Contents

Acronyms and abbreviations

AICRP	All India Coordinated Research Project
ADG	Assistant Director General
CIAE	Central Institute of Agricultural Engineering
CIPHET	Central Institute of Post-Harvest Engineering and Technology
CPRI	Central Potato Research Institute
DARE	Department of Agricultural Research and Education
DDG	Deputy-Director General
DG	Director General
DNA	Deoxyribo nucleic acid
DUS	Distinctiveness, uniformity and stability
HACCP	Hazard Analysis Critical Control Point
IASRI	Indian Agricultural Statistics Research Institute
ICAR	Indian Council of Agricultural Research
IPR	Intellectual property rights
MoU	Memorandum of understanding
NARS	National agricultural research system
NATP	National Agricultural Technology Project
NBPGR	National Bureau of Plant Genetic Resources
NGO	Non-government organisation
R&D	Research and development
SAU	State agricultural university
SMD	Subject matter division

Acknowledgements

Several institutions and individuals have contributed to the successful organisation of this workshop and bringing out the proceedings. We are highly grateful to Dr R. S. Paroda, Secretary, DARE and Director General, ICAR, for his continued interest and guidance to strengthen the public-private interface in agricultural research in general and organisation of this workshop in particular. We are also grateful to Dr Dayanatha Jha, Former Director, NCAP, Director, IARI, and Dr S. D. Sharma, Director, IASRI, for providing necessary support for organising this workshop.

Thanks are also due to the chairman and rapporteur of all the functional groups for providing background inputs for and conducting proceedings of the parallel sessions. Representatives of private sector organisations have responded warmly to our request for participation in the workshop. We are thankful to them and also to other participants from ICAR and other research institutions.

Several staff members of NCAP and Policy and Perspective Planning Unit of ICAR provided admirable logistic support for smooth conduct of this workshop, which is acknowledged with thanks.

Editors

1 Background

The public agricultural research system in India has successfully ushered 'Green, White, Yellow and Blue revolutions'. However, recent changes in agricultural, economic and scientific environment pose new challenges. Diversification and commercialization of agriculture, conservation of natural resources, development of rainfed/dryland areas, increasing consumer preference for quality products, intellectual property rights (IPR)-related constraints in technology transfer, etc. are some of the new challenges, besides continuing priority for household food and nutritional security and poverty alleviation. In order to respond to these complex challenges and to avail emerging growth opportunities, public research system is reorienting itself for greater responsiveness and efficiency. In particular, initiatives are taken towards decentralization of administrative power, extra budgetary resource mobilization, human capital and infrastructure development, institutionalization of incentive and reward system, involvement of private sector in planning and execution of agricultural research, etc. Now the focus is on sharing of demand-driven research agenda by the public and private research organisations based on their comparative advantage.

In order to strengthen the public-private interface in agricultural research, a brainstorming workshop was organized on 2nd April, 1998. One of the major recommendations of this workshop was to "constitute broad-based independent functional groups representing all stakeholders for effective interfacing between Indian Council of Agricultural Research (ICAR), state agricultural universities (SAUs), private sector, non-governmental organisations (NGOs), cooperatives and farmers in crops, horticulture, livestock, fisheries and farm machinery sectors" (For proceedings and recommendations of the workshop, see Pal and Joshi (1999).). As a follow up of this important recommendation, functional groups have been constituted by ICAR with representation of the private sector. These functional groups are expected to integrate the planning and functioning of multiple stakeholders in agricultural sector for effectively meeting current as well as potential research and development needs. The present workshop has been organised to give further direction to the previous efforts and consolidate on-going field level initiatives. The following are the specific outputs expected from this workshop:

- An overview of promising and proven technologies for commercialisation in collaboration with industry;
- firm up the approaches and modalities of partnership between ICAR and industry;
- identification of priority areas for each sector for ICAR-industry partnership; and
- action plan/milestone for the next one year for each functional group.

2 Workshop Proceedings

Inaugural Session

Chairman: Dr R. S. Paroda, Secretary, DARE and DG, ICAR

The inaugural session started with the presentation of base paper prepared for the workshop. The presentation covered conceptual issues, institutional perspectives and major initiatives of the public-private interface. The issues like need for greater public-private interface in the changing environment, functional realities and common functional domain of the public and private sectors, and typologies of the interface were covered in detail. Also, the conditions to reinforce and sustain the interface were underscored. This was followed by another presentation on technologies identified by ICAR for commercialisation and transfer by the DDG (Engg.). It was indicated that 230 technologies from different disciplines have been identified for commercialisation. These technologies are properly documented in the form of a compendium, which was also released during the workshop. The third presentation by the DDG (Edn.) dealt with modalities of the interface and its institutionalisation. It was suggested that the draft guidelines be examined by each sectoral committee, and the compiled views of the committees be further examined by the Accreditation Committee already constituted by ICAR. These guidelines should be submitted to the Organisation and Management Reforms Task Force and/or the Project Management Committee (constituted under the National Agricultural Technology Project, NATP in brief) for final approval. The Policy cell in the Council may coordinate this activity. The participants were appreciative of the initiative taken by the Council to compile and disseminate the information on technologies developed, and their commercialisation in partnership with the private sector.

The representatives of the private sector emphasised the need for market or need-based, result-oriented research. The commercially viable technologies should be identified and demonstrated in partnership mode. In order to cater to the needs of domestic as well as export markets, there should be greater emphasis on value addition, product quality control and cost effectiveness in the area of post-harvest management. The priorities in terms of commodities, markets and regions should be well identified and taken up for implementation. Such a strategy will be of mutual benefit to the public and private sectors. Another potential area for the interface could be farm mechanisation, particularly small implements for inaccessible and marginal areas. The representative of seed industry elaborated impact of support extended by ICAR and SAUs in terms of open access to germplasm and testing facilities on growth of Indian seed industry. The industry is now in a stage to pay for services and undertake activities jointly with public sector breeding programmes. The private sector participants also emphasised the need for frequent interactions between scientists of both the sectors, and opined that ICAR can help train scientists working in private research organisations in frontier research areas. The partnership in all these activities could be in consultative, collaborative or contractual mode. It was also indicated that a group should examine all policy and regulatory issues relating to research and development in general and public-private partnership in particular. This is essential to put a facilitating regulatory framework in place.

Chairman's remarks

The chairman in his opening remarks and responding to suggestions of the representatives of the private sector flagged the issues relating to overall policy environment governing the interface and specific areas of mutual interest. He also elaborated the initiatives taken by the Council to foster the public-private linkages, and stressed upon replication of successful joint programmes taken in the past. It was emphasised that it is high time to capitalise collective wisdom in a partnership mode to address national research issues, which are expanding in an era of global competitiveness. Both the sectors should develop mutual faith and trust and complement each other's activity to achieve agricultural research intensity of one percent of

agricultural gross domestic product. The Council has now necessary capability to assess and explore the policy mechanism for strengthening the public-private interface and accelerating technology development and dissemination processes. This capability is now being institutionalised and the Council intends to play a proactive role. For instance, National Centre for Agricultural Economics and Policy Research is created to examine agricultural policy issues and special units like Intellectual Property Rights Cell, at the Council and ICAR institutes are created to provide necessary support.

While pointing out the specific areas for collaboration, the chairman pointed out that there is ample scope for partnership right from research planning to technology transfer, assessment and refinement. There is a need to reorient research agenda in a consultative mode and research planning should shift from 'top down' to 'bottom up' approach. This paradigm shift is extremely important to focus on need-based research and to assess economic and environmental viability of technologies. In terms of specific areas, post-harvest technology, farm mechanisation in rainfed and other marginal areas, integrated pest and nutrient management, etc. need greater research focus, besides strengthening ongoing programmes on improved seeds, animal health, pest management, etc. The Council has developed modem research infrastructure and some of them like gene bank and phytotron facility, are highly investment intensive. Private research programmes should make use of these facilities extensively. If necessary, some of the ICAR laboratories can work as referral labs to address safety issues of exports or imports.

The chairman also underscored the fact that we are making a new beginning, which requires mutual confidence, frequent dialogue and change of mindset. Appreciation for each other's efforts, programme of mutual interests, replication of success stories and greater focus on commercial viability of technologies will bring both the sectors together and help make wider technology impact.

Parallel Sessions of the Functional Groups

Crop Sciences

Chairman: Dr Mangala Rai, DDG (CS), ICAR
Rapporteur: Dr A. K. Raheja, ADG (Seeds), ICAR

The chairman outlined the following framework for an effective interface between ICAR and industry:

1. Indian national agricultural research system (NARS) has to be taken in proper perspective (i.e. ICAR, SAUs and all others including private sector and NGOs involved in agricultural research and development (R&D) in the country).
2. Economic liberalisation process is a reality and it should be taken into account in all policy formulations.
3. In future, biotic and abiotic stresses would be increasing in view of intensive cropping system.
4. New tools of technology have emerged and there is a need for urgent action for harnessing the impact of these technologies. These technologies are far more skill demanding and capital intensive.
5. IPR regime will have to be kept in view in sharing research material and developing new technologies.
6. Partnership between public and private sectors would provide an effective cutting edge advantage in development of technologies and their dissemination.

It was observed that the seed industry is passing through critical stage with competition from large number of big companies. In present scenario, ICAR is expected to play a major role. The scope of partnership should be clearly determined on mutual consultation. It would be required to establish modalities for approaching ICAR for such partnership.

After detailed discussion the following areas were identified for collaboration between ICAR and industry.

1) Human resource development/training

The ICAR would consider favourably any proposal for providing training to scientific personnel of private sector. It was agreed that course curriculum for such training programme can be designed as per training requirement on mutually agreed basis provided that the number of trainees are more than ten. The tentative areas identified for such training programme are as follows:

i. Seed technology: Seed production, breeding methodologies, distinctiveness, uniformity and stability (DUS) testing, etc.
ii. Quarantine/plant protection: Quality assurance and quality control programmes, pesticides residue analysis, integrated pest management, biocontrol and biopesticides, pest risk analysis, etc.

2) All India coordinated trials

The ICAR has a network of All India Coordinated Research Project (AICRP) centres on different crops, which are located at various SAUs and ICAR institutes. The apex trials are conducted at these AICRP centres and at a few other centres located at private research organisations. In certain agro-climatic zones there are very limited number of AICRP centres. However, the SAUs have regional research stations in these zones which have sufficient manpower for conducting the AICRP trials. These centres conduct trials on voluntary basis depending upon the availability of fund. In order to increase the scale as well as precision of testing, the private sector may fund the trials conducted by the voluntary centres. It was agreed that such a provision can be made on crop to crop basis depending upon the requirement of testing of a particular crop in a given agro- climatic zone.

3) Identification of areas for specialised research

The areas of specialised research requiring attention on priority basis need to be identified by ICAR and private sector through mutual consultation. It was decided that the sectoral committee of representatives from ICAR and industry on crop sciences may workout the modalities.

4) Development of new molecules of chemicals

It was agreed that there is a scope for ICAR-industry collaboration for development of new eco-friendly molecules/chemicals, especially of botanical sources. An appropriate action plan in this direction will be initiated in consultation with ICAR and private sector representatives.

5) Identification/establishment of referral labs and certification facility

Concern was expressed for monitoring of quality of various products (chemicals and other agri-products) for which appropriate referral laboratories are required for providing certificate of quality. This issue was discussed in great detail and it was agreed that the industry should raise this issue in appropriate forum of the Ministry of Agriculture.

Horticulture

Chairman: Dr B. S. Dhankar, ADG (VC), ICAR
Rapporteurs: Dr D. S. Rathore, ADG (Hort.), ICAR
Dr O.P. Dutta, Head, Veg. Crop Division, IIHR

The chairman gave an overview of technologies developed in the field of horticulture by the ICAR institutions and AICRPs for different agro-climatic zones of the country. He highlighted several areas of horticultural research where private and public sectors can develop programmes of mutual interest. The private sector showed keen interest in the areas of manpower training, consultancy, value-added vegetable germplasm, segregating populations and unproved vegetable varieties developed by the NARS. The following recommendations emerged from the discussion:

General recommendations

1. Public research institutions should organise open/field days periodically to demonstrate the potential of value-added vegetable germplasm, segregating populations, advanced breeding lines and new vegetable varieties developed by them. Private seed sector should be invited in such field days.
2. The private sector showed keen interest for seedless watermelon, fusarium wilt resistant watermelon breeding lines, anthracnose resistant lines of chilli, male sterility in chilli and okra, tropical cabbage varieties and black rot resistant lines of cauliflower.
3. CPRI, Shimla, should develop potato varieties suitable for processing and can be stored after treatment with CIPC at 10° C during March to December.
4. Preparation of project proposal for funding under the Competitive Grant Scheme of NATP involving both the private and public sectors.

Specific recommendations

1. Training of manpower in the seed sector, especially in hybrid seed production and DNA finger printing for testing genetic purity of vegetable varieties. This training should be backed by periodic guidance to the user agency through consultancy, for development of male sterile lines in hot pepper, and self-incompatible lines in cole crops.
2. Public research institutions can conduct trials of vegetable varieties developed by the private sector and test genetic purity of vegetable varieties (having standardised DNA profile) using DNA finger printing technique. The cost of these activities may be borne by the private sector.
3. The public research programmes should make use of facilities available in the private sector for pilot testing of technologies.

Animal Sciences

Chairman: Dr Kiran Singh, DDG (AS), ICAR
Rapporteur: Dr Sushil Kumar, ADG (D&APT), ICAR

The chairman highlighted various technologies generated by ICAR in animal sciences and gave a brief account of research programmes hi the areas of animal production, health and products technologies. After detailed discussion the modalities of developing ICAR-industry interface were worked out and priority areas were identified. The following important issues/recommendations emerged during the discussion:

1. In animal sciences there should be a number of working groups and each group should have seven or more stakeholders from corporations, research associations, multinationals, farmers, research and developmental organisations, economists and statisticians, etc.
2. Animal production dealing with breeding, nutrition, physiology and management to work out the industry development in artificial insemination, semen, embryo transfer technology, feed compounding and supplementation and shelter management.
3. Animal health dealing with all kinds of diseases and their interventions through diagnostics, biologicals, vaccines, drugs and surgical procedures.

4. Outline the logistics for undertaking cost-benefit analysis of new technologies and their commercialisation for milk and milk products, poultry products, and meat and its byproducts.
5. Wool and wool products: A programme for improvement in the quality of carpet wool may be taken in the public-private partnership mode.
6. Human resource development for the industry personnel in ICAR institutions.

Fisheries

Chairman: Dr K. Gopakumar, DDG (Fisheries), ICAR
Rapporteur: Dr B. N. Singh, ADG (Inland Fisheries), ICAR

The functional group made the following recommendations:

1. Shrimp hatchery industry is facing shortage of broodstock for large-scale seed production. The ICAR should assist the industry in domestication of shrimp broodstock for Penaeus monodon free from pathogens.
2. Eco-friendly technology to maintain water quality for hatchery and grow out and to treat water effluents for safe disposal of water to sea.
3. Suitable modification in design of Penaeus monodon hatchery is needed for their utilisation also, as freshwater giant prawn hatchery.
4. Polyculture technology for carps with freshwater giant prawn to be developed, refined and demonstrated for commercial production to make fish culture more remunerative for the industry. The industry will make available required infrastructure and operational costs.
5. Assessment and refinement of seabass culture technology and its pre-commercial demonstration to the industry, which provides necessary infrastructure and meets operational costs.
6. Since Tilapia has export potential and many countries are culturing it, technology to be developed for mono-sex male Tilapia, assessed and demonstrated to the industry.
7. Cage culture and flow through aquaculture technology suitable for reservoirs, canals, rivers and sea to be demonstrated to the industry for (a) fish culture, (b) oysters, and (c) to establish mussel bank. For this infrastructure and operational expenses should be provided by the industry.
8. **Pearl culture technology:** Marine pearl oyster culture to be established in Mandapam area of Tamil Nadu, where pearl culture technology has stabilised. This will help cater to the export demands. For import substitution, fresh water pearl mussel culture to be established hi Andhra Pradesh, where craftsmanship and marketing for pearl is stabilised.
9. Fish harvesting technologies for making value-added products should be stabilised to meet the quality requirements for both export and domestic markets.
10. In view of global concern for quality assurance, systems to be followed for upgradation of existing post-harvest and processing methods for meeting hazard analysis critical control point (HACCP) and Euro-regulations for export and domestic markets.
11. Most of the available fishery resources have not been exploited to meet the export and domestic demand for fish products such as fillet, breaded products, fish finger and packed fish products in retortable pouches, etc. which can be marketed through the cold chain in the country. In view of this, the required technology is to be developed and made available to the industry at a reasonable price.
12. To meet quality requirement and management of diseases for reaching optimum output level, there is a need to establish referral labs in places where large-scale fish harvesting activities are being carried out. These referral labs should be backed by the mobile labs for time-to-time collection of samples at the farming, harvesting and processing stages.
13. Reorientation of human resource development to be carried out on a continuous basis to meet the challenges of global competition, so that the industry will be able to catch up with the latest technologies available time to time.

Agricultural Engineering

Chairman: Dr Anwar Alam, DDG (Agril. Engg.), ICAR
Rapporteur: Dr N. S. L. Srivastava, ADG (Agril. Engg.), ICAR

The chairman informed the house that a large number of technologies have been developed by ICAR, some of which have been listed in the compendium brought out (ICAR, 1999). ICAR would like to collaborate with the industry on commercialisation of these technologies. He briefly listed the following research priorities of the Agricultural Engineering Division:

i. Refinement and commercial production of prototypes developed by ICAR institutes.
ii. Collaboration/contractual sponsored research in the important areas of mutual interest.
iii. Identification of foreign equipment for evaluation and adoption under Indian conditions for mechanization of horticultural crops. cotton, sugarcane, hill agriculture, green house cultivation and other specialized equipment.
iv. Providing assistance for quality manufacturing of agricultural implements.
v. Providing expertise in the area of agro and food processing.
vi. Technology upgradation and scaling up of technologies developed under ICAR/SAU system.
vii. Training of farmers, scientists and engineers in their premises.
viii. Help developing linkages between ICAR and the industry.
ix. Publication of catalogues of commercially available agricultural machinery.
x. Assistance in maintaining data base about production and sale of different types of agricultural machinery and products.
xi. Identifying research problems with a view to increase export of agricultural machinery and value-added. agricultural/horticultural/ animal/fish products.

The ICAR can offer a wide range of services to the industry. These services include supply of research prototypes and their manufacturing drawings, collaborative/contractual/sponsored research in the areas of mutual interest, consultancy services, testing of equipment developed by the industry; bench and pilot scale development of jute and cotton-based products, training of manpower, preparation of feasibility reports, etc. It was also suggested that IASRI can assist the industry in application of statistical methods (sample survey, design of experiments, forecasting methods, non-linear models), use of geographical information system (GIS) and remote sensing data, development of management information system, and training in computer applications and database management.

The areas wherein the industry can offer assistance to ICAR were also spelled out. The identified areas are: refinement and commercialisation of technologies developed by the Council, collaboration in the areas of mutual interest, modification of imported machines for their adaptability in Indian conditions, manufacturing of quality products, upgrading and scaling up of technologies, training of scientists, database management, and R&D for export of proven equipment and technologies.

The representatives of the industry desired that collaborative research projects may be taken in the following areas:

a. Identification of alternate chemical to chlorine for bleaching of shellac.
b. Increasing shelf-life of bleached shellac.
c. Technology may be developed for manufacture of solid form of insulating varnish instead of liquid, for export purpose.
d. Development of appropriate methods for reduction of aflatoxin in groundnut.
e. Equipment for mechanisation of groundnut processing.
f. The Pepsi company wanted to take up groundnut equipment developed by CIAE for adoption and also offered to transfer chilli and tomato transplanting equipment development by the company.

The following suggestions were given by the industry for effective interface:

1. A separate meeting for the interface between ICAR and industry be held at the Subject Matter Division level to apprise the agricultural machinery/processing industry about the ICAR initiatives and the technologies developed for different regions, crops, soils and operations for wider publicity and interaction with the industry.
2. ICAR may help setting up of pilot plant of soybean processing for making various soy products for the benefit of entrepreneurs.
3. ICAR's effort in setting up five more prototype manufacturing centres under NATP was appreciated. It was suggested that each centre may also specialise in production of critical components of fluted rollers, furrow openers, cutter bar, sickle blade, thresher pegs, rotavator tines, etc.
4. Once a collaborative programme is identified, it should be speedily implemented and executed to avoid time lag.

Plenary Session

Chairman: Dr R.S. Paroda, Secretary, DARE and DG, ICAR

This session was devoted to discuss the recommendations of various functional groups and to finalise them alongwith an action plan. The session began with presentation of recommendations by the chairperson of each functional group, which was followed by open discussion. During the discussion it was pointed out

that the identified partnership programmes should be time-bound and result oriented. It is also important that active partners from the private sector should be identified and all information such as ICAR publications on technologies for commercialisation, should be made available to them. A suggestion was also made that more awareness should be created among stakeholders through organising regional workshops, and the groups like All India Management Association may be involved in this endeavor.

The chairman in his concluding remarks touched upon institutional and scientific aspects of the interface and programmes identified for the partnership. He emphasised that the process of globalisation, liberalisation and resource generation would bring the public and private sectors together. He stressed that we should capitalise this opportunity to reinforce the interface. For this, greater awareness, trust building through frequent interactions and institutionalisation of the functional groups are essential. In these efforts both the sectors should assume a proactive role. The functional groups should also address policy issues relating to technology development and commercialisation in general and public-private interface in particular. The initiatives taken at the group level should also percolate down in the system. Finally, keeping in view the chairman's remarks and important points emerged during the discussion, recommendations of the workshop were finalised.

3. Recommendations and Action Plan

Recommendations

1. Functional groups should meet regularly to create awareness, develop linkages, facilitate collaborative programmes and address human resource development needs.
2. Active partners from the industry should be identified for their active participation in (i) ICAR activities like research planning, and (ii) undertaking agreed collaborative research programmes.
3. Improve timely flow of information regarding ICAR technologies for commercialisation and training programmes, and update mailing list of ICAR publications by incorporating private sector companies.
4. Initiate work on registration and cataloguing of genetic and other research material available in the public and private sectors.
5. The Council should develop mechanisms and MoU for transfer of technologies to private sector for their commercialisation and also for use of ICAR research facilities for private research organisations.
6. More focus on partnership in pilot testing, assessment and refinement of technology, economic viability study and establishment of model technology parks.
7. Assessment of human resource development needs, particularly for scientists and middle-level management in the private sector, and organisation of training programmes in partnership mode.

Action Plan

General

1. ICAR may put all its technologies developed on the web page and may charge a reasonable fee for down loading this information from the web page.

Action: DDG (Agril. Engg.)

2. A single window cell may be set up for providing information to the industry on various aspects of technologies developed and their availability.

Action: ADG (IPR)

3. ICAR may forecast crop production and weather data and supply this information to industry at reasonable cost.

Action: DDG (Agril. Engg.)/Director, IASRI

4. ICAR-Industry may jointly identify potential foreign equipment to be imported for adoption under Indian conditions.

Action: DDG (Agril. Engg.)

5. For creating interest amongst the industry, few project reports giving details of the technologies developed along with their economic feasibility analysis be prepared and discussed with the concerned industry for collaboration/adoption. This will also develop confidence about the potential success of the ICAR technologies.

Action: All ICAR Institutes

Specific

1. The draft guidelines and mechanisms (MoU etc.) on policy issues relating to technology development and commercialisation in general and public-private partnership in particular (presented at the workshop) be examined by each Functional Group. Compiled views of all the groups be examined by the Accreditation Committee already constituted and the report be submitted to the O&M Task Force/PMC for final approval.

Action: Chairman, Functional Groups/ADG (P)

2. The Functional Groups should deliberate on their recommendations finalised during this workshop and develop an action plan including identification of active partners from the private sector.

Action: Chairman, Functional Groups)

3. ICAR publications on technologies for commercialisation be made available to private sector.

(Action: OSD (P&I))

4. Organise regional workshops involving groups such as All India Management Association for increasing the awareness about commercialisation opportunities in agriculture and significance of partnership among all the stakeholders.

(Action: ADG (P)/SMDs)

5. Initiate work of registration and cataloguing of genetic and other research material available in the public and private sectors.

(Action: Director, NBPGR)

4 Programme

February 8, 2000

900-1000 hrs	Registration	
	Inaugural Session	
1000-1015	Welcome	Dr P.K. Singh, Director, IARI
1015-1030	About the workshop	Dr Mruthyunjaya ADG (P), ICAR
1030-1115	Presentation of the base paper	Dr Suresh Pal Senior Scientist, NCAP
1115-1130	Tea break	
1130-1200	Opening remarks by the chairman	Dr R.S. Paroda, Secretary, DARE and DG, ICAR
1200-1300	Open discussion	
1300-1330	Remarks by the chairman	Dr R.S. Paroda, Secretary, DARE and DG, TCAR
1330-1430	Lunch break	
1430-1730	**Parallel sessions of the Functional Groups**	

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9300-1300	Parallel sessions of the Functional	
1300-1430	Groups continued Lunch break	
	Plenary Session	
1430-1530	Presentations of the reports	Chairman of the Functional Groups
1530-1630	Open discussion and finalisation of recommendations	
1630-1700	Remarks by the chairman	Dr R.S. Paroda, Secretary, DARE and DG, ICAR
1700-1715	Vote of thanks	Dr Mruthyunjaya, ADG (P), ICAR
1715-1730	Tea	

5 List of Participants

Dr. R.S. Paroda
Secretary, DARE and DG, ICAR
ICAR, Krishi Bhavan, New Delhi- 1
Phone: 3382629

Dr. P. Das
DDG (Extn.)
Krishi Anusandhan Bhavan,
Pusa, New Delhi- 11 00 12
Phone: 5731277

Dr. S.L. Mehta
DDG (Edn.)
Krishi Anusandhan Bhavan,
Pusa, New Delhi- 11 00 12
Phone: 5747760

Dr. A. Alam
DDG (Engg.)
ICAR, Krishi Bhavan, New Delhi- 1
Phone: 3382358

Dr. N.S.L. Srivastava
ADG (Engg.), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3382716

Dr. S.K. Tandon
Sr. Sc. (Engg.), ICAR
Krishi Bhavan,
New Delhi- 1
Phone: 3389096

Dr. S.D. Sharma
Director, IASRI Library Avenue,
New Delhi- 110012
Phone: 5741479

Dr. O.P. Dutta
Head, Div. of Vegetable Crops
Indian Institute of Horticultural
Research, Hessarghatta,
Bangalore-560089
Phone: 80-8466420

Prof. M.M. Mehta
Managing Director,
Maharishi Technology Corpn. Ltd.,
A- 14, Mohan Industrial Estate,
Mathura Road, New Delhi-44
Phone: 6959833 Fax: 6959580

Mr. Roshan Lal Sharma
Director
Tajna Shellac Pvt. Ltd., 41 1,
Bentinck
Chambers, 37 A, Bentinck Street,
Calcutta-700069
Phone: 0091-33-2214317, 2101868

Mr. Sumit Marwah
The Champdany Industries Ltd.
D-974, (Basement), New Friends
Colony, New Delhi- 110065
Phone: 6831305, 6832747,
6918420

Dr. B.S. Dhankar
ADG (VC), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3383859

Dr. Narendra Singh
Head, Div. of Vegetable Crops
Indian Agricultural Research
Institute
New Delhi- 11 0012
Phone: 5783628

Dr. R.N. Pal
ADG (PC), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 338 1748

Mr. A.K. Tyagi
President (H)
Uncle Chipps Co. Ltd.
C-34, Phase-II, Noida-201305
Phone: 91-11-8-562254, 562549

Dr. Kiran Singh
DDG (AS), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3381119

Dr. Jagpal Singh
Joint Director
Central Potato Research Station
Modipuram, Meerut-250110
Phone: 0121-570742

Dr. D.S. Rathore
ADG (H), ICAR
Krishi Bhavan, New Delhi- 1

Dr. Sandhya Tiwari
Dy. Director
Confederation of Indian Industry, Gate No. 31, North Block, Jawaharlal Nehru Stadium, New Delhi-3
Phone: 4366225, 4366273

Dr. N. Anand
GM (R&D)
Namdhari Seeds Pvt. Ltd., 119, 9th Main Road, Ideal Homes Township, Rajarajeshwari Nagar,
Bangalore- 560039.
Head Office: Bidadi, Bangalore
Phone: 562109, 80-8602169
Head Office: Phone: 82401, 82402

Mr. Abhiram Seth
Export Director,
Pepsi Food Ltd., 3-B, DLF Corporate Park, S-Block, Qutab Enclave,
Gurgaon- (Haryana)
Phone: 391-356273, 91-355871

Mr. Animesh Banerjee
President,
Indian Dairy Association,
Sector-4, R.K. Puram, New Delhi-22
Phone: 6170781, 6165355, 6165237

Mr. C.P. Prabhu
Quality Assurance Manager,
HEINZ India Pvt. Ltd., Manzurgarhi,
P.O. Box-1, Aligarh-202001
Phone: 0571 -400491, 400492

Dr. K. Gopakumar
DDG (Fy.),
ICAR Krishi Bhavan, New Delhi- 1
Phone: 3382713

Dr. Narendra Sharma
Director,
Indian Veterinary Research Institute
Izatnagar-243122 UP
Phone:0581-447069

Dr. B.N. Mathur
Director,
National Dairy Research Institute
Karnal- 132001 Haryana
Phone: 0184-252800, 259002

Dr. Sushil Kumar
ADG (D&APT), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3388033

Dr. Lal Krishna
ADG (AH), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3386668

Dr. Arun Kumar
ADG (ANP), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3385987

Dr. S.C. Chopra
ADG (AP&B), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3389388

Dr. V.R. Chitranshi
Sr. Sc. (Fy.),
ICAR Krishi Bhavan, New Delhi- 1
Phone: 338891-546

Mr. Jai Singh Asher
SNAP Natural and Alginate Products Ltd.,
Plot No. 1, Sipcot Industrial Complex, Ranipet-632403, T.N.
Phone: 4953013, 3422880

Dr. V.N. Pillai
Director,
Central Marine Fisheries Research Institute, Cochin-682014
Phone: 0484-394798, 394867

Dr. K.R. Prasad
President,
Asian Fisheries Technology and Management Co. Ltd.,
Confederation
of Indian Aquaculture Industry
Welfare Organization, DEVIKRUPA,
7-Ocean View Layout,
Pandurangapuram, Visakhapatnam-530003
Phone:91-91-891-567254

Dr. B.N. Singh
ADG (Inland Fy.), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3384414

Dr. Mangala Rai
DDG (CS), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3382545

Dr. S. Ayappan
Director,
Central Institute of Freshwater Aquaculture, Kausalyaganga,
Bhubaneshwar-751002
Phone: 0674-465421, 465446

Dr. P.K. Singh
Director,
Indian Agricultural Research Institute,
New Delhi-12.
Phone: 011-5781492, 5787461

Dr. B.B. Sahoo
Sr. Scientist (Fish & Fisheries-Fish Pathology), Central Institute of Freshwater
Aquaculture, Kausalyaganga,
Bhubaneshwar-751002
Phone: 0674-465421, 465446

Dr. A.K. Raheja
ADG (Seeds), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3382257

Dr. N.B. Singh
ADG (OP), ICAR Krishi Bhavan, New Delhi- 1 Phone: 3385357

Dr. R.P. Katiyar
ADG (Seeds), ICAR
Krishi Bhavan, New Delhi- 1

Dr. B.S. Dhillon
ADG (FFC),
ICAR Krishi Bhavan, New Delhi- 1
Phone: 338 1753

Dr. K.R. Chopra
Director,
Mahindra Hybrid Seeds Co. Ltd.,
Mahalaxmi Compound, A- 10, Old MIDC Area, P.B. 52, Jalna-431203
Maharashtra

Dr. K.C. Jain
ADG (CC), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3384323

Dr. R.S. Arora
Secretary General,
Seed Association of India, 1119-1120.
Vishal Tower, District Centre,
Janakpuri, New Delhi-58
Phone: 7019890, 7017061, 5612990

Dr. S. Mauria
Sr. Scientist (Seeds), ICAR,
Krishi Bhavan, New Delhi- 1
Phone: 3384558

Sh. R.B. Barwale
Managing Director,
Maharashtra Hybrid Seeds Co. Ltd.,
Resham Bhavan, 4th floor, 78, Veer Nariman Road, Mumbai-400020
Phone: 091-022-2049497, 2043020

Dr. N.N. Singh
Project Director,
Directorate of Maize Research,
IARI campus, New Delhi- 12
Phone: 5782372, 5772 105

Dr. S.N. Shukla
Principal Scientist (PP),
ICAR Krishi Bhavan, New Delhi- 1
Phone: 3384558

Dr. J.P. Mishra
ADG (IPR), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3382985

Dr. R.K.Choudhary
Project Coordinator,
National Seed Project, IARI, New Delhi- 12
Phone: 578 1908

Dr. Mruthyunjaya
ADG (ESM&P),
ICAR Krishi Bhavan, New Delhi- 1
Phone: 3382146

Dr. P.C. Bhatia
ADG (Agro), ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3782154

Dr Dayantha Jha
Director, National Centre for Agricultural
Economics and Policy Research,
Library Avenue, Pusa, New Delhi 12
Phone: 5743036, 5713628, 5819731

Dr. Suresh Pal
Senior Scientist,
National Centre for Agricultural Economics
and Policy Research, Library Avenue,
Pusa, New Delhi 12
Phone: 5713628, 5819731

Mr. Anil Kakkar
Chief Marketing Manager,
Excel Industries Ltd., 2/3 West Patel
Nagar, 1st floor, Main Patel Road,
New Delhi- 11 0008
Phone: 5817638-41

Dr. B.N. Choudhary
OSD (DIPA),
Directorate of Information and
Publication, Krishi Anusandhan
Bhavan, Pusa, New Delhi- 12
Phone: 5753361

Sh. A. Chakravarty
Director, DIPA
Directorate of Information and
Publication, Krishi Anusandhan
Bhavan, Pusa, New Delhi- 12
Phone: 5716010

Dr. A.K. Bawa
Sr. Scientist, Planning Section,
ICAR
Krishi Bhavan, New Delhi- 1
Phone: 3389406

Dr. Raka Saxena
Research Associate,
National Centre for Agricultural
Economics and Policy Research,
Library Avenue, Pusa, New Delhi 12
Phone: 5713628, 58 19731

Dr. A.K. Jha
Research Associate,
National Centre for Agricultural
Economics and Policy Research,
Library Avenue, Pusa,
New Delhi 12
Phone: 5713628, 5819731

6 ICAR-Industry Interface in Agricultural Research*

Mruthyunjaya
Indian Council of Agricultural Research, New Delhi-1

Suresh Pal
National Centre for Agricultural Economics and Policy Research, New Delhi-12

1. Background

Strengthening of national agricultural research system (NARS) involves diversification of institutional and funding base. This diversification process is governed by several factors such as technological opportunities, fanners' response to technologies, incentives and research and development (R&D) policies. All these factors are quite conducive in Indian agriculture, and therefore, the process of institutional diversification of research started quite early. In particular, there has been strong growth of private sector (for profit and non-profit) in the provision of research services. However, both the public and private sectors largely grew in isolation and interface between them was confined to open access of private sector to public research material like germplasm. The experience of developed countries shows that greater synergies can be obtained by evolving and reinforcing interface between various research institutions in the NARS. Such an interface, particularly between the public and private sector, in Indian NARS is at nascent stage, which needs to be fostered. This fact is rightly emphasised under the National Agricultural Technology Project (NATP) and specific provision is made for funding of public-private collaborative research programmes under Competitive Grant Scheme.

2. The Initiative and Progress

Although some degree of the public-private interface has evolved through need-based efforts of individuals or institutions, efforts to institutionalise the interface system-wide commenced with organization of dialogue between various stakeholders in April 1998. The deliberations underscored the need for sharing of research resources and building mutual confidence and trust between the stakeholders, simplification of R&D regulations, including Intellectual Property Rights and Plant Variety Protection legislation, evolving functional linkages and collaborative programs for technology development and dissemination. It was also recommended that functional groups involving all stakeholders should be constituted for different subject matters to facilitate continuous dialogue (For proceedings of one-day brainstorming session on 'Public-Private Interface', see Pal and Joshi (1999).). Most of these recommendations are implemented and five functional groups on crop science, horticulture, animal science, fisheries and agricultural engineering have been setup by the ICAR.

In order to start functional linkages between the public and private sector, two significant steps were taken. The first was to share post-harvest technologies developed by ICAR and SAUs with private sector for their commercialisation. For this one-day workshop was organised to discuss the proven post-harvest technologies with the private sector. The workshop was held at CIPHET (Ludhiana) in association with the Technology Development Board of the Department of Science and Technology, who provides funding support to upscaling/commercialisation of innovative technologies. The second significant step is to fund public-private collaborative research programs under the Competitive Grant Scheme of NATP. The impact of these activities is expected to be visible in couple of years.

The ICAR has also put in place an institutional mechanism to provide its services on consultancy and contractual basis (ICAR, 1997). This mechanism is in operation since April 1994. The early experience is very encouraging as indicated by confidence built and

resources generated by the Council through providing services of various ICAR institutions in the country. These services are in the form of testing samples of pesticides, food and feed, management of plantation crops and orchards, milk processing, etc. Several important project appraisal and resource management and planning work is also done. In some cases, consultancy services were provided to establish research facilities and train manpower in the private sector (Source: Information compiled by the Planning Section of ICAR.). These activities are expected to expand gradually, as operational problems are addressed and procedures are further simplified. However, concern remains that major collaborative research programmes of national priorities are yet to evolve to make a significant impact on the system. The remaining part of this note deals with this issue.

3. Developing Functional Linkages

A prerequisite of developing functional linkages between the public and private sector is the understanding of changing agricultural, scientific and economic environments. This will help identify research programmes. One also needs to know basic functional structure, incentives, constraints and strengths of each sector. This is useful for identifying common functional domain and operationalise the linkages.

3.1 Changing environment

Indian agriculture has shown considerable dynamism in the recent past. Farmers are more receptive to new technologies and they respond to price incentives. There is significant shift towards high value crops unless constrained by harsh agro-physical environment. In particular, livestock, fisheries and horticultural sectors are growing rapidly. All these point to shifting of the agricultural sector from subsistence to commercial one. This shift has strong implications for technology development, training and dissemination systems. There will be greater demand for wide range of technologies and farmers will be proactive in technology evaluation and adoption as technologies are becoming capital and knowledge intensive. Evidences also indicate that a section of market-oriented farmers will be willing to pay for quality and reliable services (Sulaiman and Sadamate, 2000). This means that private sector (for-profit) has strong incentive in catering to needs of these market-oriented farmers. Therefore, there is tremendous scope for the public-private partnership in this area. The specific areas for partnership could be improved seeds, plant protection, farm mechanisation, post-harvest processing, fisheries and animal health.

Macro-economic policies are now geared towards growth of market forces and private organisations. Broad regulatory framework governing the markets is also liberalised considerably. In particular, there is liberalisation of R&D regulations. For instance, a liberal seed policy was put in place in the late 1980s and entry of transnational companies is made easy. Furthermore, there is move to liberalise seed certification regulations, and protection of plant variety will be in place shortly to encourage private R&D in plant breeding. All these measures have paid dividends in terms of growth of private research investment and are expected to further consolidate in the years to come (Morris et al., 1998). But concern remains that the private sector is growing in isolation without interaction with the public research system.

It is unlikely that the private (for-profit) sector will cater to needs of farmers in marginal areas, except some nominal participation in provision of improved seed and animal health. The focus in marginal areas is more on resource management research. In this endeavor voluntary organisations and research foundations could be useful ally though private sector initiatives in water manage lent like drip and sprinkler irrigation also exist. Since resource management research is location specific and seeks fanners' participation, voluntary organisations will help organise farmers and disseminate technologies. The only limitation could be that funding of research in this area has to come from public sources.

3.2 Functional realities of research system

The public sector: The public research institutions are governed by financial and administrative rules of the government, perhaps because of their dependence on government funds. Although this system of governance has its own advantages, transaction cost of bureaucratic regulations is often very high. Efforts are underway to reduce the transaction cost by decentralising the system. To speedup this decentralisation process some degree of political support is essential. The economy-wide reforms are introduced to liberalise the industrial sector; in some cases privatisation of public sector organisations is also done. But nothing serious is done to improve the efficiency of public organisations like agricultural research system, which shall remain in public domain. There is a need to make these organisations more autonomous and decentralised for greater efficiency. The functional structure should be more compatible with the private sector for improving the possibility of better public-private interface.

Technology development and dissemination are under administrative control of different government departments. This has largely resulted weak research-extension linkages. Public research system has also focused on long-term upstream and strategic research, where research methodology and publications are tangible outputs. It is expected that research outputs will reach the mass through public extension system and other development departments. Developing close working linkages with private research organisations, which normally maintain secrecy of technology developed, will provide yet another window for technology transfer.

The Private sector: Private research organisations have more flexible functional structure. Research focus is on development of usable technologies and there are strong linkages between technology development and dissemination. In most of the cases, research, commercial production and marketing are vertically integrated. In few instances, there is a tie up between research organisations and marketing firms. Whatever may be the organisational structure there is tendency to quickly respond to clients' needs. Protection of proprietary materials and appropriation of research benefits largely govern the strategic response of private organisations to changing market forces.

3.3 Common functional domain

Although there appears to be contradictions in functional structure, incentives and priorities of the public and private sectors, there is a large segment of research spectrum bringing the two sectors together. The basic fact, which brings both the sectors together, is that basic and strategic research is essential for applied research, while there is no use of the former without the latter. If both the sectors are engaged in applied research, which is true for agricultural research, there is a lot of scope for joint programmes. Most of these programmes are expected to be in the area of embodied technologies such as improved seeds, where there is scope for appropriation of research benefits. Public research system accords high priority to this programme and private sector has strong incentives for its commercialisation.

Research on resource and crop management is likely to be in public domain, as this has negligible scope for appropriation of benefits. However, private sector should realize that full potential of embodied technologies can be realised only when appropriate management methods are developed and adopted. This builds the case for private sector's participation in this area. Of course, private voluntary organisations have strong comparative advantage in undertaking or supporting crop and resource management research. As we further deal with specific research area, clear roles of the public and private sectors and their joint programmes can be identified (For detail discussion on these issues, see Umali (1992).).

4. Types of the Public-Private Programmes

Development of organisations, contracts and markets can be examined in institutional perspectives. Firms intend to reduce transaction costs, which is affected by technological

factors, economy of scale and scope and asset specificity. If cost of market transaction is high, firms usually integrate vertically. The case for vertical integration is strong if asset specificity is low (Williamson, 1985). In agricultural research, transaction cost of acquiring technology from market may be high and therefore, firms having adequate resources integrate vertically through undertaking research. While other firms may find it more appropriate to enter into contract with other research institutions for supply of technologies, which can be commercialised. The firms constrained by resources may continue to depend on market for technologies. The private firms in India started with the third category. They commercialised technologies developed by public research system. But now some of the firms, particularly in seed, fertilizer and pesticide, moved into the second and first categories either through tie up with transnational companies or commencing their on research programme. The concern is that similar linkages should be developed with public research system. The possible forms of linkages and factors governing them are discussed below.

Consultative: Consultative linkages may be short-term in nature but are extremely effective. These could be at the level of individual scientist or institution. For example, private sector may consult public research system for establishing in-house research facilities. On the other hand, public research system can involve private input industry in deciding research priorities. Scientific credibility and mutual confidence may help establish such linkages.

Contractual: These linkages are expected to be stronger in the era of intellectual property rights. The private firms may contract public research services. In this case, usually research is funded by the private firms who also insist on property right of research output. The contract could be for basic or strategic research in specific area, development of technology, training of manpower or testing of research material. The other form of contract could be hiring of private services by public research system or government. Example of this could be dissemination of technologies by private agencies with public funding.

Collaborative: In collaborative programmes both the sectors participate in research and funding support may come either from both or any of them. The research is done under agreed terms of funding and sharing of research benefits. The success of collaborative program is determined by operational mechanism, timely response and building mutual confidence. Private firms may reduce transaction cost with supporting collaborative research, while the public sector will be able to commercialise technologies developed through collaborative programmes.

5. Developing the Research Partnership and Expected Output of the Interface

Consultative and contractual arrangements between the public and private sector are already in operation with fair degree of success. For example, ICAR is now providing consultancy and contractual services to all R&D institutions, including private organisations. Scientists from private research organisations participate in annual workshops and other scientific meetings organized by ICAR. However, very few public-private collaborative research programmes are developed.

The following suggestion may be useful for developing such collaborative research programmes:

a. The functional groups should interact periodically to discuss policies, research priorities and assess research efforts in the public and private sectors. This will help understand research environment in both the sectors and develop mutual confidence and trust. Development of a database including the roster of expertise from the private sector/public sector, contributions of private sector in different fields may also be planned. The working groups should work as facilitating units for developing programmes, help arrange funding and provide policy support to the field units.
b. The group should also identify institutions and if possible individual scientists from both the sectors for undertaking research on agreed priorities. The identified

institutions should further develop research programmes. A follow up schedule may also be developed.

c. There is a need for evolving procedures for sharing resources and research benefits. The focus should be on developing broad framework and some flexibility should be allowed to adjust case specificity.

* (Background note for the workshop on 'ICAR-Private Sector Interface' held on February 8-9,2000 at NCAP, New Delhi-12.)

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Annexure
Draft Guidelines for Accreditation of Private Sector R&D Laboratories/Institutes

Acommittee was constituted under the chairmanship of the Deputy Director-General (Edn.) to formulate guidelines of partnership and to develop MoU and procedures for functional linkages with R&D institutions of private sector.

The Committee decided that to have a meaningful partnership, proper credentials of the R&D establishment in private sector would be examined and those satisfying accreditation norms will be considered. Such an exercise will have to be carried out on the basis of certain guidelines to be developed. One of the issues that become very critical in this context relates to the Intellectual Property Rights (IPR). It was also agreed that ICAR should develop proforma for accreditation of R&D establishments in private sector. The proforma developed by the Department of Science and Technology' (DST) for the empanelment may be made use of for developing-suitable proforma keeping in view the specific needs of agricultural sector. The criteria to assess credentials of private R&D establishments may include proportion of turnover spent on in-house R&D, biodata of full-time staff involved in R&D, facilities/infrastructure for R&D, achievements in research in the last 5 years, perspective plan for future, etc. The R&D establishments may have to be evaluated by a team of experts, and its report should form the basis for accreditation of a laboratory.

1. Goals of Partnership with Private R&D Institutions

- For organising short-term training programmes and refresher courses for upgrading the skills in the identified areas on partnership basis.
- For conducting research in the areas of mutual interest on partnership basis.

2. Benefits of Partnership

Finalisation of partnership norms/guidelines has the following advantages:

- Unfold immense forward and backward linkages.
- Better understanding of laboratory operations for quality assurance standards and maintenance.
- Enhancing cost effectiveness in conducting research and imparting training.
- Help in front-line demonstration, testing and pre-commercialisation of new technologies.
- Larger visibility and satisfaction of being partner in the nation building process (public good creation).
- Ease of locating potential partners from the directory of laboratories.

3. Organization, Structure and Functional Details

ICAR-Industry Partnership Promotion Cell (IIPC): A cell may be established in the ICAR with a mandate to identify R&D laboratories in Industry where ICAR can seek partnership for achieving the set of goals. The Cell with the help of carefully developed norms and guidelines may identify the laboratories and maintain/update the directory for use by the ICAR and others who need it. The Cell will work under ADG (IPR). There will be technical committees (teams) for each sub-sector (e.g., crops, animal science, engineering, horticulture, fisheries). The responsibilities of the technical committees are to identify laboratories meeting the prescribed norms/guidelines in general and of the concerned sector in particular. It may also be possible that there may be laboratories having strengths in more than one sector. In such

cases the strengths have to be spelt out. The ADG (IPR) may coordinate the functioning of different technical committees to maintain harmony within the system. The recommendations of the technical committees will be processed and put up by the ADG (IPR) for the approval of the competent authority.

The partnership with a laboratory may remain valid for three years. A compendium of identified laboratories would be maintained and updated regularly.

4. General Guidelines for Assessing the Credentials of Private R&D Laboratories

i. Identification of the laboratory, in-charge, legal status, corporate status, open to others or not, etc.
ii. Details of professional staff, availability with name, part-time/full-time, designation, academic and professional qualifications, experience, etc.
iii. Other technical/supporting staff of the laboratory.
iv. Perspective plan and vision documents.
v. Achievements of research /training in the last 5 years.
vi. Assessment of strength by areas for partnership in research/training.
vii. Past record of partnership with ICAR and other organisations.
viii. Availability of guest house, hostel and other infrastructure facilities.
ix. Availability of library and other information /publication system.
x. Availability of laboratory space.
xi. Are there enough classrooms, field, livestock, machinery and equipment for conducting research?
xii. What is the annual budget? Of this, how much (%) for R&D/training?
xiii. Any patents obtained? If so details.
xiv. Terms and conditions (any specific) for partnership with ICAR.
xv. The collaboration is for the specific and limited purpose of partnership in R&D, testing and training to promote synergy. It is not a certificate to the private sector laboratory for any other purpose whatsoever.

Draft Proforma for Partnership with Private Sector Laboratories

1. Laboratory's Name and Address :

2. Applicant's Name, Designation :
   Address :
   Telephone No. :
   Telex/telegram :
   Fax No. :
   E-mail Website :

3. Legal status and date of establishment :
   (Please give Registration No. and name of authority who granted the registration)

4. Indicate exactly how the name of laboratory must be given in the partnership MoU :

5. Field of research/testing/training for which partnership is felt :

6. Is the Laboratory an independent corporate body? :

   If corporate body, please indicate to which corporate entity the laboratory belongs to

7. Please answer in Yes or No :

a. Is the Laboratory open to others

b. Is the Laboratory partly in-house activity?

c. Is the Laboratory partly open for others?

2. APPLICANT'S DETAILS

2.1 Senior Management

2.1.1 Name and title of the Chief Executive of the Laboratory

2.1.2 Name and title of the person responsible for the R&D and training set up.

2.1.3 Name and title of the contact person for ICAR-Industry Partnership Promotion (IIPP)

2.2 Other Information

2.1.1 Indicate in an organisation chart, the operating departments of the research/training/testing laboratory for which partnership is mutually beneficial

2.2.2 Document, how the research/ training/testing laboratory is related to external organisations or to components within its own parent organisation

2.3 Employees

2.3.1 Total number in R&D/training/ test laboratory

2.3.2 Furnish details about professional qualified staff (use as many pages as necessary)

S.No.	Name	Designation	Academic and Professional qualification	Experience

.....
.....

2.4 Equipment

List the major items of R&D information/ training/test equipment available for use (Please use as many pages as necessary)

S.No	Name of equipment/ facility	Model/type year of make	Date of receipt and date placed in service	Range and accuracy	Date of last calibration

.....
.....

2.5 Scope of Partnership

2.5.1 Please list the following details of activities for which partnership is sought

(use as many pages as necessary)

S.No.	Name of the activity	Specific needs	Specification (if any) for training these needs	Limit of operation

R&D
Training
Testing

2.6 Willingness of assessment

2.6.1 Are you familiar with terms and conditions of partnership and willing to abide by them? (Please answer in Yes or No)

3. Further information

1. Private sector, NGOs and other Organisations

- Perspective Planning (if, any)

- Achievements of research in the last 5 years

  - R&D
  - Training
  - Testing

- Past record of collaboration with ICAR and other scientific organisations

Agency/ Institute	Nature of Collaboration	Period	Output

- Accommodation/hostel and other infrastructure facilities

- Library and information system availability

Are there enough farm land, livestock, machinery and equipment available to meet the collaborative research needs? (Give details in each case)

Budget and financial documents?

Annual budget of the firm and for R&D/training?

Extension activities (if any)?

Applicant's name

Signature of person authorised to sign on behalf of the private organisation

Date