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Informetrics on K. Ramiah

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K. Ramiah's birth centenary (born on April 15, 1892) was celebrated by the Central Rice Research Institute and Association of Rice Research Workers at CRRI, Cuttack. He was a pioneer in rice research, an institution builder in national and international spheres, an educationist, and a distinguished parliamentarian. He passed away on August 2, 1988, leaving behind him a rich legacy of his leadership in science. Swaminathan said:

> Ramiah was a scientist's scientist. He was the embodiment of dedication to a cause, which in this case was for more and better quality of rice for the world. His life and work will remain forever, an affirming flame in the Indian agricultural horizon. What is however not known widely was the critical role he played as the chairman of the panel of scientists appointed by C. Subramaniam, the then Union Minister of Agriculture, in shaping the present phase of India's green revolution.[1, 2]

The rice varieties he evolved were so outstanding that the letters GEB (standing for his position—Government Economic Botanist) were included with each numbered variety. Some of those early varieties (for example ADT-3, CO-4, GEB-24) served as valuable parents of modern rice varieties under cultivation now. CO-25 a blast resistant variety and GEB-24 were his efforts in application of hybridisation and selection, a morale booster for researchers and

farmers alike. His work on gene identification and symbolisation, construction of linkage maps, and classification of rice varieties according to grain qualities are classics.

He laid solid foundation for research on rice breeding. His major areas of interest were: (1) Plant architecture, (2) Inheritance of characters in rice, (3) Haploid and tetraploid rice plants, (4) Mutation breeding, (5) Polyembryony, (6) Hybrid Vigour, (7) Varietal diversity, (8) Rice protein, (9) Origin and distribution of rices in India, (10) Indica x Japonica hybridization programme, (11) Innovative methods of rice cultivation, and (12) International level role as rice expert.

We all need heroes and he was one to emulate having unparalleled scientific and human achievements. He was honoured with Padmashree (1956) and Padmabhushan (1970) by the Government of India. He served as the Vice-Chancellor of the Orissa University of Agriculture and Technology, Bhubaneswar (1965-1968) and Member of Rajya Sabha (1968-1974) to represent sciences. He was honoured with D.Sc. degree of Utkal University, Bhubaneswar (1955) and Orissa University of Agriculture and Technology, Bhubaneswar (1987).

In the present study, bibliometric analysis of his research papers is carried out providing quantitative aspects of his contributions[3] because an important end result of scientific research is the publication of paper. It may work as a standard model. Knowledge is valuable for its own sake and research has cultural value. Desire to be creative is built in our genes. Narrating success stories always has an encouraging effect. A contest for world leadership in science and technology exists. New ways to motivate scientists seem as important as search for new sources of funds.[4] Science policy-makers are also interested to know about functioning of active research teams and factors responsible for optimising, maximising and enhancing outputs. Policy-makers can react by creating better facilities for the younger generations, to tap their creative potential in time.

Scientometrics is a subfield which applies quantitative methods to the study of science as an information process in the historical perspective of sociology of knowledge. In this information model, publications are the carriers of information, journals are the

communication channels and bibliographical references represent a special language of scientific information which shows the impact of previous research on the development of information flows. Scientific indicators may deal with individual scientist to a major science field as a whole.[5]

Methodology

The necessary bibliographic details were noted on reference cards and these were arranged as per need. 'Normal Count' Procedure[6] was followed. Full credit was given to each author regardless of who happens to be first or the last author. From the personal point of view, scientists all over the world look at their own papers exclusively in such a way.

The degree of collaboration[7] in a discipline was defined as the ratio of the number of collaborative research papers to the total number of research papers published in the discipline during a certain period of time.

Vinkler[8] defined publication density as number of papers published per number of journals used, and publication concentration as number of journals containing half of the papers published times 100 per total number of journals used, during the period under study.

Results and Discussions

K. Ramiah had published 85 research papers. Single authorship papers were 45 during 1915-1965 (Table 1). He had 29 papers having two authorships during 1930-1952 and 11 papers having three authorships during 1925-1952. He was the first author in all the 40 co-authorship papers. Maximum output of eight papers per year was during 1935-1936 when he was of 44-45 years age. Six papers per year were produced during 1931 and 1933. Five papers per year were produced during 1934 and 1951. Overall collaboration coefficient was 0.47 only. This is in contrast with the case of L.L. Narayana[9] and M.S. Swaminathan[10] who had good fortune of working with many students and researchers in the academic institutions. Moreover, number of scientists employed during pre-independence period and immediate post-independent period were very few to establish collaboratorship.

Professional life of a researcher begins with publication of first paper and ends with the last paper. Papers published during first half of professional life were 66, which was 78 per cent of his total papers. He had publication life period of 51 years.

The general finding was that scientists publish most frequently[11, 12, 13, 14] in their fourth decade of life and thereafter the publication rate drops.

Research collaboratorship group of K. Ramiah (Table 2) consisted of 20 collaborators. N. Parthasarathy was closest collaborator with second authorship in three papers of two authorship papers. N. Parthasarathy also had seven papers as second author in three authorship papers. S. Ramanayam had published seven papers with him. K. Ramaswamy had five papers with him.

The total authorships were 138 out of which credit for multi-authorship was 91.

Information on Author Productivity is provided in Table 3. The 62.5 per cent authorships go to K. Ramiah. The 37.5 per cent authorships is distributed amongst the twenty collaborators, out of which 7.35 per cent and 5.15 per cent authorships are for N. Parthasarathy and S. Ramanujam respectively. K. Ramaswamy had 3.68 authorships.

Like many natural phenomena, the growth of scientific knowledge appears to be cluster-like. This seems to be true in a physical sense. On a special scale, scientific discussions mainly 'cluster' around important universities, government and industrial research institutes. On a temporal scale, scientific discoveries often occur in a relatively short period of time since an important breakthrough makes new advancements possible.

The journals (Table 4) where he had published more than five papers were *Madras Agric. J.* (16), *Proc. Indian Sci. Congres* (14), *Indian J. Agric. Sci.* (9), *Curr. Sci.* (9), and *Indian J. Genet Pl. Breed* (6). Publication density and publication concentration was found to be 3.4 and 16 respectively.

Table 5 provides important keywords with their frequencies in the titles of the papers published. It is clear that he had concentrated his research efforts on Genetics and breeding of Rice (*Oryza sativa)* in India. Table 6 provides keywords mentioned only once in the titles

of the articles. This keyword analysis indicated wide spectrum of his research activity.

Indeed, he was a creative researcher who could contribute under limited facilities available to him and laid foundation for the Green Revolution in Rice to take off. Endowed with talent and hardwork, limited facilities will not be a barrier. He was an example for his generation but his contributions can inspire and sensitise even today younger researchers who are inclined to bother more about facilities and comforts.

Conclusion

This study has clearly demonstrated that research publication of a successful scientist can be analysed scientometrically and it can throw light on history of science, scientific development, interaction in a research group, organization of a research system, sociology of knowledge and quality of scientific leadership in the dissemination of research results.

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Table 1
Yearwise authorship pattern in publications of K. Ramiah with collaboration coefficients and age

Year	*Single author papers*	*First author in two author papers*	*First author in three author papers*	*Total authorships*	*Collaboration co.efficient*	*Age of K. Ramiah*
1915	1	—	—	1	0.00	24
1918	1	—	—	1	0.00	27
1920	1	—	—	1	0.00	29
1923	1	—	—	1	0.00	32
1924	1	—	—	1	0.00	33
1925		—	1	2	0.50	34
1926	4	—	—	4	0.00	35
1927	3	—	—	3	0.00	36
1930	1	1	—	2	0.50	39
1931	5	—	1	6	0.16	40
1932	2	—	—	2	0.00	41
1933	3	1	2	6	0.50	42
1934	2	1	2	5	0.60	43
1935	3	3	2	8	0.63	44
1936	2	6	—	8	0.75	45
1937	1	2	—	3	0.67	46
1938	—	3	—	3	1.00	47
1939	—	1	—	1	1.00	48

(Contd.)

Year	*Single author papers*	*First author in two author papers*	*First author in three author papers*	*Total author-ships*	*Collaboration co.effi-cient*	*Age of K. Ramiah*
1941	1	2	—	3	0.67	50
1942	—	1	—	1	1.00	51
1943	1	1	—	2	0.50	52
1944	—	1	—	1	1.00	53
1949	—	1	—	1	1.00	58
1950	—	1	—	1	1.00	59
1951	—	3	2	5	1.00	60
1952	1	1	1	3	0.67	61
1953	2	—	—	2	0.00	62
1954	2	—	—	2	0.00	63
1956	3	—	—	3	0.00	65
1957	1	—	—	1	0.00	66
1959	1	—	—	1	0.00	68
1965	1	—	—	1	0.00	74
Total	45	29	11	85	0.47	

Table 2
Collaboratorship of K. Ramiah

S. No.	Name	Single author	Two author papers			Three author papers				Total	Year	
			I	II	T	I	II	III	T		First paper	Last paper
1.	Ramiah, K.	45	29	—	29	11	—	—	11	85	1915	1965
2.	Parthasarathy, N.	—	—	3	3	—	7	—	7	10	1925	1938
3.	Saravayya, C.V.	—	—	—	—	—	—	1	1	1	1925	1925
4.	Ramanujam, S.	—	—	1	1	—	—	6	6	7	1933	1935
5.	Engledow, F.L.	—	—	1	1	—	—	—	—	1	1930	1930
6.	Jobithraj, S.	—	—	—	—	—	1	—	1	1	1931	1931
7.	Mudaliar, S.D.	—	—	—	—	—	—	1	1	1	1931	1931
8.	Dharamalingam, S.	—	—	2	2	—	—	—	—	2	1934	1938
9.	Mudaliar, C.R.	—	—	4	4	—	—	—	—	4	1935	1938
10.	Rao, K.H.	—	—	3	3	—	—	—	—	3	1936	1936
11.	Ramaswamy, K.	—	—	5	5	—	—	—	—	5	1936	1941
12.	Narasimham, M.	—	—	1	1	—	—	—	—	1	1936	1936
13.	Kaiwar, S.R.	—	—	1	1	—	—	—	—	1	1942	1942
14.	Kadam, B.S.	—	—	1	1	—	—	—	—	1	1943	1943

(Contd.)

S. No.	Name	Single author	Two author papers			Three author papers				Total	Year	
			I	II	T	I	II	III	T		First paper	Last paper
15.	Bholanath	—	—	1	1	—	—	—	—	1	1944	1944
16.	Padmanabhan, S.Y.	—	—	1	1	—	1	—	1	2	1949	1951
17.	Vachhani, M.V.	—	—	1	1	—	1	2	3	4	1950	1952
18.	Abichandani, C.T.	—	—	1	1	—	—	1	1	2	1951	1951
19.	Ghosh, R.L.M.	—	—	1	1	—	1	—	1	2	1951	1952
20.	Goor G.W. Van Der.	—	—	1	1	—	—	—	—	1	1951	1951
21.	Abraham, T.P.	—	—	1	1	—	—	—	—	1	1952	1952
	Total	45	29	29	58	11	11	11	33	136		
	Percentage	33.09	21.32	21.32	42.64	8.09	8.09	8.09	24.27	100.0		

I = First author; II = Second author; III = Third author; T = Total

Table 4
Scattering of Papers of K. Ramiah

S. No.	Journal title or channel	Total papers	Percentage	Cumulative percentage	Period of Publications	
					First paper	Last paper
1.	Madras Agric. J.	16	18.82	18.82	1915	1953
2.	Proc. Indian Sci. Congress	14	16.47	35.29	1926	1949
3.	Indian J. Agric. Sci.	9	10.58	45.87	1932	1941
4.	Curr. Sci.	9	10.58	56.45	1933	1951
5.	Indian J. Genet. Pl. Breed.	6	7.06	63.51	1941	1957
6.	Proc. Indian Acad. Sci.	4	4.70	68.21	1935	1959
7.	Int. Rice Com. Newsl.	4	4.70	72.91	1952	1956
8.	Agric. Live-Stock India	2	2.35	75.26	1931	1931
9.	Madras Agric. Dept. Yr. Bk.	2	2.35	77.61	1924	1925
10.	Madras Agric. Dept. Village Calendar	2	2.35	79.96	1925	1927
11.	FAO Agri. Dev. Paper	2	2.35	82.31	1951	1954
12.	Mem. Dept. Agric. India (Bot. Ser.)	2	2.35	84.66	1930	1931
13.	Presidential Address Indian Sci. Congr.	1	1.18	85.84	1941	1941
14.	Proc. World's Grain Exhibition Conf.	1	1.18	87.02	1935	1935
15.	Agric. J. India	1	1.18	88.20	1927	1927
16.	ICAR Bull.	1	1.18	89.38	1952	1952

(Contd.)

Table 3
Author Productivity

Number of Papers	*Active Collaborators*	*Total No. of Researchers*	*Total Authorships*	*Per-centage*	*Cumulative Percentage*
1		10	10	7.35	7.35
2		4	8	5.88	13.23
3		1	3	2.21	15.44
4		2	8	5.88	21.32
5	Ramaswamy, K.	1	5	3.68	25.00
7	Ramanujan, S.	1	7	5.15	30.15
10	Parthasarathy, N.	1	10	7.35	37.50
85	Ramiah, K.	1	85	62.50	100.00
			136		

S. No.	Journal title or channel	Total papers	Percen-tage	Cumulative percentage	Period of Publica-tions	
					First paper	Last paper
17.	Proc. Assoc. Econ. Biologist	1	1.18	90.56	1935	1935
18.	J. Agric. Sci. Trinidad	1	1.18	91.74	1956	1956
19.	Andhra Agric. J.	1	1.18	92.92	1956	1956
20.	J. Agric. Sci.	1	1.18	94.10	1930	1930
21.	Empire J. Expr. Agric.	1	1.18	95.28	1952	1952
22.	Indian Fmg.	1	1.18	96.46	1950	1950
23.	J. Indian Bot. Soc.	1	1.18	97.64	1934	1934
24.	Advances in Agril. Sci. and Their Applications	1	1.18	98.82	1965	1965
25.	Indian J. Power and River Valley	1	1.18	100.00	1951	1951
	TOTAL	85				

Table 5
Important Keyword Frequencies in Titles of the Papers Published

Keyword	*Frequency*	*Keyword*	*Frequency*
Rice	71	O. Longistaminata	2
O. Sativa	20	Japan	2
Inheritance	13	South Asia	2
Breeding	10	Agriculture	2
Genetics	5	Grain Shattering	2
Flowering	5	Growth	2
India	5	Varieties	2
Plant height	4	Floating habit	2
Paddy	3	Lodging	2
Haploid	3	Polyembryony	2
Improvement	3	Anthocyanin	2
Yield	3	Inhibitory factors	2
Manuring	3	Sterility	2
Mutation	3	Cotton	2
Fertilizer	3	Chlorophyll	2
Madras	3	X-ray	2

Table 6
Keywords Used Only Once in the Titles of the Publications

Keyword	*Keyword*
Farming	Coimbatore
Irrigation	Orissa
Cereals	Tanjore
Wheat	Cuttack
Hybridization	Punjab
Double cropping	Hybrid vigour
Sulphate ammonia	Resistance
Pyricularia Oryzae	Tetraploid
Broadcasting	Triploid
Transplanting	Linkages
Red pericarp	Dimorphism
Scent	Crossing
Seed	Proteins
Origin	Aleurone
Symbilozation	Nutrient
Grain length	Food production
Ageotropic	Burma
Bran layer	