

Institutional Review

NATIONAL RESEARCH COUNCIL

**A report prepared for the
National Science and Technology
Commission, Sri Lanka**

December 2014

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ABBREVIATIONS

GIS	Geographic Information System
ICT	Information and Communication Technology
IDR	Investigator Driven Research
ISI	International Scientific Indexing
MPhil	Master of Philosophy
NASTEC	National Science and Technology Commission
NRC	National Research Council
PARP	Presidential Awards for Research Publications
PhD	Doctor of Philosophy
PPP	Public-Private Partnership
R & D	Research and Development
S & T	Science and Technology
SAR	Self-Assessment Report
TOM	Target Oriented Multidisciplinary

EXECUTIVE SUMMARY

The NRC was founded in 1999 and formally established in 2007 as a Special Agency by His Excellency the President of Sri Lanka to assist the Government to plan, coordinate and facilitate research as well as to build a vibrant scientific and technological community to get the maximum benefit for economic development of the country and social welfare of its people. The NRC was under the purview of Presidential Secretariat since 1999 and from 2010 it is one of the scientific institutions under the Ministry of Technology and Research. To achieve its objectives, various research grant programmes including Investigator Driven Research Programme (IDR), Private-Public Partnership Programme (PPP) and Target Oriented Multi-disciplinary (TOM) Research Programme have been implemented. In addition Presidential Awards scheme for Scientific Publication (PARP) has also been implemented.

This report presents the findings of the review of the activities carried out by the NRC from 2011 to 2013. The review was conducted in September-November 2014. The main objective of the review was to assess how effectively the NRC has utilized resources to generate and implement programmes in consistent with their mandate and to provide outputs which are relevant to stakeholders and national development goals.

The review was based on verifying the information provided in the self-assessment report by visiting the NRC and the discussions held with the Council members, staff and grantees of the NRC.

The NRC has strongly contributed to technology development, publication of research, providing services to S & T community and providing necessary training to its staff. The transfer of technology to industry is facilitated by the Private-Public Partnership Programme and Target Oriented Multi-disciplinary Research Programme. The Presidential Awards scheme for Scientific Publication has contributed for encouraging the scientific community of the country to carry out high quality research.

Of the eight management aspects evaluated seven were judged to be strong. These management aspects are of institutional response to external and internal environment in planning organizational strategy, planning S & T programmes and setting priorities, planning S & T and R & D projects, project management and maintenance of quality, human resource management, management of organizational assets and coordinating and integrating the internal functions/units/activities were judged to be strong. The other two management aspects, namely managing information dissemination and partnership, and monitoring, evaluation and reporting were judged to be moderate. No management aspect was judged to be weak. Hence the overall performance of the NRC for the period considered could be judged as strong.

The output of the NRC has direct relevance to national development goals and is consistent with the objectives of the National Research and Development Investment Framework 2015-2020. The panel is of the opinion that greater allocation of resources and their timely disbursement would enhance its productivity and contribution to national development goals.

To further enhance the contributions made to S & T and R & D of the country, the NRC may consider the following recommendations.

- Giving more consideration to stakeholder needs and getting the NRC staff more involved in strategic planning
- Developing a mechanism to facilitate commercialization of innovative products
- Developing a mechanism to provide access to full texts of international publications for all grantees
- Developing an electronic database to have staff information
- Preparing guidelines for acquiring and protecting intellectual property rights of all outputs of research projects, especially when foreign collaborators are involved in projects
- Establishing an e-library to disseminate research outputs of the funded research projects
- Facilitating the transfer of technology within and among institutions through conducting workshops using current and previous grantees
- Getting feedback from grantees and respective institutions on regular basis
- Considering nationally important and relevant research publications, which are published locally, for PARP scheme in addition to the present scheme

1. INTRODUCTION

The National Science and Technology Commission (NASTEC) is mandated by the Science and Development Act No. 11 of 1994 to review the progress of Science and Technology (S & T) institutions in Sri Lanka to reflect their contributions towards the society and development of the country. In order to ensure the effectiveness and efficiency of any S& T institution towards meeting its goals and objectives, regular observations and checking of its activities and outcomes through periodic external peer reviewing processes are necessary. The aim of such a review is to assist the S & T Institution to improve the quality of its activities and outputs, as well as the performance as a whole.

Specific objectives of a peer review are to;

- obtain information on how to improve the activities of the institution;
- evaluate the effectiveness of the activities carried out by the institution;
- encourage good management of the institution;
- improve internal and external transparency of the institution;
- recommend future resource commitments;
- obtain information for policy changes;
- inform the stakeholders about the competence of the institution and
- induce a self-reflection on the results and outcomes of S & T activities leading to strategic orientation towards the desired goals

Findings of the external peer review of the National Research Council of Sri Lanka (NRC) conducted in October-November 2014 are given in this report. This is the first external peer review of the NRC and it is envisaged that the review is repeated periodically every four years. During the present review, activities carried out by the NRC during the period 2011-2013 were considered.

The NRC was founded in 1999 and formally established in 2007 as a Special Agency by His Excellency the President of Sri Lanka to assist the Government to plan, coordinate and facilitate research and development in S & T in order to build a vibrant national scientific and technological community in the country to derive maximum benefits.

The NRC comprises the Chairman and 16 members appointed by His Excellency the President of Sri Lanka who constitutes the governing body of the institution.

The vision of the NRC is to enable Sri Lanka to achieve science and knowledge based developed country status.

The mission of the NRC is to promote, fund, facilitate and monitor fundamental and applied research and enhance human resource development in Sri Lanka to achieve science and knowledge based developed country status.

As per the Presidential Directive dated 24th July 2007, the NRC is mandated to

- (i) bring in private sector and industry representation, in addition to highly productive academics and researchers into the Council,
- (ii) promote fundamental and applied research and facilitate human resource development in all disciplines of science by funding university based research students registered for higher research degrees,
- (iii) plan and coordinate the research effort of researchers in public sector scientific research and development (R & D) institutes,

- (iv) facilitate research and evaluate the performance of individual researchers in the public sector scientific R & D institutes and make periodic recommendations through the Presidential Secretariat to the Treasury for funding such research,
- (v) promote, fund and facilitate collaborative research programmes between researchers in public sector scientific R & D institutes and universities leading to the award of higher research degrees by the universities,
- (vi) promote and facilitate partnership among the industry, universities and public sector scientific R & D institutes,
- (vii) develop systems of national recognition and award for successful research and innovations and
- (viii) foster and sustain a S & T research culture and community in Sri Lanka that would respond productively to national development needs.

The general objective of the NRC is to plan and coordinate the research effort of researchers and facilitate their research in public sector scientific R & D organizations in Sri Lanka so as to build, strengthen and derive the maximum benefit to the country from a vibrant research community.

The specific objectives of the NRC are to

- I. plan and coordinate the research needs of the country by developing appropriate granting schemes and funding mechanisms to facilitate research efforts by researchers in public sector scientific R & D institutions and universities,
- II. facilitate, evaluate and monitor the performance of individual researchers in the in public sector scientific R & D institutions and universities and provide funds for research to create knowledge,
- III. promote, fund and facilitate collaborative target oriented multidisciplinary mega research programmes between researchers in public sector scientific R & D institutions and universities that will lead to solving critical national issues,
- IV. promote, fund and facilitate partnerships among the industry to conduct demand driven research directly contributing towards economic development,
- V. develop a system of national recognition and award to scientists for research excellence in their research efforts and
- VI. foster and sustain scientific and technology research culture and community in Sri Lanka that would respond productively to national development needs.

The review focused on assessing the effectiveness of the NRC in acquiring and utilizing the resources to generate programmes and carry out activities consistent with the mandate, and produce outputs that are relevant to its stakeholders and contribute to national development efforts. In this regard, both management and the outputs were assessed.

The management aspects that were evaluated are as follows.

- I. Institutional response to external and internal environment in planning organizational strategy
- II. Planning S & T programmes and setting priorities
- III. Planning S & T and R & D Projects
- IV. Project management and maintenance of quality
- V. Human resource management
- VI. Management of organizational assets
- VII. Coordinating and integrating the internal functions/units/activities

- VIII. Managing information dissemination and partnership
- IX. Monitoring, evaluation and reporting

The types of outputs that were evaluated are as follows.

- I. Technologies developed
- II. Technologies transferred to the industry/entrepreneurs
- III. Information dissemination/extension
- IV. Research publications
- V. Patents
- VI. Trainings
- VII. Progress of grants
- VIII. Distribution of funds
- IX. Recognition of scientists

The members of the review team were

- Prof. M.J.S. Wijeyaratne - Senior Professor and Chair of the Department of Zoology and Environmental Management of the University of Kelaniya
- Prof. W.G.D.Dharmaratne – Dean of the Faculty of Science, and Senior Professor and Chair of the Department of Physics of the University of Ruhuna
- Prof.G.M.K.B. Gunaherath – Senior Professor and Chair of the Department of Chemistry of the Open University of Sri Lanka
- Prof. K.I. Deen – Professor and Chair of the Department of Surgery of the University of Kelaniya
- Mr. I.Siriwardena – Senior Scientist of the NASTEC

Prof. M.J.S. Wijeyaratne served as the Chairman of the review team. Mr. I. Siriwardena coordinated the review process.

The review was based on the Self-Assessment Report (SAR) submitted by the NRC, findings made during the review visit and discussions held with the staff and grantees of the NRC.

2. PROCEDURE ADOPTED FOR PERFORMANCE REVIEW

The NRC was requested by the NASTEC to carry out a self-assessment of its activities and provide a SAR prepared according to the required format. The Review Manual which contained the guidelines for the performance review prepared by the NASTEC and the SAR prepared by the NRC were provided to the review panel four weeks before the review visit. The procedure of reviewing was discussed at the initial meeting held on 18th September at NASTEC chaired by the Chairman of the NASTEC.

The panel perused the NRC website (www.nrc.gov.lk) and the SAR submitted by the NRC prior to the review visit. The agenda of the review is given in Annex 1.

The review panel visited the NRC on 17th October 2014 and met the Chairman, members of the Council, Executive Secretary and other officers. The Director/CEO of NASTEC also participated at the initial meeting and explained the purpose of the review. The overview of the NRC was then presented by the Executive Secretary. Subsequently, the review panel met the members of the Council and staff members of different divisions of the NRC in groups to get their views on the

operations, undertakings, hindrances etc. of the NRC. The list of persons met during the review visit is given in Annex 2. During the review visit, the review panel examined many documents too. These are listed in Annex 3.

A meeting with the grantees was held at NASTEC premises on 3rd November 2014 in order to get their views on the activities and performance of the NRC. The list of participants at this meeting is given in Annex 4.

The review panel evaluated the management practices of each review aspect listed in Section 7.1 of the Review Manual as strong, moderate or weak. In addition, the outputs listed in Section 7.2 of the Review Manual were also assessed.

The Review Report, which was prepared according to the format given in the Review Manual, was submitted to the NASTEC, which will be subsequently sent to the NRC. If there are disagreements with the findings, those would be resolved through discussions. The Review Report will then be submitted to the Chairman of the NRC and the Ministry of Technology and Research. The report will also be made publicly available with necessary consents.

3. COMMENTS OF MANAGEMENT ASSESSMENT AND OUTPUT ASSESSMENT

3.1 – Management Assessment

(i) Assessment of Institutional Response to External and Internal Environment in Planning Organizational Strategy

The following management practices were assessed as **Strong**.

- Consideration of Government policies and development goals to establish goals and to plan organizational strategy for the institution
- Consideration of the organizational mandate in strategic planning
- Responsiveness to changes in Government policies and strategies
- Consideration of strengths, weaknesses, opportunities and threats in strategic planning
- Involvement of Council members in strategic planning
- Consideration of the Government allocation in strategic planning
- Regular reviewing and updating of policies and plans

The evidence for the aforementioned judgment was obtained by considering the target oriented multidisciplinary grants, the corporate plan and reviewing the public-private partnership programme.

The following management practices were evaluated as **Moderate**.

- Consideration of stakeholders' needs in strategic planning
- Extent to which members of NRC staff are involved in strategic planning.

Evidence for the above judgment was obtained from the discussions held with the NRC staff and grantees.

(ii) Planning S & T Programmes and Setting Priorities

The following management practices were assessed as **Strong**.

- Consideration of the national development goals in planning programmes and setting priorities
- Participation of the Council members in planning and setting priorities of the programmes
- Participation of staff in programme planning and priority setting
- Consideration of stakeholder interests in programme planning
- Approval of all programmes through regularized and appropriate procedures
- Consideration of the availability of the Government allocation in programme planning.
- Effectiveness and efficiency of institutional procedures in approving new S & T programmes

Two management practices, i.e., obtaining necessary equipment in planning programmes and representing stakeholders in planning and review committees are not applicable to the NRC.

The extent to which socio-economic and commercialization aspects are considered in programme planning was evaluated to be **Moderate**. However, recently this aspect has been considered in programme planning.

Research grantees who participated at the stakeholder meeting praised the systems and practices of the NRC. Furthermore, the stakeholders suggested that the NRC develop a procedure to facilitate commercialization of innovative products.

(iii) Planning S& T and R & D Projects

All management practices listed in the Review Manual under this management aspect were evaluated as **Strong**. These management practices are as follows.

- Guiding of staff in project planning
- Use of previous research data in project planning
- Use of a regulated formal process in reviewing and approving projects
- Use of organizational plans to select and plan projects
- Encouraging multidisciplinary projects
- Encouraging foreign collaborations in project planning
- Considering private- public partnerships in project planning
- Considering development research/activities in awarding research grants
- Considering both the applied research and basic research when approving research grants
- Considering the possible adverse effects on the environment when approving research projects

The review panel considered favourable that the NRC always require ethical clearance in awarding research grants involving humans and animals and consider the grant applications with greatest national relevance as priority.

(iv) Project Management and Maintenance of Quality

The following management practices considered under this aspect were evaluated to be **Strong**.

- Use of effective procedures for resource allocation
- Ensuring that infrastructure, instruments etc. are available for implementation of projects
- Use of an effective administrative procedure and supporting system in implementing projects

- Use of formal monitoring and review processes to direct projects towards achievement of objectives.
- Facilitating technical support for researchers
- Ensuring that research projects are completed within the stipulated time-frame
- Following quality assurance practices
- Providing the necessary computers and software required by grantees

However, access to world-wide literature is not provided to grantees always and therefore, this management practice was evaluated to be **Moderate**. Grantees suggested that it would have been better if the NRC provides them access to full text articles of the world literature to facilitate their research work during the period of the grant.

The review panel considered that the management practice of ensuring that the established field/laboratory methods and appropriate protocols are used is not applicable to the NRC as this sphere of activity has to be the primary role of the Principal Investigator of the research project.

(v) Human Resource Management

All management practices listed in the Review Manual under this management aspect were evaluated as **Strong**. These management practices are as follows.

- Maintenance and updating of staff information
- Planning and updating of staff recruitment based on project and programme requirements
- Effective selection of staff using a proper scheme of recruitment
- Staff training geared to achieve institutional objectives and consideration of merit in providing training
- Promotion of a good work environment within the NRC
- Effective staff appraisal
- Motivation, reward and provision of staff incentives
- Good management of staff turnover
- Good management of absenteeism and work interruption.

The NRC may consider having staff information in an electronic database.

(vi) Management of Organizational Assets

All management practices considered under this aspect were also evaluated as **Strong**. These are as follows.

- The ability of the NRC to carry out its mandate and the assigned statutory powers
- Satisfactory maintenance of infrastructure
- Proper management and maintenance of vehicles and equipment
- Effectiveness of procedures to ensure that equipment are in working order
- Effectiveness of the overall strategy in generation and proper utilization of funds
- The extent to which the NRC identifies opportunities for income generation and cost recovery
- The extent to which the intellectual property rights are protected at present

The NRC may consider preparing itself for acquiring and preserving intellectual property rights when foreign collaborators involve in projects.

(vii) Coordinating and Integrating Internal Functions of the NRC

All six management practices considered under this aspect were evaluated as **Strong**. These practices were as follows.

- The extent to which institution is evaluated internally and restructured based on current need
- Effectiveness of internal communication and coordination mechanisms
- Overall direction and coordination are provided by the Council
- Extent to which different units are assigned clearly defined functions
- Clear identification of the responsibilities of management staff
- Effectiveness of using appropriate reporting procedures and feedback in management at different levels

Review panel noted that the NRC had recruited an Information Technology graduate to digitize and develop its requirement in electronic databases, networking and improve organizational structure.

(viii) Partnership in Managing Information Dissemination

All management practices considered under this aspect were evaluated as **Moderate**. These management practices were as follows.

- The institution systematically plans and performs dissemination of information
- Extent to which the institution plans and maintains linkages with key partners for sharing and dissemination of information
- Effectiveness of institutional procedures for technology transfer
- Effectiveness of the system to obtain feedback from different types of stakeholders

The NRC may consider maintaining an electronic library of all completed projects and making this information available to the public in a pro-active manner. The NRC may also consider facilitating the transfer of technology within and among institutions through conducting technology transfer and updating workshops using current and previous grantees. The review panel is of the view that this would ensure a greater pool of technologically competent individuals who would be able to help others in their research activities. The NRC may also consider improving its effectiveness of obtaining useful and constructive feedback from grantees.

(ix) Monitoring, Evaluating and Reporting Procedures

The following management practices considered under this aspect were evaluated as **Strong**.

- Monitoring and evaluating its activities
- Internal reporting of S & T results and other related outputs
- The extent to which the results of such monitoring are used in research planning and decision making

The management practice of using management information systems was evaluated as **Moderate**. The management practice of requiring external stakeholders to contribute to monitoring and evaluation of the institution was considered as **Weak**. The NRC may consider getting feedback from grantees and respective institutions on regular basis.

3.2 – Output Assessment

(a) Types of outputs

(i) Technologies Developed

These were assessed by reviewing SAR of the NRC, specifically the annex 2 (Outputs of NRC). The review panel found that the NRC has contributed strongly to this output as several new technologies have been developed by investigator driven research (IDR) grants

(ii) Technologies transferred to Industry/Entrepreneurs

As per the information given in the SAR and the Public-Private Partnership (PPP) programme, this output was considered as satisfactory.

(iii) Information Dissemination / Extension

Information dissemination outputs were assessed by reviewing the SAR. As stated earlier, the review panel opined that while the NRC had done its best with available resources for this output, dissemination of information, especially to the public, may be improved by organizing public exhibitions, media events, open days and even becoming associated within medical school exhibitions, health care and other university open days, to improve its association with the public.

(iv) Publications

Based on the research that the NRC has funded, and its choice of grantees, the NRC has achieved its goals of ensuring high quality publication of funded research work. The review panel is of the view that the NRC has outperformed its objectives in this output.

(v) Patents

The review panel noted that several individual/institutional patents have been sponsored by the NRC, as per the SAR, and payment in lieu is being processed when documentation and formalities have been completed.

Regarding involvement of foreign collaborators in joint projects, the review panel is of the view that the NRC may consider having a mechanism for sharing patent rights, especially since global patent rights are expensive and have to be appropriately managed to avoid loss of intellectual property.

(vi) Services

The following services are offered by the NRC;

- Providing guidance for awarding research grants through developing necessary policies and making them available to prospective grantees
- Administering research grants
- Monitoring research projects
- Making recommendations on S & T matters

The review panel was highly satisfied with the above services.

The NRC may consider developing an electronic database of all published and unpublished research work supported by the NRC. This will facilitate searches by new research workers who may not

otherwise have access to NRC sponsored work, especially if such work remains unpublished by grantees. This would also support networking among Sri Lankan researchers.

(vii) Training

Staff Training: Review panel was highly satisfied with the staff development and management programmes carried out by the NRC. All staff training programmes have been within Sri Lanka up to now.

Training programmes for stakeholders: Review panel was not provided with information on training programmes conducted for grantees. The NRC may consider organizing, at least initially, a “grantees’ day” to bring together present and past grantees, and become involved more in facilitating training of grantees and exchange of information among stakeholders. The review panel is aware that this extra activity would have cost implications, and hence the availability of funds should also be considered.

(b) Output measurements

Output Category	Nos.	General Comments on quality and relevance of outputs and productivity of institution
1. Technologies Developed <ul style="list-style-type: none"> • New products/technologies • Improved products/technologies/laboratory methods • New planting materials/seed varieties 	08	Out of the highlighted Investigator Driven Research (IDR) grant outputs, 08 can be identified as potential new technologies developed. Certainly, some of the expected outputs under the target oriented multidisciplinary (TOM) research programme and PPP programme would be very important technological developments
2. Technologies transferred to industry/entrepreneurs <ul style="list-style-type: none"> • Technologies developed locally • Foreign technologies adapted and transferred 	None	IDR grant outputs have not been transferred to industries yet. PPP grants and some of the TOM grants would be directly transferred to industry.
3. Information Dissemination /Extension Publications <ul style="list-style-type: none"> ▪ S & T institutional review reports ▪ Newspaper articles based on research output ▪ Technical reports ▪ Consultancy reports ▪ Leaflets & Posters Dissemination events <ul style="list-style-type: none"> ▪ Development programmes in parallel with “Deyata Kirula” ▪ Exhibitions “Deyata Kirula” 	1 64 1 1 20 6 3	<p>The NRC has reviewed the Department of Agriculture with some suggestions for improvements.</p> <p>Wide publicity has been given to the work of some grantees through newspapers.</p> <p>NRC has conducted several very important and relevant health awareness programmes.</p> <p>NRC has participated in exhibitions annually.</p>
4. Publications (from on-going projects as at 2013) <ul style="list-style-type: none"> • Research papers in ISI journals listed in the Science Citation Index <ul style="list-style-type: none"> (a) Published (b) Pending • Other International Publications 	09 12 21	Out of 236 total publications and presentations, 126 were either published in international journals or presented at international forums. Although, the grantees are responsible for publishing high quality papers, it seems that NRC has been successful in identifying high quality

<ul style="list-style-type: none"> • Local Publications • Conference proceedings 	17	researchers through the evaluation process of research proposals.
(a) International	84	
(b) Local	93	
Total	236	
5. Patents	5	The number of patents may be lower than the number expected from 229 grants awarded so far. However, only 57 grants have been completed by 2013. Therefore, it can be considered as marginally satisfactory.
Total		
<i>Individual</i>		
• Local patents	-	
• Foreign patents	-	
<i>Institutional</i>		
• Local patents	1	
• Foreign patents	1	
• Local (pending)	3	
6. Trainings	Locally given	In house and out-bound training given to the staff to improve the quality and productivity of their work was satisfactory. Training of postgraduate students through research grants is also commendable.
<i>Staff training programmes</i>		
• Local		
• Foreign		
<i>Training programmes for stakeholders</i>		
7. Progress of grants up to 2013 (from 2006)		According to the statistics, 93% of the grants were successful. This is a highly satisfactory level of performance.
• Total number of Grants Awarded	247	
• Number of Grants Completed	57	
• Number Terminated/Withdrawn	18	
• Total number of on-going grants	172	
8. Distribution of funds among research fields – (2011, 2012, 2013)		<p>The statistics given shows that the funds have been distributed fairly well among nationally important and relevant fields.</p> <p>Perhaps, the NRC may consider providing slightly more funding for research on Veterinary, Live Stock and Fisheries sectors considering their economic importance.</p>
• Medical Science	27%	
• Ecology and Environment	18%	
• Agriculture	16%	
• Natural resources, Water management & GIS	9%	
• Physical Science and Electronics	5%	
• ICT	5%	
• Plantation (4%), Chemical Science (4%), Engineering & Technology (4%), Food & Nutrition (4%)	4x4%	
• Veterinary, Live Stock and Fisheries	3%	
• Others	1%	
9. Recognition of Scientists		The NRC has conducted this annual event successfully. A new evaluation criterion with a two-tier system was introduced in 2010, which is highly commended .
Presidential Awards for Research Publications (PARP) have been awarded annually.		
Number of awards in 2010	141	
Number of awards in 2011	143	
Number of awards in 2012	149	

4. PRODUCTIVITY OF NRC BASED ON OUTPUTS AND S & T STAFF STRENGTH

In order to assess the productivity of the NRC, its outputs were evaluated considering the main activities, namely, facilitating R & D activities, funding S & T research, information dissemination, and national recognition of scientists. In order to achieve the objectives, funds have been allocated for five main programmes in 2013 (Sections B1 – B5 of the SAR). Types of outputs considered by the review team in the evaluation are listed in Section 3.2 (a). The new programmes, i.e., the TOM research programme and PPP programme, introduced in 2013 and started funding in 2014 were evaluated based on the expected outcomes as it is too early to produce any output.

4.1 Outputs

I. Technologies developed

Section 2.1.C of the SAR has listed the important outcomes of the programmes relevant to the period of 2011-2013. Under IDR grants programme, 11 important outcomes have been listed, out of which eight outcomes could lead to technology development and the other three, addressing relevant national issues in health sector and environment. All four projects of the PPP programme, in the agriculture, medical science, plantation and milk production sectors are directly aiming at the technology transfer relevant to the country. The projects funded in 2014 under TOM grants scheme are specifically targeting two nationally important health issues and three issues related to industry and technology transfer. In considering the progress during the three year period it is clear that the NRC has been progressing well towards addressing national issues and technology development.

II. Technologies transferred to industry/entrepreneurs

According to outputs of projects reported in Annex 2 of the SAR, there are no indications of direct technology transfer to industry. However, there are great opportunities for direct technology transfer to industry through PPP projects, which are in progress. Furthermore, some of the TOM grants are expected to produce technology transfer to the industry. There are several outcomes of IDR projects having great opportunities for knowledge transfer to industry. However, this is a common problem in Sri Lanka as there are no opportunities to market research outcomes, inventions or innovations. This has to be addressed to gain the benefit of research outcomes to the country.

III. Information Dissemination/Extension

The NRC has encouraged its grantees to give publicity to their research findings and disseminate the knowledge to general public, which is very important. This has been quite successful and 64 newspaper articles have been published during the three-year period. Furthermore, 20 leaflets and posters have been published and distributed. During this period, NRC has produced two reports, a review report for Department of Agriculture and Technical report on Solar Energy Research in Sri Lanka and also three books produced for PARP. This is quite satisfactory considering the available manpower in the NRC office.

IV. Research Publications

A total of 236 research publications have resulted due to the research funded by the NRC during the period 2011-2013. The quality of research outputs depends on the capabilities of grantees and it is the responsibility of the grantees to publish their findings in reputed journals, which is beyond the control of the NRC. However, it indirectly depends on the selection process

of the NRC in identifying high quality researchers to award grants. It is clear that more than 50% of publications have been published in international journals or presented at international forums. This indicates the quality of research outcomes and the success of selection criteria followed by NRC. The review panel noted that the new criteria used for selection of PARP recipients would encourage grantees to publish research output in high quality journals.

V. Patents

Total number of patents reported up to 2013 was two and three are pending. Both patents are institutional patents, one international and one national. A common problem faced by Sri Lankan inventors and innovators is the high cost involved in applying for international patents. Some scientists are not interested in obtaining local patents as they are valid only in Sri Lanka. Therefore, as stated earlier, it is important to establish a mechanism to obtain international patents. This was suggested by some grantees at the meeting the review panel had with them.

VI. Trainings

In-house and out-bound training has been given to the staff to improve the quality and productivity of their work. These include training on intellectual property rights, 5S system, administrative procedures, team building and leadership. Training of postgraduate students through research grants is also a very important output as the NRC provides assistantships also for research students to complete MPhil and PhD degrees.

VII. Progress of grants

The main objective of the NRC is to use funds efficiently and productively to address nationally important issues in addition to developing basic scientific knowledge in the country. Therefore, the NRC has to identify high quality research projects and researchers. The number of grants given and the number of successfully completed projects are the relevant parameters to evaluate the performance of the NRC. According to the statistics, 93% of the grants were successful. Only 2 grantees had been backlisted. This is a very good performance.

X. Distribution of funds

The review panel noted that the distribution of funds in different fields is an important parameter in evaluating the NRC. The statistics show that the funds have been distributed fairly well among nationally important and relevant fields. Therefore, NRC has been successful in distributing funds. However, slightly more funding for the fields of veterinary science, livestock development and fisheries may be considered due to their high economic importance.

IX. Recognition of Scientists

PARP scheme has been established to recognize scientists who have carried out high quality scientific research at a Sri Lankan institution resulting in publication in international journals cited in the science citation index. The review team highly recommends the two-tier system introduced in 2010 for awarding Presidential Awards. This would encourage scientists to publish their research findings in high impact journals.

4.2 S & T Staff Strength

The number of cadre positions in the NRC has been increased from 12 to 16 in 2013. Six members of the staff have Bachelor's degree or above qualifications. The review panel noted that the staff

members are highly committed and motivated due to the leadership given by the Executive Secretary and the Chairman. They were very happy with the friendly working environment.

The productivity of the NRC based on the output and S & T staff strength is commendable. The NRC has achieved its objectives by distributing funds to qualified researchers to conduct research in nationally important and relevant areas. The output during the period under consideration is satisfactory.

5. OVERVIEW OF PERFORMANCE OF THE NRC AND ITS CONTRIBUTION TO NATIONAL DEVELOPMENT

In evaluating the performance of the NRC, the review panel considered the relevance of its programmes to its mandate, their effectiveness, efficiency and sustainability.

In fulfilling its mandate, the NRC is engaged in four main programmes, namely IDR grant programme, PPP programme, TOM research programme and PARP scheme. In addition, the NRC is engaged in two other programmes i.e., the research to development programme and public awareness programmes.

From the inception of the NRC, IDR Grant programme has been in existence while, PARP scheme was in place from 2001. Although many of the mandates of the NRC are covered by these two programmes, PPP programme was launched in 2012 to promote and facilitate partnership among the industry, universities and the public sector scientific R & D institutes. Further, TOM research programme was initiated in 2013 to bring the research culture into a higher level where the research findings would make a high impact on the society. Whilst maintaining a total of 172 IDR grants, 147 IDR Grants covering many scientific disciplines have been awarded during the period considered in this review. Under the PPP programme 4 projects have been funded in 2012 and 2013 while 11 TOM research grant proposals have been reviewed during this period. In 2013, the backlog of Presidential Awards (2007 – 2009) was cleared. Considering the mandate given to the NRC, all these programmes could be commendable as highly relevant.

The effectiveness, efficiency and the national importance of these programmes depend on diverse factors. The NRC is disbursing government funds mainly to carry out scientific research encouraging R & D in the country including human resource development. Disbursement of funds is done after a rigorous reviewing process and the progress of each individual research grants is monitored periodically to maintain the effectiveness of the NRC's programmes. For both these processes, positive and willing participation of reviewers is necessary. This process seems to be well in place, because the NRC has been continuously able to disburse funds in accordance with their expectations.

Proper execution of the funded research projects in a timely manner is another key performance indicator. The NRC adopts its own manner of disbursing funds to the respective grantees. Once the grant is awarded, NRC opens a joint bank account with the grantee. The total grant money is then deposited in the joint bank account with the grantee in order to facilitate the transactions by both parties. This gives the grantee the assurance that the funds are available for the research project throughout the grant period.

Procurement of goods is done according to the Government procurement guidelines. Review panel noted that this is carried out a very efficient and effective way. The IDR grantees whom the review panel met also had the same view. Further they indicated that the NRC looks into their requirements

in a very professional and efficient manner with minimum or no bureaucratic hindrance. Delays in processing some requests, which involve large amounts of finances, requiring Council approval, are due to the fact that the Council meets only once in two months. This problem may be overcome by appointing a Council subcommittee to deal with such requests on a monthly basis or upon request. It was noted that some requests of grantees over the phone or by e-mail are also accommodated. In general, this is new to Sri Lanka but is practiced in most of the western countries for several decades. Review panel considers this way of responding by the NRC to grantees' requests is very effective.

Grants are reviewed annually and the outcomes are conveyed to the grantees. This feedback mechanism is important not only to keep the momentum of the research projects but also to take some corrective measures if necessary. It is noteworthy that the NRC has taken steps to stop funding for few non-performing research projects.

Grantees of PPP programme had different views on the efficiency of NRC procedures. At the meeting the review panel had with them, few inadequacies and delays in some administrative procedures were reported. The review panel was of the view that these problems are natural at the beginning of any new project, especially with the involvement of private sector and the NRC would be able to iron-out such problems with time.

Existence of the NRC is of utmost importance to the country because it is a premier institution that disburses large sums of finances for research in diverse scientific fields. During the period considered for this review period, Rs. 638.38 Million had been disbursed among grantees. Research projects funded by the NRC not only generate new knowledge but also help in human resource development and capacity building in various scientific institutes and national universities. Therefore, the NRC plays a vital role in the national development endeavours. With the initiation of the PPP programme and the TOM Research programme, it is envisaged that the NRC will further contribute to national development in the years to come.

6. OVERALL JUDGMENT ON DIFFERENT ASPECTS

6.1 Judgment on different aspects

Overall judgment on different management aspects is based on the evaluation of management practices described in Section 3.1 (a) of this report.

The institutional response to external and internal environment in planning organizational strategy was judged to be **strong** as seven of the nine management practices evaluated were found to be **strong**. Implementation of the TOM and PPP programmes is among the good practices that can be identified under this management aspect. The remaining two management practices were evaluated to be **moderate** and no weak management practices were noted.

Of the 10 management practices evaluated under the aspect of planning of S & T programmes and setting priorities, eight were evaluated as **strong** and one as **moderate**. The other management practice listed in the Review Manual was considered as not applicable to the NRC. Hence this management aspect was also judged as **strong**. The good practices identified under this management aspect include close interaction of the members of the Council in planning S & T programmes and setting priorities considering national development goals and providing the entire amount of the research fund to the grantee as soon as the grant is awarded.

Planning S & T and R & D projects was also given a judgment of **strong** as all the management practices considered under this aspect were evaluated to be **strong**. The good practices include the consideration of national development goals in providing grants, consideration of the results of previous grants received by the grantees when awarding new grants, encouragement of foreign collaborations, establishment of the PPP and TOM research programmes and availability of standard procedures which are strictly followed.

Project management and maintenance of quality was also judged to be **strong** as eight management practices were evaluated as **strong** and one as **moderate**. The other management practice listed in the Review Manual was not applicable to the NRC. The good practices identified include close monitoring of the progress of the grants by the Council, proper evaluation of research grant applications and progress reports by experts in the relevant fields and the award of PARP.

Of the eight management practices evaluated under the aspect of human resource management, seven were evaluated as **strong** and the other as **moderate**. Hence, this management aspect was also judged to be **strong**. The good management practices carried out by the NRC under this management aspect include conducting regular monthly meetings with the staff discussing the issues and providing guidance, providing adequate training to the staff and remunerating the staff by providing incentives (PPP program) using generated funds.

All management practices evaluated under the aspect of management of organizational assets were evaluated to be **strong**. Therefore this management aspect was also judged to be **strong**. The TOM and PPP programmes are commendable as these will contribute to the generation of funds through patents. The allocation of funds to the grantees as soon as the grant is approved by opening a joint bank account with the grantee and depositing the entire allocation in that account is one of the major good practices identified under this management aspect.

Coordinating and integrating internal functions of the NRC was also judged to be **strong** as all management practices considered under this aspect were evaluated to be **strong**. Conducting monthly meetings with the staff and close interaction of the members of the Council providing guidance are among the good practices that were noted under this management aspect.

All management practices listed in the Review Manual under the aspect of partnership in managing information dissemination were evaluated to be **moderate**. Hence the overall judgment given to this management aspect was **moderate**. Establishment of an e-library, which is very useful in the dissemination of information, would be very useful. The NRC may consider strengthening the procedures that can facilitate transfer of technologies resulting in due to the research it has funded by disseminating information.

Of the five practices listed under the management aspect of monitoring, evaluating and reporting procedures, three were evaluated as **strong**, one as **moderate** and the other as **weak**. Hence this management aspect was also judged as moderate. Periodic reviewing of the grantees by progress reports, periodic reviewing of staff activities through monthly staff meetings, evaluation of publications by high impact international journals are among the good practices identified under this management aspect. However, when evaluating the research papers for PARP scheme, the NRC may consider the fact that some of the research would be very useful in the local scenario rather than internationally and therefore, would not be accepted by high impact international journals. This is particularly true for the fields outside Medicine, especially in the fields of environment, natural resources, geology, agriculture etc. Some of these research projects would be very useful for national development, conservation of Sri Lankan environment and sustainable utilization of Sri

Lankan natural resources. Since Sri Lanka is a small country and none of the above subjects is universal as human subjects, researches on such fields are difficult to get accepted by high impact journals unlike those in the field of Medicine. The NRC may consider the above fact also in granting awards under the PARP scheme in future.

6.2 Overall judgment

Based on the judgments given to each management aspect, the overall performance of the NRC could be judged as **strong**.

7. RECOMMENDATIONS

To further enhance the contributions made to S & T and R & D of the country, the NRC may consider the following recommendations.

- Giving more consideration to stakeholder needs and getting the NRC staff more involved in strategic planning
- Developing a mechanism to facilitate commercialization of innovative products
- Developing a mechanism to provide access to full texts of international publications for all grantees
- Developing an electronic database to have staff information
- Preparing guidelines for acquiring and protecting intellectual property rights of all outputs of research projects, especially when foreign collaborators are involved in projects
- Establishing an e-library to disseminate research outputs of the funded research projects
- Facilitating the transfer of technology within and among institutions through conducting workshops using current and previous grantees
- Getting feedback from grantees and respective institutions on regular basis
- Considering nationally important and relevant research publications, which are published locally, for PARP scheme in addition to the present scheme

ACKNOWLEDGEMENTS

Prof. H.J. De Silva – Chairman of the NRC

Council Members and staff members of the NRC who participated at the discussions with the review panel

Mrs.ManIshaRajapakse – Executive Secretary of the NRC

Mr.Nishantha S. Hewagama – Accountant and other staff of the NRC who participated at the discussions with the review panel

Grantees who participated at the discussions with the review panel

Prof. D. A. Tantrigoda – Chairman of the NASTEC

Dr.Muditha Liyanagedara – Director/CEO of the NASTEC

Staff members of the NASTEC who helped in numerous ways

Annex 1

NRC Review Agenda 2014

Day 1 (17th Oct. 2014)

- 8.30 am- 10.00 am : Presentation about the NRC and visit around the institution
10.00 am- 11.00 : Meeting with the Board of Management
11.00am -12.00 pm : Accounts Division
12.00pm - 1.00 pm : Lunch
1.00 pm - 5.00 pm : (30-45 minutes for each program)
Research/Scientific Officers of:
1. Investigator Driven Research Grant Program (1999)
 2. Public Private Partnership Program (2013)
 3. Target Oriented Multi-disciplinary Research Program (2013)
 4. Presidential Awards for Scientific Publication (2001)
 5. Other Programs : Research to Development: R2D (2013)
: Public Awareness Program

Day 2 (3rd Nov. 2014-Monday): Stakeholders (Grantees) Discussion (at NASTEC)

- 10.00am – 11.30 am - Investigator Driven Research Grant Program (8 Grantees)
11.30 am – 12.30 pm - Public-Private Partnership Program (2 Grantees-4 people)
12.30 pm– 1.00 pm - Lunch
1.00 pm – 2.00 pm - Target Oriented Multi-disciplinary Research Program (All 3 Grantees – 6 people)

Annex 2

The list of council/staff members presented/interviewed for the evaluation on 17th October 2014

Name	Designation
Prof. H. J. de Silva	Chairman / Council Member
Prof. Priyan Dias	Council Member
Eng. Moksevi Prelis	Council Member
Prof. Hema Pathirana	Council Member
Ms. Manisha Rajapaksha	Executive Secretary
Mr. Nishantha S. Hewagama	Accountant
Ms. A. K. D. M. Perera	Accounts Officer
Ms. A. E. K. Dayarathna	Accounts Assistant
Mr. S. K. Gamhewa	Research Officer cum Assistant Accountant
Mr. P. K. A. S. R. Nonis	Research/Scientific Officer
Ms. M. S. Maliyadde	Research/Scientific Officer
Ms. K. D. M. S. S. Sarathchandra	Research/Scientific Officer
Ms. H. H. K. N. Dharmasiri	Research/Scientific Officer
Ms. K. N. K. Dissanayaka	Research/Scientific Officer
Ms. M. W. C. Madumani	Programme Assistant

Annex 3

List of documents examined by the review panel

1. Review Manual prepared by the NASTEC
2. Self-Assessment Report prepared by the NRC
3. Annual Reports
4. Corporate Plan 2014-2019 of the NRC
5. Institution Establishment document (President's directive)
6. List of grantees for each programme
7. Standard Procedure for NRC Research Grants
8. Accounts reports of research grants
9. Other documents related to grants
10. Documents related to the awards of Presidential Awards for research publications

Annex 4

Lists of Stakeholders interviewed for the evaluation.

Investigator Driven Research Grantees

Name	Institution	Field
Prof. R.B. Mapa	Dept. of Soil Science, Faculty of Agriculture, University of Peradeniya	Agriculture
Dr. S.K. Wasala	Plant Genetic Resources Centre, Peradeniya	Agriculture
Dr.Senani Williams	Dept. of Public Health, Faculty of Medicine, University of Kelaniya	Medicine
Dr. R.Samarasekara	Industrial Technology Institute ,Colombo 07	Biochemistry
Dr. M.D. Hettiarachchi	Nuclear Medicine Unit, Faculty of Medicine, University of Ruhuna	Medicine
Dr. R.A.R.C. Gopura	Dept. of Mechanical Engineering, University of Moratuwa	Mechanical Engineering
Ms. T.H.P.S. Fernando	Rubber Research Institute, Agalawatta	Agriculture
Prof. P.Ravirajan	Dept. of Physics, University of Jaffna, Jaffna	Physics
Prof. U.L.B. Jayasinghe	Institute of Fundamental Science, Kandy	Natural Products
Dr. G.R.R. Ranawaka	Department of Zoology, The Open University of Sri Lanka, Nugegoda	Zoology/ Biodiversity

Target Oriented Multi-disciplinary Research Grantees

Name	Address	Field
Prof. W. Abeyewickreme	Department of Parasitology, Faculty of Medicine, University of Kelaniya	Dengue
Prof.M.B.P. Wijayagunawardane	Department of Animal Science Faculty of Agriculture, University of Peradeniya	Milk
Mr. M.B.P. Mahipala	Department of Animal Science, Faculty of Agriculture, University of Peradeniya	Milk
Dr. A. Dangolla	Department of Veterinary Clinical Sciences, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya	Anti-Venom

Public Private Partnership Research Grantees

Name	Address	Field
Dr. S.M.C.U.P. Subasinghe	Dept. of Forestry & Environmental Sciences, Faculty of Applied Sciences, University of Sri Jayewardenepura	Plantation
Prof. Colvin Goonaratna	Link Natural Products (Pvt) Ltd, CIC House, 199, Kew Road, Colombo 02.	Medicine/Water