

## **The Relevance of Post Graduation Research in Agricultural Sciences in Selected Indian Universities**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors KSM and KH designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors BA, DKH and NHS managed the literature searches. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/CJAST/2020/v39i2230840

#### Editor(s):

(1) Dr. Hanuman Singh Jatav, S. K. N. Agriculture University, India.

#### Reviewers:

(1) Twaha Ali Basamba Ateenyi, Makerere University, Uganda.

(2) Hyllo Lagana Fernandes, Universidade Federal de São Carlos, Brazil.

(3) Maria Emilia Camargo, University of Caxias do Sul, Brazil.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/58382>

**Original Research Article**

**Received 06 May 2020**  
**Accepted 12 July 2020**  
**Published 11 August 2020**

### **ABSTRACT**

The study was conducted in selected farm universities in Karnataka state namely Raichur, Dharwad and Bangalore Agricultural Universities for the period 2015-16 and 2016-17 to know about the relevance of post graduate research in agricultural sciences. The preferred research areas focused in various subjects of agricultural sciences were categorized and studied the relevance on the major fields of specialization in these farm universities. The results show that among various post-graduation disciplines numerically highest research relevance was observed in agronomy and least relevance was observed in crop physiology. Hence, the study suggests that research areas should be focused on current regions of overall agriculture development and research relevance should be focused on present problems which can address the farming communities about the current pressing agricultural development problems.

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*Keywords: Education; agriculture; relevance; post graduate; plant science.*

## 1. INTRODUCTION

In India, agriculture is both an old and new industry, it has been in practice for thousands of years. It is made up of companies and corporations that are involved in the production of food crops for consumption purposes; This includes both firms that specialize in raising animals and enterprises in growing crops. Thus agriculture plays the most crucial role in the socio-economic transformation of India and hence is considered an important sector for food production and employment.

Agriculture currently provides livelihood to 58-60 per cent of the total population [1]. Furthermore this sector also provides employment opportunities for the people to the extent of 48.9 per cent in the country's work force and has become the single largest private occupation sector. Therefore, based on the Royal Commission Recommendations, Indian Council of Agriculture Research (ICAR) was established at New Delhi to co-ordinate education in various sectors of Agriculture and has become a nodal organization for agricultural research and development in the country [2]. State Agricultural Universities under the guidance of ICAR operate and take responsibility in doing the same at the state level. After independence, agricultural research was given more emphasis which in turn led to increased agricultural production and near self-sufficiency in food grains and overall development of agriculture in the country.

State Agricultural Universities (SAU) are vibrant channels in producing technical manpower for operational research. To provide highly qualified, competitive technical manpower, a well-established system of education is needed (Singh, 2012). In recent times, the quality of agricultural research has been subjected to significant attrition due to several reasons like large proportion of research investments, less manpower, low contingencies for research, narrowing down of scientific expertise due to inbreeding etc. On the other end, scientific research and technological development have made India one of the leading countries in the production of many agricultural products [3].

Graduates intending to enter agricultural industries need to be well prepared in the basic and applied sciences, as well as business and management disciplines. During the process of development of qualified scientific manpower, the

education for the students at master and Doctoral level in subject and research methodologies are necessary facilities to train students intensively through their course and research work and accordingly receiving the degree. Post graduate studies and research prepare graduates for the challenging roles in agriculture at both national and international levels. The traditional role of primary production has changed so dramatically that graduates are engaged more in modern areas of farming and dairy. The demand for agriculture and allied activities will increase the value of our primary products which resulted from the need of graduates beyond the expectations. They are now sought after in the areas of research, marketing and technology transfer, apart from the agriculture they are into the different service industries allied streams such as, Crown Research Institutes, Treasury, consultancy positions within exporting companies [4]. Graduates from agriculture programmes are highly sought after both within country and abroad. Students may want a career for professional qualification in essential, such as agriculture field, or There are also many disciplines in which a research degree is desirable, such as working in public and private Institutions. Alternatively, postgraduate study can open a whole new world of opportunities [5].

Today, post-graduate education faces multiple challenges in terms of demand, supply, quality and returns for both providers and the clientele concerned. Why students decide to pursue this level of study and the incentives offered by institutions or employers are critical factors in changing and understanding trends. Thus, it is affecting a stocktaking of trends in post-graduate research, primarily with regard to the changing content and structure of advanced research degrees, while considering the impact to the origins, profiles and choices of the concerned students. The general objective of this study was to assess the relevance of post graduation research in agricultural sciences in selected universities of Karnataka state. The specific objectives of the study are to categorize research and evaluate the relevance of post graduate research in Agricultural Universities in conjunction with the needs of stakeholders in the agricultural sector; and to document success cases on usefulness of postgraduate research in transforming the research system more responsive to the need of stakeholders.

## 2. METHODOLOGY

This study was conducted in Karnataka state of India. Three Agricultural Universities from Karnataka were selected for the study. In each university, the colleges which offer Post Graduate courses were selected. The study was carried out using ex-post facto research design during the period 2015-17. The details of the study area are indicated in Table 1.

Information on Post Graduate research work was acquired for the preceding five years from 2010 to 2015; it was collected department wise from the Colleges. From each department, the major area of research was identified through questionnaires given to the head of the department from each university. Categorization of postgraduate research was based on major areas of research and data was tabulated department wise. The thrust areas of research were collected from the reports of Zonal Research and Extension Advisory Council (ZREAC), NARP and KVK, the Director of Research Office etc., from 2010 to 2015. These areas of research helped in finding out the relevance of post graduate research work conducted in the departments.

### 2.1 Instruments for Data Collection

Based on the objectives and scope of the study, a structured interview schedule was developed to collect data from respondents. The data were collected by personally interviewing the respondents. Statistical parameters such as frequency and per centage were generated from the collected data. Furthermore, samples were subjected to simple frequency distribution so as to identify the number of postgraduate research fields and in order to arrive at best interpretations, Percentages were used in making comparisons of different areas of research.

## 3. RESULTS AND DISCUSSION

### 3.1 Department of Agricultural Economics

The research areas under which postgraduate research was carried out at the department of Agricultural Economics across the universities are presented in Table 2. The data shows that 32.32% of the postgraduate research was carried out in production economics and farm

management, followed by agricultural finance and credit (22.22%), impact assessment and evaluation studies (16.16%) and agricultural marketing (13.13%) across the universities. It is interesting to note that in UAS, Raichur, Dharwad and Bangalore, production economics and farm management was the leading research area. In UAS, Raichur, no postgraduate research was carried under Crop insurance and Others (economic modeling etc.).

### 3.2 Department of Agricultural Entomology

Management studies of insect pests was the leading research area in department of Agricultural Entomology across the universities (36.48%), followed by biological control of insect pests (26.61%) and 9.87% in taxonomic studies of insect pests. In UAS, Raichur, Dharwad and Bangalore, management studies of insect pests was the preferred research area, followed by biological control of insect pests. In UAS, Raichur, besides management studies of insect pests and biological control of insect pests, insect resistance was also a preferred research area and no postgraduate research was carried in grain storage pests and their management and post harvest technologies to minimize the yield losses by insect pests. In UAS, Dharwad and Bangalore, the research area studies on isolation/characterization of insect pests also received some attention (Table 3).

### 3.3 Department of Agronomy

In the department of Agronomy, nutrient management was the leading research area for conducting postgraduate research across the universities (27.92%). In UAS, Raichur, 37.50, 25.00 and 17.50% of postgraduate research was carried under the research areas nutrient management, weed management and cropping and farming systems, respectively. The same trend was recorded in UAS, Dharwad. Nutrient management (25.62%), weed management (17.36%), integrated crop management (14.88%) and performance of cultivars (12.40%) were the preferred research areas in UAS, Bangalore. Across universities, other than nutrient management, weed management (18.87%), cropping and farming systems (12.45%), integrated crop management (12.08%) and performance of cultivars (10.94%) were the preferred research areas chosen for carrying out postgraduate research (Table 4).

**Table 1. Details of the study area**

Sl. no	States	Name of the University	Colleges studied
1	Karnataka	University of Agricultural Sciences, Dharwad University of Agricultural Sciences, Bangalore University of Agricultural Sciences, Raichur	College of Agriculture, Dharwad College of Agriculture, Bangalore College of Agriculture, Raichur

**Table 2. Department of agricultural economics**

Sl. no	Research areas	Universities						Total	
		UAS, Raichur		UAS, Dharwad		UAS, Bangalore			
		F (n=28) (%)	F (n=91) (%)	F (n=79) (%)	F (n=198) (%)				
1	Agricultural Policies	2	7.14	6	6.59	6	7.59	14	7.07
2	Agricultural marketing	3	10.71	14	15.38	9	11.39	26	13.13
3	Crop Insurance	0	0	5	5.49	7	8.86	12	6.06
4	Agricultural Finance & Credit	6	21.43	19	20.88	19	24.05	44	22.22
5	Production economics & Farm management	14	50	27	29.67	23	29.11	64	32.32
6	Impact assessment & evaluation studies	3	10.71	18	19.78	11	13.92	32	16.16
7	Others (Economic modeling etc)	0	0	2	2.2	4	5.06	6	3.03

**Table 3. Department of agricultural entomology**

Sl. no	Research areas	Universities						Total	
		UAS, Raichur		UAS, Dharwad		UAS, Bangalore			
		F (n=40) (%)	F (n=77) (%)	F (n=116) (%)	F (n=233) (%)				
1	Management Studies of insect pests	19	47.5	28	36.36	38	32.76	85	36.48
2	Taxonomic studies of insect pests	1	2.50	7	9.09	15	12.93	23	9.87
3	Insecticide Resistance	5	12.50	5	6.49	9	7.76	19	8.15
4	Studies on isolation/ characterization of insect pests	3	7.50	6	7.79	10	8.62	19	8.15
5	Biological control of insect pests	10	25.00	21	27.27	31	26.72	62	26.61
6	Insect development factors	2	5.00	2	2.60	4	3.45	8	3.43
7	Grain Storage of pests and their management	0	0	5	6.49	5	4.31	10	4.29
8	Post-harvest technologies to minimize the yield losses by insect pests	0	0	3	3.90	4	3.45	7	3.00

**Table 4. Department of agronomy**

Sl. no	Research areas	Universities						Total	
		UAS, Raichur		UAS, Dharwad		UAS, Bangalore		F (n=265)	F (%)
		F (n=40)	(%)	F (n=104)	(%)	F (n=121)	(%)		
1	Integrated crop management	1	2.50	13	12.5	18	14.88	32	12.08
2	Nutrient management	15	37.50	28	26.92	31	25.62	74	27.92
3	Weed management	10	25.00	19	18.27	21	17.36	50	18.87
4	Water management	1	2.50	8	7.69	9	7.44	18	6.79
5	Organic agriculture	3	7.50	10	9.62	13	10.74	26	9.81
6	Cropping and farming systems	7	17.50	15	14.42	11	9.09	33	12.45
7	Performance of cultivars	3	7.50	11	10.58	15	12.40	29	10.94
8	Studies on climate resilient agriculture	0	0	0	0	3	2.48	3	1.13

**Table 5. Department of crop physiology**

Sl. no	Research areas	Universities						Total	
		UAS, Raichur		UAS, Dharwad		UAS, Bangalore		F (n=128)	F (%)
		F (n=4)	(%)	F (n=39)	(%)	F (n=85)	(%)		
1	Characterization of genotypes	0	0	7	17.95	13	15.29	20	15.63
2	Crop growth models	2	50.00	10	25.64	24	28.24	36	28.13
3	Plant growth regulators	0	0	9	23.08	21	24.71	30	23.44
4	Stress management	1	25.00	2	5.13	11	12.94	14	10.94
5	Nutrient studies	1	25.00	6	15.38	10	11.76	17	13.28
6	Seed physiology	0	0	5	12.82	6	7.06	11	8.59

### 3.4 Department of Crop Physiology

The results depicted in Table 5 indicate that 28.13% of postgraduate research was conducted on crop growth models, 23.44% on plant growth regulators, 15.63% on characterization of genotypes, 13.28% on nutrient studies, 10.94% on stress management and 8.59% on seed physiology across universities in the department of crop physiology (Table 6), whereas in UAS, Raichur, three research areas, namely crop growth models (50.00%), stress management (25.00%) and

nutrient studies (25.00%) were preferred in carrying out postgraduate research. In UAS, Bangalore and Dharwad, crop growth models was the leading research area chosen for postgraduate research, followed by plant growth regulators and characterization of genotypes.

### 3.5 Department of Horticulture

Crop improvement (28.57%) was the preferred topic chosen for postgraduate research in the department of horticulture across the universities compared to other topics. In UAS, Raichur, along

with crop improvement (37.50%), weed management in horticulture crops (25.00%), post harvest studies (12.50%) and agronomical practices in horticulture crops (12.50%) are the preferred topics. Crop improvement (37.93%), followed by studies on growth regulators (20.69%) and green house cultivation (13.79%) and agronomical practices in horticulture crops (13.79%) are the topics chosen for postgraduate research. In UAS, Bangalore, crop improvement (25.00%) and studies on growth regulators (19.79%) are the preferred topics chosen for postgraduate research (Table 6).

### 3.6 Department of Soil Science and Agricultural Chemistry

Across universities, it was soil biology and fertility management (41.46%), followed by soil health management (23.78%) as the priority postgraduate research areas in the department of soil science and agricultural chemistry (Table 7). Remote sensing & GIS and soil transformation and soil delineation were the least preferred postgraduate research topics. It was UAS, Bangalore, where research on Remote sensing & GIS was carried to the extent of 3.92% (Table 7).

**Table 6. Department of horticulture**

Sl. no	Research areas	Universities						Total	
		UAS, Raichur		UAS, Dharwad		UAS, Bangalore		F (n=133)	(%)
		F (n=8)	(%)	F (n=29)	(%)	F (n=96)	(%)		
1	Crop improvement	3	37.50	11	37.93	24	25.00	38	28.57
2	Post harvest studies	1	12.50	3	10.34	14	14.58	18	13.53
3	Green house cultivation	0	0	4	13.79	12	12.50	16	12.03
4	Weed management	2	25.00	0	0	8	8.33	10	7.52
5	Growth regulators	0	0	6	20.69	19	19.79	25	18.80
6	Agronomical practices in horticulture crops	1	12.50	4	13.79	11	11.46	16	12.03
7	Propagation studies	0	0	1	3.45	6	6.25	7	5.26
8	Growing media	1	12.50	0	0	2	2.08	3	2.26

**Table 7. Department of soil science and agricultural chemistry**

Sl. no	Research areas	Universities						Total	
		UAS, Raichur		UAS, Dharwad		UAS, Bangalore		F (n=164)	(%)
		F (n=24)	(%)	F (n=38)	(%)	F (n=102)	(%)		
1	Soil survey and classification	3	12.5	4	10.53	14	13.73	21	12.80
2	Soil health management	7	29.17	4	10.53	28	27.45	39	23.78
3	Soil biology and fertility management	9	37.5	25	65.79	34	33.33	68	41.46
4	Resource management	4	16.67	2	5.26	17	16.67	23	14.02
5	Remote sensing & GIS	0	0	0	0	4	3.92	4	2.44
6	Soil and Water quality pollution	0	0	3	7.89	5	4.9	8	4.88
7	Other (Soil transformation, Soil delineationect.)	1	4.17	0	0	0	0	1	0.61

### 3.7 Relevance of Postgraduate Research in University of Agricultural Sciences at Raichur

With respect to overall relevance of postgraduate research in UAS, Raichur, the majority of postgraduate research (58.33%) is not relevant and the remaining 41.67 per cent of postgraduate research conducted in UAS, Raichur is relevant. Department wise, relevance of postgraduate research revealed that 50 per cent of the postgraduate research conducted at the department of agronomy is relevant. More than 45 per cent of the postgraduate research conducted at the department of agricultural entomology (47.50%) is relevant. Little more than 35 percent of postgraduate research was conducted at the Department of Soil Science and Agricultural Chemistry (37.50%) More than 60 per cent of the postgraduate research conducted at the department of crop physiology and horticulture (75.00%), agricultural economics (67.86%) is not relevant. It is interesting to note that more than half of the postgraduate research conducted in other departments such as soil science and agricultural chemistry (62.50%) is not relevant (Table 8).

### 3.8 Relevance of Postgraduate Research at the University of Agricultural Sciences at Dharwad

With respect to overall relevance of postgraduate research in UAS, Dharwad, majority of postgraduate research is not relevant (58.47%) and remaining 41.53 per cent of postgraduate research conducted in UAS, Dharwad, is relevant. Department wise, relevance of postgraduate research revealed that nearly half

(49.04%) of the postgraduate research conducted at the department of agronomy is relevant. More than 45 per cent of the postgraduate research was conducted at the department of agricultural entomology (45.45%). Little more than 40 per cent of the postgraduate research was conducted in the department of crop physiology (41.03%). About 38 per cent (37.93%) of the postgraduate research conducted in the department of horticulture is relevant. Nearly 37 per cent (36.84%) of the postgraduate research conducted in the department of soil science and agricultural chemistry is relevant. More than 67 per cent of the postgraduate research conducted in the department of agricultural economics (67.03%) is not relevant. More than 60 per cent of the postgraduate research conducted in the department of soil science and agricultural chemistry (63.16%) and horticulture (62.07%) is not relevant. It is interesting to note that more than half of the postgraduate research conducted in other departments such as crop physiology (58.97%), agricultural entomology (54.55%) and agronomy (50.96%) is not relevant (Table 9).

### 3.9 Relevance of Postgraduate Research at the University of Agricultural Science at Bangalore

With respect to overall relevance of postgraduate research in UAS, Bangalore, majority of PG research is not relevant (57.43%) and remaining 42.57 per cent of postgraduate research conducted in UAS, Bangalore, is relevant. Department wise, relevance of postgraduate research revealed that 48.28% of the postgraduate research conducted

**Table 8. Relevance of postgraduate research in University of Agricultural Sciences at Raichur**

Sl. no	Disciplines	Sample size	Relevant Not-relevant				Overall				
			F	%	F	%	Total Sample size (n=144)	Relevant F	Relevant %	Not-relevant F	Not-relevant %
1	Agricultural Economics	28	9	32.14	19	67.86	144	60	41.67	84	58.33
2	Agricultural Entomology	40	19	47.50	21	52.50					
3	Agronomy	40	20	50.00	20	50.00					
4	Crop Physiology	4	1	25.00	3	75.00					
5	Horticulture	8	2	25.00	6	75.00					
6	Soil Science and Agricultural Chemistry	24	9	37.50	15	62.50					

**Table 9. Relevance of postgraduate research at the University of Agricultural Sciences at Dharwad**

Sl. no	Disciplines	Sample size	Relevant		Not-relevant		Total sample size (n=378)	Overall			
			F	%	F	%		Relevant		Not-relevant	
								F	%	F	%
1	Agricultural Economics	91	30	32.97	61	67.03	378	157	41.53	221	58.47
2	Agricultural Entomology	77	35	45.45	42	54.55					
3	Agronomy	104	51	49.04	53	50.96					
4	Crop Physiology	39	16	41.03	23	58.97					
5	Horticulture	29	11	37.93	18	62.07					
6	Soil Science and Agricultural Chemistry	38	14	36.84	24	63.16					

**Table 10. Relevance of postgraduate research at the University of Agricultural Sciences at Bangalore**

Sl. no	Disciplines	Sample size	Relevant		Not-relevant		Total Sample size (n=599)	Overall			
			F	%	F	%		Relevant		Not-relevant	
								F	%	F	%
1	Agricultural Economics	79	29	36.71	50	63.29	599	255	42.57	344	57.43
2	Agricultural Entomology	116	56	48.28	60	51.72					
3	Agronomy	121	58	47.93	63	52.07					
4	Crop Physiology	85	36	42.35	49	57.65					
5	Horticulture	96	35	36.46	61	63.54					
6	Soil Science and Agricultural Chemistry	102	41	40.20	61	59.80					

at the department of agricultural entomology is relevant. More than 40 per cent of the postgraduate research conducted at the department of crop physiology (42.35%) and soil science and agricultural chemistry (40.20%) is relevant. Little more than 35 per cent of the postgraduate research was conducted at the department of agricultural economics (36.71%), horticulture (36.46%). More than 60 per cent of the postgraduate research conducted at the department of horticulture (63.54%) and agricultural economics (63.29%) is not relevant. It is interesting to note that more than half of the postgraduate research conducted in other

departments such as soil science and agricultural chemistry (59.80%), crop physiology (57.65%), agronomy (52.07%) and agricultural entomology (51.72%) is not relevant (Table 10).

#### 4. CONCLUSION

The data concludes that about 57% of PG research is not relevant in their studies, the knowledge for the topics of different disciplines can be utilised for better research initially for younger generation. It is also felt that the contributions by the Post Graduate researchers are being utilized in duplication of the work by



research scientists. It is also observed that the work carried out in Post Graduate Research is not meeting the needs of farmers directly or indirectly which could be result in wastage of resources.

#### **DISCLAIMER**

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge.

#### **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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*Peer-review history:*  
*The peer review history for this paper can be accessed here:*  
<http://www.sdiarticle4.com/review-history/58382>