

**SELF STUDY REPORT FOR  
Ph.D (Farm Machinery and Power Engineering)**



**SUBMITTED TO**  
**Indian Council of Agricultural Research, Krishi Bhavan, New Delhi.**

**SUBMITTED BY**  
**College of Agricultural Engineering & Post Harvest Technology**  
**(Central Agricultural University, Imphal, Manipur)**

**Ranipool, Sikkim**  
**2021**

## PREFACE

India faced the challenge of providing food security to millions of its people soon after independence. The Research and Development initiatives taken by the Government of India resulted in the 'Green revolution' in the late 60s and early 70s. As a result of 'Green revolution' and various other efforts, India has made significant achievement through production of food grains, fruits and vegetables, milk, livestock production, fish production etc. and gained self-sufficiency in most of the areas of Indian Agriculture. However, contribution of engineering inputs (irrigation, soil and water conservation, farm mechanization, processing, reduction of harvest and post harvest losses, processing of milk, meat and fish and development of their products, farm structures, housing / shelter for livestock, fish ponds, utilization of renewable energy sources, utilization of agricultural, livestock & fish waste and by-product, environment and agricultural interaction etc.) in these efforts were not optimum. But considering the nutritional security, livelihood security, economic sustainability and high generation of employment, a need was felt to develop and provide these engineering inputs.

Keeping in view the high potential of applications of agricultural engineering and post-harvest technological interventions in improving the agricultural scenario of NEH region and to address to the issues of shortage of trained human resource in this discipline, the College of Agricultural Engineering and Post Harvest Technology (CAEPHT) was established in May 2006 by Central Agricultural University (CAU), Imphal at Ranipool, Gangtok (Sikkim). Initially, B.Tech. Agril. Engg. Programme, was started at the time of establishment in 2006. The college has marched ahead, to offer **two B.Tech.** (B.Tech. Agri. Engg. and B.Tech. Food Tech.), **five M.Tech.** (Farm Power & Machinery, Soil & Water Engg., Processing & Food Engg., Irrigation and Drainage Engineering and Renewable Energy Engineering) and **three PhD** (Farm Power & Machinery, Soil & Water Engg. and Processing & Food Engg.) degree programme.

**At B.Tech level, students are admitted only from all the State of NEH.** Few seats are filled on all India bases through ICAR quota. The quota of various States is fixed. The State Governments recommend students (on the basis of competitive examinations within their state) for admission. Similarly ICAR nominate (on the basis of all India competitive examination) students for their quota. At M.Tech and Ph. D. level, students are admitted on the basis of all India competition conducted by the University. Few seats are filled through ICAR quota. ICAR nominate (on the basis of all India competitive examination) students for their quota.

Students of this college have excelled not only in curriculum but also in extracurricular activities and national level competitive examinations and the college is making continuous efforts to improve the quality of education offered here. The ICAR has introduced the procedure of accreditation, which help in assessing facilities available to impart the quality education offered by the college. The college was accredited by ICAR Peer Review committee for a period of **five years (up to March, 2021)**. Since the college is due for further accreditation, the present report provides all the necessary information about the college activities performed during **last five years**.

The University Level Task Force and the college level Task Force have done a great job in compiling information and bringing out this report to be submitted to Accreditation Board of ICAR. I convey my heartfelt thanks to all those, who are involved in preparation of this report.

**(P. P. Dabral)**  
**Dean**

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## **6.4. SELF STUDY REPORT FOR POST GRADUATE DEGREE PROGRAMME**

### **6.4.1 Brief History of the M.Tech (Farm Machinery and Power Engineering) Degree Programme**

#### **Background Information**

College of Agricultural Engineering & Post Harvest Technology, Ranipool was established during the year 2006 under the administration of Central Agricultural University, Imphal) to address the issue of shortage of trained manpower (human resource) in the disciplines of agricultural engineering and post-harvest technology besides other issues, pertaining to natural resource management, farm mechanization, post-harvest technology, processing & value addition, utilization of renewable sources of energy, creation of agro-industries etc. in the region.

The department of Farm Machinery and Power Engineering (FMPE) started Ph.D program in Farm Machinery and Power Engineering in 2016 with an initial intake capacity of two students. The activity of the department pertains to the areas of small farm mechanization, conservation agriculture machineries, soil dynamics in tillage and traction, ergonomics and safety in farm machinery, effective utilization of animal energy and testing of farm equipment. FMPE department gives exposures about different aspects of farm machinery design, computer aided design, ergonomics study, soil dynamics study and conservation agriculture machineries.

The Department of Farm Machinery and Power Engineering is mainly engaged in teaching to under graduate, post graduate and Ph.D. students. The faculty of the department is actively engaged in academic, research as well as extension activities based on local and future needs of the farmers, field engineers and entrepreneurs. The faculty of the department has completed 01 Extra Mural Research Project and 8 Intra Mural Research Project. The Department of Farm Machinery and Power Engineering is having three All India Coordinated Research Projects since 2009 namely Farm Implements and Machinery, Ergonomics and safety in Agriculture and Utilization of Animal Energy. The department has also established a farm machinery testing center in 2012 to cater to the need of manufacturers for testing of farm machineries in the region.

In Ph.D presently three students are perusing Ph.D in the department. To date, 7 students have completed post- graduation from the department and 05 students are presently undergoing their M Tech (Agri Engg) with specialization in Farm Machinery and Power Engineering in the department. The department also hosted one international student for M.Tech. program in 2017-19.

FMPE department is having Farm Machinery, Farm Power, Soil Dynamics, Testing, Ergonomics, Theory of Machine and Thermodynamics laboratories provide practical knowledge to the students and also to demonstrate and organize training to farmers and field engineers, entrepreneurs etc. The department also has a well equipped mechanical workshop to cater to the need of PG research of the department as well as college. The Workshop is also used for imparting practical training to UG students as well as trainees. The resources of the AICRPs of the department are helpful in the conduct of PG research.

## 6.4.2 Faculty Strength

### Faculty Strength (Cadre-wise)

Designation / Cadre	2015			2016			2017*			2018			2019			2020			2021		
	S	F	V	S	F	V	S	F	V	S	F	V	S	F	V	S	F	V	S	F	V
Professor	1	1	0	1	1	0	1	1	1	1	1	0	1	1	0	1	1	0	1	1	0
Associate Professor	4	3	1	4	2	2	2	1	1	2	1**	1	2	1	1	2	1	1	2	1	1
Assistant Professor	6	3	3	6	4	2	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0
Total	11	7	4	11	7	4	7	6	2	7	6	1	7	6	1	7	6	1	7	6	1

S-Sanctioned, F-Filled, V-Vacant

\*FMPE department was bifurcated into Farm Machinery and Power Engineering (FMPE) and Renewable Energy Engineering (REE) from 2017 onward

\*\*Incumbent has been promoted to the post of professor through CAS in 2018

### Faculty Strength

Department	Sanctioned Faculty			Faculty in place			Vacant position			Recommended by ICAR			Deviation from ICAR recommendation		
	Prof.	Assoc. Prof.	Asst. Prof.	Prof.	Assoc. Prof.	Asst. Prof.	Prof.	Assoc. Prof.	Asst. Prof.	Prof.	Assoc. Prof.	Asst. Prof.	Prof.	Assoc. Prof.	Asst. Prof.
FMPE	1	2	4	1	1	4	0	1	0	1	2	4	0	1	0

### 6.4.3 Technical and Supporting Staff

Sl. No.	Name of the Post	No. of Post	Actual Filled
1	Field cum Lab Assistant	3	3
2	Technician (T1)	8	8
3	Technician (T2)	1	1
4	MTS	2	2
<b>Total</b>		<b>14</b>	<b>14</b>

### 6.4.4 Classrooms & Laboratory

#### Classrooms

Sl. No.	Class room No.	Area (sq. m)	Seating capacity	Other facilities (LCD, Projectors, Computers, Smart board etc.)
1.	PG classroom 1	14.00	8	Whiteboard

The department has one LCD projector which is used by the faculty for delivering lectures and seminars

#### Laboratory

The Department of Farm Machinery and Power Engineering has 7 laboratories and one workshop to carry out UG/PG/Ph.D practical as well as PG/Ph.D research. All the laboratories are well equipped with all facilities to carry out research.

#### (a) Details of Laboratories available

Sl. No.	Name of laboratory	Area (Sq m)	Remarks
1.	Farm Machinery Laboratory	90	Well-equipped will all necessary equipment to conduct hands on training and practical classes for the UG students. The laboratories are also equipped with up-to-date equipment which are useful for the research activities. The lists of the equipment available are given below.
2.	Farm Power Laboratory	128	
3.	Ergonomics And Safety Laboratory	135	
4.	Soil Dynamics Laboratory	160	
5.	Farm Machinery Testing Laboratory	40	
6.	Thermodynamics and Heat Engine Laboratory	17	
7.	Theory Of Machine Laboratory	17	
8.	Workshop	323	

**(b) Lists major Equipments:**

The laboratories are well equipped to conduct the practicals/hands on training to the students and carry out PG/Ph.D research. The lists of instruments/ equipments available in the laboratories are furnished below.

**Table 7: list of major equipment in department of Farm Machinery and Power Engineering**

<b>1. Farm Machinery Laboratory</b>
1. Multi Crop Thresher
2. Self Propelled Vertical Conveyor reaper
3. T/D inclined plate planter
4. Pedal cum power operated cleaner and grader
5. Rigid tyne cultivator
6. Spring loaded cultivator
7. Tractor mounted offset disc harrow
8. Tractor mounted disc plough
9. Tractor mounted M.B.plough
10. Modular inclined plate planter
11. Tractor mounted raised bed planter
12. Tractor mounted seed cum fertilizer drill
13. Multi crop plot thresher
14. Semi axial flow thresher (SAF 750)
15. Auger digger
16. Power tiller operated seed cum fertilizer drill
17. Manual seed cum fertilizer drill
18. manual groundnut decorticators
19. Manual rice transplanters
20. Pre-germinated paddy seeder (4 rows)
21. Manual hand tools and equipments like wheel hand hoe, Hand Ridger, Grubber weeder, Serrated sickle, Naveen Dibbler, hand maize sheller etc.
22. Knapsack sprayers
23. Rocking sprayer
24. Hand rotary duster
25. foot sprayer
26. Ganesh sprayer
27. Parth Hand Sprayer
28. Hand compression sprayer
29. Motorized knapsack mist blower cum dusterr
30. Pedal operated thresher
31. Power operated wire-loop thresher with winnower
32. Small power paddy thresher (hold-on type)
33. Small power paddy thresher (Axial Flow type)
34. Animal drawn patella harrow
35. Animal drawn patella puddler
36. Animal drawn three row seed drill
37. Animal drawn 3 row seed cum fertilizer drill
38. Animal drawn 2 row mustard drill
39. Animal drawn lug wheel puddler



40. Animal drawn ground nut digger
41. Mini power maize sheller
42. Mini power chaff shredder
43. Manual and motor operated chaff cutter
<b>2. Farm power laboratory</b>
1. Single cylinder two stroke petrol engine
2. Single cylinder 4 stroke diesel engine
3. Tractors (Mahindra B 275, New Holland)
4. Power tillers (12 hp, 6.5 hp, 5.5 hp)
5. Tractor Working Cut Model
6. Diesel fuel supply system model
7. Clutch system model
8. Brake System model
9. Stearing mechanism of tractor model
10. Cut model of 2 stroke Diesel engine
11. Cut model of 4 stroke Diesel engine
12. Actual cut model of single cylinder 2-stroke engine
13. Cross section of cylinder block
14. Components of engine (crank shaft, piston, connecting rod, rocker shaft, valve, valve spring guide etc.)
<b>3. Ergonomics And Safety Laboratory</b>
1. Integrated Composite anthropometer (ICA)
2. computerized electric ergometer
3. Computerized human energy measurement system with telemetry (K4B2)
4. Polar heart rate monitor
5. Strength measurement setup
6. Novatech load cell
7. Sphygmo manometer
8. Stethoscope
9. Thermometer (digital)
10. Digital Camera
<b>4. Soil Dynamics Laboratory</b>
1. Automated soil bin with sensors and digital control panel
2. Dynamometer
3. Motorized sieve shaker
4. IS Sieve set for soil analysis
5. soil analysis kit
6. Proving ring cone penetrometer
<b>5. Farm Machinery Testing Laboratory</b>
1. Digital tachometer
2. Digital soil moisture meter
3. Digital thermometer
4. Digital anemometer/barometer/humidity sensor
5. Digital weighing balance
6. Digital vibration and noise meter
7. Digital soil penetrometer
8. Digital energy logger
9. Spray patternator testing rig
10. Mini tractor (Kubota 21 hp)
11. Rotavator for small tractor

<b>6. Thermodynamics And Heat Engine Laboratory</b>
1. Multi-cylinder petrol engine test rig with electric dynamometer
2. Twin cylinder diesel engine test rig with electric dynamometer
3. Two stroke petrol engine test rig with rope brake dynamometer
4. single stage air compressor test rig
5. Lancashire Boiler model
6. Cochran Boiler model
7. cornish Boiler model
8. Vertical water tube boiler model
9. Locomotive Boiler model
10. Babcock & Wilcox Boiler Model
11. Model of steam engine
12. Boiler mountings and accessories model (Blow off cock, stop valve, feed check valve, economiser, pressure gauge, water gauge, fusible plug, dead weight safety valve, spring loaded safety valve)
<b>7. Theory Of Machine Laboratory</b>
1. Universal Governor Apparatus
2. Cam Analysis Apparatus
3. Motorized Gyroscope
4. Static & Dynamic Balancing Apparatus
5. Coriollis component of acceleration apparatus
6. Epicycle Gear train apparatus
<b>8. Workshop</b>
1. HMT Lathe machine (05 Nos)
2. wood working lathe machine
3. Power hacksaw machine
4. Radial drill machine
5. Overhead crank shearing machine
6. Hydraulic press
7. Arc welding machine (2 Nos)
8. MIG welding machine
9. TIG welding machine
10. Gas welding setup
11. Pipe bending machine
12. Sheet rolling machine
13. Pedestal grinder machine
14. Chop saw machine
15. Work tables with bench vices
16. Carburizing furnace
17. Painting oven
18. Sheet shearing machine
19. Milling machine
20. Shaper machine
21. Smithy furnace with anvils and swedge blocks

**(c) Average Number of Students in Theory and Practical Classes**

Postgraduate students are less in number and are grouped into one theory batch and one practical batch.

Sl.	Name of the department	Theory Batch	Practical Batch
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No.			
1.	Farm Machinery and Power Engineering	Full strength	Full strength

### 6.4.5 Conduct of Practical and Hands-On-Training

Course curriculum for master degree programme has been designed with special emphasis on novel areas of farm machinery and power engineering. Systematically planned practical classes are conducted for the students in the department as per the credit assigned for the course. Whenever required, hands-on-training are also conducted for courses like system simulation and computer aided problem solving in engineering for PG/Ph.D students of the department. Besides, the students are also sent to progressive farmers' field to gain a firsthand experience and exposure to the practical problems in farming especially in hilly terrain conditions. The students also get exposure to farmers and interact with them during Technology and Machinery Demonstration Mela organized by the college every year. Glimpses of the laboratory facilities and students activities are presented below.



### Farm Machinery Laboratory



### Farm Power Laboratory

### Ergonomics and Safety Laboratory

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**Soil Dynamics Laboratory**



**Farm Machinery Testing Laboratory**



**Thermodynamics and heat engine laboratory**



**Theory of machine laboratory**



**College Workshop**

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**Glimpses from the PG research carried out by students**

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**Exposure visit of PG students to progressive farmer's field and interaction**



**Technology and Machinery Demonstration Mela 2020 and farmers interaction at CAEPHT**

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### 6.4.6. Supervision of students in PG Programm:

Ph.D program started in the department in 2015-16 with intake capacity of two students. The first Ph.D student admitted in 2016-17 and is yet to submit thesis. The number of students supervised by Faculty in the Department of Farm Machinery and Power Engineering as per the guidelines is listed below.

**Table 10: Number of students supervised in last five years in FMPE department**

Name of the Degree Programme	year				
	2015-16	2016-17	2017-18	2018-19	2019-20
Number of Ph.D (FMPE) students	-	1	-	1	2
Ph.D Recognized teacher	0	1	1	2	2
student to teacher ratio	-	1:1	-	1:2	1:1

**Table 11: Details of the Master thesis supervised in FMPE**

Sl. No.	Title of the Thesis	Name of the Student	Year of Completion
1.	Design and Development of Mechanically Metered Self Propelled Rhizome Planter	Mr. Kshitij Adhikari	2015
2.	Design and Development of Solar - Biomass Hybrid Dryer for Large Cardamom Drying	Mr. Vishnu Sankar A	2017
3.	Development of Ergonomically Designed Pedal Operated Maize Sheller for Sikkim Women Workers	Ms. Vusa Manisha	2019
4.	Optimization of Operating Parameters of Rotavator for Soil Tillage Quality of Medium Textured Soil under Soil Bin Condition	Mr. Philipo William Kulaya	2019
5.	Design, Development and Performance Evaluation of Zero-Till Planter Matching to Mini Tractor for Small Farm Mechanization	Mr. Lilesh Patel	2020
6.	Development of Ergonomically Designed Cashew Nut Sheller	Mr. Rahul Nath	2020
7.	Design and Development of a buckwheat thresher for small farm mechanization	Mr. M. Mohammad Sohail	2020



## Faculty profile

Sl. No.	Name of the faculty	Designation	Qualification	Experience, Years	No. of students guided/guiding		
					B.Tech	M.Tech	Ph.D
1.	Dr. S. N. Yadav	Professor	Ph.D.	38	11	4	2
2.	Dr. N. S. Chauhan	Professor	Ph.D.	19	14	3	1
3.	Dr. S. K. Satpathy	Assistant Professor	Ph.D.	16	8	2	0
4.	Er. S. S. Das	Assistant Professor	M.Tech*	18	6	0	0
5.	Er. S. K. Chauhan	Assistant Professor	M.Tech	9	10	0	0
6.	Er. Ng. Devrani	Assistant Professor	M.Tech*	4	3	0	0

### \*Persuing Ph.D program

## 6.4.7. Feedback of stakeholders: (Students, Parents, Industries, Employers, Farmers etc.)

- Regular advisory meetings are conducted for the students by their respective supervisors and collect feedbacks from the students.
- Every year in in the month of Feb-March, Technology and Machinery Demonstration Mela is being organized by the department where a farmer-scientist interaction meeting is organized for getting feedback from the farmers
- Improved technologies developed by the department are being demonstrated to the farmers and through Front line demonstration programmes under AICRPs and farmers feedback are obtained for further improvement in the machines, if needed.
- Interface meetings with line department officials, KVKs, ICAR -NOFRI, are organized for planning of future research and extension activities of the department.

## 6.4.8 Student Intake and Attrition in the Programme for Last Five Years

Year wise information on sanctioned strength, actual intake and attrition during the last five years of the degree programme are furnished in the tabular form. This attrition is due to students getting regular jobs in their respective state government etc.

Year	Departments	Sanctioned seats	Actual intake	Attrition	Attrition Percentage
2015-16	Farm Machinery and Power Engineering	2	0	0	0
2016-17		2	1	0	0
2017-18		2	0	0	0
2018-19		2	1	1	100
2019-20		2	2	0	0

### 6.4.9 ICT Application in Curricula Delivery

ICT enabled teaching-learning encompasses a variety of techniques, tools, content and resources aimed at improving the quality of learning and variety of options are available to the teacher and students to utilize various ICT tools at CAEPHT, Ranipool for effective teaching and learning. Teachers participate in selection and critical evaluation of digital content and resources. They are also encouraged to develop their own digital resources, sharing them with colleagues and students through the digital repositories. For this each individual staff allotted with high configured computer system and connected with high speed Internet facilities for sharing digital contents. During the time of corona pandemic, the classes were conducted totally via online mode using Google meet, zoom etc.

Below Mentioned ICT facilities are well established in the college during the period of 2015-16 to 2020-21. Detailed ICT Lab facilities are listed below:

S.No.	Name of Lab/facility	Equipment	Usage
1.	ICT Enabled smart Class Rooms	1 PG Class rooms with Computer Systems and LCD Projectors	For educational video, PPT, conferencing , teaching and learning
2.	AUTO CAD Lab	CATIA (V6) installed in 17 computers in the central computer lab	used for practical class, imparting trainings and used by the students and faculty for 3D modeling and designing
3.	ICT Enabled Seminar Hall	High Speed Internet Line connectivity, Computer Systems and LCD Projectors camera	For online interaction with University key officials by students and staff, online interaction with different subject experts in different streams

Our Library is having more than 7832 Books for use by the Students. It is also having various facilities where student can go through various Journals, Books etc. online either in the Library or Class Rooms or Departments or in their Hostel rooms etc.. The Library provides Circulation and reference services. All the in-house operations of the Library are fully computerized using the network version of the library software KOHA with web OPAC (Online Public Access Catalogue) facilities. The library has also access to online e-journals through CERA (Consortium for e-Resources in Agriculture) and IP address has been activated to access the online journals through

CERA in entire CAEPHT Campus. Plagiarism check for M.Tech & Ph.D. thesis was/is done through Ant plagiarism software URKUND in library. Photocopying & Printing facilities are also available in the library. Students used all these facilities during the period under report. For data analysis students used software viz., Design Expert, Origin etc. related to statistical analysis.

**6.4.10.** The information pertaining to 6.4.1 to 6.4.9 has been provided for PG programme *i.e.*, Ph.D. (Agricultural Engineering) in Farm Machinery and Power Engineering of College of Agricultural Engg & PHT, CAU, Ranipool Gangtok Sikkim, Sikkim is correctly.

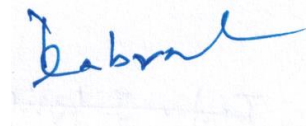
**6.4.11.** Since the accreditation of Programmes is related to the All India Admission from ICAR and also having weightage for College accreditation, therefore the data presented in the section 6.4 is liable to the verification at any stage.

**6.4.12**

### CERTIFICATE

I the Dean, P. P. Dabral, College of Agricultural Engineering & Post Harvest Technology, Ranipool, Sikkim, hereby certify that the information contained is furnished as per the records available in the college and degree awarding university.

Date:



(P. P. Dabral)

Dean

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