

Profile and Contribution

1. **Name** : Dr. **RAJ NARAYAN PATERIYA**
2. **Father's Name** : Shri N. R. Pateriya
3. **Date of Birth** : 02 Oct. 1965
4. **Postal Address** : Dr. **RAJ NARAYAN PATERIYA**, Professor, Dept.
Farm Machinery and Power Engg, College of
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5. Educational /Technical qualifications

S.N.	Examination passed	Passing years	Division and % of marks, OGPA with conversion Formula	Subject of Examination
1.	HSSC	1982	Ist 70.87 %	Maths Group
2.	B. Tech.	1988	Ist 74.08 %	Agril. Engg.
3.	M. Tech.	1990	07.93 (CGPA)	Farm Machinery & Power Engg.
4.	Ph. D.	2004	Awarded	Farm Machinery & Power Engg.
5.	GATE Qualified	1989	Qualified and got Admission at IIT Kgp	Agricultural Engineering

6. Employment record

S.N.	Post held	Pay scale	Period of service (from...to.),	Employer's address	Description of work done	Reason for leaving
1.	Associate Professor	Rs. 37000-67000 + 9000(A GP)	Since June 02, 2006 to 31 Oct, 2011.	College of Technology, Govind. Ballabh Pant University of Agril & Tech, Pantnagar	Graduate & Post Graduate teaching & other developmental activities.	Continued
2.	Professor	Rs. 37000-67000 + 10,000 (AGP)	November 01, 2011, to contd.	College of Technology, Govind Ballabh Pant University of Agril & Tech, Pantnagar	Graduate & Post Graduate teaching & other developmental activities.	

7. List of publications:

1. **Pateriya, R. N. 1999** Importance of the Wind Mill in our Country. Proceedings of the National seminar on Wind energy Commercialization, at MACT, Bhopal.
2. **Pateriya, R. N. 2000** Importance of energy in Sustainable Rural Development. Proceeding of national seminar organized by Bhartiya Krishi Anusandhan Parishad Karnal at Chitrakoot.
3. **Singh, V.C., Pateriya, R. N., & Singh, A. 2000.** Energy Audit of Wheat Crop Production of the Village Juhari District Jabalpur (M.P.) . Proceeding of national conference on commercialization aspects of renewable energy sources, at Udaipur.
4. **Pateriya, R.N. & Ghosh, H. 2001** Study of Natural Convection Solar Dryer and its Application in Food Industry. Proceeding of International Conference at BHU, Varanasi.
5. **Pateriya, R.N. & Diwadi, S. 2001.** Effects of Bamboo Matrix on the Production of KVIC Type Bio-gas Plant Placed in the Digestor. Proceeding of National Seminar of Institution of Engineers held at Jabalpur.
6. **Pateriya, R. N. 2001.** Sustainable Rural Development & Role of Improved Wood stove. Sustainable development vision and options, B.S. Sharma & Brothers. Agra. Pp. 46-49.
7. **Pateriya, R. N. & Jain, K.M. 2001.** सोलर फोटोवोल्टाइक एवं उनके उपयोग Vigyan Patrika, Allahabad.
8. **Pateriya, R.N. & Pandey, P. 2002.** Study of Energy Planning of Jakhi village dist.-Satna. Proceeding of national convention of agricultural Engineering at IIT, Kharagpur
9. **Pateriya, R.N., Mishra A. and Khan Nawab 2002.** Effects of the Air Pollution on the Ecosystem. Proceeding of national seminar on hydro chemical and Biochemical studies and environmental pollution at Aurangabad.
10. **Pandey, P.K. Pateriya, R.N., and Bhattacharya D. 2003.** A Case Study of Rural Energy Resources in Jakhi Village. Proceeding of International Conference on Energy and Environmental Technologies for Sustainable Development, MNIT, Jaipur.
11. **Pateriya R. N., Kumar, S. and Singh A. P. 2003.** Scope of the Natural Refrigerator for Food Preservation. Proceeding of fifth International Food Conference at CFTRI Campus, Mysore.
12. **Pateriya R.N. 2003** बायोमास ऊर्जा का महत्व- Published by Vigyan Parishad Prayag, Allahabad. ISSN, 0373- 1200. pp 27 – 29.
13. **Pateriya, R. N., Rai, D.P. and Singh, S. 2004.** Energy Requirement for Production of Wheat crop in the Village Ecosystem. Proceeding of the II national extension education congress on technology application approach for extension education, at Udaipur (Raj.)
14. **Pateriya R.N. 2004.** वैज्ञानिक विकास में अध्यात्म का महत्व- Proceeding of national seminar on Spritual model of India's development, Chitrakoot.
15. **Pateriya R.N. and Singh, S. 2004.** बायो डीजल ऊर्जा संकट का एक उदीयमान विकल्प- Proceeding of the Workshop organized by Vigyan Parisad at Chitrakoot.
16. **Pateriya R.N. 2000.** Monograph on Producer gas technology (Gasifier) M.G.C.G.V., Chitrakoot (M.P.).

17. **Pateriya R.N. 2004.** Design Modification of a Self-Propelled Type Rice Planter. Proceeding of the Internationals conference of agricultural Engineering at I.I.T., Kharagpur (W.B.)
18. **Pateriya R.N and Singh, S. 2005.** Adaptation of the Viable Energy Option for the Village Ecosystem. Journal of Agricultural Research and Development, Vol.I, pp.125-129.
19. **Pateriya R.N. 2005.** Economics of the Biodiesel production from Jatropha, Castor and Jojoba for the village ecosystem. Journal of Rural Technology, CSIR, Vol. II, No.3, pp.105-109.
20. **Pateriya R.N. and Singh, S. 2006.** Sustainable development and Energy Requirement for Crop production. Proceedings of the National Seminar (DAAD), College of Technology, Pantnagar.
21. **Pateriya, R.N. 2007.** Alternate use of the biomass for the sustainable development. Proceedings of National Conference of Ecosystem Diversity and Carbon Sequestration Challenges and a Bay out for using in a sustainable future, DBT, New Delhi.
22. **Pateriya, R.N., Rajput, D.S. and Singh A.K. 2007.** Performance evaluation of the forage densify machine. Proceeding of International Agricultural Engineering Conference, Bangkok, Thailand.
23. **Pateriya, R.N. Dewal, P.M. Dangwal, P.S. and Sharma, S.K. (2008).** Assessment of Dynamic properties of Soil. J. Agril. Engg.
24. **Pateriya, R.N. (2007).** Agro Industries and Appropriate Technology. In: A Book published by Madhuker Prakashan, 28, Manglam Vihar, Agra, U.P.
25. **Pateriya, R.N. (2007).** Sustainable Rural development and Multimedia. A chapter published in the Book of In: Science communication and national development, NCSTC, DST, New Delhi, pp 45-49.
26. **Pateriya, R.N. and Singh, S. (2008).** Adaptation of Viable Energy Options for the Sustainable Agricultural Development. The annual Review of Agricultural Engineering (ARAE) a publication of the Agricultural Engineering Committee of the polish academy of science, Poland.
27. **Pateriya, R.N. and Singh, S. (2008).** Ergonomics Evaluation of the Tractors Seat. Pantnagar Journal of Research. G.B.P.U.A. & T., Pantnagar.
28. **Pateriya, R.N. and Singh, S. 2009.** Alternate use of biomass for sustainable development: Gasification Technology for solving energy crisis in rural areas. In: A chapter published in the book entitled "Ecosystem Diversity and Carbon Sequestration" published by Daya Publishing House, New Delhi. Pp: 162-172.
29. **Pateriya, R.N. and Bhattacharya, T.K. 2010.** Renewable Energy Technologies for Rural Application. A chapter published in the book entitled "Agriculture in Uttarakhand Hills" published by Directorate of Experiment Station, G.B. Pant University of Agriculture and Technology, Pantnagar. Pp: 302-310.
30. **Pateriya, R.N. and Bhattacharya, T.K. 2010.** Energetics for production of Pigeonpea (Abstract). Proceeding: 44th ISAE Annual Convention and Symposium Indian Society of Agricultural Engineers held at Indian Agricultural Research Institute, New Delhi. Pp: 4.7.
31. **Pateriya, R.N. and Bhattacharya, T.K. 2010.** Engineering interventions for food production in fragile ecosystems. A proceeding on the XXVI Annual Convention and Symposium of Indian Society of Agricultural Engineers held and published by G.B. Pant University of Agriculture and Technology, Pantnagar Pp: 78-80.

32. **Pateriya, R.N. and Datta, R.K.** (2012), Design Modifications of Mat Type Rice Transplanter. International Journal of Advanced Technology & Engineering Research (IJATER), ISSN No. 2250-3536, Vol 2, Issue 6, Pp 87-91.
33. **Pateriya, R.N., Nahide H.D. and Bhattacharya, T.K.** 2012. Studies on Wear Characteristics of Imported and Indigenous Rotavator Blades. A proceeding of the XXVI Convocation held and published by G.B. Pant University of Agriculture and Technology, Pantnagar Pp: 205.
34. **Pateriya Pateriya, R.N., P. SINGH and M. TEWARI** 2012. Ergonomic Evaluation of Working Women for Building Construction works. A proceeding of the International Conference on Ergonomics and Human Factors ERGO 2012: Safety for all, held at G.B. Pant University of Agriculture and Technology, Pantnagar. Pp: 220.
35. **Pateriya, R.N. and Pal, R.** 2013. Suitability of an Offset Rotavator for Different type of Orchards. A proceeding of XXVII Annual Convention of Indian Society of Agricultural Engineers (ISAE) and International Symposium on Bio-Energy-Challenges and Opportunities held and published by Acharya NG Ranga Agricultural University, Hyderabad Pp: 42.
36. **Pateriya, R.N. and Tewari, S.** 2014. A Study on Wear Characteristics and Material Composition of AdI Blades used in Rotavator. A proceeding of 48th Annual Convention of Indian Society of Agricultural Engineers (ISAE) and Symposium on Engineering Interventions in Conservation Agriculture. Maharana Pratap University of Agricultural and Technology, Udaipur.
37. **Pateriya, R.N., Abhishek Kumar and Asish Chaudhary.** 2015. A Study on Performance of A Rotavator as affected by its λ - ratio. A proceeding of 49th Annual Convention of Indian Society of Agricultural Engineers (ISAE) and Symposium on Engineering Solutions for Sustainable Agriculture and Food Processing at Punjab Agricultural University of Ludhiana.
38. **A study on ADI rotavator blades Rana M and Pateriya, R.N..** 2016. A Study on ADI Rotavator. Blades. Research in Environment and Life Sciences, Pp 871-874.
39. **Pateriya R.N., Pal R.&Bhimwal.** 2016. Evaluation of an Offset Rotavator for Different type of Orchards. Annals of Agricultural Research, New Delhi. Vol. 36, pp. 262-268.
40. **Namdev S. and Pateriya, R. N.** 2017. Performance Evaluation of A Modified offset Rotavator in Mango Orchard. Journal of Agricultural Engineering. Vol. 2, pp 25-34.
41. **Namdev, S.K., Pateriya, R. N., Shankar, B. and Modi, R.,** 2017. Performance Evaluation of A Modified Offset Rotavator in Guava Orchard International Journal of Agricultural Engineering, Vol. 10(2), pp. 70-77
42. **Akanksha Kumain¹, R. N. Pateriya², Rajat Kumar Sharma³, Ashish Chaudhary⁴ and T. K Bhattacharya** 2017. A Study on Torque Requirement of Rotavator with ADI Blades in Soilbin Condition. International Journal of Basic and Applied Agricultural Research. GBPUA&T, Pantnagar.
43. **Pateriya, R.N., Sumit Tewari, T K Bhattacharya and Manish Tewari.** 2017. A Study on wear Characteristics and Material Composition of ADI Blades used in Rotavator accepted for publication in International Journal of Agricultural Mechanization in Asia, Africa and Latin America (AMA).

44. **Pateriya, R.N., T K Bhattacharya and Ch Ramulu. 2017.** Agricultural Machinery for Doubling the Income of Farmers in the Context of Uttarakhand State. Published in the Proceeding of Convocation of GB Pant University.
45. **Lokesh Lohani, R.N. Pateriya, Jagdish and T.K. Bhattacharya. 2018.** Performance Evaluation of a Modified Offset Rotavator in Sapota Orchard. Proceeding of 52nd Annual Convention of Indian Society of Agricultural Engineers and National Symposium on “Doubling Farmer’s Income Through Technological Interventions” Anand Agricultural University, Anand, Gujarat. Pp 170.
46. **Namdev, S.K., Pateriya, R. N., and Pandey, M. K. 2018.** Effect of λ - Ratio on Work Efficiency of Rotary Offset tiller in Litchi Orchard, Agricultural Engineering Today, Vol. 42(1), pp. 58-67.
47. **Ch Ramulu, Pateriya, R.N. and Azad Deepshikha. 2018.** Machinery for Residue Management of different Crops. Journal of Pharmacology and Phytochemistry.7(6)Pp2203-2207
48. **Pooja and Pateriya, R. N. 2019.** Study on Vibration Reduction on a Power Tiller Proceeding of 53rd Annual Convention of Indian Society of Agricultural Engineers and International Symposium on “Engineering Technologies for Precision and Climate Smart Agriculture” Banaras Hindu University, Varanasi, UP. Pp 178.
49. **Ch. Ramulu, R. N Pateriya and & M. Arjun Naik (2020).** Comparison of Straw Chopper cum Incorporator with Existing Paddy Residue Management Technologies in Combine Harvested Paddy Field at North Western Region of India. *Current Journal of Applied Science and Technology* (British Journal of Applied Science and Technology)39(14), 31-40.
50. **Ch. Ramulu, G. Gayatri, A.K Dave, R.N Pateriya and M.Arjun Naik (2020).** Wear Studies of Soil Engaging Rotary Tools and their Wear Reduction Methods: A Review. *Multilogic in Science*. IX (XXXII): 356-360.

Area of Specialization:

1. Bio energy
2. Conservation & Precision Agricultural machineries and
3. Ergonomics

Honours and awards:

1. I received best paper presentation award on my Research Paper entitled performance Evaluation of the self Propelled Riding type Rice Transplanter by Bioved Research & Communication Centre, 103/42 MLN Road, Allahabad.(1999)
2. Director, Technical Council (Energy in Agriculture) ISAE, New Delhi vide their letter no. F. No. 01/ISAE/8. May 24, 2008 for the year of 2008-10.
3. I became the Fellow member of Institution of Engineers, Kolkata, India in 2014.

Membership of professional societies:

1. Fellow Member of Institution of Engineers, Kolkata India.

2. Life member of Renewable Energy Forum - Barodra (Gujrat)
3. Life member of ISAE (New Delhi)
4. Life member of Vigyan Parishad, Prayag, Allahabad.
5. Life member of Pantnagar Journal of Research

Additional remarks

A. Research and Administrative Experience

1. Worked as a Technical Director Energy for the year 2008-2010 for Indian Society of Agricultural Engineering, New Delhi
2. Associated as a Team member of ICAR National Professor Scheme vide office letter No. PMA/C-IV/8203 dated August 1, 2006
3. A Patent filed on Pant Interculture and Mulching Machine for Sugarcane vide application no 201711026386 dated 25 July, 2017.
4. A Patent filed on Onion Digger with Cutter bar Topping unit vide application no 202011054126. Dated on 12th December 2020.
5. Working as a team of Mera Gaun Mera Gaurav vide officer letter No. PSN/BSK/3136 dated May 02, 2018.
6. Working as a Officer Incharge of Hill Agriculture and Small Farm Technology Centre vide letter No. CTE/FMP/34 dated April 21, 2012
7. Working as Nodal Officer of PCRA activity at Pantnagar vide office letter No. DES/1141 dated August 3, 2018.
8. I have been working as an additional responsibility of Joint Director Research Engineering vide office letter No. PMA/C/VI/1628 dated January 10, 2018 since January 2018.
9. Besides my teaching and research responsibility, I also worked or working as-
 - i. Asstt. Registrar (Admn.) for more than two year at MGCGV, Chitrakoot, Satna (MP).
 - ii. Coordinator of Institute of People's Science & Technology & Course Coordinator of Agricultural Engineering.
 - iii. Course Facilitator for Appropriate Technology, Student welfare officer and Procter IPST, MGCGV, Chitrakoot, Satna (MP).
 - iv. PI of Collaborative Research Project (DST Funded) on Agricultural Machinery (Rotavator Refinement)
 - v. PI of Collaborative Research Project (DST Funded) on Agricultural Machinery (Offset Rotavator Refinement)
 - vi. Staff Counsellor of Engineering Society, College of Technology, Pantnagar for the academic year 2010-11 and 2011-12.
 - vii. Incharge of Practical Training of Agricultural Engineering since year 2010-11 to continued.
 - viii. Incharge of Small Farm and Hill Technology Centre.
 - ix. Member of Course Curriculum Committee since year 2009-10 to continued.
 - x. Member/Member Secretary of College Disciplinary Board since year 2011-12 and continued.
 - xi. Hostel Warden of Tagore Bhawan Since July 22, 2011 to about five years.

xii. In-charge, Computer Lab. Department of Farm Machinery & Power Engineering College of Technology.

xiii. In-charge, Ergonomics Lab. Department of Farm Machinery & Power Engineering College of Technology.

B. Research Projects

Projects in Hand(External Funding) : 02 Funded by DST, New Delhi	Rotavator Refinements-Design Modifications and Development Design and Development of an Offset Rotavator for Orchards
Mobilization of external funds from project	Rs. 63.17 Lakhs
Projects from University Funding	Conservation Agriculture and Mechanization Technology. Agro waste as a source of Bio energy, bio-char and other industrial materials.

C. Foreign Visits

1. Institute of Organic Farming, FiBL and Swiss Federal Institute of Technology, Zurich, Switzerland (June 15 - 17, 2007).
2. University of Warmia and Muzury, Faculty of Technical Sciences, Olstzyn, Poland (June 19-21, 2007)
3. AgroSym 2016 Jahorina, Bosnia and Herzegovina (6-9 October 2016)

D. Other Experience:

- i. Examiner ship - In the various university of the country
- ii Paper setter - In the various university of the country
- iii Moderator - In the various university of the country
- iv Evaluator - In the various university of the country

E. Professional Trainings Obtained :

SN.	Name of the Course/ Training	Institute/ Organization	Year
1.	QIP Short term Course on Effective Professional Communication	IIT, Kanpur	July 07-11, 1997
2.	AICTE – ISTE Sponsored Short term training on Consequences of Climatic change & its Remedial Measures	Renewable energy Dept. CTAE, Udaipur, Rajasthan	Oct 01 – 14, 1998
3.	Summer School on Energy Management in Agriculture	Central Institute of Agricultural Engineering, Bhopal (M.P.)	May 15 – June 13 2000
4.	Summer school on Advances in seeding and harvesting machinery.	College of Agricultural Engineering Punjab Agricultural University, Ludhiana	May 20- June 19, 2001
5.	Training course for MS office and Internet application	Smriti Net com, Private Ltd., Bhopal	Feb. 15-21, 2003

6.	National Workshop on Eco technology Park Design	Rajeev Gandhi Pradaugiki Vishwa Vidyalaya, Bhopal & Mahatma Gandhhi Chitrakoot Gramodaya Vishwa Vidyalaya, Chitrakoot Distt- Satna (M.P.)	March 24-25, 2003
7.	Refresher Course on Rural Development	Mahatma Gandhhi Chitrakoot Gramodaya Vishwa Vidyalaya, Chitrakoot Distt- Satna (M.P.)	September 05-25,2004
8.	QIP Short Term Course on Alternative fuels and emission control	IIT , Kanpur	November 24-28,2004
9.	Workshop on Professional Development	Dehradun Institute of Technology, Dehradun	November 18-20,2006
10.	TEQIP workshop on Services to community and Economy	SPFU, Dehradun	December 29,2006
11.	Training and orientation program on Usage of ISIL System & Environment for Language and Communities Skill Development	College of Technology G.B. Pant University of Agriculture & Technology, Pantnagar.	February 21-23,2008
12.	Program on Understanding Self for managerial excellence for Faculty.	Indian Institute of Management, Lucknow (UP)	22-24November ,2008
13.	Training Program on Renewable Energy-Concept, Harnessing & Applications	Department of Electrical Engineering, College of Technology G.B. Pant University of Agriculture & Technology, Pantnagar.	February 4-9,2009
14.	TEQIP Program on Water Summit	College of Technology G.B. Pant University of Agriculture & Technology, Pantnagar.	February 19-21,2009
15.	Training on First Aid and Disaster Management	College of Basic Sciences & Humanities College of Technology G.B. Pant University of Agriculture & Technology, Pantnagar.	August 17-19, 2012
16.	Training on Computer Applications in Science of Technology	College of Technology G.B. Pant University of Agriculture & Technology, Pantnagar.	October 09-23, 2012

17.	Training on Negotiable Warehouse Receipt system.	Directorate of Extension Education, G.B. Pant University of Agriculture & Technology, Pantnagar.	September 9, 2013
18.	Training on Energy Sources.	I I T, Roorkee (UK)	January 6-10,2014
19.	TEQIP Program on Water Summit	College of Technology G.B. Pant University of Agriculture & Technology, Pantnagar.	March 22,2014
20.	Training on Energy Sources.	I I T, Roorkee (UK)	November 08-12,2014
21.	Training on Quality Initiatives in Technical and Higher Educational Institutions	Engineering Staff College of India Autonomous Organ of the Instructions of the Engineers, Hyderabad	2-4 February, 2014
22.	Training on Capacity Building Programme for University Teachers on Essential Teaching Skills	G.B. P.U. & T. Pantnagar	13-19 July, 2015
23.	Training on Outcome Based Education	College of Technology G.B. Pant University of Agriculture & Technology, Pantnagar.	28-29 March, 2018
24.	Training on Active Learning, Autonomy, Academic Governance and R&D	IIT, Roorkee	11-15 June, 2018

F. Expert Lectures Delivered in Summer/Winter School/Trainings/Seminar

- Delivered lecture on “Biodiversity and Role of Bioenergy Sources for the Sustainable Development” 21 days winter school/Training programme on “Role of Insect Biodiversity in Multicrop Ecosystem. Organized by Department of Entomology, College of Agriculture, GBPUAT, Pantnagar.
- Delivered lecture on “Importance of Improved Agricultural Implements for Farm Women for enhancement in Productivity” 21 days winter school/ Training on Farm Women for enhancement in Productivity. Organized by College of Home Science, GBPUAT-Pantnagar.
- Delivered key note address at the national level seminar on Environmental Management and Sustainable Development Organized by Directorate of Technical Education Bhopal.
- Delivered lecture on “Biomass for the Sustainable Development”. 21 days winter school/Training on “Crop Management Strategies under Changing Climate”. Organized by Department of Agronomy, College of Agriculture, GBPUAT-Pantnagar.

- Delivered lecture on “Importance of Bio-Energy sources for Sustainable Agricultural Development” 21 days Training, organized by Department of Pathology, College of Agriculture, GBPUAT-Pantnagar.
- Delivered lecture on “Role of Bio-Energy for Sustainable Rural Development “Workshop, organized by Department of Electrical Engineering, College of Agriculture, GBPUAT-Pantnagar.

G. Technology developed

1. Pant Interculture and Mulching Machine for Sugarcane.
2. Offset Rotavator.
3. ADI Rotavator Blades
4. Charring Machine

H. PG/Ph D studens guided- About 20 nos

I. MoU Signed

Sl. No.	Name of the Associated Organization	Date of MoU	Work Associated with MoU	Period of MoU/Date of Completion
1.	Centre of Excellence in Farm Machinery and Farm Machinery (CoEFM), Central Mechanical Engineering Research Institute (CMERI) , Ludhiana, Punjab	10-02-2010	Rotavator Refinements-Design Modifications and Development Design and Development of an Offset Rotavator for Orchards	Completed in 2019
2.	Petroleum Conservation and Research Agency, Ministry of Petroleum, New Delhi	14-7-2018	To save the conventional fuels on tractors using different types of agricultural machinery	Continued

J. Patent Filed

1. Patent filed (Application no. 201711026386 dated July 25, 2017)

1. Title: Pant Interculture and Mulching Machine for Sugarcane

2. Introduction

The total cultivated area under sugarcane in the country in 2012 was 1.3 million ha producing 98.4 million tons of cane (Office of Agricultural Economics, 2012). Weed control is most critical early in the season. Three or four months after planting, the appropriate weed management must proceed; otherwise the yield reduction could be reduced up to fifty percent (Suwannarak, 1983). That agree with the report of weeds can reduce sugarcane yields by competing for moisture, nutrients, and light during the growing season. (D. C. Odera,

2009). Weeds also utilize a part of nutrition and water resulting in a decrease in sugar content. Heavy weed infestations can also interfere with sugarcane harvest by adding unnecessary harvesting expenses (D. C. Odera, 2009). The optimum chemical management for weed control in sugarcane required 2-3 applications per crop by using the herbicide; however, the type of herbicide selection depends on the type of weed and there are limited kinds of herbicide appropriate for sugarcane (K Suwanarak, 1999). If it can contain the number of herbicide applications, it will reduce the volume of herbicide used in the country. Ideally, mechanical weed control should get preference over herbicidal control in sugarcane. At the present, mechanical weeding is still in limited use. The chisel type attached to the walking tractor has a low pulling power force and low efficiency, which is the weak point of this kind of tool. The optimum tool for weed control should be able to uproot the weeds and break the soil after operation. The spring tine is a suitable tool for weeding, as it uses 2, 3, 4, 5 or 9 spring tine units attached to a 100 hp tractor, but it is not convenient for working in sugarcane fields as the tractor runs over the sugarcane crop. There are many types of weeding tools that have been developed for local use. Overseas, most weeding tools were used for attaching to large tractors which have a working capacity of more than 50 ha/day. The present filed patent is based on the design and development of a machine for better productivity with the following objective.



Plate: Pant Interculture and Mulching Machine for Sugarcane

Advantages of the developed machine: The tractor operated intercultural and mulching machine has the following advantages over traditional methods as indicated below:

- The machine is simple in construction and easy to operate as a tractor drawn machine. The developed machine has a frame with six tines in the front part and two trapezoidal blades in the rear side.
- This machine is designed for two row intercultural operation for sugarcane planted in row to row spacing of 900 mm.
- The developed machine has an advantage of effective intercultural operation, saving time, fuel and labour costs. Therefore, we can reduce human drudgery and cost of cultivation.
- Shank was designed and fabricated from flat 50×5 mm wide flat. Four legs were designed and welded at the bottom of blade of identical size for holding the blades attached at the rear side of the frame. In each blade two shanks were welded for holding it. The two remaining shanks are 350mm apart from each other. Six sets of holes were drilled in each shank at 38 mm apart from each other so that we can facilitate the height of the blade as per the crop requirement.
- The machine has been designed with ergonomics considerations; therefore it is easy and safe to operate by any person as well as rural women.

2. Patent filed (Application no. 202011054126. Dated on 12th December 2020)

1. Title: Onion Digger with Cutter bar Topping unit

2. Introduction

The major constraints and drawbacks to enhance the productivity and to improve the quality of onion crop in India is due to lack of technological interventions and ascribed to peculiar pedoclimatic conditions of the areas and diffusion of hybrid varieties coming from other environments. One of the major constraints to increasing the area under onion crop and its productivity is due to the low level of mechanization.

Despite mechanization efforts of onion crop the topping and digging subsequent soil separation which is very labour intensive operation as received scant attention in the past. Topping of onion with a time bound period is an essential factor in deciding the storage life of onion. To increase the economic viability of farmers both the operations topping and digging along with soil separation unit at a time will reduce the cost of operation and saves the energy and increase the profitability comparatively with manual harvesting.

In India traditional method of harvesting is done manually by pulling out plants by hands if the soil is not hard, otherwise it could also be done by dug out the crop with the locally available (*khruva*) then field cured. After field curing topping, means the onion tops are wrenched up to its neck by hands or by using hand shears; leaves removed by hand shears is very prominent method. Besides it is necessary to complete topping and digging operation within a specified time for reducing harvesting losses and for higher storage life. However both the operations i.e. topping and digging of onions had done manually which is very time consuming, labour intensive, and it also results in a lot of biomechanical stresses of humans. Further the success of the manual method of harvesting operation depends on mainly two factors: (a) availability of a ready labor supply and (b) unfavorable weather conditions during the field-curing period of harvested crop. Besides this field curing sometimes is not possible because the weather during harvesting period in summer causes the outer scales of soft skinned onions would be blistered. Again filed curing is also not possible. Crop harvesting in rainy season, this requirements leads to number of problems the main one being how to deals with the onion tops.

For achieving better quality, higher yield and high economic income returns to the farmers topping and digging along with soil separation within a specified time is an essential factor. Therefore, many solutions were considered for harvesting operation within a specified period, it is essential to adopt mechanical harvesting methods. The mechanical onion harvesting methods includes cut the standing onion crop up to its neck after topping dug the topped onions and subsequently transfer the dugged onions to the soil separating unit for separation of soil from onion and finally eject the onions at rear side for field curing.

Timeliness is the key requirement in onion production. Introduction of harvesting machine to perform all the operations required to the market needs in a single operation reduces the time and cost of operation and avoid the excessive loses due to adverse climatic conditions during harvesting. Saving in time of harvesting may be utilized for post-harvest processes to increase the storage life of onions. Hence, mechanizing of complete harvesting in a single pass of operation of onion is one such area where there is a greater scope to increase its production and making it a profitable business venture for farmers. Thus it is necessary to develop a digger with cutter bar topping unit which can perform topping and digging along with soil separation to achieve complete harvesting in a single operation timely.



Plate 1. Developed onion digger with cutter bar topping unit

1. **Advantages of the developed machine:** The tractor operated Onion Digger with Cutter bar Topping unit machine has the following advantages over traditional methods as indicated below:
2. We claim having a design and developed of onion digger with cutter bar topping unit for clean harvesting of onion bulbs, which comprises components namely, topping unit, digging unit, soil separation unit, power transmission unit, windrowing unit and main frame. The mechanism when evaluated under field conditions in onion crop under different machine and soil parameters such as moisture content (9.5, 11.65, and 13.0%) (dry basis), rake angle (10, 15, 20°) and speed of operation (2.5, 3.25, 4.0 km h⁻¹) confirmed that it is capable of achieving maximum digging efficiency (93.76%), minimum damage percentage (6.44%) and topping efficiency (78.46%).
3. In the development of onion digger with cutter bar topping unit claim 1, we claim that the power transmission assembly. I.e. power transmission to the soil separation unit and to the topping unit of the invented machine. And also the invented machine has a unique features of provision for changing the different size of pulley in order to get different speed ratios.

4. In the onion digger with cutter bar topping unit of claim 1, we claim having a developed machine a topping unit have a unique features as it can vary longitudinally height according to the height of cut of onion tops.