Internal Review Report
Centre for Rural Development & Technology

1. CURRICULUM

1.1 List of degree programmes offered :UG , PG and enrolment

The Centre does not offer any undergraduate or postgraduate programme. We run 17 PG and 1 UG open elective courses for B. Tech, M. Tech. and Ph.D. students **(Annexure 1)**. The number of the students registered in the courses goes up to 150.

1.2 Consistency of curricula with academic vision of the department

Keeping pace with the latest developments, CRDT constantly strives to align the academic, R&D, and outreach activities around sustainability, artisanal technologies and social enterprises. It also addresses fundamental issues related to paradigm of development. Based on technologies developed in IIT Delhi, CRDT addresses challenges faced by small and marginal farmers, artisanal collectives, women and forest-dwelling communities. The multi-disciplinary courses offered at CRDT endeavour to expose and sensitize students to the fundamental issues of rural communities and empower them with innovative solutions. The centre is developing an M. Tech / MS (Research) programme by developing some new courses to augment the existing PG level courses currently being offered by the centre. Courses offered by CRDT give students a unique immersive experience which enables them to appreciate the complexity of challenges in the rural space. These immersive experiences also enable students to develop innovative and creative solutions which are culturally acceptable to the beneficiaries.

1.3 Quality of Programmes

a. *Periodicity of curriculum review UG and PG.*

9 of the 17 courses being offered at CRDT have been developed over the last five years and the curriculum is up to date with the latest research and grassroot success stories. Contents of some older courses are being reviewed in light of the current situation to include more advanced topics and techniques. Some, not so relevant courses are being dropped from the list of courses being offered.

b. *Mechanism of review at UG and PG level :* As per IITD norms

c. *Coursework for each UG, PG and Ph. D. programme – Core/Elective.*

At present centre offers 1 UG level open elective course and 17 PG level open elective courses **(Annexure 1)**.
The minimum coursework requirement for Ph. D. Programme is 12 credits for M.Sc. and B.Tech students and 6 credits for students with M.Tech/M.Phil.

d. *Pre PhD course offered (in last 5 years).*

Ten Pre Ph.D. courses have been offered by Centre in last 5 years
RDL700, RDL722, RDL724, RDL726, RDL730, RDL740, RDP750, RDD750, RDL760 and RDL807 **(Annexure 1)**.

e. *New advanced Pre-PhD course introduced in last 5 years.*

Nine new Pre-PhD courses have been introduced **(Annexure 1)**.

f. *Overlap between courses (c) and (d) and (e), including opening later to UG.*

None

g. *Seminar series (weekly/regularly) held each semester:* Eminent speakers from various institutions are invited to deliver lectures as part of courses offered by faculty at the centre so that research scholars of the centre as well as students of other departments and centres could benefit from their rich experience. Faculty of the Centre also deliver research seminars to share their latest results from lab and field.

h. Placement details: Students who have received PhD from CRDT have gone on to contribute in various ways towards social transformation, grassroots NGOs, livelihood generation and environmental conservation. Several students who have graduated from CRDT occupy high posts in central government ministries, state government departments, multilateral organisations such as UNICEF, UNDP etc and policy making bodies. Alumni of CRDT serve in various positions in R&D labs, ICAR, CSIR and DRDO labs. Teaching and Research in Indian and foreign universities continues to be the preferred option for many alumni. Social entrepreneurship is an emerging trend by a small but committed group of CRDT alumni. The placement details of Ph. D. students of CRDT are given in **Annexure 2**.

*i. Relevance of UG and PG programmes to recruiters, potential and on-campus recruiters***:** At present the provision to recruit the Ph. D. students is not available. However it is suggested to start the exercise as early as possible.

j. Benchmarking of curriculum
The curriculum of CRDT can be compared with CTARA, IIT Bombay and CST (formerly ASTRA), IISc Bangalore
- Centre for Rural Development and Technology (CRDT), IIT Delhi offers one UG (4 credits) and 17 PG elective courses (3 credits each)
- Centre for Technology Alternative for Rural Areas (CTARA), IIT Bombay offers 16 courses for M. Tech students which include nine core and seven elective. Also the M. Tech. program includes two seminars for 10 credits and two projects of 52 credits. CTARA also has Technology Development and Supervised Learning (TDSL) for undergraduate students with 24 credits (3 courses).
- Centre for the Application of Science and Technology for Rural Areas (ASTRA), IISc, and Bangalore offers 6 courses with total of 17 credits (2 to 4 credits/ course).
For details please refer **Annexure 3**.

2. TEACHING ENVIRONMENT
2.1 Student teacher ratio/semester :**75:1**
- Average No. of students taught by each faculty per semester /Course : 75
- Average No. of courses given by each faculty : 1.4
(The centre does not have B.Tech/ M.Tech programme at the moment; however we offer UG/PG courses which are taken by B.Tech/M.Tech students.)

2.2 No. of students graduated (Ph.D) in last 5 years : 42 Ph. D. students graduated in last 5 years supervised by single or multiple faculties of the centre (**Annexure 4**).

2.3 Student-T.A. (or student-hours/T.A.) Ratio: 25:1 ($\approx$100 students/course are enrolled in each course and 4 T.A./course). Total 21 T.A. functional in the centre (11 General, 5 OBC, 3 SC, 2 ST)

2.4 No. of skilled technical staff : 1 (Institute Staff)

2.5 Gross laboratory space: Annexure 5

2.6 Laboratory Modernization in last 5 years: Following labs have been upgraded by procuring modern analytical equipments.
Labs Upgraded: Biogas Purification Laboratory, Biochemistry laboratory, Supercritical Laboratory, Cookstove Design & Research Laboratory, Applied Microbiology Laboratory, Food Quality and Safety Laboratory.
New Labs developed: Biomass Laboratory
Cookstove Testing Laboratory
Ecological Sanitation Laboratory
Biogas Laboratory

2.7 **Course files for each course for last 5 years.** Since all courses offered by CRDT are single section courses, the individual course coordinator(s) maintain a comprehensive course file.

2.8 **Study materials for all courses:** Notes, Videos, Web based materials, Booklets, Power point Presentations, Technical Reports, PhD Theses, Group Wise Term Paper Reports and related books are provided during course period.

2.9 **Research and Innovations in teaching and learning processes:**
Interest of students has been developed by activities like, quizzes, seminars, guest lectures, lab visits, site visits (Micromodel, waste treatment sites) which have evolved as integral components of teaching. Field exposure of students via study visits to Wastewater Treatment Plants, Gaushalas and villages have been a regular feature of our courses. These help the students to gain practical knowledge about the processes discussed in the class. Students are required to make a thorough analysis of the observations/data collected and present their reports. Also one day workshop on "Holistic health and sustainable happiness" jointly by CRDT-CBME-NRCVEE is organized as an integral part of RDL760.

2.10 **Course Feedback:** The same procedure using the online feedback form is being followed centrally by all the Centres/Departments including our centre. The feedback points vary between 3.69 to 4.43 out of 5.

2.11 **Industry expert who have delivered lecture as part of course:** On an average 3-5 industry experts deliver lectures as part of courses offered by CRDT each semester.

2.12 **Industry exposure to students:** Course related visits to factories, sites, industries, exhibitions, field trips etc. are arranged by course coordinators, example – visits to industrial scale biogas upgradation and bottling and power generation units at multiple sites in Haryana and Punjab were arranged for class students.

3 RESEARCH

3.1 No. of Ph. D student supported (Degree awarded and ongoing) in last five years by

i)   Institute fellowship   : 33
ii) Sponsored projects/consultancies : 29
iii) External organization   : 17
iv) Other source (QIP, Industries, etc.) : 02
(Annexure 6)

3.2 No. of Ph.D (last 5 years): Enrolled:73, Graduated per Faculty : 06.28

3.3 Area of Research (last 5 years):

Sl. No.	Research Area	Ph. D		Journal Paper	Conf. Papers	Sponsored Project (as PI)	
		Completed	On-Going			Completed	On-going
1	Biomass and Environment	16	13	94	80	10	07
2	Food and Natural Products	13	07	70	29	10	04
3	Green Solution and Sustainable Habitat	06	07	14	15	06	03
4	Rural Energy System	07	05	26	40	06	02

3.4 Publication per faculty (av. per year for last 5 years):
Publications/Faculty/Year in national and international peer reviewed journals = 6.4
Publications/Faculty/Year in Conference proceedings = 4.2

3.5   Total Publications in last 5 years:
   i)   Journals -224
   ii)   Conference- 149
   iii)   Hindi Journals – 95
   iv)   Publication per student : 6.
      (Annexure 7)

3.6 Best 3 papers in last 5 years: Three best papers of each faculty are given in
   Annexure 8.
   Best 10 publication of the centre: Annexure 9.

3.7   Average citation per department/Centre: Average citations/faculty/Year – 302.34.
   (**Annexure 10**)

3.8   Changes, modifications, etc. done to improve the quality of Ph. D. graduates: The newly developed Pre Ph. D. courses help the Ph. D. students to plan and design their experiments, write research articles and publish research findings. Students are encouraged to present research findings in international and national conferences and learn from the interaction and discussion with eminent scientists from different countries at the event. Through the regular seminars the students are trained in various disciplines.

3.9   Sponsored Project: Details of the sponsored project of the Centre are given in
   Annexure 11 & 16.

3.10 Industry consultancies:
   The consultancy projects from, Bharat Bio Products; KVIC; HUDCO; Love 4 Cow; Municipal Corporation Bilaspur; Nagar Palik Nigam Bhilai; Municipal Corporation Raigarh State Project Facilitation Unit; Applied Membrane Technology Inc.; M/S Hindustan Dairy Farm & Biogas, Organic Fertilizer Plant, Delhi; M/s DSM Anti-invectives India;; Nandi Energy Systems Pvt Ltd., Andhra Pradesh; IREDA, have been completed.

3.11 New areas of research which are different from the faculty's PhD thesis area.
   • Microbial aspects of biomethanation
   • Efficient cookstove design and development
   • Decentralized hybrid power plants for rural area
   • Biofertilizer and Biopesticide (control of housefly, termites, nematodes, fungal plant pathogens etc)
   • Plant tissue culture
   • Rapid composting
   • Vermiculture and Vermicomposting
   • Food Quality and Safety
   • Street food outlets
   • Functional profile of cooking devices Vs Quality of food
   • Production of biofuel from aquatic biomass, Agricultural and Forest residue
   • Bioremediation
   • Waste water treatment
   • Design for sustainability
   • Ecological sanitation
   • Sustainable housing
   • Traditional Knowledge system
   • Wisdom based leadership

3.12   Methodology for (i) identifying obsolescence in research areas, and (ii) identification of new areas for future research.
   • Since we are dealing with societal issues, the research areas rarely become obsolete in a relatively shorter period of a few decades. In fact we consider the satisfactory level once

the research reaches from laboratory conditions to field and attains self sustainability, which itself takes a long period. The centre strives to achieve that.

- Identification of the New area of research is based on the relevancy of the area as per the needs and current situation as well as the problems faced by the society.

3.13 Number of large interdisciplinary projects: Please refer **Annexure 12**

4 INNOVATION, DESIGN AND DEVELOPMENT

4.1 Technologies developed: 34 technologies have been developed and are mentioned in **Annexure 13**.

4.2 Technologies transferred/disseminated: Technologies mentioned in **Annexure 14** have been disseminated/transferred in a number of villages of Haryana, Rajasthan, UP and also to different Industries.

4.3 No. of patents granted and filed:
Patent granted   : 1
Patents filed and numbers obtained : 13
(Annexure 15)

4.4 No. of students who have competed in national/international competitions and outcome: 9

a. Chandu S. Madankar got S.R. Bhatnagar Memorial award 2013 by Oil Technologists Association of India in IICT Hyderabad.

b. Rama Chandra Pradhan got Jawaharlal Nehru Best Thesis award 2013 by ICAR.

c. Geetanjali Kaushik, Best Paper Award, International Conference, Germany.

d. Commonwealth Fellowship, Canada: Ashwani Kumar

e. ERASMUS MUNDUS fellowship: Kalpana Arora, Amit Kr. Tyagi and Lalit K. Bal

f. Best oral presentation awards (ICoFF 2011) - Amit Kumar Tyagi

g. 2nd prize for poster Presentation (ICRM, 2011)-Abhishek Mishra

h. 2nd prize for poster Presentation (NextGen Biotechnology, 2012) – Neha Sharma

i. Certificate provided for outstanding reviewer ship in 2011-12 from OMICS Group-Sapna Mishra

5 R & D ENVIRONMENT (last 5 years)

5.1 No. of Post-doctoral scholars hired in the centre and their duration
On Project
- Seema Diwedi (2 years), Seema Mishra (3.5 years), Vinita Janu (3.5 years), Preeti Shukla (3.5 years), Dr. Prachi Kaushik (2 years), Dr. M. Patel (5 yr), Dr. M. Tandon (5 yrs), Dr. S. Dubey (5 years).
- Besides a number of scholars are working as postdoctoral fellows in different sponsored projects.

5.2 Sabbatical taken by faculty and where spent : Prof. S. N. Naik : February, 2008 – December, 2008, University of Saskatchewan, Canada.

5.3 No. of seminars/Invited Lectures (education and research separately) given by the faculty (i) in the department, (ii) in other departments, (iii) at other institutions/other places (during last 5 years).

	In the Dept.	In other Dept.	At other Institute	Total
Prof. Rajendra Prasad	05	--	25	30
Prof. Santosh Satya	03	01	08	09
Prof. S. N. Naik	04	02	12	18

Prof. Satyawati Sharma	10	05	10	25
Prof. V.K.Vijay	05	02	45	52
Dr. Anushree Malik	08	08	11	27
Dr. V. M. Chariar	02	10	27	39

5.4 **Adequacy of research infrastructure:** The centre has all necessary facilities related to the activities being carried out.

5.5 **Adequacy of technical staff – existing number and competency areas; competency areas in which there is a shortage.**
- There is acute shortage of technical staff as there is only 1 technical staff at the centre.
- **Areas in which technical staff is required**
  Lab Technical Assistant: 02 (Food Quality and Safety Lab, Bio-Chemistry Lab)
  Micromodel   : 02

5.6 **Work space available for (a) Masters students, (b) Ph. D. students, (c)   project staff, (d) post doctoral scholars.**
Centre has acute shortage of space and there is no space for Research scholars and post-doctoral scholar's room. As a result they have to sit in the research labs which are already crowded with equipments.

5.7 **No. of national conference/Workshops/seminars attended by PhD students (total and per student in last 5 years)**: Totally 77 conference/workshops/seminars were attended by Ph. D. students with an average of 3/student.

5.8 **No. of international overseas conference / workshop / seminars attended by Ph.D student (total and per student for 5 years): Totally** 58 international conference/workshops/seminars were attended by Ph. D students with an average of 2/student.

5.9 **No. of students who have spent time in industry/Field agencies (GOs/NGOS) as part of thesis/project work:** 05

5.10 **Self assessment reports of the department/centres/schools if any.**
Self assessment reports are being submitted by faculty members regularly as per the institute norms.

  5.11 Placement of Ph.D. graduates in technical careers (Last 5 years) : Academic-22, Research-27, Industry-03, Consultancy-02 **(Annexure 2)**

  5.12 Inter-disciplinary work :
(i) **Joint thesis guidance by faculty across groups within a department, or across centre (Awarded and Ongoing),**

Name	No.
Prof. Rajendra Prasad	09
Prof. Santosh Satya	07
Prof. S. N. Naik	12
Prof. Satyawati Sharma	15
Prof. V.K.Vijay	08
Dr. Anushree Malik	09
Dr. V.M. Chariar	05

   (ii) **Proposals submitted and funded –PI- CoPI and their group/department affiliations: Annexure 16**.

6 OUTREACH/EXTRNAL STAKEHOLDER ENGAGEMENT

6.1 Educational

a. *Workshop/Short term courses (Last 5 years)*
: Workshops/seminars : 55 **(Annexure 17)**.

b. *Training programmes (Last 5 years): 56*
- Study materials (Booklets): 15
- Assisting other institution in lab/experiment development : 01

c. *Learning, research material on the website*: The lectures delivered by faculty members under training programs are available on website.

d. *Science and technology for public information* – **on website.**
- Video on Biogas upgradation and bottling, activities of RuTag, and portals on Eco-sanitation and low cost housing are available on website for public.

e. *Books, Technical Manual, Techical Report, Technical Article (Last 5 years)*
Books : 06, Technical Manual : 27, Technical Reports : 23, Technical Article :41. **(Annexure 18)**

f. *Experiments developed and made available to other institutions*: Four experiments are developed and standardized in centre and are available for use in other institutions Prof. Satyawati Sharma – 02; Prof. S. N. Naik – 01; Dr. Anushree Malik – 01.

g. *Reach out to schools, NCERT, KVs, etc. (e.g. K-12 programmes)*: Several Workshops, training programs/interactions have been conducted at Navodaya Vidyalayas, and Delhi Schools, Degree college, Inter college, etc.

h. *Mentoring of other institutions, e. g. new IITs, NITs, Universities etc. including faculty mentoring, curriculum development, laboratory development, etc. :*
Almost all faculty members from CRDT have mentored revamping of MGIRI, Wardha and were involved in setting up of state of art laboratories. Prof. S N Naik has been involved in mentoring IIT Guwahati for setting up of Supercritical Fluid Extraction Laboratory. Prof. Satyawati Sharma is involved as an expert member M. Tech. curriculum review and development at HAU, Hisar and Gautam Buddha University, Greater NOIDA.

6.2 Industry collaboration (Including Field Agencies both NGO's & GO's)

a. *No. of students (Ph.D./Masters) directly linked to industry funded projects/Field agencies (NGO's & GO's): 02*
b. *Technologies transferred (last 10 years)* : 16 **(Annexure 14)**

c. *Research projects undertaken with industry as partner* : 14 **(Annexure 19)**

6.3 Professional

a. *Service as Board, senate, selection committee member at other IITs, NITs, DBT, DST and Universities* : Please refer **Annexure 20**

b. *Service as Ph. D. thesis examiner at other institutions.*
IIT-Kharagpur, IISc Bangalore, Delhi University, Jawaharlal Nehru University, Pondicherry University, IARI, G.J.U. Hissar, NIT Calicut, NIT Rourkela, ISM Dhanbad, Jadhavpur University, Nagpur University, Sambalpur University etc.

c. *Service as technical expert on committees* – MHRD, MNRE, DST, DSIR, CSIR, DRDO, DBT, NIF, Pan-IIT initiatives, other ministries, state and local governments.

Please refer **Annexure 21**.

d. *Technical expert on policy, regulatory, laws, standards committees.*
Please refer **Annexure 22**.

e. *Member of Board/Advisory Board of public and private sector corporations.*
Please refer **Annexure 23**.

6.4 Contribution to national development goals

a. *Projects undertaken and their outcome.*
The following projects of national importance have been executed at CRDT:
1. Revamping of MGIRI Wardha
2. Rural Technology Action Group (RuTAG)
3. National Network on Integrated Development of Karanja and Jatropha
4. Biogas Development and Training Centre
5. National Biomass Cookstove Program
6. Bioremediation project from National Fund for Basic and Strategic Research in Agriculture
7. National Network on Rural Housing and Ecosanitation
8. Optimization of perennial grasses for biomass production (OPTIMA project funded by European Commission).
9. NRFBT (HUDCO-MORD) Bamboo Porject.

b. *Policy inputs –*
Policy inputs have been given by various faculty members as committee members of;
1. Biofuels Policy
2. Plan of action for National Biomass Coostove Initiatives
3. Innovation council of Ministry of Agriculture and Ministry of Rural Development

c. *Entrepreneurship development.*
The centre organized a number of demonstration- cum- training programs to facilitate microenterprise development based on various income generating activities such as Mushroom Cultivation, Garlic Processing, Minor Millet Processing, Vermi-technology, Rapid Composting, Silvipastoral and fodder crops, Biopesticides, Processing of NTFP, Biogas & Biogas slurry management, Bamboo Technology, etc. The purpose of revamping MGIRI Wardha was to provide a nodal centre for supporting rural entrepreneurship. Recently, "Management of Rural Entrepreneurship program" of 10 days duration was organized at the centre.

6.5 Alumni engagement
a. *Regular interactions/engagement with alumni and outcomes*. There is regular interaction with our alumni both at national and international level. Several joint programmes are organized together with alumni. One of the major such an activity was revamping of MGIRI Wardha.

6.6 Recognitions and Awards
a. Award to faculty: **Annexure 24**

7. GOVERNANCE

7.1 Governance

a. *Organization structure*
Development strategies based solely on economic growth are seen to be unsustainable in the long run. Sustainable development requires a holistic approach integrating economic, environmental and socio-cultural issues with human values and human dignity as the

base. This paradigm requires careful selection and application of technologies with an understanding of the conceptual framework of sustainability. Indeed, our concern is the formal and informal production sectors in rural areas rather than the organized industrial sector. Special efforts are needed to reach out to the underprivileged sections of the society. An educational institution like IIT Delhi can work for this through various channels like academic activities, R&D and pilot scale evaluation of rural technologies and technology transfer.

The Centre for Rural Development and Technology (CRDT) was established in 1979-80 as a nodal centre to coordinate and provide 'S&T' support to such activities. Much thought and efforts have gone in evolving the Centre's activities. It was an important experiment as not many technical institutions had attempted to establish a formal Rural Development Centre at this time.

Mandate

- To function as a nodal centre for promoting interdisciplinary R&D efforts with various Departments & Centers of IIT Delhi towards sustainable rural development.

- To enable the benefits of S&T developments to the rural sector by providing technical back-up for sustainable rural development and create replicable models for the nation.

Mission

- Identify the problems of rural sector requiring S&T inputs.
- Develop sustainable technologies, involving the faculty and students of IITD, by blending appropriately modern 'S&T' with traditional knowledge.
- Transfer/Disseminate the technologies involving Govt. sponsored schemes and NGOs/field groups for employment generation and community development.
- To promote ecological balance by conserving/developing natural resources (i.e. land, water, vegetative cover especially plantations).
- Undertake appropriate research, teaching (for sensitizing and orienting students), technology transfer and network with other technical institutions, Govt. & Non-Govt. organizations, and rural industries for achieving sustainable rural development with due focus on ecological dimensions.

b. *Planning documents developed by the centre*
   All the faculty members of the centre are allotted duties every year pertaining to various activities/meetings (CFB, CRC, Professorial Committee etc.) and the records of the meetings (minutes) are maintained by the respective Faculty Incharges and also office staff.

c. *Records of discussions within the centre - internal documents (meeting minutes, brochures, working paper, vision document etc.).*
   All records are maintained and available for review.

d. *Physical resources*: Centre has 12 labs (11 research + 1 Teaching lab), 1 library, 1 workshop and Micromodal.

e. *Financial resources*: Funds are provided by the institute to the Centre under following Head on the basis of requirement raised by the faculty.
   - PLN03/CRDT (Plan) – Rs. 51 lakhs (2012-13): The faculty board decides the requirement and distribution of funds
   - NPN05/CRDT (Non-Plan)- Rs. 20 lakhs (2012-13): The faculty board decides the requirement and distribution of funds.

- Also funds are received through various sponsored and consultancy projects (Annexure 16).
- Outcome of the funds utilization: Outcome of the funds utilization is observed in the form of infrastructure development, publications, technology development and transfer/dissemination, patents, etc.

f. *Delegation of decision making within department/Centre. List the processes and structures for financial and academic management and the methodology for their review.*

The decisions pertaining to major issues (i.e. long leave by faculty, selection criteria for new faculty, joint faculty, honorary faculty, etc.) are taken by Professorial committee of CRDT. Also, centre has expert advisors namely Prof P. Vasudevan, Prof. Dhar and Prof. Gaur for discussion and guidance pertaining to special cases of academic interests, etc.

7.2 Department management and operations

a. *Organization structure*: Following is the structure of CRDT;
- Head, CRDT,
- Professorial Committee
- CRC (Chairman and members)
- Faculty board (Chairman and members)
- Faculty In-charges of different labs, library, office, micromodel complex, computer lab etc.,
- Office staff (One technical superintendent, Two Junior Superintendent and Two Attendants).

b. *Processes for curriculum planning*: A separate committee has been constituted for M.Tech/MS(R). The centre is planning to develop MS (R) first and M.Tech program (later). Besides, the planning of regular courses is done by CRC.

c. *Processes and methods for teaching resources management*: All course coordinators manage and update the teaching tools/methods according to current developments in S & T.

d. *Guest faculty, affiliation for teaching core, elective UG & PG courses*: Guest faculty are regularly invited by the respective course coordinators.

e. *Faculty short listing criteria*: The minimum criteria as per the norms of the Institute is generally followed.

f. *How collectiveness of the faculty has enhanced academic output and enhanced quality etc.*: The collectiveness of faculty of CRDT (core, joint and associate faculty) and collaboration between the faculty of CRDT and other departments, centres and also between CRDT and national and international organizations have resulted in the following;

    i) Improved quality and quantity of research publications
    ii) Increased no. of workshops
    iii) Increased no. of training programs
    iv) Development of new courses
    v) Improved the teaching and courses have attracted much larger number of students (UG and PG) from different departments.
    vi) Mega projects (TARI, KVIC, RuTAG, BDTC, Rural Housing, Bamboo Technology, NAIP etc.) have been executed at CRDT.

g. *Nature, quantum and quality of support from office staff*: List of office staffs in the centre is as follows;

Four office staff (2 supervisor level and 2 attendants) are involved in administrative work. One technical staff of supervisor level helps in workshop operation at Micromodel. The quality of support obtained is basically an average kind. There is no laboratory staff.

Name of Staff (Position)	Activities
Mrs. Leela Sagar (Jr. Suptd.)	All office work + Library
Mr. Surendar Sharma (Jr. Tech. Suptd.)	Micromodel
Mr. Nirmal Kumar (Jr. Suptd.)	Store work
Mr. Umesh Kumar (Attendant)	Cleaning, Xeroxing, Dak
Mr. Rajinder Prasad (Attendant C)	Cleaning, Xeroxing, Dak

7.3 Faculty

a. *Faculty profile*: **Annexure 25**

b. *Diversity in faculty profile*

- Gender= 5 M + 3 F (Core)
- Category = 5 Professors, 2 Associate Professors and 1 Assistant Professor
- Joint Faculty = 4 male Professors
- Region = North, South, East, West and Central India
- Ph.D. Institutions: 7 (IITD) and 1 (University of Mysore)
- Post Doc Institutions: IITD; Utsunomiya University, Japan; CFTRI, Mysore.
- Organization/Industry worked in: Uni-Lever, JNU
- Employment prior to joining the centre: JNU, IIT Delhi, IIT Kharagpur, MPUAT, Udaipur

c. *Process for faculty searches*: Through rolling & regular advertisements, short listing of applications, interaction and presentation at CRDT and interview (As per IITD norms).

d. *Result of faculty searches* (last 5 years): Four times all exercises (Point C) were done and one faculty has been recruited.

e. *Success in recruitment* **(last 5 years):** One new faculty i.e. Dr. Hariprasad. P. has been recruited in year 2013.

f. *Faculty lost to other institutes*: None

g. *Faculty time utilization* : Classes- 30 %; Meetings – 5%; Sponsored Research and Consultancies – 30 %; Ph.D. guidance – 25 %; M. Tech guidance – 5 %; Mini Project – 5 %.

h. *Level of harmony amongst faculty*: There is good cooperation among faculty members in the centre. Once in a while diverse opinions emerge but these are amicably resolved.

7.4   Students

a. *Criteria for short-listing and selecting students for admission to Ph.D programmes (last 5 years)*:

Minimum short listing criteria fixed by IITD is followed. However, on basis of number of students applied for Ph. D. programme, the criterion is enhanced.

b. *Facilities provided to students and their maintenance to Master's and Ph. D. programmes of past 5 years*: Laboratories, computer lab, library, and micromodel for field experiments are available for Ph. D. students. These facilities are maintained by TAs.

c. *Mentoring seminars/sessions held for Ph.D students for prospective faculty career*. Individual faculty member put in sincere efforts to help career advancement of students.

8   BENCHMARKING

8.1   Identify departments/centres within IITD as peers.

CRDT is uniquely placed in the institute as a centre devoted to research concerning mainly rural development. However, the centre actively collaborates with Mechanical Engineering, Chemical Engineering, Centre for Energy Studies, Chemistry Department, Department of Biochemical Engineering and Biotechnology, and National Resource Centre for Value Education in Engineering (NRCVEE).

8.2   Identify departments/centres/schools/divisions from other IITs, IISc, NITs, private universities as peers, and reasons/criteria there for.

Active groups/ centres in rural development working across India are CTARA, IIT, Bombay and ASTRA, IISc, Bangalore. We are comparably placed at each other. It will be endeavour to enhance our stature.

8.3   Identify department/centres from institutions in other countries as peers.

Department of Civil Engineering, Widener University, USA; Faculty of Agriculture, University of Bologna, Italy; College of Technology and Innovation, Arizona State University; Faculty of Applied Economics and Rural Development, University of Debrecen, Hungary are at the fore front of research relevant to rural development. The CRDT will evolve at par with them.

8.4   Define parameters for benchmarking :

(i)   *Research*: Development and transfer of technologies to village industries, farmers and artisans. Organization of conferences, seminars and workshops. Research papers, Books, Book chapters and Technical Manuals, Patents filed and granted and Projects, Availability of Labs and advanced instrumentation facility, Experimental fields, number of Ph. D students graduates per year.

(ii)   *Curriculum*: Number and Diversity of Courses offered, Minimum Credits required, Practical experiments for students, Exposure to village industries and MSMEs, etc.

(iii)   *Teaching-Learning process*: Use of multi-media for teaching, Field visits to rural areas, Exposure to experiments on pilot scale at Micromodel Complex, Virtual demonstration of experiments, videos, Use of Web Resources, Students' Feedback.

8.5   Perform Benchmarking and report the analysis/findings for last 5 (or 10) years:

Benchmarking has been done with CTARA, IITB and ASTRA, IISc Bangalore (**Annexure 26a & 26b**). We are comparable placed at each other.

9 FEEDBACK SYSTEM AND RESULTS

9.1 System for feedback from UG, PG and Ph.D. students and its results.

CRDT uses the standard feedback system for courses used by IIT Delhi. This involves mid-semester feedback which is made use of by the course instructors to further enhance their quality of teaching. Feedback is also provided by students at the end of the semester.

Faculty of CRDT hold regular meetings with their research scholars, take their feedback on facilities, consumables required etc and ensure that all kinds of physical support, resources and mentorship is available to them.

9.2 Mechanism of obtaining industry feedback and the findings.

CRDT is in constant interaction with government, NGO sector, funding agencies, MSME networks etc to understand their issues and takes up research and development relevant to rural communities. CRDT also makes consistent efforts to take up outreach activities so as to disseminate the outcome of research in CRDT to benefit rural communities.

9.3 Alumni feedback mechanisms and its outcome.

Presently, there is no formal mechanism for alumni feedback. However alumni of CRDT do visit us and their opinion is valuable for us in redefining our work and in setting new milestones.

9.4 Placement records – Ph.D., M.Tech. and B.Tech.

The Centre does not offer any postgraduate programme. It runs open elective courses for B.Tech, M.Tech. and Ph.D. programmes. Placement records of Ph. D. students are mentioned in **Annexure 2**.

10 FUTURE VISION FOR NEXT 5-10 YEARS

10.1 Goals and benchmarking for future in relation to

i. *Curricula*

➤ Development of new MTech / M. S. Research program on "Green Technologies and Sustainable Rural Development".

➤ Development of a new course "Orientation to Rural Development" (1-0-0, Audit)

➤ Curriculum Review: The course contents of the previously developed seven courses would be reviewed and revised in light of the current situation to include more advanced topics.

➤ Modification in RDD 750 (Minor Project) : This course would be made mandatory for all Full Time Ph.D. students and this would include exposure to designated rural areas and study of the viable models of sustainable development.

➤ Special orientation program: Special orientation program in the form of lecture series/seminars by outside eminent and dedicated visionaries would be included for orientation of Ph.D. and other students.

➤ Long and Short Term Training programs: Joint training programs marked in the institute calendar may be taken up by together by CRDT faculty members in all the areas being pursued at the Centre.

ii. *Research*

The main focus of CRDT is on multidisciplinary and quality research on field worthy technologies suitable at grass root level. The four **Major Thrust Area Groups [Biomass and Environment; Rural Energy system; Green Solutions and Sustainable Habitat; Food and Natural products]** at the centre have been very productive and getting fundings from various sources (MORD, MNRE, MOEF, DST, ICMR, MOFP, DBT, UNICEF, UNDP, GTZ,/GIZ, Ministry of MSME, NABARD, National Bamboo Mission etc.) and establishing collaboration/linkages within IITD, and at National and International levels. Further, Centre is exploring increasing quantum of funding and

linkages with new partner agencies for quality and impactful research and holistic development.

iii. Outreach

Over the next ten years, CRDT aspires to reach out to village communities through KVKs, NGOs, Gram Panchayats, Self Help Groups, TRIFED, KVIC, NRLM Resource Blocks, NIRD, SIRDs etc to disseminate the technologies and techniques, carry out Training of Trainers, support and mentor microenterprises and create models of prosperous communities and sustainable resource management.

iv. Processes for regular internal assessment.

CRDT has plans for setting up an Advisory Board with resource persons from diverse fields who would be formally briefed every two years on vision, milestones achieved and challenges faced. CRDT would seek their advice to plan the future activities.

10.2 Vision of curricula and teaching-learning processes – UG, PG and Ph. D.; Innovations proposed.

Already Centre offers open elective courses at U.G and P.G. level. Currently, the centre has 17 PG and 1 UG courses. Centre also offers Ph.D. program. The students enrolled in CRDT need to be better oriented towards the basic aims and vision of the centre as well as also ground realities for proper comprehension of their research objectives. Hence, the following are proposed in addition;

- ➢ **M.Tech / M. S. Research** programs on **"Green Technologies and Sustainable Rural Development"** would be developed.
- ➢ **Development of a new "Orientation Course"** (1-0-0,Audit)

  This course would be mandatory for all CRDT students and will provide an overview of the Centre's mandate and activities. The course contents would be discussed and developed together by all the faculty members. Every faculty member of the Centre would take few lectures, while one of them would coordinate the same.
- ➢ **Curriculum Review**

  The course contents of the previously developed five courses would be reviewed and revised in light of the current situation to include more advanced topics.
- ➢ **Modification in RDD 750 (Minor Project)**

  This course would be made mandatory for all Full Time Ph.D. students and this would include exposure to designated rural areas and study of the viable models of sustainable development. To facilitate this, a list of organizations/field units will be finalized by the CFB/CRC and mechanisms for the field exposure will be put in place.
- ➢ **Special orientation program**

  Special orientation program in the form of lecture series/seminars by outside eminent and dedicated visionaries would be included for orientation of Ph.D. and other students.
- ➢ **Long and Short Term Training programs**

  Joint training programs marked in the institute calendar may be taken up by together by CRDT faculty members in all the areas being pursued at the Centre.

10.3 Areas identified for improvement in (i) curriculum, (ii) teaching-learning processes.

(i) Regular Curriculum review (every 5 years)

(ii) M. Tech / MS (Research) in Green Technologies & Sustainable Rural Development.

10.4 New areas for research and Masters Programme, and industry participation in these.

Currently, four major areas which the CRDT works on include, (i) Rural Energy System, (ii) Biomass and Environment, (iii) Food and Natural Products and (iv) Green Solutions and Sustainable Habitat.

Specific sub-themes within these broad four research areas would be taken up as focus areas based on need assessment.

10.5 Projections for (i) funded projects, (ii) journal publications.

CRDT's focus continues on research output to be utilised by society i.e. farmers, artisans and women to enhance their quality of life. It is expected that CRDT will continue to receive support from funding agencies including MoRD, MNRE, MoEF, DST, DBT, ICMR, MoFP, UNICEF, UNDP, GIZ, Ministry of MSME, NABARD, National Bamboo Mission etc. The centre is exploring increasing quantum of funding and linkages with new partner agencies for quality and impactful research and holistic development.

The centre will publish its research findings in high impact peer reviewed journals.

10.6 Projected graduation numbers – Ph.D., M.Tech. and B.Tech : 10-11 Ph. D students/Year and number of M.Tech students.

10.7 Projected faculty profile, and areas for recruitment of faculty : At present CRDT has 8 faculty members. There is a need to recruit at least 5 new faculty members in the four focus areas of research at CRDT.

10.8 Projections for future benchmarking (for comparison after 5 years) – institutions in India and abroad, and parameters for future comparison : Please refer Section 8 Benchmarking (8.4 and 8.5).

10.9 Infrastructure and governance – limiting factors that affect achievement of benchmarks and methods to overcome these.

- Because of limited lab space availability, centre is unable to take more students in lab related courses (0-0-6, 2-0-2).
- While Centre has highly qualified and competent faculty, CRDT would benefit by recruiting faculty with background of Science and Engineering who are passionate about working on issues related to rural development.

10.10 Working with other departments/centres and institutions in teaching and research.

In keeping with the rural needs, the research and teaching activities at CRDT span over a large number of domains namely Biomass and Environment, Food, Energy, Rural Housing and eco-sanitation. Given the *diverse interests* and rural needs, the centre envisages to develop appropriate area and methodology of teaching and technologies in collaboration with other Departments and Centres at IIT Delhi. Also CRDT has strong collaborations and network with several national and International research and field level organizations.

10.11 New initiatives that the department/centre will undertake.

- M. Tech / MS (Research) in Green Technologies & Sustainable Rural Technology.
- Innovative research in the thrust areas of the Centre.

10.12 Outreach goals and anticipated limitations in the attainment of these.

Outreach Goal : To disseminate the technology being developed at CRDT to large number population in rural areas.

Anticipated Limitations:

- Training once imparted needs to be followed up with refresher modules etc.
- Absence of an Outreach System / Field Centre to exclusively focus on identifying grassroot partners to disseminate the technologies.

10.13 Mechanisms for effective changes based on feedback received and development and implementation of corrective measures. : There will be a faculty in charge as convener of feedback mechanism. He/she would put up the issues to the CFB for making the necessary changes based on the feedback**.**

10.14 Questions to which the department seeks answers from the Review Committee.

(i) Enhancing motivation and commitment of Ph. D. scholars towards rural society.

(ii) How field impact/serving rural society can be incorporated along with numbers of publication, impact factors etc. as yard stick for faculty performance evaluation?

11. INFORMATION IN PUBLIC DOMAIN

11.1   Minutes of all meetings.
Minutes of all meetings are maintained and available in CRDT office.

11.2   All reports archived in the central/department/centre libraries.
Yes, all are available.

11.3   Any other documents developed by the centre: Brochure, vision document and working paper.

11.4 Feedback documentation and action taken on the same, and its outcome.
Feedback forms and outcome are available online.