

INCENTIVES MATTER: THE ROLE OF RESEARCH PRODUCTIVITY AWARD IN INCREASING SCIENTIFIC OUTPUT OF PAKISTANI SCIENTISTS

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Abstract

Incentive programmes can increase performance of scientists. The scheme of Research Productivity Award (RPA) was introduced in 2001-02 as an incentive for scientists to promote quality research in the universities and R&D organisations of the country, to increase the number of research publications from Pakistan in reputed international journals, to attract younger students towards research careers and recognition of Pakistani scientists in international research community. The scheme has continued for more than a decade successfully and has achieved its main objective of increasing the number of research papers published internationally and is playing important role in the promotion and internationalisation of science in Pakistan. The present paper presents an in-depth analysis of the scheme of RPA from 2001-02 to 2012-13 and present findings of the feedback survey to find overall satisfaction level and feedback of the scientists for the scheme of RPA.

Keywords: Research productivity award, Bibliometrics, Research publications.

Introduction

The significance of research output of scientists towards the socio-economic growth of a country is well established (Teitel, 1994; Wolfe and Salter, 1997; Wang, 2007; Jaffe et al., 2013). Countries that focus their academic efforts in basic sciences, such as, physics and chemistry, had the highest economic growth as compared to countries investing in selected areas of applied knowledge (Jaffe et al., 2013). Studies are available that support the role of incentives on workplace performance and in enhancing productivity of individuals (Wright, 1990; Jenkins et al., 1998; Condly et al., 2003; Ragasa, 2012; Al-Abduljabbar, 2013). It is an established fact that the environment plays a significant role in shaping the culture of research and scientific productivity. Such conducive environment includes having an adequate think space, a supportive and engaging critical mass, and most importantly, an efficient incentives system (Fabella, 2013). Stolovitch et al. (2002) shared that incentive programmes can increase performance by as much as an average of 22 percent. The research found that incentive programs can increase interest in work as well as can attract and retain higher quality workers.

Franzoni et al. (2011) shared his findings that scientific performance can be increased by government-initiated incentives to publish as is evident from increased submissions and publications at the country level.

Science and Technology is recognised as a tool for socio-economic development in Pakistan. At government level many enterprises are taken in the recent past to meet the scientific and technological challenges of the 21st Century. The biggest challenge, faced by Universities and the R&D organisations of Pakistan, was retaining high quality S&T manpower in the country. Many important initiatives were taken in this regard and the most important was the scheme of Research Productivity Award (RPA) introduced by Pakistan Council for Science and Technology (PCST). This scheme was introduced in 2001-02 based on the recommendations of the Ministry of Science & Technology (MoST) and the task of selection of scientists, who qualify for the Research Productivity Award (RPA), was entrusted to PCST. The scheme gained an instant popularity in the scientific community and is placed at high esteem by the researchers and scientists of the country not only because of the cash incentive but most importantly because of

the value attached with this award. The key objectives of this award were to promote quality research in the universities and R&D organisations of the country, to increase the number of research publications from Pakistan in reputed international journals, to attract younger students towards research careers and recognition of Pakistani scientists in international research community. As a result of successful RPA programme rapid increase in international research publications per year on science and technology was observed and the number increased from 796 in 2001 to 6,816 in 2012, as retrieved from online database of the Web of Science, the Thomson Reuters. Improvement of image among international scientific community and increase in contribution to global knowledge system are also key benefits of this programme.

The present paper presents an in-depth analysis of the scheme of RPA from 2001-02 to 2012-13. It also includes feedback survey carried out by PCST to find overall satisfaction level and feedback of the scientists for the scheme of RPA.

Methodology

The data has been retrieved from PCST database of Research Evaluation Section. Annually, applications are invited from scientists/engineers working in public/private sector universities, S&T/R&D organisations and Ministries/Divisions, who are engaged in basic and applied research. Foreign faculty working at Pakistani institutions for at least one year and having published research papers in international impact factor journals with address of Pakistani institutions were also considered eligible to apply. The applications were evaluated and RPA had

been awarded on the basis of research productivity of scientists, measured according to the internationally accepted criteria of Impact Factor and Citation Index from 2001-2009 and with the threshold Impact Factor+Citation Index+Output of Applied Research in the years i.e. 2010-11 to 2012-13.

A questionnaire was structured to carry out a feedback survey for the scheme of RPA. The questionnaire was sent to 3000+ scientists and 2000+ duly filled and completed questionnaires were received and included in the study.

The data was analysed using GraphPadPrism (Version 3.02, GraphPad Software Inc, San Diego, CA, USA), a spreadsheet-based graphing and statistical software package.

Results and Discussion

The applications for RPA were invited for the first time in 2001 and attracted the interest of a large number of scientists and researchers from all over the country. Around 2700 scientists applied for RPA 2001-02 but only 293 qualified the eligibility criteria and were declared successful for the award. Fig. 1 gives details of the total number of applicants and applicants declared eligible for the award from 2001-02 to 2011-12. On average 30.68% of the applicants were declared eligible for award on the basis of the internationally accepted criteria of Impact Factor and Citation Index from 2001-2009. The number of eligible scientists for the award showed a sudden increase after 2009-10. This increase was a result of the revision of the RPA criteria in 2009, which not only included applied

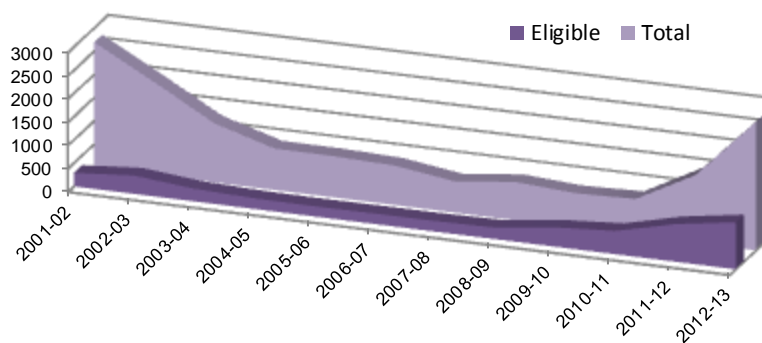


Fig. 1. Number of total scientists applied for RPA V/s Number of eligible scientists.

research output in the form of patents and crop varieties to the purview of the scheme but also reduced the minimum threshold for the eligibility. The revised criteria also included the private sector and foreign faculty working in Pakistan to the scheme thus broadening the scope of RPA award.

RPA was awarded from 2001-02 to 2009-10 on the basis of research productivity of scientists, measured according to the criteria of Impact Factor and Citation Index in seven categories from A-G with the threshold Impact Factor + Citation Index score starting from 5. Table 1 shows the detail of the scores and cash incentive for different categories.

Table 1. Score and cash incentive for categories A-G from 2001-02 to 2009-10

Category	Impact Factor and Citation Index	Amount (Rs)
A	300+	1,200,000
B	201-300	900,000
C	151-200	600,000
D	101-150	360,000
E	51-100	210,000
F	21-50	120,000
G	5-20	60,000

RPA was awarded on the basis of revised criteria in seven categories from A-G with the

threshold Impact Factor + Citation Index + Output of Applied Research score starting from 1 (Table 2).

Table 2. Score and cash incentive for categories A-G from 2001-02 to 2009-10

Category	Impact Factor + Citation Index + Output of Applied Research	Amount (Rs)
A	30 and above	350,000
B	25 – 29.999	250,000
C	20 – 24.999	200,000
D	15 – 19.999	150,000
E	10 – 14.999	100,000
F	5 – 9.999	75,000
G	1 – 4.999	50,000

The data revealed that most of the eligible scientists were declared eligible after evaluation of their yearly research productivity in category 'G' as shown in Table 3. There are low or nearly none scientists in higher categories in the initial and mid years of the scheme as the minimum threshold was high and difficult to achieve. No scientist could acquire the minimum threshold for the highest category 'A' for five consecutive years, i.e., 2003-04 to 2008-09 and same was the case for category 'B' where we find no scientists for the years 2006-07 and 2007-08.

Table 3. Category wise distribution of eligible scientists for RPA

RPA Year	Number of Scientists							Total Amount (Rs. Million)
	A	B	C	D	E	F	G	
2001-02	6	6	9	5	35	75	157	45.39
2002-03	4	12	14	24	52	108	183	-
2003-04	-	1	4	9	23	67	168	29.49
2004-05	-	1	2	13	26	44	146	26.28
2005-06	-	2	2	3	21	48	145	23.01
2006-07	-	-	3	3	17	50	155	21.75
2007-08	-	-	3	4	15	50	157	21.81
2008-09	-	1	1	5	10	47	184	21.308
2009-10	14	8	7	13	36	73	264	-
2010-11	26	16	8	12	38	103	299	32.231
2011-12	45	11	16	31	52	136	522	22.119
2012-13	47	10	21	36	66	196	637	22.073
Total	142 (2.92%)	68 (1.39%)	90 (1.85%)	158 (3.25%)	391 (8.04%)	997 (20.51%)	3017 (62.05%)	265.461

Scientists and researchers from chemical sciences discipline constituted 33.4% of the total

eligible applicants from 2001-02 to 2012-13 and proved to be the most productive scientists.

Scientists belonging to biological sciences, physics and agricultural sciences also reflect relatively good position in overall research productivity. However, environmental sciences, health sciences, computer sciences and statistics are the most neglected disciplines, where scientists could not demonstrate significant research output. There could be different reasons for low number of awardees in these disciplines.

Most of the journals published in these areas have low impact factor, which is a result of low citations made for publications in these fields. As a result these scientists either fall in lower categories or mostly fail to meet the minimum eligibility criteria. Discipline-wise detail for RPA 2001-02 to 2012-13 is given in Table 4, while an overall picture is given in Fig. 2.

Table 4. Discipline wise distribution of eligible scientists in each RPA year.

Discipline	RPA Year											
	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Agricultural Sciences	33	35	17	21	13	12	7	13	39	53	99	196
Biological Sciences	79	88	60	56	50	52	51	60	93	110	196	222
Chemical Sciences	92	137	95	84	96	91	96	89	132	176	264	282
Computer Sciences	0	0	2	0	0	0	1	0	2	3	4	3
Earth Sciences	7	8	7	3	2	2	0	0	1	4	6	8
Engineering Sciences	6	12	10	6	2	5	1	4	7	10	21	35
Environmental Sciences	0	0	0	0	0	0	0	1	8	9	20	19
Health Sciences	0	7	3	0	1	2	2	1	1	2	4	16
Mathematics	6	12	6	8	9	9	11	13	19	27	59	67
Pharmaceutical Sciences	3	10	4	3	2	2	2	3	12	12	19	27
Physics	67	86	67	49	45	52	58	63	101	96	119	134
Statistics	0	2	1	2	1	1	0	1	0	0	2	4
Total Scientists	293	397	272	232	221	228	229	248	415	502	813	1013

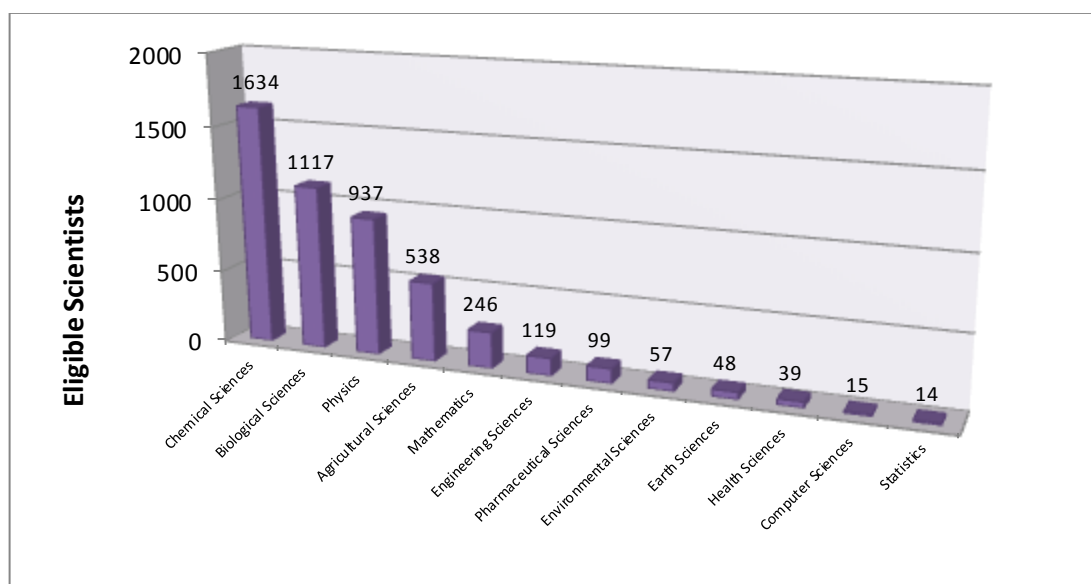


Fig. 2. Discipline wise total number of eligible scientists for RPA for the period 2001-2012.

PCST has carried out a feedback survey for the scheme of RPA. The overall satisfaction level and feedback of the scientists for the scheme of RPA is shown in Fig. 3. 63.6% scientists revealed

an overall satisfaction with RPA criteria and 95.9% showed confidence and wanted the scheme to continue.

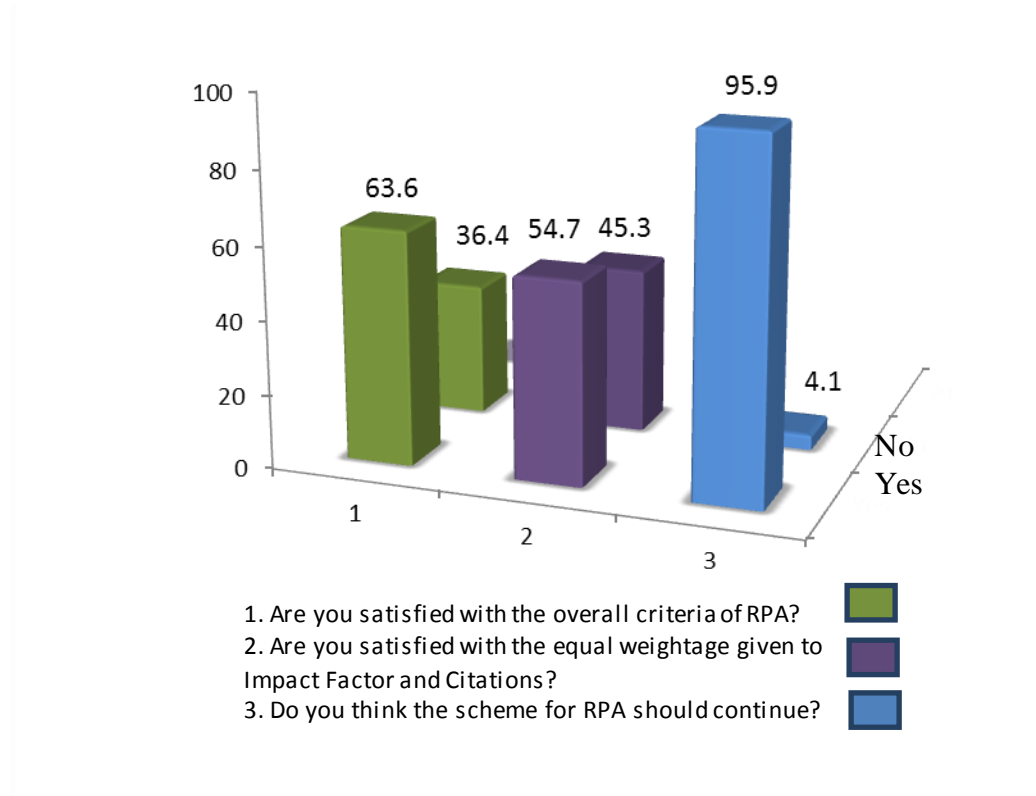


Fig. 3. Feedback survey for the scheme of RPA

Conclusion

The RPA scheme has achieved its main objective of increasing the number of research papers published internationally and is playing an important role in the promotion and internationalization of science in Pakistan. Focusing this, the scheme needs to be continued but steps must be taken to make it more effective in improving the quality and quantum of international level research of Pakistani scientists, especially to increase the contribution of engineers and medical doctors. Also, as a step ahead and to make the scheme more effectual, the translation of scientific knowledge into products, processes and services for the socioeconomic development of country should be added to the program.

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