A Study on Research Productivity of Agricultural Researchers

काशी हिन्दू विश्वविद्यालय BANARAS HINDU UNIVERSITY

THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF

Master of Science (Agriculture)

in

Extension Education

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Submitted by
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CERTIFICATE

To,

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Banaras Hindu University,
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Through: The Head, Department of Extension Education, Institute of Agricultural Sciences, B.H.U, Varanasi.

Dear Sir,

I have great pleasure in forwarding the thesis entitled **"A Study on Research Productivity of Agricultural Researcher"** submitted by **Shalu Srivastava**, **I.D. No. 20412EXE013, Enrollment No. 383024**in partial fulfillment of the requirements for the degree of **Master of Science (Agriculture)** in **AgriculturalExtension and Communication**, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (U.P.) and placing on record that she has completed the requisite residential requirements as contained in the statutes of the university.

I certify that the entire scheme of investigation presented herein was planned and carried out solely by the candidate under my guidance and supervision. The data presented in thesis, to the best of my knowledge and belief, are genuine and original.

Thanking you,

Yours faithfully,

Forwarded by **(B. Jirli)**

Supervisor

Head of Department

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Date: *(Shalu Srivastava)*

Place: *Varanasi*

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LIST OF SYNBOLS AND ABBREVIATIONS

% **:** percent

&	**:**	And
i.e.	**:**	That is
et.al.	**:**	And others
ARIIA	**:**	Atal Ranking of Institutions on Innovation Achievements
CSIR	**:**	Council of Scientific and Industrial Research
CIMMYT	**:**	International Maize and Wheat Improvement Center
DBT	**:**	Department of Biotechnology
DST	**:**	Department of Science and Technology
FRARI	**:**	Framework for Ranking Agricultural Research Institutes
FRAU	**:**	Framework for Ranking Agricultural Universities
GOI	**:**	Government of India
HEI	**:**	Higher Educational Institute
IRRI	**:**	International Rice Research Institute
MHRD	**:**	Ministry of Human Resource Development
MOOCS	**:**	Massive Open Online Course
NARES	**:**	National Agricultural Research and Extension System (s)
NIRF	**:**	National Institutional Ranking Framework
RP	**:**	Research Productivity

INTRODUCTION

Agriculture is an important sector which requires continuous development and innovation. This can be accomplished through high-quality agricultural research and development (R&D). Agricultural research in India has a fascinating history in terms of growth and development. Agriculture was included as one of the eighteen arts in the curricula of Nalanda and Takshila Universities. However, organized agricultural education began in the early twentieth century with the establishment of six agricultural colleges in Kanpur, Lylapur, Coimbatore, Nagpur, Pune, and Sabour (Bihar). There were only 17 agricultural colleges in the country in 1948, all of which were overseen by state departments of agriculture and animal husbandry.

The country's public agricultural research system, which is primarily governed by the Indian Council of Agricultural Research (ICAR) and State Agricultural Universities (SAUs), is one of the world's largest agricultural research systems. Over decades, ICAR has assumed the responsibilities of research, education, and extension education activities in various fields of agriculture and allied disciplines. On the recommendation of the Royal Commission on Agriculture, the ICAR was established as a registered society in 1929. The SAUs were established in response to the recommendations of the University Education Commission (1949) and the Second Education Commission (1964-1966).

Scientists employed by the public agricultural research system are primarily engaged in research, extension, and educational activities. The two major outputs of agricultural research are scientific publications and technologies. In terms of scientific publication, it is worth noting that scientists from the disciplines of Agriculture, Forestry, Fisheries, and Animal Husbandry make the greatest contribution (26.4 percent) to research publication in India. It has also been reported that scientists from SAUs and ICAR contributed 18.3 percent and 6.7 percent of the total number of research publications in India, respectively (Kumar, *et.al*. 2009).

1.1 What is Research

Research is a critical and unavoidable component of the production and advancement of current knowledge, as well as the generation of new knowledge and its application for advancement in a certain field of study. Agro-based economies, such as India, require highly productive (effective and efficient) scientific staff to maintain agriculture's growth and development, enhance farmers' socio-economic conditions, and ensure the country's food security.

The term "research" comes from the old French word "recerchier," which means "to search again and again." It literally means "to look for something again," and it signifies that the previous search was not exhaustive and complete in the sense that there is still room for improvement. The term "research" refers to a search for information. It's a scientific and methodical search for

relevant information on a given topic or location. Research is, in fact, a form of scientific examination.

The ancient Indian researcher were “Rishis”, who carried research and development activities for benefit of the society. The outputs were located in the from of literature. The documents are still available and the outcomes were the influence of the finding, on it solution.

According to the Advanced Learner's Dictionary of Current English "A meticulous investigation or inquiry, notably through quest for new facts in any discipline of study. According to Redman and Mory, is "a systematic effort to gather new knowledge." Some people see research as a movement, one that takes us from the known to the unknown. It is, in fact, a journey of discovery.

Kerlinger (1973) defined research as a systematic control, empirical and critical investigation of hypothetical prepositions about the presumed relation among natural phenomena.

Research, according to Kpolovie (2016; and 2010), is the logical, systematic, and objective collection, analysis, synthesis, evaluation, and recording of accurate and controlled observations to aid informed generalizations, the establishment of principles and theories that foster description, explanation, prediction, and control of natural occurrences to meet man's needs.

Creswell (2002) noted that quantitative research is the process of collecting, analyzing, interpreting, and writing the results of a study, while qualitative research is the approach to data collection, analysis, and report writing differing from the traditional, quantitative approaches.

1.2 What is Productivity

Productivity is a widely used concept that is frequently misunderstood. It might imply different things to different individuals. For example, financial experts may look at productivity through the lens of revenue, costs, and profit, whereas engineers look at productivity from a technical standpoint, such as plant and equipment operational capability. Productivity is an average measure of the efficiency of production.

Productivity can be defined as a ratio of a volume measure of output to a volume measure of inputs in general terms (OECD, 2001)

Productivity refers to the efficiency with which goods and services are produced, as well as the value added by the manufacturing process.

The term "scientific productivity" relates to how productive scientists are in their research. In other words, the term refers to the amount of output scientists create during a set period of time, as opposed to the inputs used in the research.

1.3 Research Productivity

The terms ‘research productivity' and 'productivity' are literally formed from the words ‘research' and 'productivity.' While research is concerned with the cautious, observant, and watchful study

or analysis of phenomena, particularly in order to search for and discover new knowledge, information, and facts, productivity is concerned with the production or output produced within a specific time frame.

In the context of higher education, research productivity is an index that best represents the publication of papers in professional journals, whether as journal articles, book chapters, or books, as well as the presentation of research papers in conference proceedings that are invariably cited and acknowledged by other scientists' publications in globally accessible papers and books.

Research productivity, according to Creswell (2008) and Tafreshi, *et.al*. (2013), includes writing a book or book chapter, gathering and analyzing original evidence, working with students on dissertations and class projects, obtaining research grants, carrying out editorial duties, obtaining patents and licenses, writing monographs, developing experimental designs, and producing works of art. A research project entails more than just gathering data; it also necessitates preparing ahead of time to determine which sources to consult, what types of notes to take, and how to put it all together into an effective document that can be disseminated globally.

"No nation or state can advance above its research volume." The industrialized countries achieved and maintain their enviable status by investing much in research" (Kpolovie, 2015). The ability of universities to take the lead in knowledge discovery processes is critical to a nation's or continent's industrialization. Universities are tasked with generation of new ideas and adapting old ones in order to keep up with shifting life trends. Universities are seen as a modern entrepreneur engine and information generator through research (Dorgu & Kpolovie, 2019)

Academicians seeking to maintain their academic status and university administration seeking to ensure a smooth and progressive climate for academic staff are both interested in determining the research productivity of university faculty members (Dorgu & Kpolovie, 2019). Academic personnel's productivity is measured in terms of how productive they are at research in the academic setting.

Research productivity also refers to novel ideas and thoughts that, following theoretical and applied investigations, result in articles being published in prestigious journals, patent registration, or documentation (Hedjazi and Behravan, 2011).

Reporting and publishing research findings in (inter)national journals, conference presentations, patent registration, impact factors, and reviews are all examples of research productivity, according to Zainab (1999).

Zamaripa (1993) tried to figure out which metrics should be used to evaluate research production. The number of publications in peer-reviewed journals, the number of grants received to the unit each year, and the number of papers presented at national scientific gatherings were the most relevant indicators.

In a study, Paul (2012) defined research productivity as a composite measure of respondents' research output over a seven-year period as indicated by research activities, products developed,

scientific publications contributed, teaching activities, extension activities undertaken, awards received, and recognitions earned.

Research productivity is the totality of research performed by academics in universities and related contents within a given time period (Print and Hattie, 1997).

Publication is probably the most important metric of research productivity. Publication is crucial to scholarly activity and recognition, as it is widely viewed as the principal source of esteem, as a condition for individual promotion, as evidence of institutional excellence, and as a sine qua non for securing competitive research funds. Indeed, it may be argued that research only becomes a "work" in the academic world when it is published as a paper or its equivalent, and that the most fundamental social processes of science are the communication and sharing of research findings and results (Fox 1983).

Research productivity consists of a variety of outputs: collections, inventions, databases, patents, techniques, books, and published papers. Published papers, since they are construed as an indicator of personal merit, represent an important aspect of research productivity (Keith et al., 2002; Ynalvez, 2006).

1.4 Operational Definition

Individual Research Productivity is defined as a comprehensive measure of an agricultural researcher's number of publication, intellectual property rights secured, projects completed, e-content developed and consultancy delivered during the course of his professional career.

1.5 Importance of Research Productivity

In India and other developing nations, research is mostly sponsored by the government, and the development of desired outputs and outcomes is typically contingent on effective resource management, among other factors. Governments and academics, on the other hand, have been dealing with how to assess the efficiency and efficacy of research institutions. This is due to the fact that research processes, as well as research governance metrics, are diverse, complicated, and multi-layered. History, mandate, leadership, and other factors have all influenced the governance process and work culture of each research center. Any research outcome cannot be quantitatively predicted with any degree of accuracy, as this would negate the purpose of the study. To add to the complication, the indicators of assessing research efficiency are influenced by the sort of research conducted by an organization, its core clientele, the time it takes to complete the research output, the life duration of the research product's value, and other factors. The construction of a ranking and rating system in the Higher Education (HE) sector relies heavily based on research productivity (RP). Despite the numerous efforts to invigorate the research culture among academic personnel, there are still barriers and opposition to conducting research. Scientists in research institutes, on the other hand, do a variety of duties like as research, teaching, training, demonstrations, and other extension-related activities that are difficult to quantify and vary widely across institutions, disciplines, and individuals. The productivity of employees in achieving organizational goals determines the success of any

organization. That will only be achievable once individual output has been maximized. The study of faculty research output is justified since it affects individual development and reputation in academia, as well as departmental and institutional status (Creamer 1998). Faculty performance evaluations, research funding awards, promotion and compensation choices all consider publication history. The slogan "publish or perish" sums up the significance of research productivity in academic careers. As a result, knowing a scientist's research output aids policymakers in determining a scientist's strengths and weaknesses, allocating resources based on performance, and formulating suitable Programmes and policies. As a result, policy interventions that focus on maximizing the efficiency and effectiveness of each and every scientist in agriculture, as well as taking necessary actions to incentivize individuals (scientists) to strive for excellence and contribute more to agriculture research, are made possible.

1.6 Ranking of University

The Government of India (GoI) has taken steps in recent years to evaluate the performance of research and higher education institutions using quantitative measures for inputs and outputs. The Ministry of Education's (erstwhile, Human Resources Development - MHRD) National Institutional Ranking Framework (NIRF) for academic institutions, the Principal Scientific Adviser, Prime Minister's Office, GoI's Evaluation of Science Indicators of Public Funded R&D Institutions based on the Framework developed by NITI Aayog, the National S&T Survey conducted by the Department of Science and Technology (DST), Ministry of Science and Technology (MoST), and the Institutional Ranking framework for Agricultural Research Organizations of ICAR are latest examples.

Improving research and output can serve as a benchmark for institutions to demonstrate their international standing. Focus on improving the quality of research, accessibility, and citability of your faculty's contributions, which can be used to calculate the combined Research metrics. Back it up with intellectual property rights (IPR), patents, projects, professional practice, and executive development Programmes that maximize the impact of institutional research holistically.

1.6.1 Ranking Frameworks (RF) Used by GoI and its Agencies

Any of the approaches used to measure the performance of academic and research institutions based on a set of criteria/indicators is referred to as a ranking framework. Each indicator is assigned a score, which is then tallied and ranked against other institutions. The rating serves as an annual report card to stakeholders on what an institution has accomplished in the previous year, based on a set of performance metrics. The government and funding agencies have taken a keen interest in RF in recent years because it allows them to quickly assess the performance of institutions, compare them, create healthy competition, and encourage the adoption of best practices. The popularity of indicator-based RF stems from its ease of use and transparency.

The following table 1.1 summarizes the existing Ranking Frameworks operated by the Government of India and its agencies as of 2020.

Table 1.1 Ranking frameworks and their parameters used by GoI and its agencies

NAME	INDICATORS ADOPTED FOR RANKING	YEAR OF START	DEVELOPED BY	FREQUENCY
1. National Institutional Ranking Framework (NIRF)	• Research Productivity and IPRs (40%), • Teaching-learning and resources (30%), • Outreach & inclusivity (15%), • Perception (10%) • Graduation outcomes (5%)	2016	MHRD	ANNUAL
2. ICAR-Framework for Ranking Agricultural Universities (FRAU)	• Teaching resource and outcome (30%) • Research Productivity (30%) • Extension and outreach (30%) • Peer recognition (10%)	2017	NAAS	ANNUAL
3. ICAR-Framework for Ranking Agricultural Research Institutes (ICAR-FRARI)	• Output and outcome of research (38%) • Institutional performance (30%) • Impact of research (12%) • Recognition and awards (10%) • Quality of governance measured (5%) • Vision and future readiness of institute (5%)	2019	NAAS	ANNUAL
4. Atal Ranking of Institutions on Innovation Achievements (ARIIA) For technical HEI	• Developing an Innovative and Entrepreneurial Mind-setthrough Series of Activities (4%) • Teaching and Learning: Academic Programmes related toInnovation &	2019	MHRD	ANNUAL

	Entrepreneurship (I & E) & IPR offered by the HEI (6%) • Dedicated Infrastructure & Facilities to Promote Innovation&Entrepreneurship at HEI (13%) • Generation of Innovations/ ideas with the support of HEI and recognition received (13%) • Ventures Established with the support of the HEI &Recognitions Received (12%) • Angel &VC Fund/Investment Mobilized to Support Innovation& Startups Incubated at HEI (5%) • Promotion of Collaboration for & Co-Creation of I & E Initiatives (5%) • Intellectual Property (IP), Generation and Commercialization (19%) • Budget - Annual Expenditure Spent towards I&E Activities and Revenue from I&E (14%) • Participation of HEI in I & E Initiative of MOE (9%)			

Table 1.1 showed the importance of research productivity for the visibility of an institution as well as for the individual. Research productivity and outcomes had highest and equal weightage among all the given indicators. Weightage for research productivity has been assigned as 40 percent, 38 percent, 30 percent, and 19 percent in NIRF, ICAR-FRARI, FRAU & FRIIA respectively.

1.7 Indicators of Research Productivity

The indicators of research productivity included:

1.7.1 Publication

According to Liu *et.al* (2005) research publication is a channel through which the academic librarians give their contribution to the existing body of knowledge through research papers. Books, articles in respected journals, technical reports, conference papers and proceedings, book chapter(s), training and patent rights, and student supervision are all examples of these channels. In other words, these publications are used to rate academic institutions and are utilized as indices of academic research productivity.

Number of publications is the well-known research productivity indicator. Publications are tangibleoutputs of research in professional journals, conference proceedings, writing books or chaptersin books, working with post-graduate students on dissertations, and class projects, carrying outeditorial duties, obtaining patents and licenses, writing monographs, developing experimentaldesigns, producing works of an artistic or creative nature and engaging in public debate and commentaries (Iqbal and Mahmood, 2011).

The types of publications used to assess research productivity vary by discipline. Here it includes research papers, popular articles, book, book chapters, technical bulletin, features stories, and manuals published by the agricultural researcher in his/her professional career.

The publication includes the following items:

1.7.1.1 Research Paper

A research paper is a popular academic writing assignment. Students and academics must locate knowledge on a topic (i.e., conduct research), take a viewpoint on the topic, and present support (or proof) for that position in a structured report for research papers.Or an academic piece that provides the results of original research or an appraisal of research undertaken by others is also referred to as a research paper. Before being accepted for publishing in an academic journal, most scientific publications must go through a peer review procedure**.**

1.7.1.2 Popular Articles

Articles that are widely read (Magazines) Are frequently published for a general readership by journalists or professional authors. Use terminology that is easily comprehended by a wide range of people.

1.7.1.3 Book

Book is wholly or completely written by one or small numbers of co-author.

1.7.1.4 Book Chapter

Each chapter of a book is the work of a different author or group of authors, while the editor may bear some responsibility for maintaining style and content uniformity.

1.7.1.5 Technical Bulletin

The purpose of the technical bulletin is to raise awareness of valuable inventions and to instruct beneficiaries on how to use them. Provides operational recommendations for a flawless operation that demonstrates that claim benefits can be obtained. This is also a type of advertising material for those who use technology.

1.7.1.6 Features Story

A feature story is a factual and soft news story on a person, event, or aspect of a large event that is more personal in nature. Feature stories are most commonly found in newspapers, magazines, and other print publications, although they are also frequently seen on television, radio, and podcasts.

1.7.1.7 Manuals

A manual is a document that serves as a reference book for an activity and provides instructions or directions on how to conduct it.

1.7.2 E-Contents

E-content is the various types of content created and delivered via electronic media. Any digitized content that can help with the learning process and/or outcome.It can be used by a wide range of students with a variety of needs, backgrounds, and prior experience and skill levels. It can be easily and quickly shared and transmitted to an unlimited number of users all over the world. The use of well-designed and developed e-content benefits teachers, students, and others.

1.7.2.1 Video Module and Text Module

Modules which are using video and text to deliver the e-content to the audience for better understanding and quick learning.

1.7.2.2 MOOCs

MOOCs stand for Massive Open OnlineCoursewith open enrollment. There are no admission restrictions, and anyone with an internet connection from anywhere in the world is welcome to participate.

1.7.2.3 Blogs

A blog is a frequently maintained website or web page written in an informal or conversational style, often run by an individual or small group.

1.7.2.4 You-Tube

YouTube is a popular video-sharing website that allows registered users to upload and share videos with anyone who has access to the site. These videos can also be embedded on other

websites and shared. YouTube was founded in 2005 by former PayPal employees and was purchased by Google in 2006.

1.7.3 Intellectual Property Rights

IPRs (Intellectual Property Rights) are legal rights that protect creations and/or inventions made as a result of intellectual activity in the fields of industry, science, literature, and the arts. Patents, copyrights, trademarks, and trade secrets are the most common IPRs.

1.7.3.1 Patent

A patent protects an invention from being created, sold, or copied without permission by a third party. Patents are the most common type of IPR that people think of when they think of IPR protection. A patent holder has the right to commercialize his or her patent or to grant a license to the invention to any third party who follows mutually agreed-upon guidelines.

1.7.3.2 Copyright

For ideas, there is no copyright protection. It only includes "tangible" forms of art and creation, such as music, art, architectural drawings, and software coding.

Any musical, literary, literary, dramatic, or architectural work created by the author is vested with the copyright holder's rights to commercialize or reproduce it. Copyright is one of the most important types of intellectual property.

1.7.3.3 Trademark

A trademark is a well-known sort of intellectual property protection. A trademark is a unique indication that allows end-users to quickly identify the specific goods or services that a company provides. A trademark might be a phrase, a sentence, a symbol, a fragrance, a sound, or a color scheme. A trademark, unlike a patent, can protect a group or class of items or services rather than a single product or technique.

1.7.3.4 Geographical Indication

A geographical indication (GI) is a label that is applied to products that have a specific geographical origin and that have qualities or a reputation that are due to that origin. A sign must identify a product as coming from a specific location in order to function as a GI.

1.7.4 Research Projects

A research project is a scientific undertaking that aims to answer specific research question. Research projects that are institutionally /nationally/ internationally /collaborative funded.

1.7.4.1 Internally (institutionally) Funded Research Projects

Research projects that are financially supported by the institute or an organization in which the researcher is working, also known as institutionally funded research projects.

1.7.4.2 Externally Funded Research Projects

Research projects that are financially supported by the national funding agencies like DST & DBT etc. within national territory.

1.7.4.3 Internationally Funded Research Projects

Research projects that are financially supported by the international agencies or international organization e.g., IRRI, CIMMYT, etc.

1.7.4.4 Collaborative Research Projects

Research projects that are done by collaborating certain institute or an organization. It can be institutionally/externally/internationally research projects collaborating with the institute.

1.7.5 Consultancy

Consultancy can be defined as the service being provided by the professional advisor. It provides instant solution, delivery speed, required knowledge, etc. to its stakeholders. The consultancy may give to the central governmental agencies, state governmental agencies, non-governmental agencies, international agencies by the expert or professional advisor.

1.8 Factors Influencing Research Productivity

There are mainly four factors that influencing the research productivity of agricultural researchers:

1.8.1 Motivational Factors

The factors of motivations are:

1.8.1.1 Promotion

At universities around the world, particularly at research universities, research output is widely used as one of the most important measures for appraisal and promotion purposes.Many studies have looked into the possibility that individual scientific productivity has a life cycle, with productivity increasing when the scientist is young, peaking at/before middle age, and then declining (Levin and Stephan, 1991)

Tien and Blackburn (1996), looked at how a ranking system affected academics' attitudes and behaviors toward research and research productivity and stated that promotion has the greatest motivating effect when it is contingent on performance". As a result, publications are primarily

used as a criterion for promotion and as the foundation for recognizing academic excellence at universities around the world (Man et al., 2004). Because of this promotion criterion, some academics remain at the same rank for an extended period of time (i.e., they do not receive any promotions) because they do not publish (Sulo *et. al*., 2012).

1.8.1.2 Creativity and Curiosity

The ability to formulate new and novel perspectives or ideas in order to fill an information gap or solve a problem is referred to as creativity (Schutte*et.al*, 2020). And curiosity is a strong desire to learn new things and understand how to work. Both creativity and curiosity are needed to do the work more efficiently and make it productive.

1.8.1.3 Job Satisfaction

Job satisfaction is an attitudinal construct in organizational psychology that refers to various aspects of work. It denotes a pleasant emotional state that arises from a positive evaluation of one's job when one achieves some expected outcomes at work, such as good pay, promotion, or an interesting working environment (Locke, 1969).
Oshagbemi (2003) stated job satisfaction as an affective reaction to a job that results from the comparison of actual outcomes with the objectives. It is predicted that a highly satisfied employee will perform well at work.

1.8.1.4 Teaching Quality

Teaching quality encompasses not only a teacher's credentials, but also the perspective they bring to the classroom, the instructional strategies they employ, and the school and community's overall organization. This multi-layered approach is supported by research, including the previously discussed study by Heck (2007).

1.8.1.5 Peer Recognition

A genuine expression of commendation and appreciation between coworkers is peer recognition. Everyone seeks validation and this validation helps them to perform well in an organization, enhancing their productivity.

1.8.2Institutional/OrganizationalFactors

1.8.2.1 Research Climate

Research has reflected the importance of a research climate within everyacademic department and the entire university.Early career academics benefit from a positive research climate, and if one prevails, junior and less-skilled academics can learn from senior academics.
Junior academics' research skills and research self-efficacy will improve if they receive regular support from senior colleagues.Academics will be more motivated to research if everyone has the opportunity to express ideas and receive advice, and if their ideas are respected by others.

1.8.2.2 Peer Support

Academic support is very important nowadays in the demanding and competitive environment of higher education. Drew & Klopper, 2014 stated that peer support is similar to the practice of peer reviewing teaching in order to share teaching ideas and improve academics' teaching abilities.Peer support in research is becoming increasingly popular because it improves academics' research skills, knowledge, and capability. It's a good practice for junior and less-experienced researchers.

Hunter and Kuh (1987) defined peer support as research mentoring between a mentor and a mentee. A mentor is an important source of stimulation because novice researchers benefit greatly from his or her guidance in producing more results.

1.8.2.3 Teaching Load

It is claimed that teaching load is negatively correlated with research time, resulting in low research productivity. According to Levitan and Ray (1992) the amount of time that academics can spend on research is the most important factor in research productivity. According to(Kaya & Weber, 2003) research, academics who spend 50% of their academic time on research activities have significantly higher productivity than those who spend less than 50% of their academic time on research activities.As a result, if academics had fewer teaching responsibilities and more time for research, they would be able to devote more time to research and publish more papers.According to Blackburn & Lawrence (1995), as academics' teaching loads increase, their research loads and productivity decrease.

1.8.2.4 Educational Resources

Presence of educational resources in physical form like books, articles, etc. is very important to for a researcher to conduct a research, lack of these resources may hinder his/her research productivity. Scholarly resources such as academic books and scientific journals, particularly high-ranking international journals, are critical in motivating academics to conduct research and resulting in high research productivity (Lertputtarak, 2008).

1.8.2.5 Research Funding/ Financial Support

Finance in general, and specifically research funding, is a key indicator of research productivity (Man *et al*., 2004).Sulo *et al*. (2012) discovered a positive link between the amount of research funding received by academics and the number of research outputs they produce.The fund is critical for disciplines like science and technology and medicine that require money to conduct experiments. Even small changes in research funding can cause academics' research productivity to fluctuate, while other factors remain constant (Man et al., 2004).

1.8.2.6 Research lab Equipment and Devices

Prescence of lab equipment and devices in an institute/department or an organization is important to a researcher for doing research. lack of lab resources may affect the individual research productivity.

1.8.2.7 Proficiency of a Foreign Language

Proficiency in a foreign language, particularly English, is thought to be important for academics' research productivity. English has long been a crucial tool for research and international publications in the scientific and technological fields. Being fluent in this language not only makes it easier for academic researchers to read English-language publications, but it also allows them to publish their findings in international journals. Of course, research publications in other popular languages, such as French, German, Japanese, or Chinese, exist, but English publications continue to dominate the world of science.Hanauer and Englander (2013) found that a majority of scientists in non-English countries had difficulty using English in their scientific writing and publications as a result of their mixedmethod research. This reflects the fact that most English-speaking countries have the highest rate of international publications, whereas Asian countries have some of the lowest rates of international publications (Man, *et.al.*2004).

1.8.3 Behavioural Factors

TheBehavioural factors are interconnected with motivational factors. Behavioural factors consist of discussion with colleagues, seeking advice from senior, research collaboration, review manuscripts, etc.
According to Nguyen (2015) in his study on Factors Influencing the Research Productivity of Academics at the Research-Oriented University in Vietnam found that Behavioural factors plays important role in research productivity The quantitative studies discovered links between research habits publishing outputs: the total number of books that have been published, Research collaboration, postgraduate education, and outputs were all positively related.

1.9 Statement of Problem

The need to improve the effectiveness of the public agricultural research system has become more apparent in recent years as the country's socioeconomic and technological landscape has changed. Agricultural scientists must address challenges such as sustainability, equity, environmental protection, climate change, and other issues in addition to growing agricultural productivity. The complicated nature of agricultural research necessitates highly motivated experts working in a research-friendly setting. Since agricultural research has become increasingly multidisciplinary, teamwork and communication skills have been critical to scientific success.Concerns have been raised about the decline in academic and research standards at research institutes in general, and agricultural institutions in particular. Agriculture's frightening growth rate, combined with other challenges, has prompted policymakers to raise the standard of agricultural research. As a result, it's critical to know how capable the scientists working in the public agricultural research system are of meeting these ever-increasing obstacles.

Furthermore, it is critical to comprehend the factors that promote individual and organizational efficiency and effectiveness. In terms of their contribution to agricultural research and overall achievement, scientists differ significantly. According to Rajeswari *et al* (2012)The most prevalent issues faced by Indian agricultural scientists, are that research aptitude in students is not properly cultivated during their course of study, and universities have long abandoned the emphasis on research and have become simple teaching centers. According to Muia *et al* (2016), how the knowledge gained through these research activities is handled or disseminated to potential users is unclear and, in some situations, haphazard. Meanwhile, Hedjazi and Behravan (2011) observed a lack of interdisciplinary collaboration, communication, and cooperation among faculty members. On the other hand, faculty members carry out research projects on their own time and according to their interests, which is a primary reason of low research production among university faculty members. One of the significant problems in the ICAR system is a lack of human resources, which places an additional strain on agricultural scientists by requiring them to participate in teaching, research, and extension activities, as well as some administrative tasks.

So, in order to explore the determinants and characteristics associated with research productivity the present study will entitled as "A Study on Research Productivity of Agricultural Researchers" has been undertaken with following research questions.

1. What are the indicators associated with the research productivity?
2. How to measure the research productivity of agricultural researchers?
3. What factors are influencing the research productivity?

1.10 Objectives

The study titled "A study on Research Productivity of Agricultural Researchers" was done with the following objectives to obtain appropriate answers to all research questions:

1. To study the profile of agricultural researchers
2. To study the indicators associated with research productivity of agricultural researchers
3. To study the factors influencing the research productivity of agricultural researchers

1.11 Scope of the Study

The result of the study will give us an idea about the level of research productivity of the agricultural researchers including both scientists and professors. The inferences drawn might be used to support the research system and services for the promotion of quality research. The result from analysis is expected to be helpful for researchers and research system. Outcomes of the study may be fruitful in designing research and extension research system for promoting the research and will fill the gap present in the research system.

1.12 Limitation of Study

1.12.1 The existing literature on research productivity of agricultural researchers are very limited.

1.12.2 Due to time limitation, large number of respondents were not covered in short period of time.

1.12.3 The study was only limited to agricultural scientists and professors.

Hence, the result of the study rare interpreted with these limitations in view and care should be taken while generalizing those conclusions.

REVIEW OF LITERATURE

Past knowledge is essential in providing sound fundamental understanding of the situation under investigation. In addition, the review of studies provides insights about missing research gaps and up to date status of researcher to collect relevant data, analysis and interpret the same so as to draw meaningful interpretations. So, the possible efforts were made to collect the relevant research studies and their findings in the area of research productivity and made all possible efforts to make reviews relevant to the objectives taken under present study. Keeping in view the objectives of the study, review is presented under the fallowing headings

1. Profile of agricultural researchers
2. Indicators associated with research productivity of agricultural researchers
3. Factors influencing the research productivity of agricultural researchers

2.1 Profile of Agricultural Researchers

2.1.1 Age

Zainab (1999)in his review identified personal, academic, and departmental correlations as factors of individual research production. Gender, age, family background, and personality traits are some of the personal correlations studied. Academic correlates include rank and tenure, qualifications, and experience, while departmental correlates include cumulative advantage, reinforcement, the graduate program, institutional prestige, time allocated for research, department size, discipline differences, colleagues, leadership, and departmental/faculty management.

Turner and Mairesse (2003)investigated the differences in individual production among French physicists and found that output grew between the first and third age cohorts, before 50, and then declined after 51 years. More specifically, scientists aged 39 to 45 years published 0.26 papers per year more than those aged 26 to 38, and scientists aged 46 to 50 years published 0.36 papers more than the youngest group. Researchers in their fifties and sixties published only 0.13 papers more than those in their twenties and thirties.

Hedjazi and Behravan (2011) Studied on A study of factors influencing research productivity of agriculture faculty members in Iran and found thattwo variables in a demographic factorsthat are , academic rank and age , among individual factor , three variables, that is , working habits, creativity ,autonomy and commitment, and among institutional factors four variables that is , network of communication with colleagues, resources availability , management and clear objectives of research were important predictors for agricultural faculty members.

2.1.2 Gender

Fox (2005)in his study of 1215 tenured and tenure-track faculty in the United States found that the overall difference between women's and men's productivity could be attributed to gender disparity at both extremities of production. In the three years leading up to the poll, he discovered that women researchers were nearly twice as likely as their male counterparts to have published zero or one paper (women 18.8 percent, men 10.5 percent). Men were twice as likely as women to be on the other end of the spectrum, with 20 or more publications published (men 15.8 percent, women 8.4 percent).Both men and women's output were skewed considerably in their favor. Half (50.8%) of the entire number of papers published by women could be attributed to 14.5 percent of women, while 19.8 percent of males accounted for half (49.3%) of the total number of papers published by male academics in the study.

Abramo *et.al.* (2008) in his study on Gender differences in research productivity: A bibliometric analysis of the Italian academic system stated that Men and women have significantly different productivity levels. However, the differences are smaller than reported in a large portion of the literature, confirming an ongoing trend of decline, and are also seen as more noticeable for quantitative performance indicators than other indicators.

Stack (2014) studied on Gender, Children and Research Productivity and found that women continue to publish significantly less than men. Second, PhDs with children under the age of 11 have higher productivity. Third, women with young children have low productivity. Fourth, while gender is unrelated to productivity in the social sciences, the field with the highest proportion of female PhDs, women in the social sciences who have young children have lower productivity. Location in a research university and effort were the most important predictors of productivity (hours worked). The full model accounts for 39% of the variation in productivity. Children are not a strong predictor of productivity, but the influence they do have is gendered

2.1.3 Academic rank

Boakye-Dankwah (1992) investigated the factors influencing the research productivity of 215 agricultural education academics at 49 American universities.They looked at six dependent variables: refereed articles, research projects, books, book chapters, conference presentations, and research proposals. These research outputs were tallied over a three-year period. The data analysis consisted solely of descriptive statistics. According to the findings, research productivity was positively correlated with academic rank. According to the findings, assistant professors were motivated to conduct research because of promotion and tenure, whereas associate professors preferred salary increases and promotion.

Jones and Preusz (1993)found in an attempt to investigate the attitudinal components of individual faculty production that participation in cooperative research initiatives had a significant link with research productivity. It was also discovered that the amount of time spent connecting with coworkers for scientific talks was linked to research output. According to the

authors, personal interactions with coworkers allowed for informal exchange of ideas and participation in collaborative research endeavors.

Carayol and Matt (2006) combined individual and collective factors to explain individual research production. They store information regarding the type of employment employed (full-time research versus teach-and-research positions) and whether mid-career promotion is gained at the individual level, in addition to age (from Researcher to Director of Research, and from Assistant Professor to Full Professor). The age of the colleagues, their positions, the number of non-permanent researchers, non-researchers, and funding variables are among the collective variables. Their research is based on a one-of-a-kind database that spans more than a decade and includes more than eleven hundred permanent researchers working in more than eighty scientific labs at the Louis Pasteur University (ULP) in Strasbourg.

Shin and Cummings (2010) developed an analytical model based on the review of the literature, they theorized that research productivity is predicted by faculty research preference, time on research and teaching, collaboration with colleagues, faculty academic training, academic rank, years since PhD, demographics (gender, and living with children), and their affiliated disciplines affect individual research performance. This approach is the one used in faculty hiring and evaluation for promotion in many universities in Korea, and similar criteria are applied in evaluating institutional performance by the Korean Research Foundation.

KN Ravi and Jirli (2020) study entitled Research Productivity of Agricultural Scientists in India: Present Status and Way Forward stated that the expanding agricultural distress in India, as well as different climate-related issues, necessitate productive and potential agricultural research and development, which can be accomplished by a productive scientific community. Understanding and measuring researchProductivity is a critical step in providing a foundation for Scientists, Academicians, and Students to formulate acceptable research strategies for increasing scientific productivity.

Alibeygi (2022) studied on An Analysis of the Research Productivity of Faculty Members: The Case of Razi University in Iran and found that the mean faculty research productivity score of Ph.D. faculty members was 1.63. The median value (2.8) revealed that half of the faculties have research score yearly lower than 2.8. and the remaining half have greater than this value and according to the regression analysis, three variables explained 31% of the variance in research productivity. Academic rank, age, and number of children were among the variables considered.

2.2Indicators Associated with Research Productivity of Agricultural Researchers

Lotka (1926) was the first to try to quantify research production in an article frequency distribution of scientific productivity, and the result of his research is an inverse-square law of productivity. 1/n2 is proportionate to the number of people who produce n papers. For every 100 authors who only publish one paper within a certain time period, there are 25 who publish two, 11 who publish three, and so on. To put it another way, allowing the results to accumulate results in an integration that yields an inverse first-power law for the number of people who produce more than n papers; thus, about one out of every five authors produces five or more papers, and one out of every ten produces at least ten papers.

Vijayaraghavan (1983)while researching the perceptions of junior agricultural scientists in the I.C.A.R, discovered that the majority of respondents thought their performance in paper publication, research project formulation, teaching, and extension activities was good. In comparison, they reported that their performance in research project completion and participation in professional get-togethers was below average.

Singh (1989)conducted a multi-dimensional study of ICAR women scientists, and found that respondents rated their performance as good on various dimensions such as teaching, research project completion, administration, participation in professional gatherings, research project formulation, paper publication, and extension.

Ramsden and Moses (1992)used two indicators of individual research performance in their study. An index of research productivity (IP) was referred as the five-year sum of (3 X the number of single or multi-author books) + (the number of papers published in refereed journals) + (the number of edited books) + (the number of chapters in refereed books). And an index of research activity (IA) was measured from answers to a question about whether or not the respondent had undertaken every series of academic activities during the previous two years.

Hu and Gill (2000) investigated why certain academics are more productive in academic research than others. Over a five-year period, the authors counted the number of refereed journal articles published by academics in the subject of information systems. The effect of 13 independent variables on research productivity was determined using regression analysis. Only time spent on research and PhD programs was found to be significantly associated with research production. The findings specifically revealed that if academics spent little time on research while teaching more than 11 hours per week, their research productivity would suffer.

Skonik (2000) reported on an Ontario Council on University Affairs survey of academic work in which it was discovered that the most prolific group in terms of publishing worked an average of 51 hours per week. On average, 24 hours of this total working hour were spent on research and 20 hours on teaching. Staff with the lowest publishing outputs, on the other hand, reported an

average of 43 working hours per week, comprising 12 hours of research and 24 hours of teaching.

Fairweather (2002)expressed that the number of refereed publications in the previous two years is the most important indicator of research productivity that meets these criteria, where "publication" includes articles in refereed journals, published reviews of books, articles, or creative works, books, textbooks, monographs, and chapters in edited volumes.

Kotrlik *et.al* (2002) study entitledFactors Associated with Research Productivity of Agricultural Education Faculty, based on the regression analysis three variables explained 50% of the variance in research productivity. Those variables were the number of doctorate students advised to completion in the previous five years, faculty members' evaluations of their research confidence, and the number of graduate assistant hours assigned to the faculty member. Percentage of a faculty member's time spent on research, salary, organizational culture and support for research, age, gender, rank, number of master's students advised to completion in the previous five years, and number of years they had held a tenure track position were the variables that did not explain a significant proportion of the variance.

Charles Jeeva *et al.* (2008) studied 72 researchers from two fisheries research institutions and discovered that each researcher had produced 4.88 technologies, 1.65 book chapters, 3.08 scientific articles in foreign journals, 16.75 articles in Indian journals, 6.68 popular articles, 3.74 technical bulletins/ booklets/ folders/ pamphlets etc., 10.4 presentations in seminars/ workshops/ conferences etc., and a total of 42.31 articles in the field of fisheries research.

Wickremasinghe S.I. (2008) in his study on Evaluating research productivity: a case study of the rice scientists in India and Sri Lanka found that the mean research productivity of Indian rice scientists was found to be significantly higher (p1) than that of Sri Lankan rice scientists. The following are some of the possible explanations for this disparity that emerged from this study. a) Research publication is the most important criterion for promotion and career development of Indian scientists; b) Many Indian journals are available for rice research publication; and c) The majority of Indian rice scientists hold PhD degrees, which is required for conducting independent research. The study also revealed policy implications for training Sri Lankan rice scientists up to the PhD level in order to increase research productivity.

Sharma (2009) did a bibliometric study using a total of 2603 research articles published by scientists at the Central Potato Research Institute (CPRI) between 1991 and 2007. The articles were acquired by reading CPRI annual reports and the Journal of the Indian Potato Association. According to the findings, the majority of scientists (82.67 percent) prefer to publish research papers in joint authorship with a 0.82 degree of collaboration. The study also reveals that there is no consistent pattern of literature growth, but that factors such as fund availability, scientist recruitment and availability, and years with special events such as conferences and seminars have an impact on scientists' scientific productivity during the time period under consideration.

Hedjazi and Behravan (2011) expressed that research productivity refers to innovative thoughts and ideas which, after theoretical and applied studies, lead to publication of articles in leading journals, patent registration or documentation in their study. In other terms, any field of knowledge which puts forth a new idea to the world and records it, possesses research.

Maharana *et.al.* (2011) studied on Research Productivity of Agricultural Scientists of Central Rice Research Institute(CRRI), Cuttack: A Study and stated that citations from 586 papers collected from the Annual Reports of CRRI, Cuttack from 1996 to 2009 are included in the study. This paper identified publication trends by subject area, journal, authorship pattern, collaboration, and so on. According to the study's findings, journal articles (72.69 percent) are the most common type of publication. The authorship collaboration at CRRI was found to be extremely low, at 0.15. Individual productivity shows that 96.68 percent of the authors published ten or fewer articles during the period. With 55 articles, Dr. T. K. Adhya was the most productive author. Oryza has the highest frequency of CRRI article publication.

Paul (2012) conducted study on Work Styles, Best Practices and Productivity of Agricultural Scientists and established a Research Productivity Index (RPI) to quantify the research productivity of agricultural scientists. He conducted research at two agricultural institutes, one with a low performance institute (LPI) and the other with a high-performance institute (HPI). According to the conclusions of the survey, the productivity of the majority (88%) of agricultural scientists from the LPI was low to very poor, with only 5% of them being high in production. Only 6% of the scientists in the HPI had a very low level of productivity, whereas the remaining 28% had a better level of production. The gap in mean research productivity scores between the two institutes was discovered to be as high as 53.64 percent.

Pal and Sarkar (2020) studied on Evaluation of Institutional Research Productivity and stated that the publication of research results, which allows researchers to exchange ideas and receive critical feedback on their work, is the most fundamental concept in the socialization of science. However, a researcher gains recognition, then reputation, and finally esteem value through publishing. Academic promotions and positions are typically determined by scholarly behavior and research outputs. Quantification of research is thus an obvious requirement in many academic endeavors.

Jessica (2021) conducted a study onLibrary Information Services, Resources and Research Productivity of Agricultural Scientists from Agriculture Research Institutes in Nigeria. The study investigated whether there is a difference in the research productivity effectiveness of agricultural scientists at universities and that of agricultural research institutes. The study sampled 701 respondents (460 and 241) from agricultural universities and agricultural research institutes, respectively, from a population of 1465. The mean and standard deviation were used to analyses the data, and the t-test was used to test the hypotheses. The findings revealed that library information services were widely used, with most library information resources having a mean utilization score of 2.50 or higher.The findings also revealed that there was no significant

difference in the research productivity of agricultural scientists in Nigerian universities and agricultural research institutes in Nigeria.

Kadam and Bhusawar (2021) conducted a study on Research Productivity of Agricultural Faculty Members withSpecial Reference toMaharashtra, India: A Scientometric Studyfor theperiod 2004–2019, of four agricultural universities in Maharashtra and found that The Indian Citation Index's publications-related output of 4,120 research articles from various agricultural universities were analyzed to determine the growth and patterns in agricultural research. The year-by-year distribution of research productivity, co-authorship index, and collaborative index, degree of collaboration, most prolific authors, and top-ranked sources favored by agricultural faculty members for publishing their research output were all provided in this study. The rise of research productivity at the four agricultural universities was found to be inconsistent. More than 70% of the overall research output came from Dr. Panjab Rao Deshmukh Agricultural University in Akola and Mahatma Phule Agricultural University in Rahuri.The most popular journals were discovered to be Annals of Plant Physiology, Journal of Soils and Crops, and Trends in Bio Sciences. The collaboration index increased from 3.55 in 2004 to 3.86 in 2019. The average modified collaboration coefficient was 0.69, while the average degree of collaboration was 0.99. In comparison to a conference paper, report, or short message, the research article was shown to be the most desired sort of research document among agricultural faculty members.

2.3Factors Influencing the Research Productivity of Agricultural Researchers

Laharia (1978)in his study of personal and organizational variables impacting the productivity of agricultural scientists, found that job satisfaction and interpersonal communication had a strong positive association with productivity, whereas degree of aspiration had a significant negative correlation. The route analysis found that work satisfaction had the greatest direct impact, whereas the impact of other variables was minimal.

Rushton *et.al* (1987) concluded that among psychological academics, there were substantial and meaningful personality correlates of research output and teaching success. According to their findings, the creative researcher was ambitious, persistent, seeking clarity, domineering, demonstrating leadership, forceful, autonomous, not meek, and non-supportive. As a result, the creative researcher may be partially "born" and partially "created."

Butler and Cantrell (1989)examined an exploratory study to compare the valence of six extrinsic rewards in relation to research output, including money, reduced teaching load, tenure, mobility, recognition, and promotion. According to the findings, the most enticing rewards were money and a reduced teaching load, while mobility, recognition, and promotion were the desired outcomes. Money was deemed to be the most important factor for assistant professors, whereas mobility was the most important one for associate professors.

Jones and Preusz (1993)discovered that involvement in joint research projects had a substantial link with research productivity in an attempt to explore the attitudinal aspects related with individual faculty production. The amount of time spent interacting with coworkers for scientific talks was also found to be connected to research productivity. Personal interactions with coworkers, according to the authors, allowed for informal interchange of ideas and participation in collaborative research efforts.

Tien and Blackburn (1996) investigated the impact of an academic ranking system on academic research behavior. The researchers investigated whether academic rank advancement was a result of high research productivity. 'Promotion' was defined as an upward movement of one step within the hierarchical structure of academics during their careers. This study's research hypotheses centered on the prediction that promotion would increase academics' research productivity.

Babu and Singh (1998) gathered 200 variables impacting research productivity through relevant literature, examination of great scientist biographies, and discussions with notable scientists for their study. Finally, 80 variables were chosen for use with the Q-sort technique after a thorough evaluation. The scientists in the study were a diverse group, ranging from Fellows of the Indian National Science Academy to junior agricultural experts. Data was collected through mailed questionnaires and personal interviews. A total of 325 people responded out of a total of 912 people. 26 variables were chosen for further analysis based on Q-sorted data and were submitted to principal component factor analysis. The findings revealed eleven characteristics that influence scientists' research output. Persistence, resource adequacy, access to literature, initiative, intelligence, creativity, learning capability, stimulative leadership, concern for advancement, external orientation, and professional commitment were among them.

Teodorescu (2000)in his model of faculty research publication productivity, stated that individual achievement and institutional characteristics could predict faculty research output across national borders. And concluded that there was heterogeneity in correlates of faculty research production across national boundaries after testing the model across ten countries. Involvement of faculty in disciplinary affiliations, such as participation in professional groups and attendance at professional conferences, has a strong link with research production across countries.

Chen *et.al* (2006) investigated the effect of different motivational factors on research productivity of academics in the business discipline. They empirically tested 12 motivational factors which were classified into two categories one was intrinsic motivation and other was extrinsic motivation having six factors each and stated that the motivation to conduct research would be highest to an academics when they believe that their performance on research will lead to some rewards. The tenure status of academics and the amount of time they spend on research were found to be positively correlated with research productivity in this study. It was also discovered that tenured professors were organically driven to undertake research, but untenured professors were extrinsically motivated.

Manjunath *et.al* (2006) conducted study in 14 institutions under the jurisdiction of University of Agricultural Sciences, Dharwad (Karnataka) found that the majority of teachers (70.15%), researchers (59.52%), and extension workers (66.67%) were classified as having a medium degree of research productivity. Also, there was a positive and substantial association at the 5% level of probability between satisfaction of job, organizational commitment, atmosphere of the organization, and achievement motivation of instructors and their teaching productivity. Satisfaction of job, organizational commitment, organizational climate, accomplishment motivation, job autonomy, and researchers' experience were all found to have a strong relationship with their teaching productivity.

Ito and Brotheridge (2007)in their study Predicting Individual Research Productivity, investigate the association between research productivity and five tactics or determinants. Despite the fact that researchers might use a variety of tactics, the ones included in this study were consistently identified as relevant in the prior research. These five components are: (1) developing a strategic focus, (2) creating ideas, (3) pursuing resources such as research funds, (4) time management, and (5) time investment in research-related activities. Except for time invested, each of these elements is considered as a multi-item variable in this study, which measures the amount to which an individual engages in the activity.

Lertputtarak (2008) investigated the factors that contributed to a low level of research productivity among academics at a Thailand public university and found that academics lacked university support and had a heavy teaching load. Academics lacked research self-efficacy on an individual basis. These three factors contributed to academics' low research productivity.

Hedjazi *et.al.* (2011)conducted a study on Study of Factors Influencing Research Productivity of Agriculture Faculty Members in Iran and regression analysis revealed that among demographic characteristics, two variables were significant predictors of agricultural faculty, namely academic rank and age; among individual characteristics, three variables were significant predictors of agricultural faculty, namely working habits, creativity, as well as autonomy and commitment; and among institutional characteristics, four variables were significant predictors of agricultural faculty, namely network of communication with colleagues, facility resources, corporate management, and clear research objectives.

Manjunath and Shashidahra (2011) conducted a study on Determinates of Scientific Productivity of Agricultural Scientists found that the level of scientific productivity of agricultural scientists was neither too high nor too low. During the survey, it was discovered that the majority of scientists performed three functions during the year: research, teaching, and extension. This type of workload may have hindered them from achieving significant levels of research output. Furthermore, more experienced teachers became interested in research mostly through postgraduate Programmes, while researchers and extension workers became involved through their usual tasks and IVLP and other similar special activities. This could result in a higher number of respondents falling into the medium level category.

Sulo *et.al* (2012) conducted a study at university in Kenya, examined the factors causing the low research productivity of academics. The analysis revealed that research productivity was positively correlated with the quantity of time spent on research, the availability of research money, the credentials of the researchers, and the research environment. The academic's qualification had the largest impact on their production of the four variables. Furthermore, research money is vital since it allows academics to work on projects, publish their findings, attend conferences, and purchase reference materials. The amount of funding received by respondents was directly proportional to the number of conferences they attended each year.

Catherine (2016)conducted a study on Do Organizational Factors Affect Individual Scientist's Productivity?A Comparative and Multilevel Analysis of Nigeria and Ghana agricultural research systems using multilevel analysis, he investigated the factors that explain variations in research productivity and outreach among 344 agricultural scientists in Nigeria and 237 agricultural scientists in Ghana. Significant capacity actors explaining research output include education level, years of experience, and perceived adequacy of money, physical and human resources. In addition to capacity factors, incentives were found to play a role in predicting research output. The presence of a powerful M&E system, as well as the presence of a flexible-type organizational culture, are all consistently significant incentive factors explaining productivity. Findings revealed that, Ghana's emphasis appears to be the amount and quality of human resources, whereas Nigeria's priority appears to be the adequacy of physical and financial resources, as well as the application of organizational management systems.

Paul *et.al* (2017) in his study collected 200 samples of scientists from a high performing and low performing agricultural institutes of India and revealed that there are 11 major factors that determines the research productivity of agricultural scientists and these factors are Organizational research environment, creativity, perseverance and commitment, research facility, ability to work under constraint, incentive policy, proactiveness, purpose driven orientation, achievement motivation, involvement in teaching, and job satisfaction.

Salman *et.al* (2018)conducted a study on Factors Affecting Research Productivity in Private University of Lahore: A Discriminant Analysis and found that teaching responsibilities and conferences are the key factors and plays important role in determining the research productivity in universities. Also stated that peer recognition and R&D factors cannot be considered as driving forces behind research publications.

Heng *et.al* (2020) in his study entitledFactors influencing academics' research engagement productivity: A developing countries perspective in Australia concluded that personal and environmental factors are two major factors that influence the academic's engagement in research and their research productivity and classified the factors into three main category individual, environmental and national factors.

RESEARCH METHODOLOGY

Methodology is the planning and guiding of specialized study. This section of this chapter provides a brief overview of the scientific techniques and methodologies used to conduct the study.

The research method utilized to conduct the study has been divided into the components below.

3.1 Research design

3.2 Selection and sampling of respondents

3.3 Measurements of variables

3.4 Collection of data

3.5 Analysis of data

3.6 Statistical tools used

3.1. Research Design

Ex-post facto research design is being used for present study. According to Kerlinger (1964) An ex-post facto research is defined as a systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable. Inferences about relations among variables are made, without direct intervention, from concomitant variation of independent and dependent variables.

3.2 Selection and Sampling of Respondents

3.2.1. Locale of the Study

The study was conducted in all agricultural institutions of India. Agricultural education and research Institutes that regularly conduct both teaching and research, were chosen. The study included Indian Council of Agricultural Research (ICAR) institute, Central Agricultural Universities, State Agricultural Universities (SAU), deemed universities, affiliated college of general university and Krishi Vigyan Kendra (KVK).

3.2.2. Selection of Respondents

The questionnaire was sent to 1000 Agricultural researchers of India through mail, including both professors and scientists for the study, out of them only 200 response was obtained which was 20% of the total population. Out of 200 respondents 89 are scientists/assistant professor (45%), 85 are principal scientists/professors (42%) and 26 are senior scientists/associates (13%) from all over Indian agricultural institutions.

Table 3.1. Selection of Variables and Their Measurement

S.NO	INDEPENDENT VARIABLES	MEASUREMENT	LEVEL OF MEASUREMENT
A	DEMOGRAPHY		
1.	AGE	Direct questioning	Ratio
2.	GENDER	Direct questioning	Nominal
3.	MARITAL STATUS	Direct questioning	Nominal
4.	BACKGROUND	Direct questioning	Nominal
5.	EDUCATIONAL QUALIFICATION	Direct questioning	Nominal
6.	PARENT'S OCCUPATION	Direct questioning	Nominal
7.	MEDIUM OF INSTRUCTION	Direct questioning	Nominal
8.	GRADUATION	Direct questioning	Nominal
9.	POST GRADUATION	Direct questioning	Nominal
10.	Ph.D.	Direct questioning	Nominal
11.	ACADEMIC RANK	Direct questioning	Nominal
B.	FACTORS INFLUENCING RESEARCH PRODUCTIVITY		
I.	MOTIVTIONAL FACTORS	Schedule was prepared	Interval
II.	INSTITUTIONAL FACTORS	Schedule was prepared	Interval
III.	BEHAVIOURAL FACTORS	Schedule was prepared	Interval
	DEPENDENT VARIABLE		
1.	RESEARCH PRODUCTIVITY	Procedure designed for the purpose	Interval

3.3.1. Measurement of Dependent Variables

3.3.1.1. Demography

3.3.1.1.1 Age

Age has been operationally defined as the respondent's chronological age in completed years at the time of the interview. The responses were categorized by chronological age. The criteria

S. No.	Category	Criteria
1	Young age (<36 years)	<Mean – S.D.
2	Middle age (37-57 years)	Mean ± S.D.
3	Old age (>58 years)	>Mean + S.D.

foryoung, middle, and old were determined by the mean, standard deviation.

3.3.1.1.2 Sex

Sex is defined as the gender of respondents. It was divided into male and female categories. The quantification was based on the indicants, with 1 being male and 2 representing female.

S. No.	Category	Indicants
1	Male	1
2	Female	2

3.3.1.1.3 Marital Status

In this work, marital status referred to the state of being married or not married.it was categorized into single (unmarried) and married and the indicants were given as 1 for single and 2 for married.

S. No.	Category	Indicants
1	Single	1
2	Married	2

3.3.1.1.4 Background

Background was operationally defined as the geographical area from which the respondent belongs or come from. The geographical area has been categorized into urban, semi-urban and rural areas. And the indicantswere given as 1 for urban, 2 for semi-urban and 3 for rural areas.

S. No.	Category	Indicants
1	Urban	1
2	Semi-urban	2
3	Rural	3

3.3.1.1.5 Educational Qualification of Parents

The official affirmation, usually in the form of a certificate, diploma, or degree, recognizing the successful completion of an education program or a stage of a program is referred to as educational qualifications. It was classified into illiterate, high-school, intermediate, under-graduate, post-graduate, and others including Ph.D. And the indicants were given as 1 for illiterate ,2 for high-school, 3 for intermediate ,4 for UG ,5 for PG and 6 for others for both father and mother.

3.3.1.1.5.A. Father

S. No.	Category	Indicants
1	Illiterate	1
2	High-school	2
3	Intermediate	3
4	Under-graduate	4
5	Post-graduate	5
6	Others (if any)	6

3.3.1.1.5.B. Mother

S. No.	Category	Indicants
1	Illiterate	1
2	High-school	2
3	Intermediate	3
4	Under-graduate	4
5	Post-graduate	5

6	Others (if any)	6

3.3.1.1.6. Occupation of Parents

Here the term occupation referred as a job or profession in which mother and father of respondent were engaged.

3.3.1.1.6.A. Father

The occupation was classified in five categories viz. Agriculture, Government service, Private service, Business/entrepreneurs, and other including unemployed for father and the indicantswere given 1,2,3,4, and 5 respectively.

S. No.	Category	Indicants
1	Agriculture	1
2	Government service	2
3	Private service	3
4	Business/Entrepreneurs	4
5	Others (if any)	5

3.3.1.1.6.B. Mother

The occupation was classified into six categories viz. Agriculture, Government service, Private service, Business/Entrepreneurs, Home-maker and other if any) for mother and the indicants were given as 1,2,3,4,5 and 6 respectively.

S. No.	Category	Indicants
1	Agriculture	1

2	Government service	2
3	Private service	3
4	Business/Entrepreneurs	4
5	Home- maker	5
6	Others (if any)	6

3.3.1.1.7. Medium of Instruction

Here the term medium of instruction has been defined as the language used in teaching or in classroom for high-school and intermediate. It has been classified into English and Regional language and the indicants has been assigned is 1 for English and 2 for regional language for both High school and intermediate.

3.3.1.1.7.A. High-School

S. No.	Category	Indicants
1	English	1
2	Regional language	2

S. No.	Category	Indicants
1	English	1
2	Regional language	2

3.3.1.1.7.B. Intermediate

3.3.1.1.8. Under- Graduation

Any academic degree acquired by a student who has completed undergraduate courses at an institution of higher education, such as a college or university, is referred to as an undergraduate degree. Here the under-graduation degree refereed as person who completed four years B.Sc. Agriculture course. It has been classified based on universities from where the degree was completed .it has been categorized into central university, state agricultural universities, and affiliated college of a general university. And the indicants were assigned as 1,2, and 3 respectively.

S. No.	Category	Indicants
1	Central university	1
2	State agriculture university	2
3	Affiliated college of general university	3

3.3.1.1.9. Post-Graduation

A postgraduate degree is a form of qualification earned after completing a bachelor's degree. Master's degrees, Postgraduate Diplomas and Certificates, and other postgraduate qualifications are all included in postgraduate degrees.

In this context post-graduation degree has been defined as the specialization in agriculture and allied subjects and qualification earned after completing four years B.Sc. Agriculture course. Here the university is divided into five categories central university, ICAR institutions, state agricultural universities, affiliated college of a general university and others (deemed university, foreign university) from where the post-graduation has been completed. The indicants were assigned as 1,2,3,4 and 5 respectively.

S. No.	Category	Indicants
1	Central university	1
2	ICAR Institution	2
3	State agriculture university	3
4	Affiliated college of general university	4
5	Others (deemed university/ foreign university)	5

3.3.1.1.10. Ph.D.

The Ph.D. has been defined in Agriculture and allied subjects as a research-based three-year program requires master degree in specialized subject and under graduation degree of four years in B.Sc. Agriculture.

It has been classified based on universities from where the Ph.D. course is completed viz. central university, ICAR institutions, state agricultural universities, affiliated college of a general university and others (deemed university, foreign university, incomplete/temporal withdrawal) and the indicantswere assigned as 1,2,3,4 and 5 respectively.

S. No.	Category	Indicants
1	Central university	1
2	ICAR Institution	2
3	State agriculture university	3

4	Affiliated college of general university	4
5	Others (deemed university/foreign university/ incomplete/temporal withdrawal)	5

3.3.1.1.11. Academic Rank

Academic rank denotes a scientist's or teacher's position at a college, high school, university, or research facility**.**

Here the academic rank has been categorized into scientist/assistant professor, principal scientist/professor and senior scientist/associate and indicants assigned as 1,2 and 3 respectively.

S. No.	Category	Indicants
1	Scientist/Assistant professor	1
2	Principal scientist/Professor	2
3	Senior scientist/Associate professor	3

3.3.1.2. Factors Influencing Research Productivity

3.3.1.2.1. Motivational factors

Motivation is an underlying force that guides or directs a person's specific goal-directed behavior. It is a cognitive process that can be triggered by a biological, social, cultural, cognitive, or psychological requirement.

Mawoki and Babandako (2011) stated that motivation toward a specific job is a process that arouses, energizes, and directs a person to specific behaviors in order to improve work performance. Here the motivation means arousal, goal-directed behavior, and behavior maintenance to do the research.

S.No.	Category	SA	MA	N	MD	SD
	Indicants	5	4	3	2	1
1	Getting Research projects helps me in my Promotion (+)					
2	Research helps me in getting a managerial position (+)					
3	Research helps me in Satisfying my personal need and it motivate me to stay in the same field (+)					
4	I do research for creativity and to satisfy my curiosity (+)					
5	Doing research enhances my quality of teaching (+)					
6	I do research for achieving peer recognition (+)					

S.No.	Category	Criteria
1	Low	<Mean – S.D.
2	Medium	Mean ± S.D.
3	High	>Mean + S.D.

3.3.1.2.2. Institutional Factors

Institutional factors are the factors associated with the institute or an organization that influences the research productivity of an individual These factors included the organizational setup, institutional climate for research, administration support, support of head to the department for research, teaching load, educational resources in physical forms, funds availability, lab resources, proficiency of foreign language, etc. The statements were

categorized into five categories based on the level of influence, these were 0%,1-25%,26-

S.No.	Category	0%	1-25%	26-50%	51-75%	>75%
	Indicants	5	4	3	2	1
1	All faculty / scientist/ professors are committed to research (+)					
2	Institutional administration is supportive in helping others to do research (+)					
3	Regardless of seniority their research ideas are respected by others in my department (+)					

50%,51-75% and more than 75%.

3.3.1.2.2.A.

4	The institutional head can influence the individual research productivity. (+)					

S.No.	**Category**	**Criteria**
1	Low	<Mean – S.D.
2	Medium	Mean ± S.D.
3	High	>Mean + S.D.

3.3.1.2.2.B

S.No.	Because of these factors my research is being influenced	0 %	1-25%	26-50%	51-75%	>75%
	Indicants	5	4	3	2	1
1	Because of Heavy teaching load I am unable to conduct research (-)					
2	Because of heavy managerial /administrative activities I am unable to conduct research (-)					
3	Because of Lack of educational resources in physical form (books/articles, etc.) I am unable to conduct research (-)					
4	Because of Lack of financial support, I am unable to conduct research (-)					
5	Because of Lack of research lab/equipment /devices, etc. I am unable to conduct research (-)					
6	Because of low proficiency of a foreign language, I am unable to conduct research (-)					
7	Because of Lack of opportunity, I am unable to conduct research (-)					
8	Because of Preparation and sending research proposal to various funding agencies I am unable to conduct research (-)					

S.No.	Category	Criteria
1	Low	<Mean – S.D.
2	Medium	Mean ± S.D.
3	High	>Mean + S.D.

3.3.1.2.3. Behavioural Factors

Here the term referred as what were the research motivational factors that influenced the academic research behavior?Research behavior is a general term used in qualitative analysis to describe academics' involvement in research. It is the human behavior-related variables. They could be a result of a person's personality, a situation, or a reaction to the environment.
These factors included discussion with colleagues, seeking advice from senior for research, collaborative behavior and feedback. It was classified into 0%,1-25%,26-50%,51-75%and more than 75% based on the agreement with the statements.

S.No.	Category	0%	1-25%	26-50%	51-75%	>75%
	Indicants	1	2	3	4	5
1	I discuss with my colleagues to get the research ideas (+)					
2	I seek the advice from my seniors for research (+)					
3	I collaborate with my colleagues to do research (+)					
4	I ask my colleagues to review Manuscripts (+)					
5	I give feedback on manuscripts of other colleagues (+)					

6	I discuss with researchers from another department / institute (+)					

S.No.	**Category**	**Criteria**
1	Low	<Mean – S.D.
2	Medium	Mean ± S.D.
3	High	>Mean + S.D.

3.3.2. Measurement of DependentVariables

3.3.2.1. Research Productivity

Research Productivityterm has been operationally defined as a comprehensive measure of an agricultural researcher's number of publication, intellectual property rights secured, projects completed, e-content developed and consultancy delivered during the course of his professional career.

According to Creswell (1986) research productivity, can include publishing research in professional journals and conference proceedings, writing a book or chapter, gathering and analyzing original evidence, working with post-graduate students on dissertations and class projects, obtaining research grants, carrying out editorial duties, obtaining patents and licenses, writing monographs, developing experimental designs, and producing artistic or creative works**.**

Turnage (1990) defined research productivity as the relationship between a system's outputs and the inputs it uses to produce those results.

Research productivity consists of a variety of outputs: collections, inventions, databases, patents, techniques, books, and published papers. Published papers, since they are construed as an indicator of personal merit, represent an important aspect of research productivity (Keith et al., 2002).

Here the term research productivity includes number of publications, IPRs, e-content, number of research projects ongoing/completed, consultancy developed, to an individual.

3.3.2.1.1. Publications

The term publication is a vast term, the types of publications used to assess research productivity vary by discipline. Here it included research papers, popular articles, book, book chapters, technical bulletin, features stories, and manuals published by the agricultural researcher in his professional career.

S.No.	Number of Publications	1-5 yrs. of service	6-10 yrs. of service	11-15 yrs. of service	16-20 yrs. of service	21-25 yrs. of service	26-30 yrs. of service	>30 yrs. of service
a.	Number of Research papers published							

b.	Number of Popular articles published							
c.	Number of Book published							
d.	Number of Book chapters published							
e.	Number of Technical bulletins published							
f.	Number of Feature stories published							
g.	Number of Manuals published							
h.	Any other publication published (If any)							

3.3.2.1.2. E-contents

e-content has been defined as the various types of content created and delivered via electronic media. Any digitized content that can help with the learning process and/or outcome.It can be used by a wide range of students with a variety of needs, backgrounds, and prior experience and skill levels. It can be easily and quickly shared and transmitted to an unlimited number of users all over the world. The use of well-designed and developed e-content benefits teachers, students, and others. Here, in this context the term e-content related with the number of video modules developed, text modules developed, MOOCs developed, blogs and YouTube developed by an agricultural researcher in his/her professional career.

S.No.	**Number of e-contents developed**	**1-5 yrs. of service**	**6-10 yrs. of service**	**11-15 yrs. of service**	**16-20 Yrs. of service**	**21-25 yrs. of service**	**26-30 yrs. of service**
a.	Number of video modules developed						
b.	Number of text module developed						
c.	Numbers of MOOCS developed						
d.	Number of blogs developed						
e.	Number of YouTube videos developed						
f.	Any other (please specify)						

3.3.2.1.3. Intellectual Property Rights

Patents, design rights, utility models, and other similar invention rights, copyrights, mask work rights, trade secret or confidentiality rights, trademarks, trade names, and service marks, and any other intangible property rights, including applications and registrations for any of the foregoing, in any country, arising under statutory or common law or by contract, whether perfected, now existing, or hereafter filed, are all examples of intellectual property rights.
In this context the term intellectual property rights included numbers of patent, copyright, trademark and geographical indications an agricultural researcher is having in his professional career.

S.No.	Number of Intellectual Property Rights	1-5 yrs. of service	6-10 yrs. of service	11-15 yrs. of service	16-20 yrs. of service	21-25 yrs. of service	26-30 yrs. of service	>30 yrs. of service
a.	Patent							
b.	Copyright							
c.	Trademark							
d.	Geographical indication							
e.	Other (please specify)							

3.3.2.1.4. Research Projects

A research project has been defined as a scientific undertaking that aims to answer specific research question. Research projects are institutionally /nationally/ internationally /collaborative funded. In this context the research project included number of internally(institutionally) funded projects, externally (national funding agencies) funded, internationally funded and collaborative projects that were ongoing or completed by an agricultural researcher during his professional career.

S.No.	Number of Research projects	1-5 Yrs. of service	6-10 Yrs. of service	11-15 Yrs. of service	16-20 Yrs. of service	21-25 Yrs. of service	26-30 Yrs. of service	>30 yrs. of service
a.	Numberof Internally (Institutional)Funded research project							
b.	Number of Externally funded research projects (national funding agencies)							
c.	Number of Internationally funded projects							
d.	Number of Collaborative projects (internally / externally/ internationally)							

3.3.2.1.5. Consultancy

Consultancy has been defined as the service being provided by the professional advisor. Here the term consultancy referred as the service provide by the agricultural researchers to the central governmental agencies/ state governmental agencies/ non-governmental agencies/ international agencies in his professional career.

S.No.	Consultancy	1-5 Yrs. of service	6-10 Yrs. of service	11-15 Yrs. of service	16-20 Yrs. of service	21-25 Yrs. of service	26-30 Yrs. of service	>30 yrs. of service
a.	Consultancy delivered to central Governmental agencies							
b.	Consultancy delivered to state Governmental agencies							

c.	Consultancy delivered to non-governmental agencies							
d.	Consultancy delivered to international agencies							

Table 3.2 Phase Wise Distribution of Years of Service

The professional career period of agricultural researchers has been divided into seven phases in five years of equal interval. Every phase of professional career has a significance.

Phases	**Years of service**
Phase I	1-5 yrs.
Phase II	6-10 yrs.
Phase III	11-15 yrs.
Phase IV	16-20 yrs.
Phase V	21-25 yrs.
Phase VI	26-30 yrs.
Phase VII	>30yrs.

3.4. Collectionof Data

The data were collected from mailed questionnaire. A structured interview was made using google form to collect the data. Varying elements were assigned different weightage based on their relative position on the scale, and accordingly scoring was done. The data was examined and interpreted.

3.5. Statistical Tools and Analysis of Data

The data being collected with the help of well structured & pre tested interview schedule. The data is analyzed using the statistical tests and measurements listed below.

3.5.1. Frequency

Frequency and percentages were used to know the distribution pattern of respondents according to objectives of the study.

3.5.2. Percentage

The percentage value was calculated to make the comparisons simple. Percentage value was determined by dividing the frequency in the particular cell by the total number of respondents and multiplying it by 100.

Percentage (P) =(n÷N) x 100

Where,

n = Frequency of particular cell

N = Total number of the respondents

3.5.3. Mean

During data analysis, the arithmetic average of the set of data required to be computed frequently. This measurement was used to determine the data's central tendency. The sum of the different measures was divided by the total number of respondents to calculate the mean score of a set of data. The mean scores for each group were calculated using the following formula:

$$X = \frac{\sum X_1}{N}$$

Where,

X = Mean

$\sum X_1$ = Sum of each of the individual measurement of the scores

N = Number of respondents

3.5.4. Standard Deviation

Standard deviation is defined as the square root of the mean of the sum of squares of the deviation taken from the mean of the distribution.

$$\mathrm{SD} = \sqrt{\frac{\sum |x - \bar{x}|^2}{n}}$$

Where,

- x = Terms Given in the Data
- $\bar{x}$ = Mean of the population
- n = Total number of Terms
- x- $\bar{x}$= Deviation from the mean

3.5.5. Correlation

Correlation is a statistical measure between two variables that is defined as a change in quantity in one variable corresponding to a change in another. We used the correlation between the independent and dependent variables. The correlation between the response variable (dependent variable) Y and the independent variables X1, X2, X3...X11 was used in this study. To demonstrate that there is a correlation between two variables, a change in one variable is accompanied by a change in the other, and definite relationships exist between the two.

The correlation coefficient (r) is a measure of how close two variables are in terms of their linear relationship. The correlation coefficient equation is:

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{\left(\sum X^2 - \frac{(\sum X)^2}{N}\right)}\sqrt{\left(\sum Y^2 - \frac{(\sum Y)^2}{N}\right)}}$$

Where

r =correlation.

X and Y = the two variables for which the test is performed.

N = the number of observations.

The value of 'r' is always in the range of -1 to +1. When 'X' is negative, range value of 'X' is associated with small value of 'Y' for the test of significant, a positive value of 'r' indicates a tendency for 'X' and 'Y' to increase together.

3.5.6. Chi- Square Test

A statistical approach for determining the difference between observed and predicted data is the Chi-Square test. This test can also be performed to see if it corresponds with our data's categorical variables. It can be used to determine whether a discrepancy between two category variables is due to chance or is the result of a relationship.

$$x_c^2 = \frac{\Sigma\,(O_i - E_i)^2}{E_i}$$

Where

c = Degrees of freedom

O = Observed Value

E = Expected Value

The number of variables that can change in a statistical calculation is represented by degrees of freedom. To verify that chi-square tests are statistically valid, the degrees of freedom can be determined.

3.5.7.<u>Calculating Mean for Indicators Associating with Research Productivity</u>

3.5.7.A. Average Number of Publication(n=200)

YEARS OF SERVICE	NUMBER OF RESPONDENTS COMPLETED THEIR SERVICE IN RESPECTIVE YEARS	POPULAR ARTICLES	BOOK PUBLISHED	BOOK CHAPTER PUBLISHED	TECHNICAL BULLETIN	FEATURE STORIES	MANUALS
1-5	200	mean =No.of popular article /No. of respondents completed 5 years of service	mean =No. of book published /No. of respondents completed 5 years of service	mean =No. of book chapter published /No. of respondents completed 5 years of service	mean =No. of technical bulletin/No. of respondents completed 5 years of service	mean =No. of feature story/No. of respondents completed 5 years of service	mean =No. of manuals /No. of respondents completed 5 years of service
6-10	162	mean =No.of popular article /No. of respondents completed 6-10 years of service	mean =No. of book published /No. of respondents completed 6-10 years of service	mean =No. of book chapter published /No. of respondents completed 6-10 years of service	mean =No. of technical bulletin/No. of respondents completed 6-10 years of service	mean =No. of feature story/No. of respondents completed 6-10 years of service	mean =No. of manuals /No. of respondents completed 6-10 years of service
11-15	141	do	do	do	do	do	do
16-20	109	do	do	do	do	do	do
21-25	80	do	do	do	do	do	do
26-30	48	do	do	do	do	do	do
>30	30	do	do	do	do	do	do

3.5.7.B. Average Number of E-Content Developed (n=200)

Years of service	NUMBER OF RESPONDENTS COMPLETED THEIR SERVICE IN RESPECTIVE YEARS	TEXT MODULE	MOOCS	BLOGS	YOU-TUBE
1-5	200	mean =No. of text module developed /No. of respondents completed 5 years of service	mean =No. of MOOCS developed /No. of respondents completed 5 years of service	mean =No. of blogs developed /No. of respondents completed 5 years of service	mean =No. of You-Tube developed /No. of respondents completed 5 years of service
6-10	162	mean =No. of text module developed /No. of respondents completed 6-10 years of service	mean =No. of MOOCS developed /No. of respondents completed 6-10 years of service	mean =No. of blogs developed /No. of respondents completed 6-10 years of service	mean =No. of You-Tube developed /No. of respondents completed 6-10 years of service
11-15	141	do	do	do	Do
16-20	109	do	do	do	Do
21-25	80	do	do	do	Do
26-30	48	do	do	do	Do
>30	30	do	do	do	Do

3.5.7.C. Average Number of Intellectual Property Rights Secured (n=200)

Years of service	NUMBER OF RESPONDENTS COMPLETED THEIR SERVICE IN RESPECTIVE YEARS	PATENT	COPYRIGHT	TRADEMARK	GEOGRAPHICAL INDICATION
1-5	200	mean =No. of patent /No. of respondents completed 5 years of service	mean =No. of copyright /No. of respondents completed 5 years of service	mean =No. of trademark /No. of respondents completed 5 years of service	mean =No. of geographical indication /No. of respondents completed 5 years of service
6-10	162	mean =No. of patent /No. of respondents completed 6-10 years of service	mean =No. of copyright /No. of respondents completed 6-10years of service	mean =No. of trademark /No. of respondents completed 6-10 years of service	mean =No. of geographical indication /No. of respondents completed 6-10 years of service
11-15	141	do	do	do	Do
16-20	109	do	do	do	Do
21-25	80	do	do	do	Do
26-30	48	do	do	do	Do
>30	30	do	do	do	Do

3.5.7.D. Average Number of Research Projects Completed (n=200)

Years of service	NUMBER OF RESPONDENTS COMPLETED THEIR SERVICE IN RESPECTIVE YEARS	INSTITUTIONALLY/INTERNALLY FUNDED PROJECTS	EXTERNALLY FUNDED PROJECTS	INTERNATIONALLY FUNDED PROJECTS	COLLABORATIVE PROJECTS
1-5	200	mean =No. of internally funded projects/No. of respondents completed 5 years of service	mean =No. of externally funded projects/No. of respondents completed 5 years of service	mean =No. of internationally funded projects/No. of respondents completed 5 years of service	mean =No. of collaborative projects/No. of respondents completed 5 years of service
6-10	162	mean =No. of internally funded projects /No. of respondents completed 6-10 years of service	mean =No. of externally funded projects/No. of respondents completed 6-10 years of service	mean =No. of internationally funded projects/No. of respondents completed 6-10 years of service	mean =No. of collaborative projects/No. of respondents completed 6-10 years of service
11-15	141	do	do	do	Do
16-20	109	do	do	do	Do
21-25	80	do	do	do	Do
26-30	48	do	do	do	Do
>30	30	do	do	do	Do

3.5.7.E. Average Number of Consultancies Delivered (n=200)

Years of service	NUMBER OF RESPONDENTS COMPLETED THEIR SERVICE IN RESPECTIVE YEARS	CONSULTANCY DELIVERED TO CENTRAL GOVERNMENTAL AGENCIES	CONSULTANCY DELIVERED TO STATE GOVERNMENTAL AGENCIES	CONSULTANCY DELIVERED TO NON-GOVERNMENTAL AGENCIES	CONSULTANCY DELIVERED TO INTERNATIONAL AGENCIES
1-5	200	mean =No. of consultancy delivered to central governmental agencies /No. of respondents completed 5 years of service	mean =No. of consultancy delivered to state governmental agencies /No. of respondents completed 5 years of service	mean =No. of consultancy delivered to non-governmental agencies /No. of respondents completed 5 years of service	mean =No. of consultancy delivered to international agencies /No. of respondents completed 5 years of service
6-10	162	mean =No. of consultancy delivered to central governmental agencies /No. of respondents completed 6-10 years of service	mean =No. of consultancy delivered to state governmental agencies /No. of respondents completed 6-10 years of service	mean =No. of consultancy delivered to non-governmental agencies /No. of respondents completed 6-10 years of service	mean =No. of consultancy delivered to international agencies /No. of respondents completed 6-10 years of service
11-15	141	do	do	do	Do
16-20	109	do	do	do	Do
21-25	80	do	do	do	Do
26-30	48	do	do	do	Do
>30	30	do	do	do	Do

3.5.8. Index for Research Productivity of Agricultural Researchers

An index has been developed based on the response received through google form, mailed to 40 experienced researchers of agriculture (20 scientists/professors and 20 Ph.D. final year students). The form consisted five indicators of research productivity visualize Publication, E-content, Intellectual Property Rights, Research projects, and Consultancyand each respondent have to give a weightage score to all indicators according to their importance in research. The cumulative weightage score was mustto be 100 and based on these weightages a formula has been developed for calculating the research productivity of agricultural researchers.
The formula is:

R=[(2.43*X1) +(1.94*X2) +(2.52*X3) +(1.57*X4) +(1.52*X5)]

R= Research productivity
X= Components
X1= Publication
X2= e-content
X3= Research projects
X4= Intellectual Property Rights
X5= Consultancy

RESULT AND DISCUSSION

This chapter aims to throw light on the findings of the study followed by the interpretation and discussion. The results are presented in a systematic manner to give a clear image of the research findings as well as the relevance of the data collected. As a result, in order to make the presentation of the data scientific and systematic, this chapter has been divided into sections based on the objectives of the study and selected variables.

4.1. Profile of agricultural researchers.

4.2. Indicators associated with the research productivity of agricultural researchers

4.3. Factors influencing the research productivity of agricultural researchers

4.1. Profile of Agricultural Researchers

4.1.1 Age Wise Distribution of Agricultural Researchers

It has been found that researchers were predominantly from middle age group and found to be more than half (59%) percent, while 27.5 % and 13.5% were from age group below 36 yrs. and above 58 yrs. respectively. It has been inferred that middle age group respondents were more active in research activities than young and old age group. This agrees with the finding of Zewotir (2011)who studiedDemographic and academic factors affecting research productivity at UKZN and found that almost two thirds of the staff lie between theages of 35 and 44, with very few members of staff having an age under 25 or over 60.

S.no.	Age	Frequency	Percentage

1.	Young (<36 yrs. old)	55	27.5
2.	Middle (36-58 yrs. old)	118	59.0
3.	Old age (>58 yrs. old)	27	13.5
	Total	200	100

Table 4.1 Distribution of Respondents According to Age (n=200)

MEAN= 47

S.D=11

4.1.2Gender Wise Distribution of Agricultural Researchers

Ithas been observed that majority of the respondents were male i.e., 88.5 % followed by female i.e., only 11.5%. Therefore, efforts to increase the number of female researchers and scientists may receive additional focus. The finding is supported by Kotrlik and *et.al* (2002) who has found that Most of the agricultural education faculty were male (88 or 83.0%) and remaining 17% were female. Also K.G. Sudheir (2013) in his study Research publication trend among the scientists of central tuber crops research institute (CTCRI), Thiruvananthapuram: A Scientometric study revealed that male dominated in the publication productivity (70.81%) and contribution of females were very less (29.19%)

Table 4.2 Distribution of Respondents According to Gender (n=200)

S.no.	Gender	Frequency	Percentage
1	Male	177	88.5
2	Female	23	11.5
	Total	200	100

4.1.3 Marital Status Wise Distribution of Agricultural Researchers

It has been observed that majority of respondents were married (92.5%) whereas remaining 7.5% were not married. It inferred that married researcher are more prominent in research activities. This is in line with the Hedjazi and Behravan (2011)who studied on A study of factors influencing research productivity of agriculture faculty members in Iran and found that 93.6% respondents were married and 6.4% were not married.

Table 4.3 Distribution of Respondents According to Marital Status (n=200)

S.no.	Marital status	Frequency	Percentage
1	Single	15	7.5
2	Married	185	92.5
	Total	200	100

4.1.4 Background wise distribution ofagricultural researchers

It has been revealed that out of 200 respondent's majority of them were from rural background i.e., 53% followed by 27.5% were from urban background and remaining 19.5% were from semi-urban background. It has been anticipated that researchers from rural background were more active in research activities.

Table 4.4 Distribution of respondents according to background (n=200)

S.no.	Background	Frequency	Percentage
1	Urban	55	27.5
2	Semi-urban	39	19.5
3	Rural	106	53.0
	Total	200	100

4.1.5 Educational Qualification of Father

It has been found that 30.5% fathers of respondent have completed their post-graduation followed by 21% who have completed high- school, 18% completed their under graduation, 14% completed PhD, 11.5% completed intermediate and 4.5% are illiterate.

Table 4.5 Distribution of Respondent According to Educational Qualification of Father (n=200)

S.no.	Educational Qualification	Frequency	Percentage
1	illiterate	9	4.5
2	high school	42	21.0
3	Intermediate	23	11.5
4	UG	36	18.0
5	PG	61	30.5
6	Others (Ph.D.)	29	14.5
	Total	200	100

4.1.6 Educational Qualification of Mother

It has been found that 48% mothers of respondent have only completed their high-school followed by 25% who are illiterate, 13% completed their intermediate, 8.5% are undergraduate, 5% are post graduate and 0.5% have completed their PhD.

Table 4.6 Distribution of Respondent According to Educational Qualification of Mother (n=200)

S.no.	Educational Qualification	Frequency	Percentage
1	illiterate	50	25.0
2	high school	96	48.0
3	Intermediate	26	13.0
4	UG	17	8.5
5	PG	10	5.0
6	Others (PhD)	1	0.5
7	Total	200	100

4.1.7 Occupational Distribution of Father

It has been found that the occupational distribution of respondent's fathers was 46.5% who were from government service, followed by 39% who were from agriculture sector, 10% were from business and entrepreneurial service, and 4.5% were from private service.

Table 4.7 Distribution of Respondent According to Occupation of Father (n=200)

S.no.		Frequency	Percentage
1	Agriculture	78	39.0
2	Govt. service	93	46.5
3	Pvt service	9	4.5
4	Business/Entrepreneur	20	10.0
5	Others (IF ANY)	00	00
	Total	200	100

4.1.8 Occupational Distribution of Mother

It has been revealed that the occupational distribution of respondent's mother was found to be more than three fourth i.e., 78% women were home maker followed by 12% who were from agriculture sector, 7% from government sector, 2% were from business/entrepreneurial service and only 1% were from private service.

Table 4.8 Distribution of Respondent According to Occupation of Mother (n=200)

S.no.	Service	Frequency	Percentage
1	Agriculture	24	12.0
2	Govt. service	14	7.0
3	Pvt service	2	1.0
4	Business/Entrepreneur	4	2.0
5	Home maker	156	78.0
6	Others (if any)	0	00
	Total	200	100

4.1.9. Medium of Instruction in High-School

It has been found that majority of respondent have regional language as the medium of instruction in high-school i.e., 68% followed by 32% respondent who have English language as medium of instruction in high-school.

Table 4.9 Distribution of Respondent According to Medium of Instruction in High-School (n=200)

S.no.		Frequency	Percentage
1	English	64	32.0
2	Regional language	136	68.0
	Total	200	100

4.1.10Medium of Instruction in Intermediate

It has been found English was the medium of instruction in intermediate i.e., for 52% respondent followed by regional language by 48% respondents. It is in line with the findings of Kaba and *et.al* (2022) in their study A study to investigate the impact of social research toward research productivity found that 78.22% were having English as medium of instruction in college and rest 21.77% were having regional language.

Table 4.10 Distribution of Respondent According to Medium of Instruction in Intermediate (n=200)

S.no.		Frequency	Percentage
1	English	104	52.0
2	Regional language	96	48.0
	Total	200	100

4.1.11 Educational Qualification of Agricultural Researchers

Table 4.10 Distribution of Respondent According to Under Graduation Completed from Institution (n=200)

S.no.		Frequency	Percentage
1	Central university	36	18.0
2	State agriculture university	136	68.0
3	Affiliated college of a general university	28	14.0
4	Others (if any)	0	0
	Total	200	100

It has been found that 68% respondents have done their under-graduation from state agricultural university followed by 18% who have completed their graduation from central university and 14% respondent have done graduation from affiliated college of a general university.

Table 4.11 Distribution of Respondent According to Post Graduation Completed from Institution (n=200)

S.no.	Institution	Frequency	Percentage
1	Central agriculture university	38	19
2	ICAR institution	25	12.5
3	State agriculture university	123	61.5
4	Affiliated college of a general university	12	6.0
5	Others (deemed /foreign university)	2	1.0
	Total	200	100

It has been found that 61.5% respondent have done their post-graduation from state agricultural university followed by 19% who have done post-graduation from central university ,12.5% done from ICAR institution ,6% done from affiliated college of a general university and rest 1% from deemed and foreign university.

Table 4.12 Distribution of Respondent According to Ph.D. completed fromInstitution (n=200)

S.no.		Frequency	Percentage
1	Central agriculture university	42	21.0
2	ICAR institution	56	28.0
3	State agriculture university	80	40.0
4	Affiliated college of a general university	11	5.5
5	Others (deemed /foreign university/withdrawal)	11	5.5
	Total	200	100

It has been found that 40% respondents have done their Ph.D. from state agricultural university followed by 28% who have done Ph.D. from ICAR institution, 21% done from central university, 5.5% from affiliated college of a general university and 5.5% from others including deemed university, foreign university and some have withdrawal temporarily

4.1.12 Academic Rank Wise Distribution of Agricultural Researchers

It has been revealed that 44.5% respondents were scientists/assistant professors followed by 42.5% who were principal scientists/professor and 13% who were senior scientist/assistant professor. There has been less participation of senior scientist/ associate professor in research activities. This in line with the findings of Bartlett (2002) who mentioned that 38.7% were full professors, 22.6% were associate professors, and 38.7% were assistant professors.

Table 4.13 Distribution of Respondent According to Academic Rank (n=200)

S.no.	Academic rank	Frequency	Percentage
1	Scientist/Assistant professor	89	44.5
2	Principal scientists/Professor	85	42.5
3	Senior scientist/ Associate professor	26	13.0
	Total	200	100

4.2. Indicators Associated with the Research Productivity of Agricultural Researchers

Table 4.2.1 Distribution of Respondents Based on Average Number of Publications in Different Phases of Professional Career (n=200)

PHASE	RESEARCH PAPERS	POPULAR ARTICLE	BOOKS	BOOK CHAPTER	TECHNICAL BULLETIN	FEATURE STORY	MANUALS	TOTAL
Phase I	8.3	5.1	0.5	2.3	1.1	0.4	1.0	18.9
Phase II	11.5	6.4	0.9	3.7	1.8	0.6	1.4	26.5
Phase III	14.7	6.3	1.1	3.1	2.3	1.0	1.7	30.5
Phase IV	14.2	6.4	1.3	3.5	2.3	0.8	1.8	30.5
Phase V	14	6.9	1.6	2.7	2.7	0.7	1.6	30.5
Phase VI	9.7	3.4	1.6	2.8	1.77	0.6	1.6	21.5
Phase VII	6.9	4.1	2.6	3.3	1.8	0.6	1.2	20.5

(Table 4.2.1 has been prepared by using the formula mentioned in chapter 3)

The professional career period of agricultural researchers has been divided into seven phases in five years of equal interval. Every phase of professional career has a significance. The publication behavior as represented by the sample size of study is being discussed here.

The table 4.2.1 explained the average number of publications published by the agricultural researchers in their professional career. On an average the total number of publications published by respondents has been increased in I, II and III phase (18.9, 26.4, and 30.4 respectively) then became constant in IV and V phase (30.5 and 30.5 respectively) and declined in VI and VII phase (21.5 and 20.5). The trends have been discussed below:

Fig.4.1Trends of Publishing Research Papers, Popular Article, Books, Book Chapters by Agricultural Researchers

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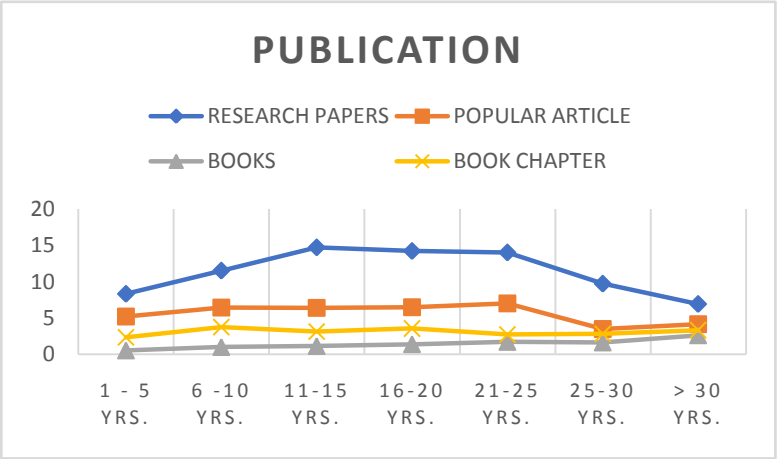


It has been observed from Fig. 4.1 that the number of research papers published by the respondents has been increased in initial phases I, II and III (8.3, 11.5, and 14.7 resp.) become constant in phases IV, and V (14.2 and 14) and declined as the year of service increases in phases (9.7 and 6.9). Popular article is the translation of complex research findings for the benefit of stakeholders. Reaching the end users of agricultural research become simple using this channel. On an average the publication of popular articles increased from starting (5.1), became constant and again increased, attained its maximum (6.9) and drastically fallen down by approximately half (3.4) and then slightly increased at last (4.1) from phase I to phase VII. This shows increasing, constant and decreasing trend. The number of bookspublished by respondents have been increased with the increasing service year, maximum number of books have been published in phase VII i.e., 2.6. and the least number of books published in the phase I i.e., 0.5.On an

average number of books published by respondents have been increased from phase I (2.3) and then keeps on increasing. Maximum number of book chapters published by respondents were in the phase II (3.7) it declined in phase V (2.7) but then increased in phase VII (3.3).

Fig. 4.2Trends of Publishing Technical Bulletin, Feature Stories and Manuals by Agricultural Researchers

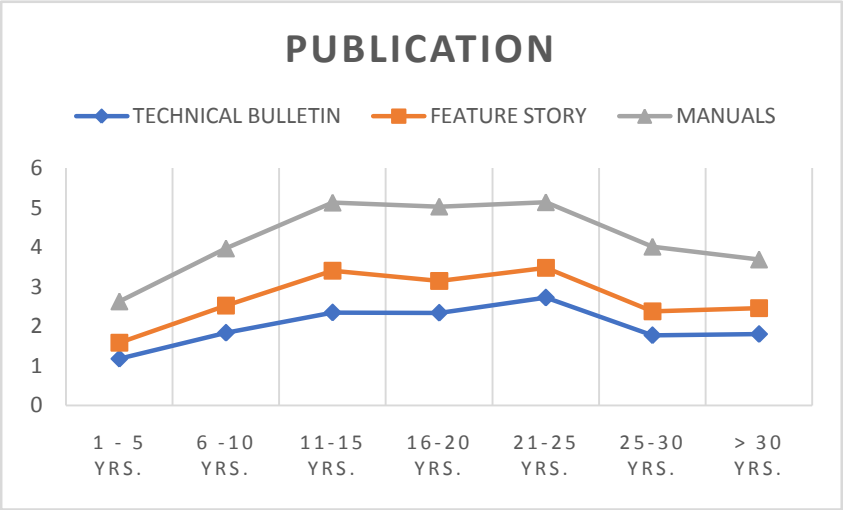


Fig 4.2 explained that the trend for publishing technical bulletin, feature stories, and manuals has been increased in phase I, II and III, then became approximately constant in phases IV, and V and then declined in phases VI and VII.Maximum publication productivity was found in III and V phases. It was expected that the publication productivity increased with increasing academic rank and years of service but here it has been found that publication productivity increased in initial phases of service then became constant in the middle and declined in the last two phases.

Academic promotions are one of the probable reasons for increasing trend, it can be considered under motivational factors, apart from it, creativity and curiosity are generally found to be high

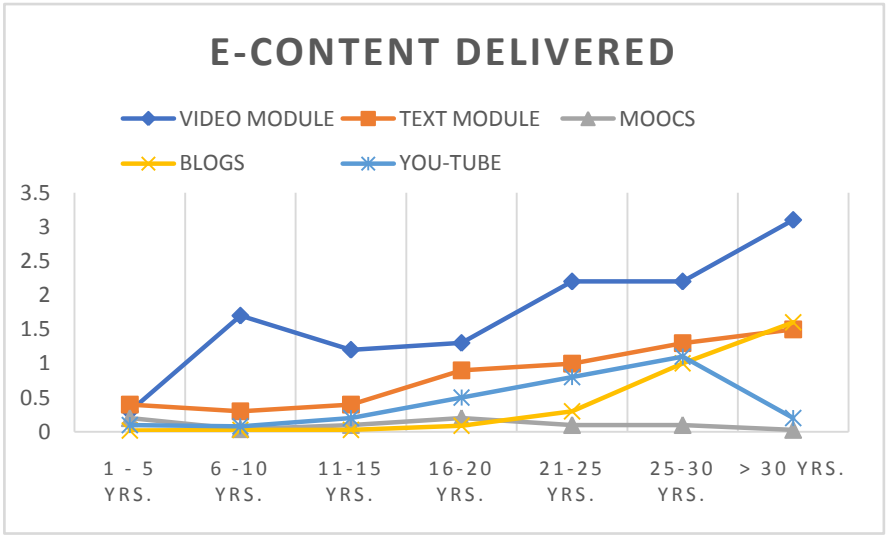
in newly joined faculty members and hence this could be another reason for increasing productivity during initial years of service. The probable reasons behind constant and decline trend are institutional factors like support from institution, financial support, increasing teaching load, etc. The possible reason for increasing trend in the last few years of service are experience, more expertise in particular area of subject as age and academic rank increases, more technical and scientifical knowledge also increases etc.

Table 4.2.2. Distribution of Respondents Based on Average Number of E-content Delivered in Different Phases of Professional Career (n=200)

PHASE	VIDEO MODULE	TEXT MODULE	MOOCS	BLOGS	YOU-TUBE	Total
Phase I	0.3	0.4	0.2	0.02	0.1	1.1
Phase II	1.7	0.3	0.04	0.03	0.08	2.1
Phase III	1.2	0.4	0.1	0.03	0.2	2.2
Phase IV	1.3	0.9	0.2	0.09	0.5	3.0
Phase V	2.2	1.0	0.1	0.3	0.8	4.5
Phase VI	2.2	1.3	0.1	1.0	1.1	5.9
Phase VII	3.1	1.5	0.03	1.6	0.2	6.6

The pandemic and post-pandemic period realized the relevance of e-content for the purpose of education and extension of agriculture and allied innovations. Learner in general may it be student of formal education or farmers of non-formal education were searching for authentic and beneficial information. E-mediated platforms have made enough penetration among stakeholders in delivering the needed information. The next step is authenticity of contents available on e-mediated platforms. The NARS is playing and should continue to play key role in developing, managing, delivering and regularly updating information on e-mediated platforms.

Fig.4.3Trends of Delivering Video Module, Text Module, MOOCs, Blogs and You-Tube by Agricultural Researchers



Video module are the effective way of dealing with educational contents. It can be emphatically used for extension service also. Social media is a key platform in addition to providing entertainment, has a lot of potential of educating masses. If the content in any form coming from authentic sources it's an added advantage to receiver. Hence NARS institution has a key role to play here.it has been found that on an average the number of video module delivered by the respondents in phase I was very low 0.3 but it was keeps on increasing with increasing phases. It was highest in phase VII (3.1). Whereas the average number of text moduledeliveredby respondentswas highest (1.5) in phase VII and was lowest in phase II (0.3). The number of MOOCs delivered on an average was equally highest in Phase I and Phase IV (0.2) and was lowest in phase VII (0.03). Number of blogs delivered by the respondents was highest in phase

VII (1.6) and was lowest in Phase I (0.02). The average number of You-tube video was delivered by the respondents was highest in phase VI followed by 0.8 in phase V.

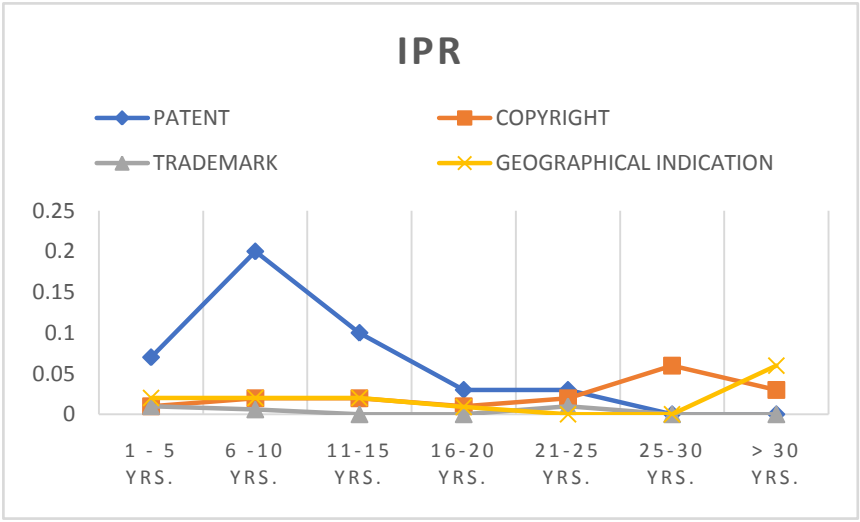
All together it was depicted that the on an average the number of e-content delivered by respondents has been increased as the academic rank and aged has been increases. The possible reasons are increasing demand of digital education nowadays forcing researchers to focus more on digital content also due to impact of covid from past 4 years has been increases the use of digital technology for both regular and distance education and moving towards digital era empower the researchers to work more in this direction for dissemination of technology to large number of people in short time. And will help all stakeholders of agriculture to get authentic and useful information.

Table 4.2.3. Distribution of Respondents Based on Average Number of Intellectual Property Rights Secured in Different Phases of Professional Career (n=200)

PHASE	PATENT	COPYRIGHT	TRADEMARK	GEOGRAPHICAL INDICATION	TOTAL
Phase I	0.07	0.01	0.01	0.02	0.11
Phase II	0.2	0.02	0.006	0.02	0.246
Phase III	0.1	0.02	0	0.02	0.14
Phase IV	0.03	0.01	0	0.009	0.049
Phase V	0.03	0.02	0.01	0	0.06
Phase VI	0	0.06	0	0	0.06
Phase VII	0	0.03	0	0.06	0.09

IPRs are the products of research and development efforts. It is anticipated from the research system to deal with innovation and inventions. The state agricultural universities are basically involved in imparting education to students who take up research and development activities. Generation of IPRs adds value to individuals, institution and nation on a whole.

Fig.4.4Trends of Securing Patent, Copyright, Trademark and Geographical Indication by Agricultural Researchers



In the initial phases of professional career, it is difficult to produce IPRs. As professional moves ahead in his/her professional career it is anticipated to increase. The trend available contradicts the expectations. It has been found that on an average the number of patentssecured in Phase II was highest (0.2) and was least (0) in the phase VI and phase VII both. Whereas, on an average the number of copyrights secured by the respondents was highest in Phase VI (0.06) and least (0.01) in Phase I and Phase IV. Also, on an average the number of trademarks secured by respondents was highest in Phase I and Phase V (0.01) and was 0 in phase III, IV, VI and VII. And on an average the contribution in the number of geographical indications secured by respondents was 0.06 in phase VII followed by 0.02 in three consecutive I, II and III and 0 in phase V and phase VI.

It has been found that maximum IPRs was secured in Phase II (0.246), academic promotion. Curiosity, creativity, motivation is high in initial years of service. And the lowest IPRs was in

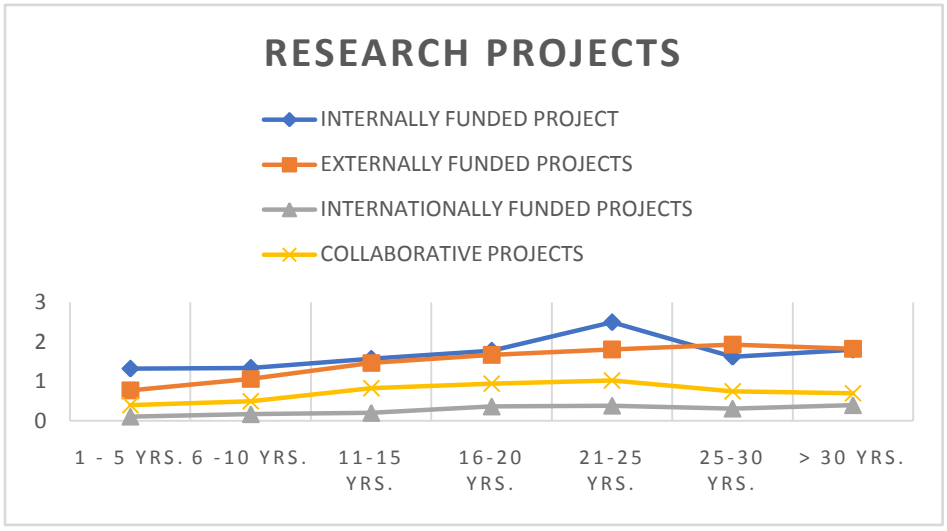
phase V and phase VI (0.06). The reason for low IPRs is that teaching professors does not completely involve in research therefore increasing teaching load could be the one reason for declining IPRs, lack of educational resources, lack of motivation, could be another reason in late years of service.

Table 4.2.4. Distribution of Respondents Based on Average Number of Research Projects Completed in Different Phases of Professional Career (n=200)

PHASE	INTERNALLY FUNDED PROJECT	EXTERNALLY FUNDED PROJECTS	INTERNATIONALLY FUNDED PROJECTS	COLLABORATIVE PROJECTS	TOTAL
Phase I	1.3	0.7	0.1	0.4	2.6
Phase II	1.3	1.0	0.1	0.5	3.0
Phase III	1.5	1.4	0.2	0.8	4.0
Phase IV	1.7	1.6	0.3	0.9	4.7
Phase V	2.5	1.8	0.3	1.0	5.7
Phase VI	1.6	1.9	0.3	0.7	4.6
Phase VII	1.8	1.8	0.4	0.7	4.6

Research projects are the efforts of researchers in providing appropriate shape to the innovative ideas. Also, it is a continuous process to search innovative solution to the contemporary problem.

Fig.4.5Trends of Internally Funded, Externally Funded, Internationally Funded and Collaborative Projects by Agricultural Researchers



It was found that the average number of internally funded projects (institutional projects) completed by respondents was highest 2.5 in Phase V and least 1.3 in phase I, II. The average number of externally funded projects (within country) completed by respondents were highest 1.9 in Phase VI and least 0.7 in phase I. The average number of internationally funded projects was highest 0.4 in Phase VII and lowest 0.1 phase I, II. Whereas the average number of collaborative projectswas highest 1.0 in Phase V and lowest 0.4 in phase I.

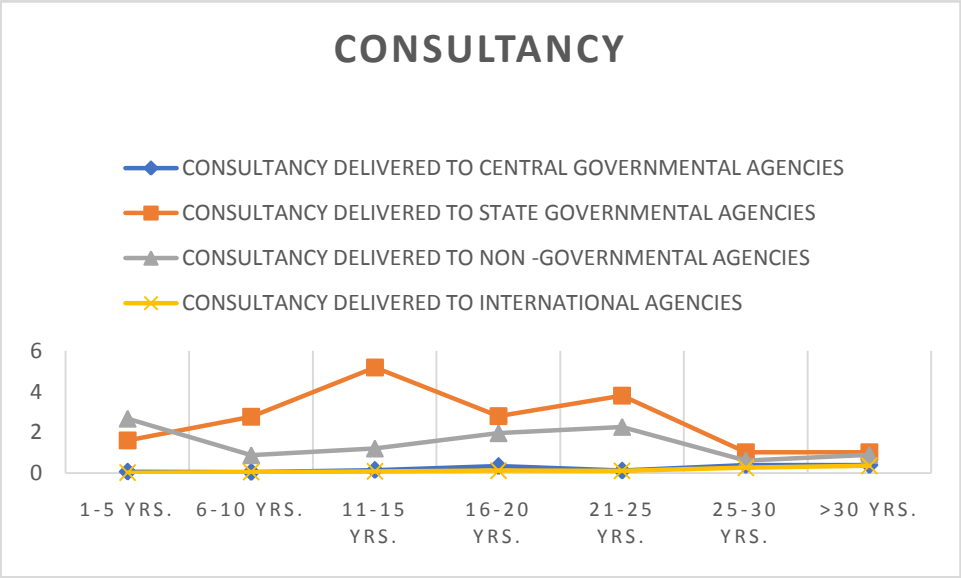
It is anticipated that as the experience and professional rank of researcher enhances, they should have a greater number of research projects in all categories. The result also revealed the same but in phase VI and phase VII of professional career there is declining trend

Table 4.2.5. Distribution of Respondents Based on Average Number of Consultancies Delivered in Different Phases of Professional Career (n=200)

PHASE	CONSULTANCY DELIVERED TO CENTRAL GOVERNMENTAL AGENCIES	CONSULTANCY DELIVERED TO STATE GOVERNMENTAL AGENCIES	CONSULTANCY DELIVERED TO NON - GOVERNMENTAL AGENCIES	CONSULTANCY DELIVERED TO INTERNATIONAL AGENCIES	TOTAL
Phase I	0.08	1.60	2.67	0.03	4.39
Phase II	0.06	2.77	0.88	0.06	3.79
Phase III	0.16	5.18	1.21	0.09	6.65
Phase IV	0.35	2.79	1.96	0.13	5.25
Phase V	0.13	3.80	2.27	0.12	6.33
Phase VI	0.40	1.02	0.62	0.27	2.33
Phase VII	0.60	1.02	0.90	0.36	3.29

Consultancy is the service being provided by the professional advisor. It provides instant solution, delivery speed, required knowledge, etc. to its stakeholders. And will help their stakeholders to find out the solution of problems. It is expected that the consultancy should be higher as the academic rank and experience enhances. It gives information to stakeholders, addressing their issues, performing a diagnosis, which may require redefining the issue, depending on the diagnosis, making recommendations helping to put advised ideas into practice, fostering agreement and dedication to corrective action, promoting stakeholder's learning, or instructing them on how to handle difficulties of a similar nature in the future.

Fig.4.6Trends of Consultancy Delivered to CentralGovernment, State Government, Non-Governmental and International Agencies by Agricultural Researchers



It has been observed that the average number of consultancies delivered to central government by the respondents were maximum in phase IV (0.35) and lowest (0.06) in Phase II. The average number of consultancies delivered by respondents tostate governmental agencies were highest (5.18) in Phase III and lowest (1.02) in Phase VI and Phase VII. Whereas the average number of consultancies delivered to non-governmental agencies by respondents were highest (2.67) in phase I and lowest (0.6) in Phase VI. And the average number of consultancies delivered to international agencies were 0.36 in Phase VII and lowest 0.03 in phase I.

It has been found that the consultancy delivered was highest in Phase V (6.33) and in Phase III (5.2). Motivational factors, satisfaction, curiosity, perseverance, promotions are some possible reasons for this trend.

From above listed all the indicators of research productivity (publication, e-content, IPRs, research projects and consultancy) it was found that the productivity of respondent to publish and delivered the activity was highest in Phase III and in Phase V. Academic promotion, motivation, financial support, present of educational resources are the probable reason of it.

Table 4.2.6. Research Productivity Wise Distribution of Agricultural Researchers (n=200)

S.No.	Category	Frequency	Percentage
1	Low (below 14)	90	45
2	Medium (14-58)	68	34
3	High (above 58)	42	21
	Total	200	100

MEAN = 36

S.D.=22

The table 4.2.6. has been calculated from developed research productivity index for measuring the performance of agricultural researchers. It was found that 45% agricultural researchers were having low research productivity (90), followed by 34% who were having medium research productivity (68) and 21% respondents having high research productivity (42) out of 200 respondents.

It is interesting to note that more than 72% of respondents are of 40 plus years of age if you look into the productivity more than 79% of respondents are in category low to medium. The expectation of policy maker is in the reverse way. The research productivity should have been increasing trend from medium to high category.

The possible reason maybe, as academic professional achiever has highest position of professor/principal scientist after completion of 15 years of service. The result is also commensurate with the promotion policy. But beyond professor/principal scientist there is no formal promotion to all. It is only you can achieve administrative position which depends on many factors. Hence research and development indicators are exhibiting declining trend after Phase IV or Phase V of professional career.

4.3. Factors Influencing the Research Productivity of Agricultural Researchers

Table 4.3.1. Distribution of respondents based on extent of agreement for motivational factors (n=200)

S.No.	Category	SA	MA	N	MD	SD
1	Getting Research projects helps me in my Promotion (+)	114 (57%)	65 (32.5%)	11 (5.5%)	16 (3%)	4 (2%)
2	Research helps me in getting a managerial position (+)	61 (30.5%)	77 (38.5%)	35 (17.5%)	12 (6%)	15 (7.5%)
3	Research helps me in Satisfying my personal need and it motivate me to stay in the same field (+)	119 (59.5%)	59 (29.5%)	13 (6.5%)	4 (2%)	5 (2.5%)
4	I do research for creativity and to satisfy my curiosity (+)	132 (66%)	47 (23.5%)	15 (7.5%)	6 (3%)	0 (0%)
5	Doing research enhances my quality of teaching (+)	133 (66.5%)	50 (25%)	12 (6%)	3 (1.5%)	2 (1%)
6	I do research for achieving peer recognition (+)	83 (41.5%)	79 (39.5%)	22 (11%)	9 (4.5%)	7 (3.5%)

Table 4.3.2. Distribution of Respondent Based on Motivational Factors Influencing

Category	Frequency	Percentage
Low (below 22)	29	14.5
Medium (22-28)	126	63
High (above 28)	45	22.5
	200	100

Research Productivity.

MEAN=25

S.D.=3

It was seen from table 4.3.1. that majority of respondents were strongly agreed on the statements viz. getting research projects helps in my promotion (57%), research helps me in getting managerial position (30.5%), research helps me in Satisfying my personal need and it motivate me to stay in the same field (59.5%), I do research for creativity and to satisfy my curiosity (66%), doing research enhances my quality of teaching (66.5%), and I do research for achieving peer recognition (41.5%). Majority of respondents (63%) found to have medium level of influence, 22.5% were having high level of influence and 14.5% were having low level of influence.

This supports the findings of **Paul *et.al* (2017)** revealed that there are 11 major factors that determines the research productivity of agricultural scientists and these factors are Organizational research environment, creativity, perseverance and commitment, research facility, ability to work under constraint, incentive policy, proactiveness, purpose driven orientation, achievement motivation, involvement in teaching, and job satisfaction.

S.No.	Category	0%	1-25%	26-50%	51-75%	>75%
1	All faculty / scientist/ professors are committed to research (+)	36 (18%)	32 (16%)	64 (32%)	55 (27.5%)	13 (6.5%)
2	Institutional administration is supportive in helping others to do research (+)	33 (16.5%)	46 (23%)	49 (24.5%)	53 (26.5%)	19 (9.5%)
3	Regardless of seniority their research ideas are respected by others in my department (+)	37 (18.5%)	40 (20%)	53 (26.5%)	51 (24.5%)	19 (9.5%)
4	The institutional head can influence the individual research productivity. (+)	55 (27.5%)	46 (23%)	46 (23%)	43 (21.5%)	10 (5%)

Table 4.3.3. Distribution of Respondents Based on Extent of Agreement for Institutional Factors Influencing Research Productivity (Positive Statements) (n=200)

Table 4.3.4 Distribution of Respondents Based on Institutional Factors Influencing Research Productivity (Positive Statements)

S.No. 1	Category	Frequency	Percentage
1	Low (below 9)	49	24.5
2	Medium (9 - 15)	109	54.5
3	High (above 15)	42	21
	Total	200	100

MEAN= 12 S.D.=3

From the table 4.3.2. it was found that for the first statement that was, all faculty / scientist/ professors are committed to research 32% respondents were agreed to 26-50% category , with statement second, Institutional administration is supportive in helping others to do research respondents (26.5%) were agreed to 25-75% category , with third statement ,regardless of seniority their research ideas are respected by others in my department 26.5% respondents were agreed to 26-50% category and with fourth statement, and 27.5% respondents were agreed in 0-25% category on statement- the institutional head can influence the individual research productivity. Also 54.4% respondents were found to have medium level of influence with institutional factors followed by 24.5% who had low level of influence and 21% who had high level of influence.

Table 4.3.5. Distribution of Respondents Based on Extent of Agreement for Institutional Factors Influencing Research Productivity (Negative Statements) (n=200)

S.No.	Category	Frequency	Percentage
1	Low (below 24)	38	19
2	Medium (24to36)	124	62
3	High (above 36)	38	19
	Total	200	100

S.No.	Because of these factors my research is being influenced	0 %	1-25%	26-50%	51-75%	>75%
1	Because of Heavy teaching load I am unable to conduct research (-)	54 (27%)	62 (31%)	39 (19.5%)	21 (10.5%)	24 (12%)
2	Because of heavy managerial /administrative activities I am unable to conduct research (-)	36 (18%)	69 (34.5%)	39 (19.5%)	37 (18.5%)	19 (9.5%)
3	Because of Lack of educational resources in physical form (books/articles, etc.) I am unable to conduct research (-)	96 (48%)	52 (26%)	33 (16.5%)	13 (6.5%)	6 (3%)
4	Because of Lack of financial support, I am unable to conduct research (-)	45 (22.5%)	67 (33.5%)	44 (22%)	30 (15%)	14 (7%)
5	Because of Lack of research lab/equipment /devices, etc. I am unable to conduct research (-)	58 (29%)	62 (31%)	39 (19.5%)	24 (12%)	17 (8.5%)
6	Because of low proficiency of a foreign language, I am unable to conduct research (-)	126 (63%)	35 (20%)	22 (11%)	10 (5%)	7 (3.5%)
7	Because of Lack of opportunity, I am unable to conduct research (-)	74 (37%)	59 (29.5%)	35 (17.5%)	21 (10.5%)	11 (5.5%)
8	Because of Preparation and sending research proposal to various funding agencies I am unable to conduct research (-)	80 (40%)	64 (32%)	36 (18%)	13 (6.5%)	7 (3.5%)

Table 4.3.6. Distribution of Respondents Based on Institutional Factors Influencing Research Productivity (Negative Statements)

MEAN= 30

S.D.=6

From the table 4.3.2.(B) it was found that for statements: because of Heavy teaching load I am unable to conduct research, because of heavy managerial /administrative activities I am unable to conduct research, because of Lack of research lab/equipment /devices, etc. I am unable to conduct research and because of Lack of financial support, I am unable to conduct research maximum of respondents (31%, 34.5%, 31% and 33.5% respectively) were found to be agreed with 1-25% category. And for the statements: because of Lack of educational resources in physical form (books/articles, etc.) I am unable to conduct research, because of low proficiency of a foreign language, I am unable to conduct research, and because of Preparation and sending research proposal to various funding agencies I am unable to conduct research 48%, 63%, 37% and 40% respondents were agreed to only 0-1% category. And 62% respondents have been medium influenced by institutional factors, 19 % influenced less and 19% influenced high with institutional factors.

The result support the findings of **Lertputtarak (2008)** who investigated the factors that contributed to a low level of research productivity among academics at a Thailand public university and found that academics lacked university support and had a heavy teaching load. Academics lacked research self-efficacy on an individual basis. These three factors contributed to academics' low research productivity.

4.3.7 Distribution of Respondents Based on Extent of Agreement on the Behavioural Factors Affecting Research Productivity (n=200)

S.No.	Category	0%	1-25%	26-50%	51-75%	>75%

1	I discuss with my colleagues to get the research ideas (+)	36 (18%)	48 (24%)	57 (28.5%)	49 (24.5%)	10 (5%)
2	I seek the advice from my seniors for research (+)	35 (17.5%)	50 (25%)	62 (31%)	40 (20%)	13 (6.5%)
3	I collaborate with my colleagues to do research (+)	48 (24%)	56 (28%)	53 (26.5%)	38 (19%)	5 (2.5%)
4	I ask my colleagues to review Manuscripts (+)	33 (16.5%)	46 (23%)	57 (28.5%)	46 (23%)	18 (9%)
5	I give feedback on manuscripts of other colleagues (+)	40 (20%)	54 (27%)	46 (23%)	51 (25.5%)	9 (4.5%)
6	I discuss with researchers from another department / institute (+)	41 (20.5%)	59 (29.5%)	55 (27.5%)	37 (18.5%)	8 (4%)

4.3.8 Distribution of Respondents Based on Behavioural Factors Affecting Research Productivity

S.No.	Category	Frequency	Percentage
1	Low (below 14)	39	19.5
2	Medium (14 to 26)	120	60
3	High (above 26)	41	20.5
	Total	200	100

MEAN= 20

S.D.=6

From the table 4.3.7. it was found most of the respondents for statement 1,2 and 4 viz. I discuss with my colleagues to get the research ideas, I seek the advice from my seniors for research, and I ask my colleagues to review Manuscripts 28.5% ,31% and 28.5% respectively agreed in 26-50% category. Whereas the greatest number of respondents (28%, 27% and 28.5%) agreed with 1-25% category for statements: I collaborate with my colleagues to do research, I give feedback on manuscripts of other colleagues, and I discuss with researchers from another department / institute respectively. Also, it was found that majority of respondents (60%) having medium level of influence of Behavioural factors followed by 20.5% having high level of influence and 19.5% having low level of influence.

The findings ofJones and Preusz (1993)support the result theydiscovered that involvement in joint research projects had a substantial link with research productivity in an attempt to explore the attitudinal aspects related with individual faculty production. The amount of time spent interacting with coworkers for scientific talks was also found to be connected to research productivity. Personal interactions with coworkers, according to the authors, allowed for informal interchange of ideas and participation in collaborative research efforts.

4.4 Relationship Between Dependent Variable (Research Productivity) and Independents Variables

S.No.	Independent variables	Pearson correlation value	Sign. (2 tailed)
1	Age	.532**	.000
2	Motivational factors	.217**	.002

3	Institutional factors (positive)	.154*	.029
4	Institutional factors (negative)	.441**	.000
5	Behavioural factors	-.049	.491

** Correlation is significant at the 0.01 level (2tailed)
* Correlation is significant at 0.05 level (2 tailed**)**

Correlation analysis has been done using step wise method in SPSS 26 between independent variables with dependent variable to the relationship between them. And it was found that with age, motivational factors and institutional factors there is a positive correlation ship with research productivity and plays significant role and has contribution in research productivity. whereas the Behavioural factors are negatively correlated and not play significant role with research productivity.

4.5 Chi Square Analysis for Association of Independent Factors with Dependent Factor Research Productivity

S.No.	Independent variables	Pearson correlation value	df	Sign. (2 tailed)
1	Gender	3.051	2	.218
2	Marital status	3.813	2	.149

3	Background	8.866	4	.065
4	Medium of instruction (high-school)	.317	2	.853
5	Medium of instruction (intermediate)	.597	2	.742
6	Father occupation	20.396	10	.026
7	Mother occupation	8.792	10	.552
8	Academic rank	.853	4	.931
9	UG from	4.794	4	.309
10	PG from	3.195	8	.922
11	Ph.D. from	6.524	8	.589
12	Father educational qualification	4.101	6	.663
13	mother educational qualification	1.078	8	.998

Chi square test has been done between independent and dependent variables and found that all the independent variables were positive correlated with research productivity but not significant. Which means independent values are having positive relationship with research productivity but are not significant.

Summary and Conclusion

Emerging challenges in agriculture-dependent countries like India, such as population growth, urbanization, resource scarcity, globalization, liberalization, and climate change, necessitate highly productive (effective and efficient) scientific personnel to ensure continuous growth and development in agriculture in order to improve farmers' socio-economic conditions and meet the country's food security. As a result, the Agricultural researcher's Research Productivity serves as a yardstick for agricultural advancement, innovation, and development.

Research Productivity is defined as a comprehensive measure of an agricultural researcher's number of publication, intellectual property rights secured, projects completed, e-content developed and consultancy delivered during the course of his professional career.

Research productivity, according to Creswell (2008) and Tafreshi, *et.al*. (2013), includes writing a book or book chapter, gathering and analyzing original evidence, working with students on dissertations and class projects, obtaining research grants, carrying out editorial duties, obtaining patents and licenses, writing monographs, developing experimental designs, and producing works of art. A research project entails more than just gathering data; it also necessitates preparing ahead of time to determine which sources to consult, what types of notes to take, and how to put it all together into an effective document that can be disseminated globally.

Due to changes in the country's socioeconomic and technological landscape, the need to improve the efficiency of the public agricultural research system, which primarily consists of the Indian Council of Agricultural Research (ICAR) and State Agricultural Universities (SAUs), has become more apparent in recent years. The slow rate of agricultural growth during the last two decades has compelled agricultural administrators, policymakers, and scientists to pay close attention. Agricultural scientists must address challenges such as sustainability, equity, environmental protection, climate change, and other issues in addition to growing agricultural productivity. The complicated nature of agricultural research necessitates highly motivated experts working in a research-friendly setting. Since agricultural research has become increasingly multidisciplinary, teamwork and communication skills have been critical to scientific success. Academic and research standards in research institutions in general, and agricultural institutes in particular, have been a source of concern. With these issues in mind, the

current study, named "A Study on Research Productivity of Agricultural Researchers," was conducted with the following objectives in mind.

4. To study the profile of agricultural researchers
5. To study the indicators associated with research productivity of agricultural researchers
6. To study the factors influencing the research productivity of agricultural researchers

5.1 Methodology

5.1.1 Study Area

The study was conducted in all agricultural institutions of India. Agricultural education and research Institutes that regularly conduct both teaching and research, were chosen for study.

5.1.2 Selection of Respondents

The questionnaire was sent to 1000 Agricultural researchers of India through mail, including both professors and scientists for the study, out of them only 200 response was obtained.

5.1.3 Collection of Data

The data were collected from mailed questionnaire. A structured interview was made using google form to collect the data.

5.1.4 Analytical Tools Used

The profile of the respondents was presented in the tabular form using frequency, percentage, mean and standard deviation. The research productivity was measured using index developed for the study and the factors influencing research productivity was estimated by using Pearson’s correlation coefficient and chi square test.

5.2 Major Findings of the Study

5.2.1 Profile of the Respondents

- More than half (59%) respondents belonged to age group of 37yrs. to 58 yrs. while 27.5 % and 13.5% were from age group below 36 yrs. and above 58 yrs. respectively
- Majority of respondents were (88.5 %) males and 11.5 percent were females.
- Majority of respondents were married (92.5%) whereas remaining 7.5% were not married.
- Majority of respondents (53%) were from rural background followed by 27.5% who were from urban background and remaining 19.5% who were from semi-urban background.
- 30.5% fathers of respondent have completed their post-graduation followed by 21% who have completed high- school, 18% completed their under graduation, 14% completed PhD, 11.5% completed intermediate and 4.5% were illiterate.
- 48% mothers of respondent have only completed their high-school followed by 25% who were illiterate, 13% completed their intermediate, 8.5% were undergraduate, 5% were post graduate and 0.5% have completed their PhD.
- 46.5% fathers of respondents were from government service, followed by 39% who were from agriculture sector, 10% were from business and entrepreneurial service, and 4.5% were from private service.
- More than three fourth i.e., 78% respondent's mother were home maker followed by 12% were from agriculture service, 7% from government service, 2% were from business/entrepreneurial service and only 1% were from private service.
- Majority of respondent (68%) have regional language as their medium of instruction in high-school followed by 32% respondent who had English language as their medium of instruction in high-school.
- English was the medium of instruction in intermediate for 52% of respondent followed by regional language of 48% of respondents.
- 68% respondents have done their under-graduation from state agricultural university followed by 18% who have completed their graduation from central university and 14% respondent have done graduation from affiliated college of a general university.

- 61.5% respondent have done their post-graduation from state agricultural university followed by 19% who have done post-graduation from central university ,12.5% done from ICAR institution ,6% done from affiliated college of a general university and rest 1% from deemed and foreign university.
- 40% respondents have done their Ph.D. from state agricultural university followed by 28% have done Ph.D. from ICAR institution, 21% done from central university, 5.5% from affiliated college of a general university and 5.5% from others including deemed university, foreign university and have withdrawal temporarily
- 44.5% respondents were scientists/assistant professors, 42.5%were principal scientists/professor and 13%were senior scientist/assistant professor.

5.2.2 Indicators Associated with Research Productivity of Respondents

- The publications published by respondents has upward trend in I, II and III phase, became constant in IV and V phase and has downward trend in VI and VII phase in his professional career.
- The average number of e-contents delivered by respondents has been increased from phase I to phase VII. The upward trend has been observed in the professional career of respondents.
- The average number of IPRs secured has been found to be declined after phase III and was maximum in phase II.
- The average number of research projects completed by respondents has upward trend in all phases except in phase VI and VII where downward trend has been observed.
- A zig-zag trend has been observed in delivering average number of consultancies by the respondents. Highest consultancies delivery has been observed in phase III and V.
- 85.5 percent of the respondents were in the category of low to medium research productivity followed by 14.5 percent respondents having high research productivity.

5.2.3 Factors Influencing the Research Productivity of Respondents

- In correlation analysis for determining the association between independent factors and research productivity of agricultural researchers, it was found that age, motivational factors and institutional factors were significantly related with the research productivity

at 5% level of significance. And Behavioural factor was found to be negatively correlated with research productivity.

- In chi square analysis for determining the association between independent variables and research productivity of agricultural researchers, it was found that there was no significant relation found between independent variables with dependent variable i.e., research productivity of agricultural researchers.
- Majority of respondents were strongly agreed on the statements of motivational factors viz. "getting research projects helps in my promotion" (57%), "research helps me in getting managerial position" (30.5%), "research helps me in Satisfying my personal need and it motivate me to stay in the same field" (59.5%), "I do research for creativity and to satisfy my curiosity" (66%), "doing research enhances my quality of teaching" (66.5%), and "I do research for achieving peer recognition" (41.5%).
- 32% respondents were agreed to statements that "all faculty / scientist/ professors are committed to research" with 26-50% category , 26.5% agreed that "Institutional administration is supportive in helping others to do research" with 25-75% category , 26.5% respondents were agreed that "regardless of seniority their research ideas are respected by others in my department" with 26-50% category and 27.5% agreed that "the institutional head can influence the individual research productivity" with 0-25% category.

5.3 Conclusion and Implications of the Study

It is evident from the findings that majority of agricultural researchers had relatively low to medium research productivity, which was caused by a variety of organizational and personal issues. The research productivity of agricultural researchers has also been influenced by demographic, motivational, organizational and Behavioural factors. The best practices that emerged during the study could be useful for agricultural researchers as they develop plans to increase research productivity. The implications of the current investigation are as follows:

- Immediate and sincere efforts have to be made to enhance productivity level of agricultural researchers. There is enough scope to enhance productivity of agricultural

researchers as most of them have lower to medium level of productivity as found in the present study.

- The organizational climate of agricultural research organizations needs to be regularly assessed in order to be constantly improved in terms of autonomy, innovations, facilities, trust, recognition, and support.
- In order to have access to modern infrastructure and facilities for conducting research across disciplines, research managers and policy makers should make every effort to allocate enough funding for agricultural research.
- Research organization should focus on continually boosting researcher's levels of motivation.
- Development of a system of professional mentoring of younger researchers by achiever researchers is felt necessary.
- Development of regular monitoring system for the agricultural researcher’s performance is required.

5.4 Suggestions for Future Line of Work

- In order to generalize the inferences from the study it need to be extended for Ph.D. students, and for professors of different faculty and departments to know their research productivity.
- There is large scope for study on the extent of effects of different independent variables with research productivity of agricultural researchers as very few studies were found on it.
- Comparative analysis of research productivity of researchers from different departments of ICAR, SAU, CSIR.
- Very less literature was available on study of research productivity of agricultural researchers. Hence more studies in this aspect will be beneficial in developing and improving the research system.

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APPENDIX

A STUDY ON RESEARCH PRODUCTIVITY OF AGRICULTURAL RESEARCHERS

PART ONE: DEMOGRAPHICS

1. NAME:
2. Age:
3. Gender: (a) Male ☐ (b) Female ☐
4. Marital status: (a) Single ☐ (b) Married ☐
5. Background: (a) Urban ☐ (b) Semi-urban ☐ (c) Rural☐
6. Educational qualification **(1) Father**:(a) high school☐(b)intermediate☐(c)UG☐(d) PG☐
   (2)Mother: (a)high school☐(b) intermediate☐(c) UG☐(d) PG☐

7. Parent's occupation: (1) **Father**: (a) Agriculture☐(b) Govt. service (c)Pvt. Service☐
   (d) Business/ Entrepreneur ☐(e)Any other (please specify)
   (2) **Mother**: (a) Agriculture☐(b) Govt. service ☐(c)Pvt. Service☐
   (d) Business/ Entrepreneur ☐(e)Home maker ☐(f)Any other (please specify)

8. Medium of instruction (1) **Highschool** (a)English☐ (b)regional language☐

(2) **Intermediate** (a) English☐ (b) Regional language☐

9. **Graduation from**: (a) Central University☐(b) State Agriculture University ☐ (c)Affiliated college of a General University ☐(d) Any other (please specify)

10. **Post-graduation from**: (a) Central Agriculture University☐(b) ICAR institution ☐ (c)State Agriculture University ☐(d)Affiliated college of a General University☐ (e)Any other (please specify)

11. **Ph.D. from**: (a) Central Agriculture University☐(b) ICAR institution☐(c)State Agriculture University ☐ (d)Affiliated college of a General University☐(e)Any other (please specify)

12. **Academic Rank**:(a) Scientist/Assistant Professor☐(b)Principal scientist/Professor☐ (c) Senior Scientist/ Associate ☐

13. Year of Recruitment:
14. Name of Discipline:
15. Name of the Institution:

PART TWO: RESEARCH PRODUCTIVITY

(a) **Please indicate number of publications published in your professional career**

Years after joining the service							
Number of Publications	**1-5 yrs.**	**6-10 yrs.**	**11-15 yrs.**	**16-20 yrs.**	**21-25 yrs.**	**26-30 yrs.**	**>30 yrs.**
i. Number of Research papers published							
j. Number of Popular articles published							
k. Number of Book published							
l. Number of Book chapters published							
m. Number of Technical bulletins published							
n. Number of Feature stories published							
o. Number of Manuals published							
p. Any other publication published (please specify)							

(b) Number of publications prior to your appointment (if any):

Number of e-contents developed	**1-5 yrs.**	**6-10 yrs.**	**11-15 yrs.**	**16-20 Yrs.**	**21-25 yrs.**	**26-30 yrs.**	**>30 yrs.**
g. Number of video modules developed							
h. Number of text module developed							
i. Numbers of MOOCS developed							

(c) Please indicate number of e-contents you have developed in your service:

j. Number of blogs developed							
k. Number of YouTube videos developed							
l. Any other (please specify)							

(d) Please indicate number of Intellectual Property Rights you have in your professional career:(Provide data in numbers)

Number of Intellectual Property Rights	**1-5 yrs.**	**6-10 yrs.**	**11-15 yrs.**	**16-20 yrs.**	**21-25 yrs.**	**26-30 yrs.**	**>30 yrs.**
a. Patent							
b. Copyright							
c. Trademark							
d. Geographical indication							
e. Other (please specify)							

(e) Please indicate number of research projects ongoing/completed in your professional career:

Number of Research projects	**1-5 Yrs.**	**6-10 Yrs.**	**11-15 Yrs.**	**16-20 Yrs.**	**21-25 Yrs.**	**26-30 Yrs.**	**>30 yrs.**
e. Number of Internally (Institutional) Funded research project							
f. Number of Externally funded research projects (national funding agencies)							
g. Number of Internationally funded projects							
h. Number of internally funded +							

Collaborative projects							
i. Number of externally funded + Collaborative projects							
j. Number of internationally funded + Collaborative projects							

(f) Please indicate number of Consultancy delivered:

	1-5 Yrs.	**6-10 Yrs.**	**11-15 Yrs.**	**16-20 Yrs.**	**21-25 Yrs.**	**26-30 Yrs.**	**>30 yrs.**
e. Consultancy delivered to Farmers							
f. Consultancy delivered to central Governmental agencies							
g. Consultancy delivered to state Governmental agencies							
h. Consultancy delivered to non-governmental agencies							
i. Consultancy delivered to international agencies							

PART THREE: FACTORS INFLUENCING YOUR RESEARCH PRODUCTIVITY

This part aims to understand your perceptions about different factors influencing your research productivity.

A. Motivational factors

Please indicate how much do you agree with the following motivational factors for you to undertake the research.

	Strongly Agree	**Moderately Agree**	**Neutral**	**Moderately Disagree**	**Strongly Disagree**

a. Getting Research projects helps me in my Promotion	☐	☐	☐	☐	☐

	0%	**1-25%**	**26-50%**	**51-75%**	**>75%**

b. Research helps me in getting a managerial position	☐	☐	☐	☐	☐
c. Research helps me in Satisfying my personal need and it motivate me to stay in the same field	☐	☐	☐	☐	☐
d. I do research for creativity and to satisfy my curiosity	☐	☐	☐	☐	☐
e. Doing research enhances my quality of teaching	☐	☐	☐	☐	☐
f. I do research for achieving peer recognition	☐	☐	☐	☐	☐

a. All faculty / scientist/ professors are committed to research	☐	☐	☐	☐	☐
b. Institutional administration is supportive in helping others to do research	☐	☐	☐	☐	☐
c. Regardless of seniority their research ideas are respected by others in my department	☐	☐	☐	☐	☐
d. The institutional head can influence the individual research productivity.	☐	☐	☐	☐	☐

B. <u>Institutional factors</u>

I. Please indicate how much percentage you are agree with the following statements with respect to the research climate of your institute

II. Among the following obstacles please indicate your level of influence that inhibit your research productivity

Because of these factors my research is being influenced	**0 %**	**1-25%**	**26-50%**	**51-75%**	**>75%**
a. Because of Heavy teaching load I am unable to conduct research	☐	☐	☐	☐	☐
b. Because of heavy managerial /administrative activities I am unable to conduct research	☐	☐	☐	☐	☐
c. Because of Lack of educational resources in physical form (books/articles, etc.) I am unable to conduct research	☐	☐	☐	☐	☐
d. Because of Lack of financial support, I am unable to conduct research	☐	☐	☐	☐	☐
e. Because of Lack of research lab/equipment /devices, etc. I am unable to conduct research	☐	☐	☐	☐	☐
f. Because of low proficiency of a foreign language, I am unable to conduct research	☐	☐	☐	☐	☐
g. Because of Lack of opportunity, I am unable to conduct research	☐	☐	☐	☐	☐

h. Because of Preparation and sending research proposal to various funding agencies I am unable to conduct research	☐	☐	☐	☐	☐

C. <u>Behavioural factors</u>

Please indicate how much the Behavioural factors influenced your research productivity

	0%	**1-25%**	**26-50%**	**51-75%**	**>75%**
a. I discuss with my colleagues to get the research ideas	☐	☐	☐	☐	☐
b. I seek the advice from my seniors for research	☐	☐	☐	☐	☐
c. I collaborate with my colleagues to do research	☐	☐	☐	☐	☐
d. I ask my colleagues to review Manuscripts	☐	☐	☐	☐	☐
e. I give feedback on manuscripts of other colleagues	☐	☐	☐	☐	☐
f. I discuss with researchers from another department / institute	☐	☐	☐	☐	☐

This is the end of the survey. Thank you very much for your support.