

# Collaborative Authorship in Nuclear Science & Technology in Ghana

A Bibliometric Study Based on the INIS Database

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# Motivation for Study

- In 1963 the Ghana Atomic Energy Commission was established
  - ▶ (Act 204 1963, Superseded by Act 588, 2000). Section - 3. enjoins the Commission
    - ★ *“To maintain relations with the IAEA and other similar international and national organizations, and to collaborate and liaise with those organizations on matters of research and development of nuclear energy and nuclear technology”.*
    - ★ *“To collaborate with Universities and Research Institutions for the purposes of conducting research into matters connected with the peaceful uses of nuclear energy and nuclear technology”.*

## Aim of study:

- To find out how far the GAEC has fulfilled this collaboration mandate.
- To add to existing literature on INIS bibliometric studies



# Purpose of Study

## Purpose

- Use co-authorship to determine collaboration

## Research Questions

- 1 What is the proportion of single authored papers against co-authored papers?
- 2 What is the growth of co-authored papers over the past years?
- 3 What is the degree of collaboration in nuclear S&T in Ghana?
- 4 What is the proportion of national and internationally co-authored papers?
- 5 Which countries does Ghana collaborate with in nuclear science & technology?
- 6 What is the level of collaboration in different subject areas?
- 7 What is the level of collaboration in different types of institutions?



# Methodology

- **Data Source:** International Nuclear Information System (INIS)
- **Search criteria: Author:** Ghana and Recordtype: “Journal article”
- **Study period:** 1971 - 2015
- Total records retrieved - 496
- **Statistical tool:** Microsoft Excel



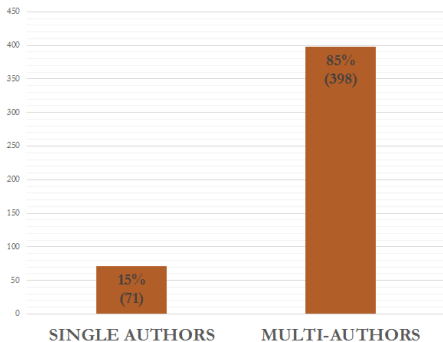


Figure 1: Single-authored papers Vs co-authored papers

- Total number of papers retrieved was 469
- 85% (398) were co-authored
- 15% (71) were single-authored

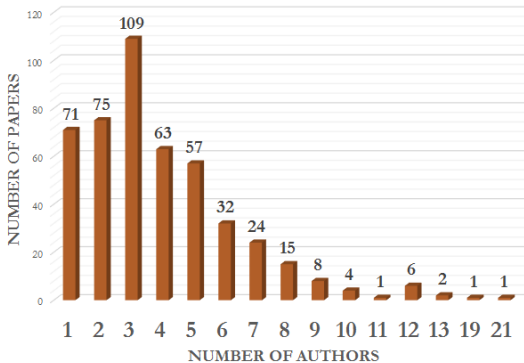


Figure 2: Distribution of papers by number of co-authors

- Number of co-authored papers was 398
- Number of co-authors per paper ranged from 2 to 21 authors.
- The number of co-authors for all papers was 1862, (i.e. 4 papers per author)
- 3-authored papers dominated, with 109 (27.4%); followed by 2 authors 75 (18.8%); and 4 authors 63 (15.8%).

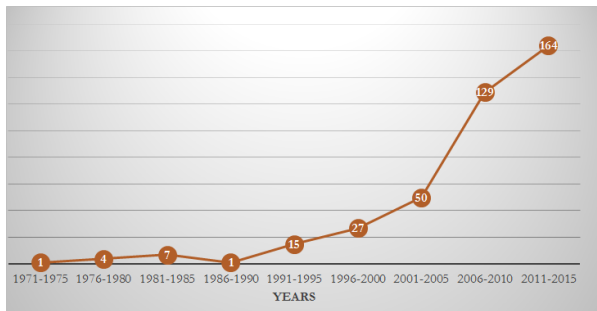


Figure 3: Growth of co-authored papers in 5 year intervals

- There has been a steady and constant increase in the number of co-authored papers since 1991
- The highest growth of 164 (41.2%) co-authored papers was during the last five years (2011-2015)

**Table 1:** Degree of collaboration in five year intervals

Years	No. of Single-authored	% Papers	No. of Multi-authored	% Papers	Total Papers	Degree of Collaboration NM/(NM+NS)
1971 - 1975	11	15.49	1	0.25	12	0.00
1976 - 1980	9	12.68	4	1	13	0.01
1981 - 1985	3	4.22	7	1.76	10	0.01
1986 - 1990	9	12.68	1	0.25	10	0.00
1991 - 1995	8	11.27	15	3.77	23	0.03
1996 - 2000	7	9.86	27	6.78	34	0.06
2001 - 2005	10	14.08	50	12.56	60	0.11
2006 - 2010	9	12.68	129	32.41	138	0.28
2011 - 2015	5	7.04	164	41.2	169	0.35
<b>Total</b>	<b>71</b>	<b>100</b>	<b>398</b>	<b>100</b>	<b>469</b>	<b>0.85</b>





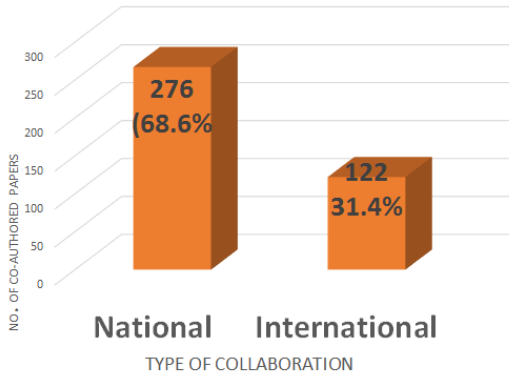


Figure 4: National vs. international co-authorship

- No. of co-authored papers 398
- National co-authored papers 276 (68.6%)
- International co-authored papers 122 or (31.4%)

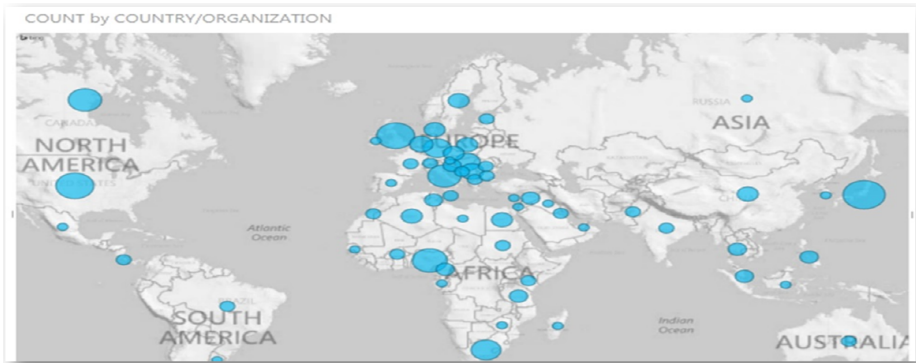


Figure 5: Ghana's international collaborating partners in nuclear science & technology

- Ghana collaborated with about 63 countries and international organisations
- Japan occupied the first position followed by United Kingdom, United States, Nigeria, Canada.

**Table 2:** Ghana's international collaborating partners in nuclear science & technology

COUNTRIES	PAPERS	COUNTRIES	PAPERS	COUNTRIES	PAPERS
JAPAN	16	SWEDEN	4	EGYPT	2
UK	13	CAMEROON	3	ESTONIA	2
USA	13	MALAYSIA	3	FRANCE	2
NIGERIA	11	PHILIPPINES	3	INDIA	2
CANADA	10	SLOVENIA	3	KENYA	2
ITALY	10	SYRIA	3	KUWAIT	2
IAEA	9	TANZANIA	3	MACEDONIA	2
SOUTH AFRICA	8	THAILAND	3	MALTA	2
GERMANY	7	TUNISIA	3	MOROCCO	2
HUNGARY	6	AUSTRALIA	2	PAKISTAN	2
NETHERLANDS	5	BOSNIA H	2	ROMANIA	2
SERBIA	5	BRAZIL	2	SUDAN	2
ALGERIA	4	BULGARIA	2	SWITZERLAND	2
CHINA	4	BURKINA FASO	2	OTHERS	18
DENMARK	4	COSTA RICA	2		
POLAND	4	CZECH REP	2		



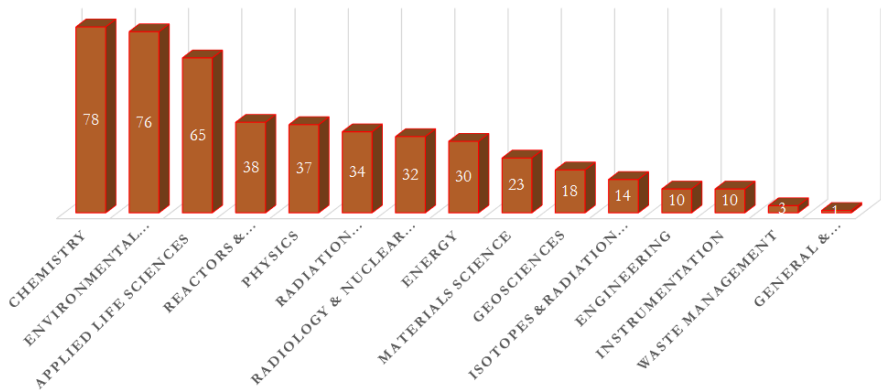


Figure 6: Distribution of co-authored papers by subject



Table 3: Distribution of co-authored papers by type of institution

TYPE OF INSTITUTION	COUNT	%
UNIVERSITIES	286	47.03
RESEARCH	282	46.38
HOSPITALS	13	2.13
NON-GOVERNMENTAL	13	2.13
GOVERNMENT AGENCY	10	1.64
INDUSTRY	4	0.65
TOTAL	608	100

- Majority (93.41%) of the co-authors were affiliated to universities (47.03%) and research organizations (46.38%)
- Less than 1% of co-authors were affiliated to industry



# Findings I

- Majority of the journal articles were co-authored (85% against 15% single authored) which is an indication of collaboration in the nuclear sector.
- The number of co-authors per paper ranged from 2 to 21 with three-authored papers dominating.
- Research collaboration has increased considerably since 1991. The highest number 164 (41.2%) was recorded during the last five years (2011-2015). The growth in co-authorship confirms previous studies in S&T worldwide.
- National co-authored papers (276 or 68.6%) were more than Internationally co-authored papers (122 or 31.4%).



## Findings II

- The authors preferred to collaborate with authors from about 63 countries/International organizations worldwide; among the top 10 were Japan, followed by UK, USA, Nigeria, Canada and Italy, IAEA, South Africa and Germany.
- The subject area with majority of co-authored papers was Chemistry (78) followed closely by Environmental Science (76) and Applied Life Sciences (65).
- Co-authored papers were found to be prevalent (93.41%) in the universities (47.03%) and research organizations (46.38%). Less than 1% of co-authors were affiliated to industry which confirms the gap between research and industry
- Overall, the degree of collaboration was quite high (0.85).



# Recommendations

## For INIS

- The INIS Database is well structured for bibliometric studies so other INIS LOs use it to analyse their own nuclear literature to provide management information.
- It also offers a means of potential collaboration (research) among INIS LOs.
- INIS Should consider input of author surnames, followed by other names as found on publication for easy identification of individual authors and their gender.

## For Ghana

- Efforts should be made to foster formal and informal collaboration between Research organizations/Universities and Industry to attract funding and commercialization of research findings.
- Need to encourage more collaboration at the International level to reap benefits such as foreign facilities, expertise, and enhance visibility of research output.





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attention!***

