Agricultural Economics Research Review
Vol. 28 (No.1) January-June 2015 pp 1-26
DOI: 10.5958/0974-0279.2015.00001.4

Presidential Address

Status and Strategies for Strengthening of Agricultural Economics Research and Education in National Agricultural Research System of India

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At the outset, I am extremely thankful to all the members of AERA for honouring me as the Conference President. I am using this Conference President Address to share the conversations about "Strengthening of agricultural economics research and education in NARS of India". These conversations occur in small groups at our work places, in our dialogue with colleagues in meetings, interviews, etc. This address is an opportunity to talk as a group about the present and future of our profession, and professional organizations.

Science, Society and Social Sciences

In the recorded history of world development, India's agricultural performance has been significant in reducing hunger and poverty and making India comfortably self-sufficient in foodgrains. The role of National Agricultural Research System (NARS) in this performance is well and widely appreciated. The mission of NARS is "*to achieve sustainable food security, reduce poverty and mitigation of adverse anthropogenic change in natural environment*". The core instruments to achieve this mission are research and education. It is well recognized that advances in agro-biological sciences are the key for the well-being of society, but are not sufficient to maximize societal welfare. Societal welfare will be high when advances in agro-biological sciences meet the needs and aspirations of the people in the processes of discovery, adaptation, adoption and diffusion of new technologies and innovations, supportive policies and institutions. These are all social science topics. It is therefore hard to imagine how the NARS would possibly achieve its mission without strong social science to complement the natural science, particularly when agriculture is becoming more complex, knowledge-intensive and policy-driven/sensitive.

Expanding Role of Social Sciences

Social scientists have a comparative advantage characterized by their ability to organize research around societal problems in scientific disciplines. The main contribution of social scientists will be to improve focus, design, implementation and evaluation of agricultural R&D. In particular, the big opportunities for social scientists to serve the mission of NARS include: (a) technological changes that sustainably increase agricultural productivity by and for the poor, (b) natural resource conservation that benefits the rural poor directly and/or indirectly via improving and augmenting ecosystem services, especially those that help agricultural productivity; and (c) institutional innovations and policies that enhance the quality of life of the poor and marginalized agrarian population. Of these three opportunities, the most fundamental and game changing one is the technological change wherein the opportunity for close interaction between social scientists and bio-physical scientists is basic and maximum.

Some of the specific roles that may be played by the social scientists in general and agricultural economists in particular, are to analyze, identify, assist implementation and monitoring of strategies and

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policies relating to augmenting production of food and other agricultural commodities through technologies, improving the efficiency of agricultural research system, improving the efficiency of agricultural production and marketing system, striking a balance between incentives for farmers and affordable prices for consumers.

Some more roles added in recent years include prioritizing agricultural research for increasing the development impact of technologies, development of supportive and policy framework and encouraging/ motivating/incentivizing the stakeholders for food and nutritional security for all and reducing poverty at a rapid rate, adapting and mitigating the adverse impacts of climate change, sustainable livelihood approaches and analysis, economic shocks and energy crisis, sustainable use of natural resources, particularly land and water, addressing the growing scarcity of labour in agriculture, rural demographic changes and the future of farming. To effectively play some of these roles which are not considered as mainstream, we need to substantially strengthen and diversify our disciplinary skills and capacity.

Social Science Fatigue—Historical Trends

It is widely felt that the social science capacity in terms of number, quality, consistence, coherence, productivity, relevance, and linkages both upstream (ARIs) and downstream (development agencies, NGOs, FOs, farmers) in the NARS, is not only low but also falling. It is a concern which is often more expressed, sympathized than analyzed and redressed. In this regard, it is pertinent to recapitulate the summary of a special session to discuss problems of teaching agricultural economics organized by Indian Society of Agricultural Economics in 1989 (Rath, 1990). The main problems identified during the special session included, (i) most of the agricultural economics research studies were empirical and quantitative to a very high degree, but unfortunately not always analytical enough; (ii) the teaching of agricultural economics is heavily centred on production economics; (iii) mechanical application of empirical methods in many studies; (iv) not much use of massive body of empirical information relating to Indian agriculture in teaching/research studies; (v) not much use of knowledge of technical agriculture in broad terms in economic analysis; (vi) no policy to recruit teachers who have training in non-SAUs to avoid excessive inbreeding; (vii) non-availability of suitable teaching materials, and finally (vii) speakers ventilating their sense of unhappiness with the existing state of affairs.

The proceedings of a workshop convened by NCAP in March, 1996 on "Post-Graduate Education in Social Sciences" apart from others, reported that delay in filling teaching/research positions, especially social science positions was affecting teaching standards and discouraging meritorious students to opt for social sciences and therefore recommended creation and recruitment of appropriate number of positions in social sciences at all levels without delay. At the same time, it may be mentioned that such generalizations about social science capacity are necessarily oversimplifying. There are examples of outstanding achievements by individuals and institutions. In fact, there is no dependable time series data to properly describe the status of agricultural economics research and education.

The status of and challenges to social sciences seem to be universal. The World Social Science Report 2010 (www.unesco.org/shs/wssr) reveals the marginal presence of South Asia and India in the domain of international social science research and the poor position of India on account of meagre funding, low capacity and lack of institutional autonomy. It has suggested building of better social science research capacity, particularly in the regions where social problems are most acute and social science is anaemic. The Fourth Review Committee of the Indian Council of Social Science Research (ICSSR) (www.icssr.org/ finalreport.pdf) also reports that the level and quality of social science research is falling in India against expectations in recent years.

During 2008, the CGIAR management conducted a stripe review of social science research capacity in CGIAR Centres to address concerns of declining quality, methodological weakness, lacking critical mass of high quality social scientists with sufficiently diverse disciplinary skills, weak quality of partnerships with ARIs, data problems and weak organization of research around problems than discipline (www.sciencecouncil.cgiar/publications/reviews/ stripe; http://ssrn.com/abstract=1845534). The stripe review team collected comprehensive data on social science research activities, and formulated a normative

Table 1. List of agricultural Universities from where Agricultural Economics Departments were selected for survey

Sl. No.	University	Location
1	Indian Agricultural Research Institute	New Delhi
2	National Dairy Research Institute	Karnal, Haryana
3	University of Agricultural Sciences GKVK	Bangalore, Karnataka
4	University of Agricultural Sciences	Dharwad, Karnataka
5	Gobind Ballabh Pant University of Agriculture and Technology	Pantnagar, Uttarakhand
6	Haryana Agricultural University	Hissar, Haryana
7	Punjab Agricultural University	Ludhiyana, Punjab
8	Banaras Hindu University	Varanasi, Uttar Pradesh
9	Assam Agricultural University	Jorhat, Assam

framework of optimal roles of social sciences in the CGIAR against which the current role could be assessed. The study used e-consultations with social scientists of the Centres to prioritize issues, define hypotheses, analyze publications and their citations, and review the selected publications and projects. The CGIAR management after carefully examining the report of the review team, is implementing many of the recommendations for improvement of social science capacity in the CGIAR Centres.

Concerned about the continued inadequate supply of the needed capacity to contribute to more effective policies and policymaking in Sub-Saharan Africa, IFPRI had facilitated a review of the status of agricultural economics capacity in the Eastern and Southern African region in 2001 (www. ifpri.org/sites/default/files/publications/stausafrica.pdf). The study examined staffing, work responsibilities, academic degrees and courses, facilities/support systems, market for degree holders, linkages and way forward. The study confirmed the widening of gap between demand and supply of agricultural economists in the region and suggested to urgently strengthen and expand the training in agricultural economics to meet the unsaturated demand. The specific suggestions included, (a) training institutions in the region would diversify the content and method of delivery of their different training programs to remain relevant to the current and future challenges and to cater to the diverse needs in the public sector, private sector, civil society and research institutions, and (b) apart from individual initiatives, common and institutionalized strategy is also required.

Despite some of the challenges facing social science capacity being universal, they are considered more serious and significant in the discipline of agricultural economics in the Indian NARS. As per the available data, the number of agricultural economists in position in ICAR was 130 in 2009 (forming about 3% of the total ICAR scientists in position) which has reduced to 119 in 2012 (2.38% of total ICAR scientists in position). Further, it is found from National Information System in Agricultural Education (NISAGE) website that the admissions to M.Sc. and Ph.D. programs in social science areas in NARS institutions formed about 14-15% of total admissions in 2009-10 and 2010-11. The details on admissions in agricultural economics are not available.

Social Science Fatigue—Search for New Evidences

In the absence of data, a quick survey was undertaken to assess the status of agricultural economics research and education (AERE) in NARS and to ascertain views on its strengthening. The survey/review data covering past 10 years (2004-2013) consisted of two parts, first collection of primary data from NARS institutions and second, reviewing of research articles published in selected national and international journals. The data collection was limited to only 10 reputed agricultural economics departments in the NARS (Table 1). A comprehensive survey schedule was prepared and canvassed to gather data for the study for Period-I (2004-08) and Period-II (2009-13). Out of sample 10 agricultural economics departments, only 9 have responded. Further, even

among the responses, information in many places was either not reported or was incomplete. Hence, intended analysis and discussion were constrained.

The status of agricultural economics was also assessed in terms of research contributions (thematic categories/topics and topics with focus on methodologies) in 3 major Indian research Journals, viz. *Agricultural Economics Research Review* (AERR), *Indian Journal of Agricultural Economics* (IJAE) and *Economic and Political Weekly* (EPW)) matching with the changing national and global agricultural problems during the past 10 years (2004-2013) alongside research contributions in 3 major international Journals, viz. *American Journal of Agricultural Economics* (AJAE), *Australian Journal of Agricultural Economics* (Aus JAE) and *Canadian Journal of Agricultural Economics* (CJAE)) during the same period. The idea was to infer what was happening in the economy at large and particularly with respect to agriculture and farmers and find the changing research focus of Indian researchers and international fraternity.

An attempt is also made to study the titles/topics along with abstracts of articles published (national and international) to provide a comprehensive inventory of topics (thrust areas) under different thematic categories. This will provide the researchers, particularly Indian researchers the scope to focus their research thrusts (thematic as well as methodological) so that they remain continuously competitive and relevant. The highlights of the survey and the review of the research articles are briefly stated below.

Agricultural Economics Research and Education Resource in the Indian NARS

Declining Staff Strength

During both the study sub-periods, the staff in position was less than the sanctioned strength in all categories, in general, especially scientific/teaching category. In different institutions, the shortfall in scientific/teaching category varied from 25 per cent to 40 per cent. Between the sub-periods 2004-08 and 2009-13, there was a reduction in both the sanctioned strength as well as in-position staff in Period II in some institutions. For instance, the reduction in sanctioned and in-position scientific staff strength in all categories was about 10 per cent. The shortage of staff will lead to more number of courses to be taught and students to be guided by each teacher/faculty which will affect the quality of teaching/research guidance. As regards technical and supporting staff, the over-all ratio of scientific: technical: supporting staff was 1:0.75:0.25, which is grossly inadequate as compared to the ICAR norms of 1:2:2.5. For whatever reasons, the reduction in sanctioned strength of agricultural economics discipline in Period II despite its growing importance, is surprising and disquieting (Tables 2, 3 and 4). It may

Table 2. Strength of scientific staff in the Department of Agricultural Economics of selected agricultural universities in 2004-08 and 2009-13

University	Period I (2004-08)		Period II (2009-13)	
	Sanctioned	In-position	Sanctioned	In-position
D1	25	23	19	14
D2	12	11	12	7
S1	14	14	14	14
S2	13	13	14	14
S3	17	13	17	13
S4	7	7	10	8
S5	23	21	29	27
S6	76	52	70	41
S7	52	32	39	25

Note: D represents Deemed to be University and S represents State Agricultural University

Table 3. Strength of technical staff in the Department of Agricultural Economics of selected agricultural universities: 2004-08 and 2009-13

University	Period I (2004-08)		Period II (2009-13)	
	Sanctioned	In-position	Sanctioned	In-position
D1	25	22	12	12
D2	NR	8	NR	2
S1	NR	1	NR	1
S2	NR	NR	NR	NR
S3	17	13	NR	13
S4	3	2	3	3
S5	NR	0	NR	0
S6	65	63	65	63
S7	33	28	34	28

NR=Not reported

Note: D represents Deemed to be University and S represents State Agricultural University

Table 4. Strength of supporting staff in the Department of Agricultural Economics of selected agricultural universities

University	Period I (2004-08)		Period II (2009-13)	
	Sanctioned	In-position	Sanctioned	In-position
D1	NR	10	NR	9
D2	NR	3	NR	2
S1	2	0	2	0
S2	NR	NR	NR	NR
S3	NR	2	NR	2
S4	2	1	2	2
S5	2	2	2	2
S6	28	28	28	17
S7	6	5	6	5

NR=Not Reported
D represents Deemed to be University and S represents State Agricultural University

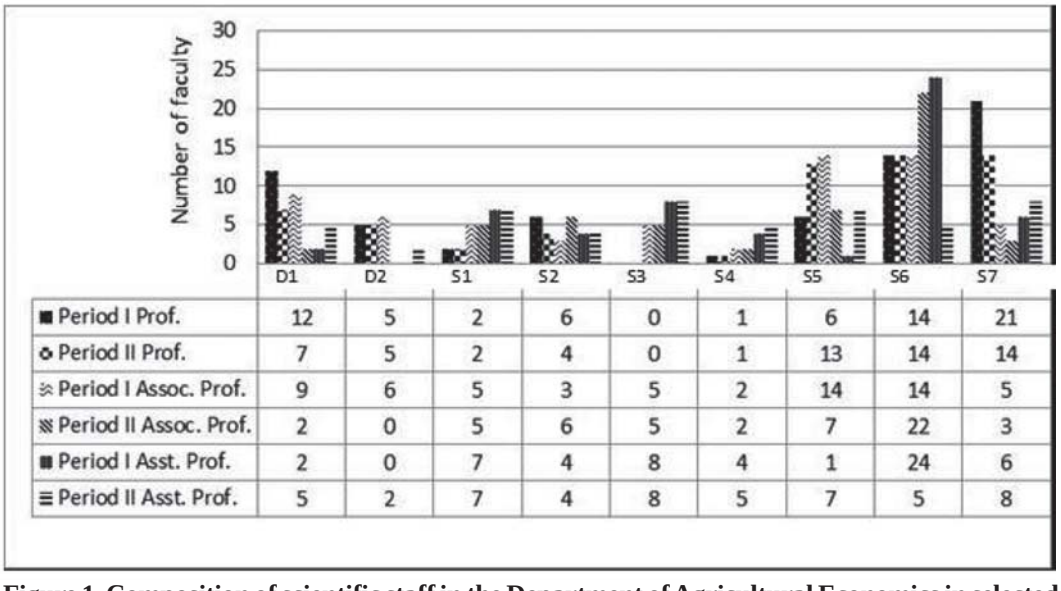
be pertinent to mention that the disciplines of agricultural economics and agricultural statistics suffered considerably by the decision of ICAR to abolish the post of ADG (Economics, Statistics and Marketing), who was providing leadership as well as project funding support to the growth of these disciplines. Though the establishment of NCAP (now NIAP) by ICAR to some extent has salvaged this situation, the national leadership and mentoring role of ADG in promoting research and education at the ICAR headquarters has been impaired. Further, under the new arrangement, NCAP is constrained to perform its mandated roles.

Skewed Staff Composition

Over the study sub-periods, the composition of scientific staff is skewed towards Principal Scientists (Figure 1). It resembles an inverted pyramid where generals are more than the soldiers. It is the result of faulty recruitment and promotion policy. Some signs of correction are visible but it surely will take a considerable time and effort to reverse the inverted pyramid.

Ageing Staff

The compositional pattern has led to the higher average age of the faculty, 51 years in Period I and 49 years in Period II (Figure 2). It was observed that in some departments there would soon be the problem of availability of experts particularly in emerging specializations, senior faculty to teach and guide research. This situation has particularly happened as we ignored mentoring and succession planning in our Departments/Institutions.



	D1	D2	S1	S2	S3	S4	S5	S6	S7
Period I Prof.	12	5	2	6	0	1	6	14	21
Period II Prof.	7	5	2	4	0	1	13	14	14
Period I Assoc. Prof.	9	6	5	3	5	2	14	14	5
Period II Assoc. Prof.	2	0	5	6	5	2	7	22	3
Period I Asst. Prof.	2	0	7	4	8	4	1	24	6
Period II Asst. Prof.	5	2	7	4	8	5	7	5	8

Figure 1. Composition of scientific staff in the Department of Agricultural Economics in selected agricultural universities

Note: D represents Deemed to be University and S represents State Agricultural University

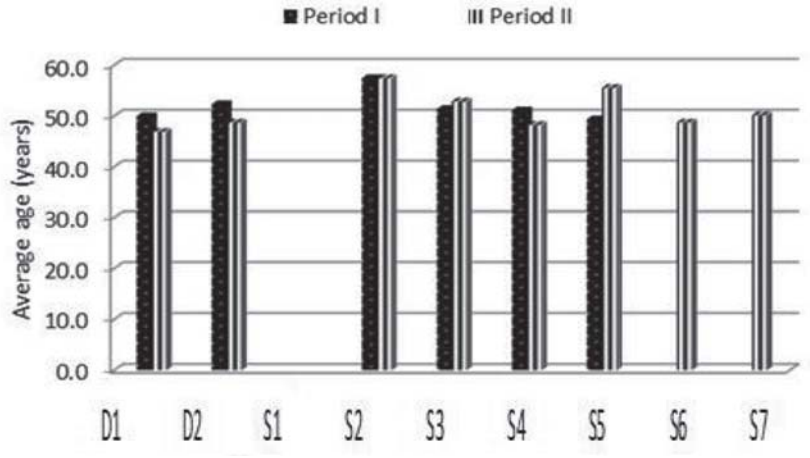


Figure 2. Average age of faculty in Agricultural Economics Departments in selected agricultural universities

Notes: D represents Deemed to be University and S represents State Agricultural University
Period I: 2004-08; Period II: 2009-13

Table 5. Level of inbreeding among agricultural economists in selected agricultural universities

University	Number of faculty whose highest qualification was obtained			Level of inbreeding*, %
	From the same university	From other universities	Not reported	
D1	16	8	1	66.7
D2	2	2	2	50.0
S1	4	1	7	80.0
S2	11	0	0	100.0
S3	7	1	2	87.5
S4	4	4	0	50.0
S5	9	17	0	34.6
S6	21	13	1	61.8
S7	15	10	0	60.0

Notes: *denotes per cent of faculty whose highest qualification was attained from the same university in total.
D represents Deemed to be University and S represents State Agricultural University

High Inbreeding

Another important issue was the level of inbreeding in the departments. It was found that (Table 5) it is 100 per cent in one case, high (around 80%) in 2 cases, medium (35 to 80%) in 5 cases and low (less than 35%) only in one case. This is a serious problem which directly contributes to quality assurance in teaching departments. To minimize inbreeding, ICAR is insisting SAUs to select candidates passed in ICAR NET examination. But this advice is not strictly followed. The breach of transfer policy in ICAR institutes and SAUs is also contributing to this problem.

Specializations, Rolling Slow

A look at the fields of specialization of faculty (Table 6) revealed that farm management still dominated followed by markets & trade and agricultural finance. It was observed (NCAP, 1996) that the continued and increasing emphasis on farm management and production economics-oriented curriculum stretching over two decades, had resulted in a structural imbalance in the composition of human resource development and expertise-mix within the discipline. The induction of staff with specializations in market & trade in Period II is a welcome sign. But,

Table 6. Specialization of faculty in Agricultural Economics Departments of selected agricultural universities

University	Farm Management		Markets and Trade		Agricultural Finance		Agricultural Development		Natural Resource Economics		Others	
	Period I	Period II	Period I	Period II	Period I	Period II	Period I	Period II	Period I	Period II	Period I	Period II
D1	6	4	7	6	2	4	1	4	0	0	1	1
D2	1	0	1	1	0	0	0	1	0	0	2	4
S1	3	4	1	1	0	1	0	0	0	0	1	0
S2	2	2	1	1	4	4	1	1	2	2	1	1
S3	3	2	1	1	1	1	0	0	0	0	5	5
S4	2	2	1	2	1	1	0	0	0	1	2	2
S5	13	6	6	3	7	4	0	0	0	0	0	0
S6	NR	24	NR	5	NR	2	NR	0	NR	0	NR	3
S7	NR	8	NR	8	NR	2	NR	0	NR	6	NR	1

Notes: NR=Not Reported

D represents Deemed to be University and S represents State Agricultural University

Period I: 2004-08; Period II: 2009-13

we need to strengthen the specializations of natural resource management, agricultural development and agricultural policy. These suggestions were also made in as early as 1996 (NCAP, 1996). The pressure on agricultural economics faculty to teach agri-business courses is a new development for which the departments are ill-equipped yet in both skills and facilities. We need to introspect on this and gear ourselves soonest to handle this new development well.

Nomenclature—Change Needed

Another dimension is related to the nomenclature of the Agricultural Economics Department in our institutions. In many of the US universities, it is named as Department of Agricultural and Resource Economics, Department of Agricultural Economics and Agribusiness, Department of Applied Economics and Management, Department of Food and Resource Economics, Department of Agricultural, Environmental and Development Economics and Department of Agricultural, Food, and Resource Economics. Perhaps it is time to think about the change in nomenclature to reflect the changed focus of the discipline in India. If we want to retain the name as such, we may have to redefine agricultural economics "to include the interface of production and consumption of agricultural products with natural resource base and the environment and to include the implications of food consumption for health and nutrition" (Caswell, 2013).

Imbalanced Time Allocation

Scientific staff spend about 50-70 per cent of their time on teaching in the SAUs, whereas it is 30-50 per cent in the DUs of ICAR (Figure 3). The time spent on research is about 20 per cent in SAUs and around 40 per cent in the DUs of ICAR. Research guidance takes about 15 per cent in SAUs and 20 per cent in DUs of ICAR. Extension activities takes about 10 per cent in SAUs and negligible in the DUs of ICAR. The time spent on consultancy services is the least or nil in general. It is very distressing to note that staff in SAUs is busy in teaching on account of serious staff shortage.

The pattern of time allocation to teaching, research, research guidance, extension/outreach activities and consultancy requires discussion and decision in view of its direct bearing on the performance of students and finally the institutions.

Lack of Critical Mass

A critical mass of the staff is desirable to make a bigger impact. The dispersal of faculty/academic staff among campuses of the Universities including the main campus was studied. But, the response was sketchy and incomplete. However, it is reported that the staff are scattered in different research stations/campuses denying the existence of critical mass at a place/location to raise big ticket issues and work comprehensively on them.

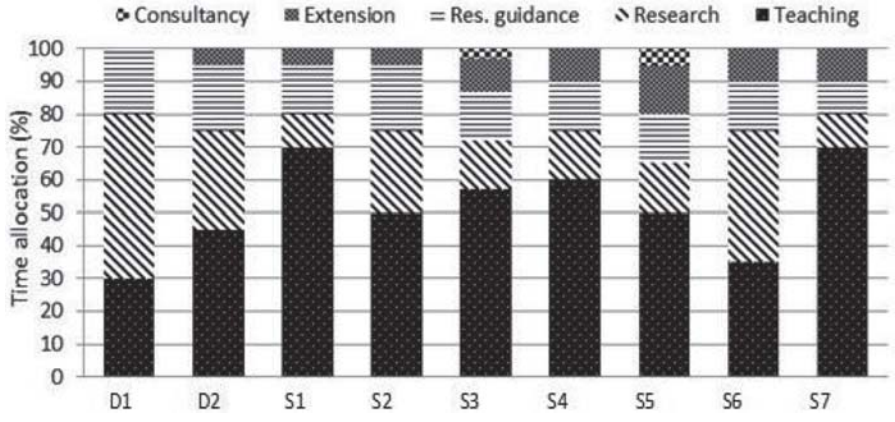


Figure 3. Time allocation by faculty of Agricultural Economics across work areas in selected agricultural universities

Note: D represents Deemed to be University and S represents State Agricultural University

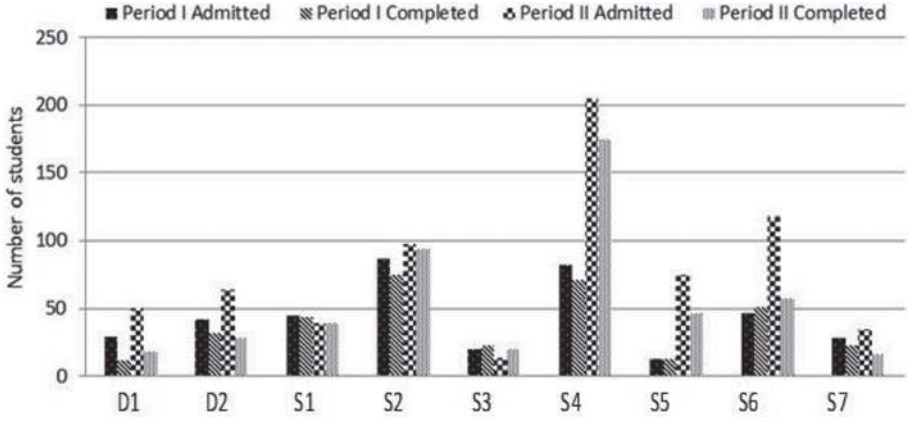


Figure 4. Number of students admitted *versus* completed study from Agricultural Economics Departments in selected agricultural universities

Note: D represents Deemed to be University and S represents State Agricultural University

Period I: 2004-08; Period II: 2009-13

Student Employment

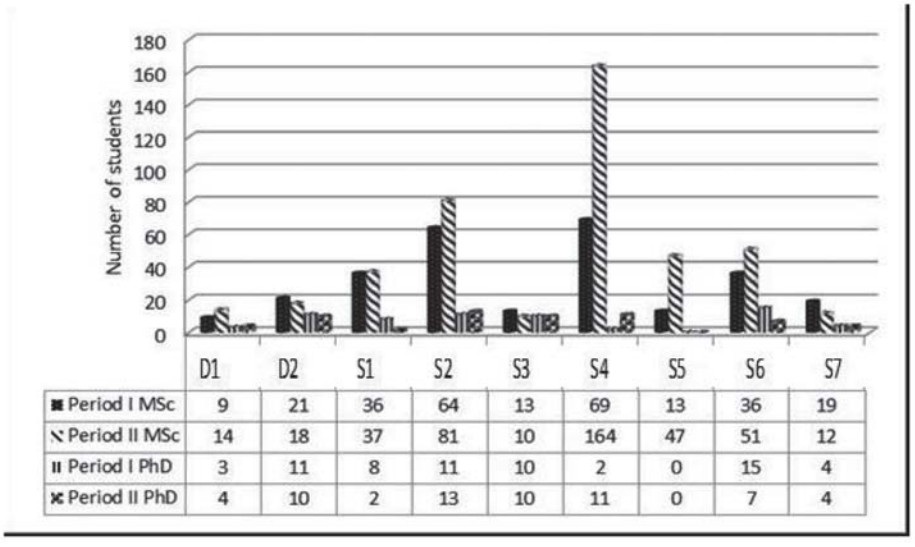
The study on employment situation in terms of gender (male and female) and enrolment in programs (M.Sc. and Ph.D.) remained sketchy due to incomplete response from institutions. Another issue for which response remained sketchy and incomplete related to the coverage of scholarships/financial support to students in M.Sc. and Ph.D. programs.

Work Responsibilities and Output

Student Admissions and Turn Out

There has been increase of about 30 per cent in student admissions in M.Sc. and Ph.D. programs during 2009-13 (Figure 4). The increase in admissions has to be viewed in the light of reduced staff strength observed during Period II, indicating a higher work pressure, lesser attention and possibly a fall in the quality of education. Another development is the increasing demand for new programs like Business Administration. The pressure on agricultural economists to teach these courses has obvious implications on quality of education and marketability of the products from agri-business programs.

Another aspect of the study related to the proportion of number of total M.Sc. and Ph.D. students admitted and completed the programmes (Figure 5). It indicated that in Period I, it was 87 per cent, which reduced to 70 per cent during Period II. This trend is quite different in M.Sc. (90% in Period I and 75% in



	D1	D2	S1	S2	S3	S4	S5	S6	S7
Period I MSc	9	21	36	64	13	69	13	36	19
Period II MSc	14	18	37	81	10	164	47	51	12
Period I PhD	3	11	8	11	10	2	0	15	4
Period II PhD	4	10	2	13	10	11	0	7	4

Figure 5. Number of students completed degrees in Agricultural Economics/Allied subjects in selected agricultural universities

Note: D represents Deemed to be University and S represents State Agricultural University
Period I: 2004-08; Period II: 2009-13

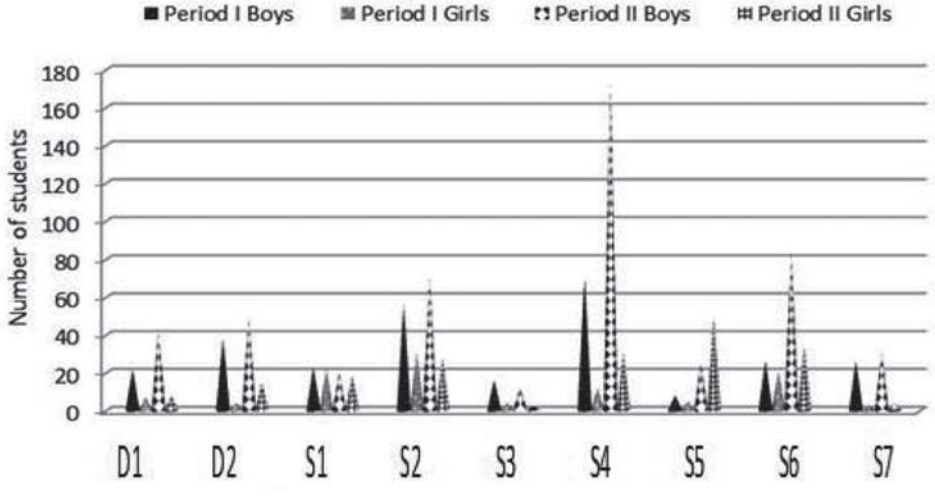


Figure 6. Gender composition of students in Agricultural Economics Departments in selected agricultural universities

Note: D represents Deemed to be University and S represents State Agricultural University
Period I: 2004-08; Period II: 2009-13

Period II) and Ph.D. (77% in Period I and 53% in Period II) programs. The lower turn-out rate in Period II may be on account of shortage of staff, more students leaving the course in between on account of not meeting their expectations or job opportunities becoming available. The results relating to the average time taken by Ph.D. students during the past 10 years turned out to be 4 years against the normal, expected period of 3 years (only in one case it was 3.3 years). These issues have implications on admissions and image of the departments, though it is known that fixing time period to complete the program is a dicey issue.

Gender Balance in Admissions Missing

Gender balance is becoming important and admissions in AUs in recent years in general reflect considerable improvement in the entry of girl students. The results relating to this aspect in the departments indicated that one-third of the admitted students were girls in both the periods. In about 4 departments, it was around 15 per cent (Figure 6).

PG Research and Good Education Practices

It was found that about half of the departments that had complied with the recommendations of the 4th Dean's Committee, were using e-courses, conducting student comprehensive examinations meticulously, student advisory committee arrangement was working well and the selection of research guides was objective and satisfactory. Only one of the Departments responded that the selection of the research topic was casual, 2 of them reported objective, 4 of them reported that the selection matched with the interest and capacity of the student and selected guide, 3 of them reported that it matched with the future needs, one of them reported that it was aligned with the ongoing research in the department. As per the private conversations, I feel that these disparate responses on different dimensions of quality education and research guidance suppress the facts.

Poor Resource Mobilization/Consultancy

The funding and resource mobilization initiatives were studied by examining sources, adequacy, flexibility of use to build facilities and infrastructure, hire ad-hoc research staff, etc. But, the response was poor and highly inconsistent. As reported elsewhere, the consultancy efforts to develop rapport with corporate sector, government organizations, public sector units and NGOs, which provide funding with flexibility as well as placement opportunities to students were almost non-existent. It was observed that the infrastructural, financial and manpower provisions for social sciences were far from adequate and there was an urgent need to raise the allocation for these facilities for social sciences in SAUs and ICAR (NCAP, 1996). It was observed that use of the same norms and standards for apportioning resources/grants as applicable to biological sciences was not appropriate for social sciences. Since social science disciplines require more funds for travel, field studies, stationery, etc., higher provisions should be made for these purposes by reallocating funds from the other heads less relevant for social sciences.

External Evaluation Missing

We also intended to look at evaluation observations on the functioning of Departments by external sources like QRT, RAC. But the response was not available. It is important to compile them, introspect on them among ourselves and introduce reforms in an appropriate way to attain excellence.

Poor Publications, Infrequent Academic Events

The stature, image and visibility of social science departments depend upon the quality of their products, namely knowledgeable students and research publications in high impact journals. The survey results did not provide conclusive evidences on the production of quality students though all the selected Departments were once known for their excellence in teaching and research contributions. The general opinion in private conversations was that there has been a sliding down in quality, with a few exceptions here and there. The CAS guidelines on not permitting research papers published from M.Sc./Ph.D. theses for assessment is a dampener for poor theses work and publications out of theses, especially in case of in-service candidates. The opinion of the peers about the quality of the theses they had reviewed reinforced the general opinion stated earlier. This is a serious issue which requires our attention.

Regarding publications from the staff of the departments, it was found from the limited information available, that the record of IARI was still commendable. The reasons for not providing information on publications fully or partially are not known. But the issue is very important for the image and survival of the departments and hence needs discussion and solution.

Another activity which enabled exposure, linkage and capacity building of staff and students was conducting academic events such as seminars and organizing conferences, workshops, etc. Only 4 Departments were active in this respect during both the periods. The other capacity building program was organizing trainings or attending training programs. Though such initiatives were relatively more in Period II but were visible and pronounced in only 4 Departments. Only 2 Departments were active in extension and out-reach activities, particularly in Period II (Figure 7). We need to discuss these activities/ opportunities and take a call on how to, how much to strengthen them.

Linkages and Partnership, Weak

Yet another opportunity to be in the reckoning, limelight, resource mobilization and capacity building

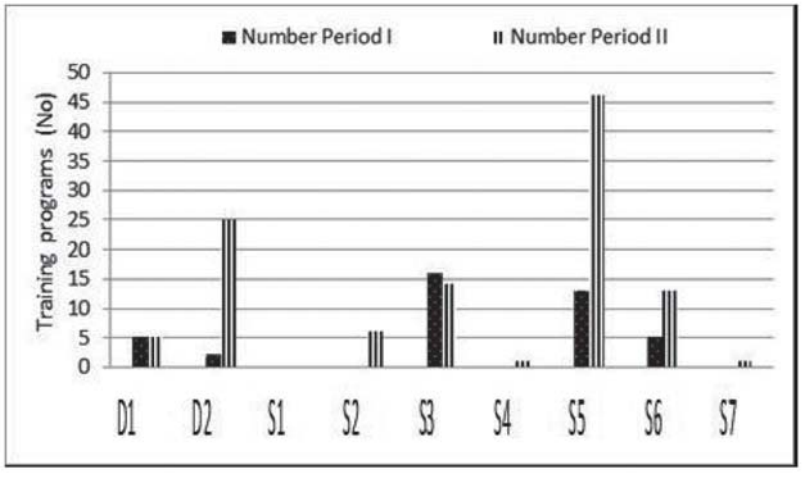


Figure 7. Number of training programs organized / attended by Agricultural Economics Departments of selected agricultural universities

Note: D represents Deemed to be University and S represents State Agricultural University
Period I: 2004-08; Period II: 2009-13

is the nature and extent of linkages/collaboration/ partnership/networking with outside agencies/ institutions. The study (Table 7, Figure 8) revealed reasonable efforts by 6 Departments only, but the depth and width of these linkages require further strengthening to really benefit on a continuous basis.

Facilities and Support System, Mixed Signals

The survey indicated that the infrastructural facilities were good in 6 departments, equipments were adequate in 7 departments, access to literature and internet facility was good in 8 departments, transport was good in 6 departments and hiring of contractual staff was comfortable in 6 departments. By any standard, this finding was satisfying that our departments have good facilities and support system. But, private conversations with staff in these Departments do give contradictory views. For instance, salary limits for contractual staff, the quality of contractual staff one can get with salary limit will affect the quality of research work.

Keeping up with the Joneses: Analysis of Journal Articles

To reflect on how the discipline has evolved/ transformed/diversified over the years with research contributions published in India vis-à-vis the globe in responding to the evolving researchable issues during the past 10 years, survey data were reinforced by undertaking analysis of journal articles published in India and the globe respectively. A comprehensive review of the titles and abstracts of articles published in these journals along with study/knowledge of developments and contemporary issues in agricultural economics discipline during the study period suggested analysis under 31 topics (Annexure 1). The criteria for selection of topics avoided either too much aggregation or disaggregation.

New Areas of Focus, Fast Emerging

A perusal of these 31 topics (Annexure 1) covered particularly in articles of international journals indicated that new areas of focus were: agribusiness, behavioural economics, bio-diversity conservation, bio-tech regulation, consumer choice, disease/pest management, ecological/environmental/natural resource economics, energy economics, food security/ safety/nutritional security, health economics, HRD of scientists/farmers/development personnel, information economics, innovation economics, institutional economics, international economics, labour economics, research policy, sustainable agricultural system, political economy, experimental economics, etc. Our researchers may also explore these areas more and more in the coming years as these are emerging in the national scene too. If we have to remain fit and relevant, we need to learn, equip and research on them.

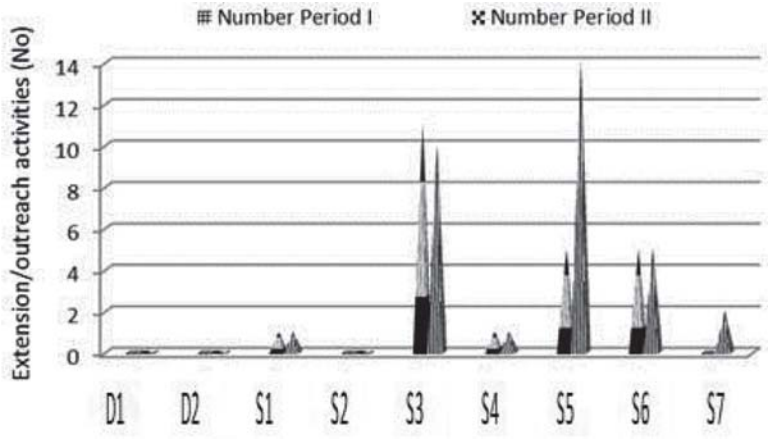


Figure 8. Number of extension/ outreach activities organized by Agricultural Economics Departments of selected agricultural universities

Note: D represents Deemed to be University and S represents State Agricultural University
Period I: 2004-08; Period II: 2009-13

Table 7. Existing linkages/collaborations/partnerships/networking of Agricultural Economics Departments of selected agricultural universities

University	Type	Agencies involved	Period	Activity
D1	Research collaboration	CGIAR, ICSSR, and other ICAR institutes		Research projects
D2	NR			
S1	Research collaboration	IRRI	2011-14	Empirical farm studies
S2	Academic exchange	Erasmus Mundus (EU)	2004 onwards	Student and faculty exchange
S3	Research collaboration	Mc Gill University (Canada), ICRISAT, Dept. of Agriculture, IBRC	2003 onwards	Capacity building, transfer of technology, Evaluation studies, Impact assessment, research projects
S4	NR			
S5	Networking	NAIP, Cornell-Satguru	2012 onwards	Research projects, extension, student and faculty exchange
S6	NR			
S7	Networking	NCAP, Other Agrl. Universities		Network projects

Note: D represents Deemed to be University and S represents State Agricultural University

The 1970s saw major changes in the funding of agricultural research at the global level (Alex *et al*., 2010). The advent of plant patenting and rapid developments in molecular biology led to significant increases in private sector investment in agricultural research. Social science research which was not a beneficiary of increase in private sector funding, suffered from the decline in public support. This forced agricultural economists to diversify their research for financial funding support. The response in broader terms included shift in emphasis from production economics to resource economics to agri-business

Table 8. Total articles published in three selected national journals – 2004-2013

Journal Issue	IJAE	AERA	EPW	Total
Research Issues	194	277	943	1414 (83%)
Conference Issues	127	168	0	295 (17%)
Total	**321**	**445**	**943**	**1709** (100%)

IJAE = Indian Journal of Agricultural Economics
AERA = Agricultural Economics Research Review
EPW = Economic and Political Weekly

Table 9. Total articles published in three selected international journals – 2004-2013

Journal Issue	AJAE	AusJAE	CJAE	Total
Research Issues	703	236	187	1126 (72%)
Conference Issues	301	45	95	441 (28%)
Total	**1004**	**281**	**282**	**1567** (100%)

AJAE = American Journal of Agricultural Economics
AusJAE = Australian Journal of Agricultural Economics
CJAE = Canadian Journal of Agricultural Economics

economics on one side and simultaneously diversifying to agricultural marketing and trade, environmental economics and agricultural development, institutional economics, and agricultural policy. Along with these developments in topics and sub-topics, there was evolution in methodologies to aid newer analysis and interpretation.

Journal Articles: Indian Scenario

The details of total articles published during 2004-2013 in national and international journals are provided in Tables 8 and 9, respectively. In all, 1709 articles were published in 3 selected national journals against 1567 articles in 3 selected international journals. In the case of articles published in national journals, nearly 87% were in regular issues and the rest were in conference issues. In the case of articles in international journals, nearly 72% were published in regular issues and the rest were in conference/special issues.

Table 10. Distribution of articles in Indian and international journals across subject matter areas of agriculture, 2004-2013

Subject matter	National journals (IJAE, AERA, EPW)	International journals (AJAE, AusJAE, CJAE)
Crop Sciences	276 (16%)	186 (12%)
Horticulture and Plantation	95 (6%)	55 (4%)
Livestock	89 (5%)	177 (11%)
Fisheries	56 (3%)	56 (4%)
Forestry	36 (2%)	31 (2%)
Others	1157(68%)	1062 (68%)
Total	1709 (100%)	1567 (100%)

Indian and International Journals: Crop Sciences Dominate

The distribution of articles across subject matter areas in national journals (Table 10) revealed that crop sciences topped (16%), followed by horticulture and plantation (6%) and livestock (5%). In case of international journals, crop sciences topped (12%) followed by livestock (11%). The proportion of other areas (68%) was same in national as well as international journals.

Indian Journals: Dominance of Production Economics

As regards emphasis on sub-topics in the articles in 2 national journals, viz., AERR and IJAE, (Table 11), the ranking indicated more articles in production economics (23%), followed by agricultural development (16%), agricultural marketing (13%) and agricultural policy (8%). When EPW was also included, the ranking became agricultural development at top (14%), followed by production economics (13%), agricultural policy (9%) and natural resource economics (9%). Since EPW is slightly different from conventional research journals like AERR and IJAE, the change in ranking is understandable. The major change with inclusion of EPW was in terms of entry of natural resource economics within 4 rankings, which indicated the emerging focus on the natural resource management.

Table 11. Ranking of topics covered by research articles in Indian journals, 2004-2013

Rank	IJAE	AERA	EPW	All 3 journals	IJAE+AERA
1	Production Economics (22%)	Production Economics (24%)	Agricultural Development (11%)	Agricultural Development (14%)	Production Economics (23%)
2	Agricultural Development (19%)	Agricultural Development (14%)	Natural Resource Economics (11%)	Production Economics (13%)	Agricultural Development (16%)
3	Agricultural Marketing (12%)	Agricultural Marketing (13%)	Food security (11%)	Agricultural Policy (9%)	Agricultural Marketing (13%)
4	Agricultural Policy (9%)	Agribusiness (7%)	Agricultural Policy (10%)	Natural Resource Economics (9%)	Agricultural Policy (8%)
Total of 4	62	58	43	45	60

Table 12. Ranking of topics covered by research articles in International journals, 2004-2013

Rank	American Journal	Australian Journal	Canadian Journal	All 3 journals
1	Agricultural Marketing (21%)	Environmental Economics (24%)	Environmental Economics (21%)	Agricultural Marketing (16%)
2	Agricultural Policy (10%)	Natural Resource Economics (23%)	Consumer Choice (16%)	Environmental Economics (14%)
3	Production Economics (10%)	Production Economics (9%)	Agricultural Policy (14%)	Natural Resource Economics (10%)
4	Environmental Economics (9%)	International Trade (7%)	International Trade (11%)	Agricultural Policy (10%)
Total of 4	50	63	62	50

International Journals: Agricultural Marketing Dominates

Regarding emphasis on sub-topics in articles in 3 selected international journals (Table 12), the ranking was agricultural marketing at top (16%), followed by environmental economics (14%), natural resource economics (10%), and agricultural policy (10%). These rankings clearly reflected the research priorities of developed countries. We have to catch up with these priorities in our work and publications as these priorities are also becoming important in India so that we can influence policies and remain relevant in the changing national system. We may have to slightly de-emphasize research in conventional production economics and undertake more research in agri-business, marketing and trade, natural resource economics, agricultural policy, etc. This requires considerable efforts in strengthening of capacity building right from the post-graduate education and providing training nationally and internationally. The survey results have revealed that our strength is very poor at the present. Opportunities are many but interest and initiatives from our fraternity are less. There should be organized efforts to widely communicate these opportunities among the fraternity.

Indian Journals: Improved Methods, Few Applications

The emphasis on capacity building will be much more critical in understanding and using advanced tools and techniques which have evolved very fast internationally. An effort was made to list the articles showing the use of improved methodologies in national and international journals. The distribution of such

Table 13. Distribution of methodological development/ articles using improved methodologies in selected Indian journals during 2004-2013

Journal	Regular issues	Conference issues	Total
Total number of articles			
IJAE	194	127	321
AERA	290	155	445
Total	484	282	766
Number of articles with methodological improvements			
IJAE	13	10	23
AERA	27	2	29
Total	40	12	52
Percentage of articles with methodological improvement to total articles			
IJAE	7	8	7
AERA	9	1	7
Total	8	4	7

Table 15. Distribution of methodological development/ articles using improved methodologies in international journals during 2004-2013

Journal	Regular issues	Conference issues	Total
Total number of articles			
American Journal	703	301	1004
Australian Journal	236	45	281
Canadian Journal	187	95	282
Total	1126	441	1567
Number of articles with methodological improvements			
American Journal	325	61	386
Australian Journal	155	12	167
Canadian Journal	88	49	137
Total	568	122	690
Percentage of articles with methodological improvement to total articles			
American Journal	46	20	38
Australian Journal	66	27	59
Canadian Journal	47	52	49
Total	50	28	44

articles in regular and conference issues in AERR and IJAE is provided in Table 13. It was observed that only 7 per cent of the articles published in India used improved methods. The use of methodological advances in respect of topics (Table 14) indicated the highest percentage for agricultural development (19%), followed by environmental economics (17%), agricultural marketing (15%) and production economics (15%). The situation in respect of international journals, provided in Table 15, revealed that as against 7 per cent in national journals, the percentage was nearly 6-times higher in international journals, indicating very high priority towards using advanced tools and techniques. This has provided a very challenging benchmark for all of us to attain with full preparation. The details of per cent use of methodological advances in respect of topics (Table 16) indicated the highest ranking with agricultural marketing (17%), followed by environmental economics (16%), natural resource economics (12%), and production economics (11%). These priorities more or less matched with the distribution of topics covered in the distribution of total articles in national and international journals. To highlight the improved methods used in different topics, an inventory has been provided in Annexure 2 and it is hoped that this inventory will be very helpful to the researchers for learning and using improved methods in different topics.

Table 14. Percentage distribution of methodological development /research articles using improved methodologies in selected Indian journals, 2004-2013

Rank	IJAE	AERA	IJAE+AERA
1	Environmental Economics (30)	Agricultural Marketing (24)	Agricultural Development (19)
2	Agricultural Development (22)	Production Economics (21)	Environmental Economics (17)
3	sustainable agriculture (13)	Agricultural Development (17)	Agricultural marketing (15)
4	Natural Resource Economics (9)	Environmental Economics (7)	Production Economics (15)
Total of 4	74	69	66

Table 16. Percentage distribution of research articles on methodological development in international journals, 2004-2013

Rank	American Journal	Australian Journal	Canadian Journal	All 3 journals
1	Agricultural Marketing (23%)	Environmental Economics (22%)	Environmental Economics (18%)	Agricultural Marketing (17%)
2	Environmental Economics (12%)	Natural Resource Economics (20%)	Consumer Choice (15%)	Environmental Economics (16%)
3	Production Economics (12%)	Production Economics (10%)	International Trade (12%)	Natural Resource Economics (12%)
4	Natural Resource Economics (9%)	Agricultural Marketing (8%)	Agricultural Marketing (12%)	Production Economics (11%)
Total of 4	56	60	57	56

Table 17. Distribution of articles focusing on India in international journals, 2004-2013

(Number)

Topic	American Journal	Australian Journal	Canadian Journal	All 3 journals
Agricultural Development		1	1	2
Agricultural Marketing	1	2		3
Agricultural Policy	4			4
Development Economics	1			1
Energy Economics	1			1
Environmental Economics	2	1		3
HRD in Research		1		1
Institutional Economics	3			3
International Trade	1			1
Labour Economics	1			1
Research Policy		2		2
Total	14	7	1	22

Table 18. Distribution of articles focusing on countries other than India, published in selected Indian journals, 2004 to 2013

(Number)

Topic	AERA	IJAE	Total
Agricultural Marketing	1		1
Agricultural Development		3	3
Agricultural Policy	1	1	2
Environmental Economics	1		1
Food Security	1	1	2
Institutional Economics		2	2
International Trade	1		1
Natural Resource Economics	1		1
Production Economics	1	6	7
Research Policy	2	1	3
Sustainable Agriculture System	1	1	
CGE Model Development	1		1
Total	10	15	25

Articles in International Journals: Indian Focus

Yet another dimension examined related to the distribution of articles focussing on India published in international journals during 2004-2013. It was observed that out of total 22 articles published in international journals focusing on India (Table 17), 14 articles (50% were on agricultural policy and institutional economics in AJAE; 7 articles were in AusJAE (50% on agricultural marketing and research policy) and 1 article in CJAE focusing on agricultural development.

Articles in National Journals: International Focus

As against record of articles in international journals with Indian focus, out of 25 articles published in Indian journals focusing on countries other than India, 10 were in AERR and 15 were in IJAE (Table 18). The major topics in these articles related to

agricultural development, production economics and research policy. The articles covered topics relating to major countries/country group like Philippines, Bangladesh, South Asia, Egypt, Poland, Canada, Nepal, Pakistan, Ethiopia, Kenya, Sri Lanka, Iran, Malaysia and Nigeria. Perhaps if we improve our skills in using advanced tools and methods, we can increase chances of publication in international journals with high impact factor values.

Concluding Remarks

The analysis of quick, limited survey data and review of articles published in national and international journals in the past 10 years has flagged some serious concerns about weakening social science capacity in NARS which require debate and decisions for developing a strategy for strengthening agricultural economics research and education in Indian NARS. Perhaps a more detailed survey and analysis could have provided more conclusive evidences about the fatigue in social sciences. In fact, some of the concerns, as noted earlier, were reported in as early as 1990 and 1996, but without any follow up. These concerns include:

1. The falling number of staff in agricultural economics in NARS despite increasing number of admissions and opening of newer specializations like agri-business management. A closely related issue is the inverted pyramid structure of top positions and ageing of staff, no succession planning and fear of vacuum of experts in the near future mainly owing to faulty recruitment and promotion policy.
2. Serious problem of inbreeding which adversely affects the quality of teaching, research and research guidance in particular and governance in general.
3. Continued emphasis on farm management specialization despite emerging specializations like agricultural agri-business, marketing and trade, natural resource management, agricultural development and policy.
4. Time allocation of staff in teaching, own research, research guidance, extension/outreach activities, consultancy.
5. Critical mass of staff at a single/main campus where enough infrastructural and academic support is normally available to enhance output and impact.
6. Attracting bright students, availability of financial support to students, admission of girl students.
7. Student admission and program completion ratio (turn-out ratio), and completion time of Ph.D. students. Will completing the degree in two years in M.Sc. and 3 years in Ph.D. program amount to ill- equipment of products?
8. Existence and compliance to prescribed quality assurance norms for PG Programs like student admissions, compliance to 4th Dean Committee recommendations, use of e-courses, particularly to teach advanced/new courses introduced in the revised syllabus, teaching materials/manuals, conduct and evaluation of comprehensive examinations, selection of research topics, guides, integrating knowledge technical agriculture in empirical analysis, etc.
9. Output performance, erratic publication record, organising scientific events, training programs, and a general indifference, inertia and failure to leverage opportunities for growth. Organizing and attending training/refresher courses to upgrade skills for conducting analytical studies need attention. The role of national institutions like IARI, NIAP and some SAUs where such capacity exists as regional training centres is to be emphasized. Scientific societies like AERA, ISAE, ISAM also have a role to play in this context.
10. Linkages and collaboration with Centres of Advanced Studies, professional institutions and agencies.
11. Teaching, research and publications not matching with fast developments in the discipline in terms of pedagogy, specializations, topics and advanced analytical tools.
12. Availability of funding and mentoring opportunities, the growing indifference, inertia and lack of commitment among scientists seen in work place and professional transactions is a major worry to our growth and visibility. At times we hear administrative hassles and financial rules dissuade using opportunities.

Acknowledgements

The help in providing data by the Agricultural Economics Departments of Indian NARS, analysis of data by Dr. P. Shinoj, NCAP, New Delhi and Mr. Rajeev Betne, IFPRI, Delhi, collection and analysis of data on journal articles by Dr (Ms.) Lakshmi Prasanna, DRR, Hyderabad, and editing the manuscript by Dr. B.S. Aggarwal, AERA, New Delhi is gratefully acknowledged.

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Annexure 1

Category-wise topics covered by journal articles

Category/Area/ Specialization	Topics covered
Agribusiness	Decision regarding channels of marketing and contracts, explaining variations in design of contracts, efficacy of different channels, firm characteristics as determinant of adoption of food safety measure, location choice of agribusiness firms and underlying determinants, multi-stage economies in vertical integration, estimation of market power, bilateral bargaining, interaction among firm efficiency, export intensity and environment, effect of quality uncertainty on market structure, Effects/efficiency of advertising, The Strategic Use of Private Quality Standards in Food Supply Chains, Slotting Allowances under Supermarket Oligopoly, Specialized Agricultural Mechanization Service Provision a Viable Business Model?, Macro-econometric analysis of supply contracts, Antitrust analysis of supermarkets, Survey of recent developments in contract theory and agricultural policy analysis, nexus between firm characteristics and adoption of food safety standards, impact of food retail regulations, Super markets role in controlling food inflation.
Agricultural Policy	Agricultural Credit Policy, subsidies, agricultural insurance, effect of infrastructure on agricultural productivity, effect of farm payment programs, farming laws, policy responses to higher food prices, Agricultural spillover effects of cash transfers, small farmers development programs, Risk management using climate forecasting, understanding adoption of livestock management policies, transfer efficiency analysis of different support programs, agricultural input pricing policy of governments, innovative saving products for rural people, crop holiday implications, equity in distribution of subsidies, Government procurement and stock management, liberalization of selected agricultural sectors, taxation of agricultural income, notifying farming as an essential service/ industry, state/regional agricultural policies.
Agricultural Development	Entry, exit, farm-size, common agricultural policy effects on regional growth, well being of farm and non-farm households, development of forest dependent communities, impact of infrastructure on poverty and consumption growth, Pension transfers and farm household technical efficiency, food inflation targeting, migratory response to agricultural risk, welfare effects of supermarkets, old farmers pension program and farm succession, convergence of productivity-hypothesis testing , farm structure-dynamics, Agriculture in Economic development, consistency and conflicts of agricultural trade policies and aid policies, diversification choices in agriculture, irrigation-poverty and inequality, convergence in farm size of family farms, trade effect on regional incomes, Modeling drought and recovery, livelihood diversification strategies, is inflation is led by agricultural price rise, driving forces of agricultural decline, NREG and watershed based development, viability of agriculture based enterprises, farming systems approach for agricultural development, Income and livelihood issues of farmers, addressing constraints in adoption of improved technologies, terms of trade and investment in agriculture, agricultural development in non-agricultural regional economy, farm-house-holdings income- investment and consumption, intergenerational occupational mobility, Agricultural growth for inclusive growth.
Agricultural Marketing	Farm characteristics affecting marketing contract decisions, demand and supply of agricultural commodities and agricultural inputs, determinants of demand and supply of agricultural commodities, agricultural marketing methods, agricultural price volatility, price dynamics in the presence of price floor, effect of forecasts on prices, futures market, interstate agricultural commodities marketing, Marketing of genetically modified crops, performance of agricultural marketing advisory services, co-movement of commodity prices, rivalry in pricing, price discrimination, effect of grading, competitive provision of quality in agricultural marketing, collective marketing effects, derivative pricing, packers willingness to pay for traceability, evolving concentration pattern in agricultural input markets- determinants-impact-implications, impact of innovations in value chain, FDI in retail,
Behavioral Economics	Incentive compatible pollution control policies, risk and valuation of genetically modified commodities, measuring risk attitude of agricultural producers, primacy of human and social capital in participation in different programs, an analysis of members attitude behavior towards co-operatives.
Biodiversity Conservation	Conservation of endangered species, targeting incentives to reduce habitat fragmentation, allocating conservation resources under the endangered species Act, In stream flow for endangered species.

Category/Area/ Specialization	Topics covered
Biotechnology Regulation	Regulatory actions under scientific uncertainty regarding genetically modified products, policy of labeling of genetically modified products, adoption of genetically modified crops, optimal type of Government intervention, insuring against losses from transgenic contamination, coexistence of genetically modified crops with conventional agriculture, coexistence rules and regulations.
Consumer Choice	Consumer choice of GM products/organic products/micronutrient dense fortified food products, effect of initial endowment on consumers participation in different kinds of markets, Consumers willingness to pay for different attributes, Joint consumption of goods and recreational time, Brand inertia/ habit formation, advertising and fast food demand, Food stamps and food spending, empirical investigation of excessive choice effects, income and health choices, complexities in studying consumer behavior through choice experiments, effect of search costs on consumer choice, effect of labeling on consumer behavior, effect of selling complements and substitutes on consumer's willingness to pay.
Development Economics	Effect of household size and income on food demand, Spatial variations in economic development and determinants, determinants of income growth in metropolitan and non-metropolitan areas, export sectors and rural development, determinants of investment and abandonment in rural areas, Household reallocation-economic mobility, Explaining evolution of Poverty, Resolving retirement consumption puzzle, household level welfare effects of introduction of commodities and policies, explaining longer life of rural firms, accounting for the poor, impact of orphan-hood, economic outcome of immigration, interdependence of macro-economics and agricultural economics,Linkage between global financial crisis and production agriculture, natural resource curse and poverty, rural wealth creation, concepts, measures and strategies, federal policy-rural community growth and wealth creation, role of public wealth in recovery and resiliency to natural resource management, multi-dimensional poverty, development of index of backwardness.
Disease/Pest Management	Economics and ecology of managing (emerging)infectious disease, infectious disease and crop/livestock productivity under different management systems, Economic/behavioral incentives and health policies for disease/pest management, gender based harvesting in wild life disease management, Livestock disease indemnity design under conditions of moral hazard and adverse selection, disease forecast, cross reactivity in disease control, managing pest resistance evolution, joint determination of livestock disease dynamics and decentralized economic behavior, factors influencing adoption of vaccination.
Ecological Economics	Complementarities of farms and forests, Cost effectiveness of ecosystem management , pesticide use and fish harvest, farmers perceived costs of wetlands, protecting water ecosystem through targeted local land use policies, bio-economic model of cattle stocking on rangeland, honey bee pollination markets, regulatory policies for ecosystem managements, ecological services from agriculture, predicting ecosystem services from agriculture, pricing of ecosystem services.
Energy Economics	Energy productivity in green house industry, welfare effects of bio-fuel tax credit/farm subsidy policies, economics of blend mandate of bio-fuels, impact of bio-fuel policies on cropping pattern, welfare impact of alternate bio-fuel and energy policies, Economics of switching to perennial energy crops under uncertainty and costly reversibility, challenges to development of dedicated energy crop, renewable energy policy alternatives to the future, Wind versus nuclear options for generating electricity in a carbon constrained world.
Environmental Economics	Population – environment nexus, effect of micro-level decisions on macro-level landscape changes, environmental effect of manure application regulations/fertilizer quota programs , environment valuation-complexity- approaches, conservation investment in heterogeneous landscapes, effect of conservation easements, environmental regulation and spatial structure of livestock industry/fish harvest rate, Amenity/disamenity impacts of agriculture, pollution control, targeting strategies for land conservation, Understanding Environmental Kuznet hypotheses, point/non-point effluent trading with spatial heterogeneity, impact of grain for green program, effect of different systems of animal production/animal feeding practices on pollution, Effect of size based environmental regulation, Effect of yield improvements on greenhouse gas emission, optimal environmental taxation from societies perspective, impact of environmental degradation on agriculture, tradeoff between environmental risk factors and food production.

Category/Area/ Specialization	Topics covered
Farm Management	Estimating farm equipment depreciation, household production decisions, monoculture/ crop rotation, use of electronic teaching in farm record keeping, agricultural management e-school, farm level impact of prolonged droughts, managing complexity in modern farming, farmers response to changing risk aversion, technological and financial approaches to risk management in agriculture, optimal crop rotation, climate impact on investment in crop sowing machinery, effect of yield and price risk on conversion to organic farming, impact of technology at farm level,
Food Safety	Sharing of food borne illness prevention cost between consumer and industry, inspection policy, slaughter house rules, effect of different food safety programs, traceability for food safety regulation, index of consumer confidence in the state food safety system, willingness to pay for food safety, valuing lives saved from safer food, food safety pressure on structure of agricultural sector, impact of drug residue standard and other policies.
Food Security/ Nutritional Security	Effect of food aid/food stamps and other safety net programs, dynamics of different nutrient consumptions, recovering shadow value of nutrients, non-economic determinants of nutritional security like parental time allocation, intra-household allocation of food and nutrients, effect of fast food availability on nutritional security, Effect of farm commodity and retail food policies on food/ nutritional security, effect of taxing food/beverages, determinants of changing food self sufficiency at country level, determinants of food deserts, impact of farmers markets on food security, rules versus discretion in food storage policies, relationship between food prices and expenditure on diabetes, International dimension of obesity and other related problems.
Health Economics	Farmers health insurance and access to health care, relation between participation in food stamp program and health care spending, defining access to health care, Arsenic mitigation, valuing health benefits of novel functional food, Pesticide application and occupational health risk among farm workers, compensating wages for occupational health risk in agriculture.
HRD in Agricultural Education	Students demand for agricultural education (Agricultural Economics) program attributes, effect of authorship and quality of journal on agricultural Economists salaries, valuing of graduates attributes by employers, factors associated with student's motivation in agricultural economics classes, on the relationship between student-advisor match and early career productivity, predicting performance in undergraduate agricultural economics, measurement of impact of improving research capacity.
HRD off Farmers/ Agricultural Work Force	Can education program be substitute for regulatory program in pesticide use, role of education in agricultural productivity, Spatial sorting of immigrants, modeling the origins of managerial ability in agricultural production.
Information Economics	Value of information in production and marketing decisions of farmers and agribusiness firms, information content, value of information in environmental/ecological conservation, whom do consumers trust for information regarding genetically modified crops.
Innovation Economics	Process innovation under t imperfect market conditions, IPR –welfare effects, IPR-Market competition interaction, assessing commercial potential of agricultural innovations, entrepreneurship and innovation in agri-food system, value and university innovation, IPR in commodity future contracts.
Institutional Economics	Effect/determinants of participation in crop insurance, contracts, role of program design, land tenancy, role of extension, community programs, vertical and horizontal integration of agro-industries, labor supervision, land distribution effect on productivity, property rights, bundling and licensing genes in agricultural bio-technology, impact of transaction costs, micro-finance effects, social capital , organizational economics in agricultural policy analysis,Redesigning co-operative boundaries-emergence of new models, designing organizations for Globalized world, agricultural contracts-competition-antitrust, networks and transaction costs, inequality-reciprocity-and credit in social networks, measuring social networks effects on technology adoption, relative consumption-a model of peers, effect of fair trade affiliation, collective action, ICT use in agriculture, Governance, role of NGOs.
International Economics	International financial volatility, nexus between economic development and foreign direct investment- trade, capital accumulation and economic growth in developing countries, impact of FDI and trade on economic growth in developing countries, Exchange rate and FDI.

Category/Area/ Specialization	Topics covered
International Trade	Trade reforms, Trade policies effects, exchange rate volatility/pass through effect, non-tariff trade barriers and their effects, effect of trade agreements, standards as catalysts versus barriers, approaches for evaluating trade impacts, world demand for agricultural commodities/inputs, benefit cost analysis of trade promotion, international trade pattern and land use effects of bio-fuel policies, trade impact on environment, food trade-food safety violations-import refusals, demand under product differentiation, impact of government intervention.
Labour Economics	Seasonal adjustments in labour markets, value of on-farm work to farmers, determinants of participation in labour markets, estimation of wage gap, seasonal migration for employment, labour supply estimation using separable/non-separable household models, Shadow wages and shadow income in farmers labour supply functions, off-farm labour supply, Effect of immigrant legalization, immigrant workers and farm performance, minimum wage –immigration control and agricultural labour supply, uniqueness of agricultural labour markets, is there farm labour shortage?, determinants of labour supply decisions of households, causes and consequences of demand supply gap in labour, labour bank experiments, trend in wages and employments, rural employment schemes and wage rate nexus, migration- child labour in agriculture, coping strategies for shortage of labour.
Natural Resource Economics	Optimal harvest licensing, effect of agricultural zoning, Spatio-temporal modeling of natural resource management (land, ground-water, forests etc),Common property resource management, impact of transition from one management to another management system of natural resources, determinants of land use conversion, gains from water trading under asymmetric information, Estimating inter-temporal preference for natural resource allocation, optimal harvesting of multi-rotational forests, multi-aged tree forests, joint estimation of technology adoption and land allocation for designing conservation policy, drain water management for salinity mitigation, determinants of farm land value, urban sprawl and farm land prices, water pricing, choice of regulatory instrument under conditions of uncertainty about compliance, impact of alternate policies in natural resource management, TFP change in agriculture- emission from forests, auction design for voluntary conservation programs, household size and residential water demand, Intergenerational equity and social discount rate, valuation of water in different uses.
Political Economy	Political economy in policy choice, political economy in regulating contracts.
Production Economics	Dynamics of technology adoption, changes in productivity, decomposition of output growth, technological change and economy of scale, farm diversification, integrating agronomic principles into production function specification, farm household production efficiency, aggregation of production function of firms and productivity analysis, estimating state contingent production frontier, estimation of production function involving damage control inputs, sources of productivity growth in agriculture, commodity specific total factor productivity in crop and livestock sectors, urban influence on cost of production, economic replacement of heterogeneous herd, Dynamic efficiency measurement, testing household specific explanation for inverse productivity relation, measuring heterogeneous preference for cattle traits in cattle keeping households, crop yield skewness under the law of minimum technology, evaluation of risks associated with different production systems/ production technology, parametric and non-parametric analysis of production models with multi-dimensional quality, measuring excess capacity in agricultural production, Sequential adoption of packaged technologies, Modeling agricultural supply response using mathematical programming approach, modeling the effects of climate change on higher order moments of crop yield, modeling household production response in the presence of transaction cost and heterogeneity in labour market, bundling technology and insurance, stochastic efficiency analysis with risk aversion bounds, technological choice and efficiency, Event specific data envelopment models, resource use efficiency under self-selectivity, integrating spatial dependence into stochastic frontier analysis, impact of national food security mission on production.
Research Policy	Assessing public priorities for experimental station research, crowding effects of basic and applied research, International and institutional R&D spillover- welfare effects, impact of different kinds of research funding on state agricultural productivity, synergies and tradeoff in university life science research, impact of agricultural research on productivity and poverty, public investment and incentives livestock sector, productivity of frontier technologies, returns to public agricultural research, public

Category/Area/ Specialization	Topics covered
	R&D and private R&D in agricultural productivity growth- long run relationship, efficiency of income transfer to farmers through agricultural research, Levy funded research choices by producers and society, privatized provision of essential plant breeding infrastructure, Managing public intellectual property rights with downstream inter-firm research spillover, preferences for research funding allocation to plant molecular farming, IPR-Knowledge sharing among plant breeders, Social pricing of patents, agricultural system, Research prioritization, Agricultural R&D in meeting agrarian crisis, Returns to alternative models of organization of research, relevance of millennium development goals for academic agricultural research, a critique of Eurocentric social science , R&D strategies of MNCs in India.
Sustainable agricultural System	Agricultural sustainability and technology adoption, instability in agriculture, source of instability in agricultural production systems, System of Rice Intensification, sustainability index, vulnerability index, optimal crop planning for sustainable agriculture in different ecosystems.
General	Experimental economics, Econophysics.

Annexure 2

Area and methodological development / improved method adopted

Area	Methodological development/ Improved methods adopted
Agribusiness	Flexible trans-log distance function, Difference in difference methodology, Estimation of Multi-Stage Economies, Conjectural Variation model of industrial organization, TFP including some environmental productivity measurement, Agent based model, Principal Component Analysis,
Agricultural Development	Multi-objective programming, Meta frontier approach combined with propensity score matching, Household model, bargaining model, CGE modeling, Choice modeling, Instrumental Variable technique, 3SLS, Decomposed negative binomial model, Agent Based model, Model with endogenous breakpoints, Goal programming, new additive model of decomposition, Sustainable livelihood framework, Prioritization framework, Discriminant function, Input-Output Model.
Agricultural Marketing	Sequential Decision making, time varying volatility model, improved AIDS, Rotterdam mixed demand model, expanded random coefficient model, Game theoretic model, distributional event response model, spatial econometrics, experimental economics, Time varying Smooth Transition Regression(STR), State-space framework, Kalman filter, Threshold error correction models, CGE, equlibrium modeling with differentiated products, extended parity Bound model, equilibrium displacement model, co-integration with endogenous structural breaks, muli-stage spatial model, Dynamic SUR model in imperfect competition framework, agent based model, principal-agent model, computational economic approach accounting for spatial price discrimination, auction theory, generalized quadratic AIDS, Censored demand system, quantile regression, structural economic model of vertical relationships, shifting mean auto-regression with structural breaks, Experimental Auctions, Model allowing for home good preference, Impulse response function, Integration of stochastic simulation into a backward recursive programming approach, Inter-temporal household decision model, Hybrid Model built on Kalman Filter and Artificial Neural Network, Integrated Hydrological economic and GIS, Option pricing, Conjoint analysis, Non-linear threshold error correction model, Autoregressive poisson regression model, Multi-Stage budgeting framework, Artificial Neural Network.
Agricultural Policy	State-space framework, statistical model for estimating fraudulent conduct, cox proportional Hazard model, estimation of stochastic discount factor, spatio-temporal model, propensity score matching, instrumental variable technique, simultaneous equation model with endogenous switching, two stage censored data model, damage control technology model, Experimental Economics, systems approach, stochastic frontier, options value, Dynamic Political Economy Model, Integrated Model, Numerical Method, Two stage analysis with multi-variate Tobit Model, Club good framework, Positive Mathematical Programming, Fractional Logit Model, Dynamic bio-economic optimization model, Agent based model, Agent based model combined with econometric Model, Stochastic Continuous state dynamic Programming, Portfolio based insurance model, Improvement in subsidy estimation method.
Behavioral Economics	Asymmetric information model on farmers risk.
Biodiversity Conservation	Moment based approach, spatial modeling, stochastic modeling, General equilibrium model, Spatial application of classic co-ordination game.
Climate Change	Game Theory, Mathematical Programming Model using two stage approach.
Consumer Choice	Time varying demand model, conjoint analysis, incentive compatible conjoint ranking mechanism, brand choice modeling, spatio-temporal modeling, pooled model combing stated and revealed preference theory, excessive choice effect, understanding relative roles of habit, variety seeking and optimal decisions, constrained latent class panel model, Experimental Auction, Double Hurdle Model, Equality constrained Latent quality models, Latent Class models, Intervel Censored regression model, Model with provision for Non-linear preferences, Latent class models, quantile regression.
Development Economics	Optimal control model, dynamic CGE linking to a micro-simulation model, item specific purchasing power parity.
Disease/Pest Management	Host density threshold model, principal agent model, multi-market model, principal agent model, bio-economic model, spatial Model, Systems approach, Dynamic optimization with bio-econometric variables, CGE, Dynamic multi-regional CGE.

Area	Methodological development/ Improved methods adopted
Ecological Economics	Spatial econometric model, bio-economic modeling, instrumental variable technique, stochastic dynamic programming, Minimum Data Analysis, Non-linear Programming.
Energy Economics	Russell measure, open economy equilibrium model, difference in difference propensity score matching model, General equilibrium model, multi-regional model.
Environmental Economics	Environmental Change and population growth jointly determining model, spatial equilibrium modeling, micro-response macro-outcome model, alternative count data models, distance function, negative binomial distribution model, multi-variate random utility models, option values, dynamic programming, sequential decision making model, bio-economic model, material balance approach, latent segmentation approach, hurdle model, conjoint analysis, Random parameter logit model, latent class logit model, two stage optimal control model, spatial autoregressive hedonic models, discrete choice and two part tariff model, endogenous voluntary threat approach, latent threshold estimation model, choice experiments and experimental auction, spatial econometrics, team contracts, benefit transfer, Instrumental Variable approach, Negative Binomial Regression, Novel extreme value approach, Putty-Clay Model, Different methods of information processing models, Hierarchical Game, Leader follower commitment game model, Mixed adverse selection and Moral Hazard Model, Model of budget constrained tenders, Multiple bound discrete choice model, Non-linear programming, Option value through choice modeling, Stochastic bio-economic model, Multiple round bidding Auction, Internet based choice experiment, Regional Agri-models, Evolutionary algorithms, SUR model with hetero-scdesasticity correction, Panel Smooth Transition regression, Spatial Hedonic Models, Polynomial Environmental Kuznet Curve, Agricultural Value loss function, Substitution between animal power and machine power and effects on greenhouse gas emission, Analytical Hierarchy process.
Farm Management	Non-cooperative household model, Bio-economic farm modeling, Multi-Year discrete stochastic program, Multiple phase optimal control model.
Food Safety	Multi-market equilibrium displacement model , Principal Component Analysis.
Food Security	Dynamic indirect utility function model, maximum entropy, propensity scoring matching model, segmentation approach, two stage collective household production model, modeling accounting for asymmetric consumption behavior and loss aversion, instrumental variable technique, difference in difference matching estimators, endogenous treatment effect model, equilibrium displacement model, intra-household allocation model.
Health Economics	Partial equilibrium model, Dose response function.
HRD in Agricultural Education	Conjoint analysis, Mixed Methodology.
HRD of Farmers	Structural equation model.
Information Economics	Hamilton approach, laboratory market model.
Innovation Economics	Sequential game-theoretic model, hazard model.
Institutional Economics	Multi-equation structural model, experimental economics, duration model, incomplete contract model, propensity score matching model, repeated game model, Bilateral negotiations, semi-parametric analysis, Principal Component Analysis.
International Economics	Gravity model with institutional distance.
International Trade	Game theoretic model, dynamic SURE model, gravity equation with first differenced panel, multi-market model, mixed complementary problem, trade restrictiveness index, combination of gravity approach and partial equilibrium model, frame work allowing multiple equilibria and multiple speed of adjustment, model relating import price risk in allocating imports across exporting countries, product differentiation model, Markov switching regression, Bio-economic optimization model, GTAP model.

Area	Methodological development/ Improved methods adopted
Labour Economics	Seasonal adjustment model, Hazard function, instrumental variable approach, multivariate two limit tobit model, simultaneous equation model, Simulation.
Natural Resource Economics	Spatial Ecology, laboratory experiment, dynamic optimization, age class model, Augmented multinomial logit model, risk programming model, instrumental variable technique, Linear complemenatarity problem, recursive utility model, nested logit model, dynamic optimization, instrumental panel data variable model, spatial econometrics, Hazard Model, semi-parametric spatial regression, intergenerational transfers modeling, a model with non-linear discarding costs, general equilibrium model, bio-economic modeling, spatially disaggregated structural Econometric model, propensity score matching and instrumental variable technique, Hydro-economic optimization model, bargaining model, Hedonic pricing and residential sorting approach, Integration of intergenerational equity preference into estimation of social discount rate, inter-temporal arbitrage model, Multi- cohort bio-economic model, State contingent adaption model, Switching regression model, Dynamic LP, Dynamic Stock Management using bio-economic model, Agent Based Model, Dynamic optimization model with asset specificity in irrigation, Optimal Control Model, Measurement of externality.
Political Economy	Agent based modeling, oligopoly model.
Production Economics	Adoption dynamics using panel data, spatial panel data model, stochastic revenue function, damage function, spatial econometrics, Decomposing TFP using cost and input distance function, Bayesian optimal hedging model, State contingent production frontier, interaction between productivity enhancing and damage controlling inputs, Economic surplus under imperfect competition model, Bellman's equation, Non-parametric dynamic measures of efficiency, stochastic dynamic programming, experimental Economics, mixed multinomial logit model, distance function, stochastic frontier model with endogenous repressors, optimal replacement models, propensity score matching model, recursive bivariate probit models, partial moment function, time varying individual effects model, Kalman filter, Positive mathematical Programming, Decomposable new TFP, moment functions and maximum entropy techniques, experimental Economics, game theoretic model, dynamic investment response model, equilibrium displacement model, propensity score matching, Richer version of just and Pope model, Allowing for inefficiency at Individual level in stochastic frontier, Dynamic optimal inter-temporal investment model, Event specific DEA, Fuzzy DEA, Hicks-Moortseen TFP- decomposition using DEA, Incorporating spatial dependence into stochastic frontier analysis, State Contingent production function, Frontier Meta- Production function, Principle Component Analysis, Cluster analysis, Artificial Neural Network.
Research Policy	Accounting for international R&D spillovers effect, trade openness, Elasticity of TFP with respect to R&D, Game Theoretic model, Stated choice experimental data model, DREAM model, Demand Supply based pricing of patents.
Sustainable Agricultural System	Goal programming, Vulnerability index, sustainability index.