74	11	546
Burkina Faso	4	0	0	1	19	1	264
Sudan	1	1	0	2	5	11	239
Zambia	3	0	0	5	41	2	205
Gambia	1	1	0	0	12	1	66
Gambia	2	0	0	0	8	2	268
Gabon	1	0	0	0	5	1	82
Libya	2	0	0	0	1	2	181
Namibia	2	3	0	0	12	16	225
Mauritius	4		0	2	3	4	174
Nigeria	1	1	0	0	8	1	150
Mozambique	4	0	0	0	11	2	98
Congo Peoples Rep	0	1	0	0	3	1	92
Eritrea	2	0	0	0	7	2	86
DRC	0	1	0	0	6	1	41
Mauritania	0	0	0	0	1	0	59
Cent Afr Republic	0	0	0	0	0	0	23
Swaziland	4	0	0	0	3	1	48
Angola	0	0	0	1	2	2	33
Rwanda	0	1	1	0	3	0	20
Lesotho	1	2	0	0	6	1	25
Burundi	0	0	0	0	0	0	25
Liberia	0	0	0	0	2	0	7
Somalia	0	0	0	0	1	0	1
Senegambia	0	0	0	0	0	0	0
TOTAL	**514**	**218**	**24**	**620**	**2,247**	**1,363**	**48,302**

Table 4: Patents Awarded to African Inventors by USPTO - 2000-2004

Country	**Utility Patents**	**Design Patents**	**Plant Patents**	**Reissue Patents**
Algeria	2			
Angola		1		
Egypt	29			
Ivory Coast	1			
Jordan	1			
Kenya	17	12		
Morocco	4	1		
Namibia	1			
Nigeria	12			
South Africa	557	61	10	2
Tanzania	2	1		
Tunisia	1			
Zimbabwe	4			
Uganda	2			
Africa Total	633	76	10	2
World Total	**817,197**	**82,006**	**4,275**	**2,184**