1. Introduction

1.1 Background

Besides the Indian Council of Agricultural Research (ICAR), Agricultural Universities are major partners in the growth and development of Agricultural Research and Education under the National Agricultural Research System (NARS). There are 62 Agricultural Universities at present distributed in different States of the country. While some States have one University, others have more than one with major focus on crops (Agriculture), fruits and vegetables (Horticulture), and livestock (Veterinary/ Animal Science/ Fishery). They are essentially meant to cater to the research and education needs of the State in which they are located.

In addition to the research undertaken with the support of their respective State Governments, they also engage in research sponsored under various schemes by external agencies like ICAR, DBT, Private Organizations, International Institutions, *etc*. Their research efforts focus on a variety of crops, animals including poultry, fisheries, forestry, agricultural engineering, home science, *etc*. Besides applied and adaptive research, they also undertake basic and strategic research on problems relevant to the area/region they serve. While the majority of their research programmes and projects are undertaken by the scientists at the Regional Research Stations/ Sub-stations, the projects handled both by the faculty and PG students in the Colleges and main Campuses of the University also contribute to the overall research efforts in the University. The efficiency and effectiveness of research depends on the way in which it is managed by the University Officials, such as i) research at the Regional Stations by the Associate Directors of Research (ADRs), ii) research at the Colleges by the Heads of Department (HoDs) and Deans and iii) the overall research by the Director of Research (DR) at the University level.

As far as research policy making in the University is concerned, the Research Council (RC) formed as per the Act, Statutes and Regulations of the University and chaired by the Vice-Chancellor (VC) has 3-5 experts representing different disciplines, Deans, Directors and nominated HoDs of the University, as well as Directors of the Line Departments of the State Government. It meets twice in a year to review the on-going programmes and provides broad guidelines on the nature of research to be carried out. Composition of RC varies among the Universities.

1.2 Project Management Cycle

Project management cycle refers to a framework for systematic planning, implementation, monitoring, and evaluation of research projects. Project management follows a series of steps that constitute the 'Project Cycle', as under:

1.2.1 Identification of Priority Areas

It requires that there is a demand/felt need for the outputs and the availability of resources to produce them. The three ways by which the problems for research can be identified are: i) *State/ Zone/ University priorities* (Vision Documents) that are broadly identified and accepted/ approved; ii) *Pre-project/ Scoping/ Desk Study* to have a feel of the problems/constraints and their relative importance; and iii) *Participatory Rural Appraisal* (PRA) - This will help to link the scientists with end users for identification of real world problems faced by the latter, research results already available and the gaps in research which need further investigation. After the problems along with research gaps are identified, they need to be prioritized keeping in view the resources at the disposal of Scientists/ Universities.

1.2.2 Preparation of Proposals

Once the priority areas are identified, they need to be developed into project proposals by paying attention to: i) *Title* - Clear, concise and self-explanatory; ii) *Justification/ Rationale* - Need for the project after identification of research gap through review; iii) *Objectives* - Specific, Measurable, Achievable, Realistic, and Time-bound (SMART); iv) *Organization/ Governance* - Various individuals/units associated with implementation; v) *Strategies and Methods* - Plan of action including the methodology, tools and techniques; vi) *Schedule of Activities* - With specified time frame to be included for monitoring the progress against time and targets; vii) *Resources required* - Manpower, facilities, equipment, services, *etc.;* viii) *Budget* - Head-wise, both recurring and non-recurring; ix) *Objectively verifiable indicators* - Indicated for periodic monitoring and final evaluation: and x) *Expected outputs* - Various forms to be specified in measurable terms.

1.2.3 Reviews and Reformulation of Proposals

The developed proposals need to be reviewed in terms of relevance, feasibility and scientific quality. This could be achieved by inviting suggestions for improvement from experts in the focus area of the project, either through written communication or e-consultation within a reasonable time frame. If necessary, the required modifications have to be undertaken to improve the quality of proposals.

1.2.4 Approval of Proposals and Allocation of Resources

The appraisal of proposals formulated by the scientists will be done by the competent authority more objectively based on specifically identified criteria like Relevance of research, Addressing the State/ Zone and/or University priority, Rationale/ Justification on the basis of research gap identified, Appropriateness of design or techniques included, Adequacy of scientists' time allocation to various activities, Innovativeness/ technologies expected, Appropriateness of the expected output answers the questions being addressed, *etc*. Whichever projects satisfy these criteria to the maximum extent, they are approved and the required resources are allocated for implementation.

1.2.5 Implementation and Monitoring of Research

Various activities included under the approved project proposals are then implemented with the resources provided. The progress (both technical and physical) needs to be assessed periodically through proper monitoring by reviewing the achievements against the monitorable targets set. A sound monitoring system is required for efficient management of research projects.

- ***Purpose of monitoring:*** i) Collection of information that will enable on-going decision-making regarding activities and progress, as well as decide on the on-course corrections to be taken to overcome the constraints, if any, identified during monitoring; and ii) Documentation of input use and activities carried out for accountability requirements.
- ***Instruments used for monitoring:*** i) Progress reports (for technical and physical progress); ii) Internal reviews by the competent authority in the University; and iii) External reviews, wherever required.
- ***Components of monitoring:*** i) Collections of relevant information; ii) Processing and analysis of collected information; iii) Decision-making based on information collected; and iv) Action plan development.
- ***Users of monitoring:*** i) Researchers (Project Team); ii) Project Leaders; iii) Research Managers; and iv) Funding Agencies.

1.2.6 Evaluation of Results and Impacts

It basically refers to appraising or determining the worth, value, or quality of research in terms of its relevance, effectiveness, efficiency and impact.

- ***Principles of evaluation:*** i) It will be more effective if adequate monitoring, recording, and information mechanisms are in place and faithfully implemented during the course of the project; ii) It has to situate the activity in the institutional, social and economic context in which it is carried out; and iii) It must clearly bring out the extent of achievement of research objectives set at the beginning and the actual contribution of these results to broader development objectives.
- ***Types of evaluation:*** i) On-going (*Concurrent*) evaluation during the course of project implementation after the achievement of a particular objective; and ii) Final (*Ex-post)* evaluation after the completion of the project.
- ***Methods followed should be:*** i) *Valid* – Sound and correct; ii) *Credible* – High quality and acceptable; and iii) *Feasible* – Implementable and easy to understand.
- ***Uses of evaluation:*** i) Use of results for public accountability; and ii) Use of results to improve management and decision-making by the research managers in the University.
- ***Focus of evaluation:*** i) Relevance of objectives set; ii) Achievement of objectives (project effectiveness); iii) Appropriateness of the design and methods followed (project efficiency); iv) Contribution to the overall knowledge in the research area; v) Adoption and use of information and technology generated; vi) Lessons learned from the project; and vii) Recommendations for future research.

1.3 Research Function in Agricultural Universities

The research function in the Agricultural Universities operates through two streams, *viz.* Agricultural Research Stations and Faculty/ Colleges (Figure 1).

1.3.1 Stream 1: Agricultural Research Stations

Most of the research needs of the State are looked after by the Agricultural Research Stations operating under the Agricultural University concerned. Each of these Research Stations is headed by an Associate Director of Research (ADR). Scientists working in various Departments of the Research Station undertake research under the guidance of their respective Heads of Division (HoD). On all matters related to research, the ADRs report to the Directorate of Research headed by the Director of Research (DR) located at the University Headquarters.

1.3.2 Stream 2: Faculty / Colleges

In various Colleges attached to the Agricultural University, the research activity mainly revolves around the faculty research undertaken by the teachers working in different Departments or Divisions in the Colleges, including the research undertaken by them in the Research Institutes (RIs) attached to the Colleges, as well as the Post Graduate research by the PG students. The HoDs consolidate all the research activities of their Departments and report to the Dean of the College concerned.

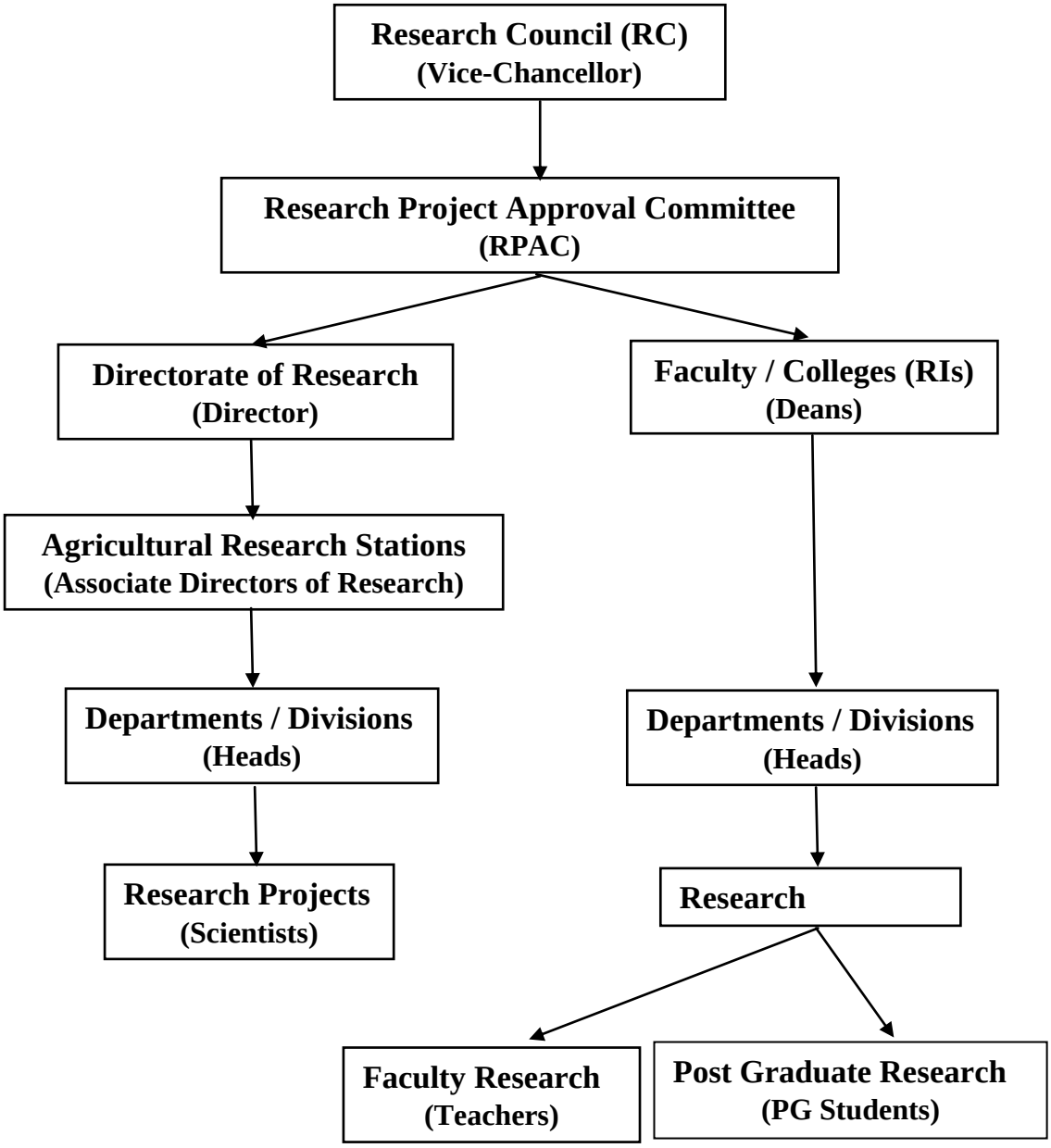
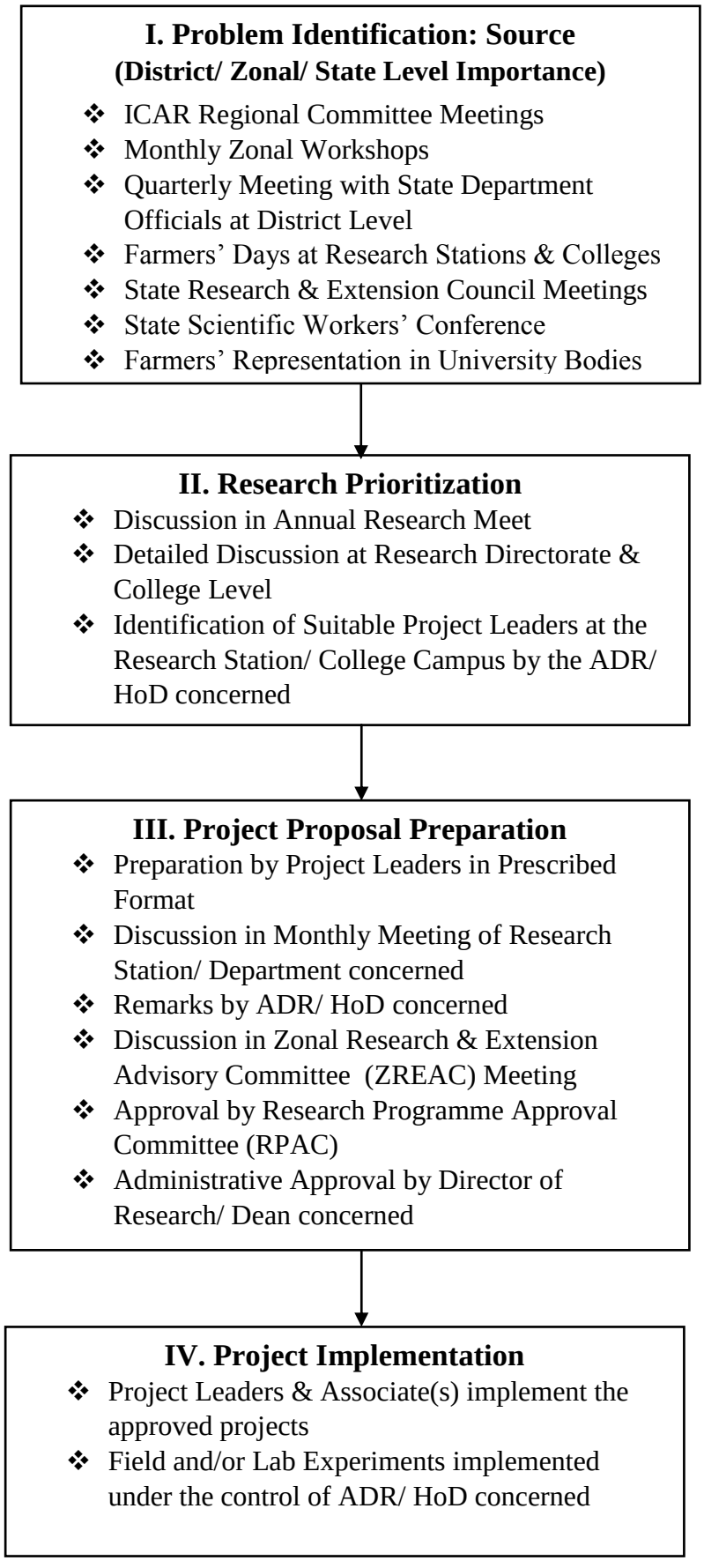


Fig. 1: Research Functions in Agricultural Universities

The Director of Research and the Deans of Colleges report to the Research Council chaired by the Vice-Chancellor through the Research Project Approval Committee.

1.4 Research Management Process in Agricultural Universities

Notwithstanding minor variations across the Universities in respect of the process followed in the management of research, broad outline of the process involved is indicated in figure 2:



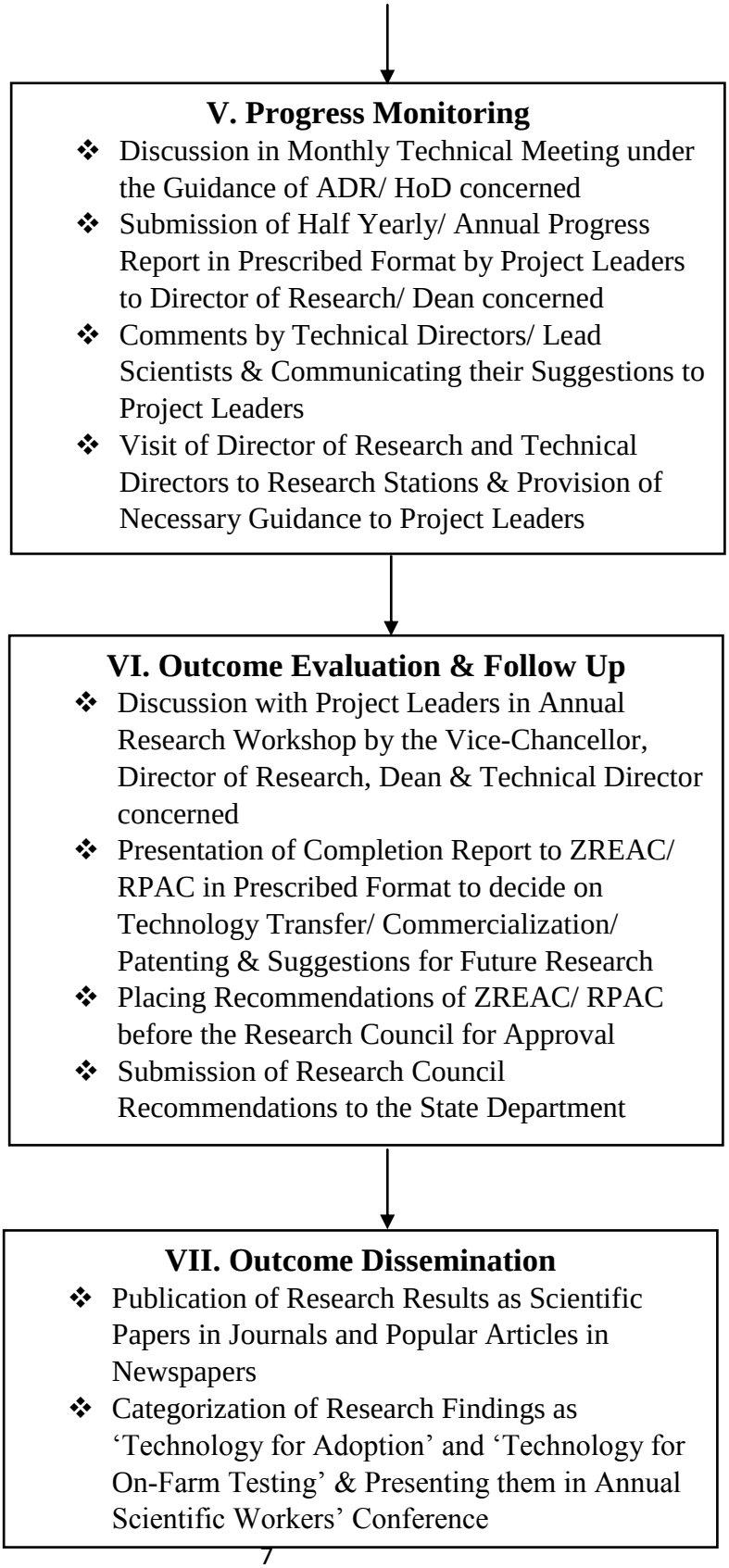

V. Progress Monitoring
❖ Discussion in Monthly Technical Meeting under the Guidance of ADR/ HoD concerned
❖ Submission of Half Yearly/ Annual Progress Report in Prescribed Format by Project Leaders to Director of Research/ Dean concerned
❖ Comments by Technical Directors/ Lead Scientists & Communicating their Suggestions to Project Leaders
❖ Visit of Director of Research and Technical Directors to Research Stations & Provision of Necessary Guidance to Project Leaders
VI. Outcome Evaluation & Follow Up
❖ Discussion with Project Leaders in Annual Research Workshop by the Vice-Chancellor, Director of Research, Dean & Technical Director concerned
❖ Presentation of Completion Report to ZREAC/ RPAC in Prescribed Format to decide on Technology Transfer/ Commercialization/ Patenting & Suggestions for Future Research
❖ Placing Recommendations of ZREAC/ RPAC before the Research Council for Approval
❖ Submission of Research Council Recommendations to the State Department
VII. Outcome Dissemination
❖ Publication of Research Results as Scientific Papers in Journals and Popular Articles in Newspapers
❖ Categorization of Research Findings as 'Technology for Adoption' and 'Technology for On-Farm Testing' & Presenting them in Annual Scientific Workers' Conference

Fig. 2: Research Management Process in Agricultural Universities

1.4.1 Problem Identification

The problems for research are identified on the basis of: i) discussion in monthly Zonal Workshops of each District; ii) quarterly meeting with State Department Officials at the District level; iii) Statewide Farmers Interactive Meeting by the University Scientists; iv) Farmers' Days in various Campuses and Research Stations; v) State Research and Extension Council (SREC) Meeting; v) State Scientific Workers' Conference (SSWC) where State Development Department Officials and University Scientists participate; and vi) Farmers' representation in the Decision- making Bodies of the University and Research Stations.

1.4.2 Research Prioritization

Once the researchable areas are identified on knowing the problems of District/ Zonal/ State level importance, research activities are prioritized after discussion in the Annual Research Meet followed by detailed discussions at the Research Directorate and College level. Based on the specialization, Project Leaders in the relevant discipline in the Research Station/ College Campus are identified to take up applied/adaptive or basic/strategic research in a particular researchable area allocated to them by the Head of the Station/ Department.

1.4.3 Preparation of Project Proposals

As per the work load, the identified Project Leaders first prepare project proposals in the prescribed format, which are discussed in the Monthly Meeting of the Research Station/ Department. They are then sent for remarks to the Associate Director of Research (ADR) and discussed in the Zonal Research and Extension Advisory Committee (ZREAC) Meeting. The proposals are finally approved by the Research Project Approval Committee (RPAC) operating at the Research Directorate/ College level. Administrative approval for implementation of the projects is issued by the Director of Research/ Dean concerned.

1.4.4 Implementation of the Project

The concerned Project Leader in association with one/ more Scientists (Project Associates) implement the approved project by carrying out field and/or lab experiments under the overall supervision of Head of the Research Station/ Department concerned.

1.4.5 Monitoring and Evaluation

. The progress of on-going research projects is discussed in the Monthly Technical Meetings under the guidance of Head of the Research Station/ Department concerned. The Half Yearly/ Annual Progress Reports of research projects prepared by the Project Leaders in the prescribed format and submitted to the Director of Research/ Dean concerned are referred to the Technical Directors/ Lead Scientists (present for each Crop/ Commodity/ Resource Domain like Natural Resource Management, Food Processing, Mechanization, Social Sciences, Rural Home Science, *etc*.) for comments. Useful suggestions offered by them are communicated to the Project Leaders pursuing the research projects. The Director of Research and Technical Directors during their visits to the Research Stations monitor the progress of the research projects and provide necessary guidance to the Project Leaders in their research pursuit. The Vice-Chancellor, Director of Research and Technical Directors/ Deans monitor and evaluate the progress of research projects during discussion with the Project Leaders in the Annual Research Workshops of various Crops/ Commodities/ Resource Domains.

1.4.6 Project Completion and Follow Up

On completion of the project, completion report/ details are presented to the ZREAC/ RPAC in the prescribed format to enable a decision on technology transfer, commercialization, patenting or suggestions for future research**.** Further, recommendations of the ZREAC/ RPAC are placed for approval of the RC. The recommendations of RC along with suggestions for technology transfer/ commercialization/ new line of research are submitted to the State Department.

1.4.7 Dissemination of Research Outcome

The Project Leaders publish the findings from their research projects in various Scientific Journals (both National and International) which are valued greatly by the scientific community. They also publish Popular Articles in Journals and Newspapers for the benefit of the farming community. The research findings from research projects are mainly categorized as: i) for adoption (technologies that have performed consistently well and approved by the relevant Bodies for release); and ii) for on-farm testing (technologies that are under advanced stage of evaluation). Both are presented and discussed in the Annual Scientific Workers' Conference for the transfer of technology.

1.5 Project Documentation

Proper documentation of project details at all stages of its implementation, starting from proposal development through periodic monitoring to final evaluation, is vital for effective management of research in the Agricultural Universities. It not only facilitates the research managers, *viz.* Director, Dean and Vice-Chancellor of the University, to know the details of all research projects (new, on-going and completed) undertaken, but also enables them to ensure accountability of the scientists implementing the projects.

While some Universities have structured and informative Proformae for project proposal, monitoring and evaluation, some others are found wanting. For such of those Universities not having well laid-out Proformae, an indicative list of Proformae , as followed in the ICAR Institutes (RPP – I for initial project proposal, RPP – II for periodic monitoring and RPP – III for final evaluation), are suggested in the Annexure.

1.5.1 Project Proposal

This proforma includes basic information on: Identity (Code/ Number); Title (simple, concise and informative); Key Words (standard); Location (name of the Division, College/ Research Station); Project Team (Leader and Associates including work components assigned and time allocation); Duration (starting and likely date of completion); Objectives (clear and concise); Past Work Done (literature review); Activities (year and objective-wise); Technical Programme (field and/or laboratory-oriented, methodology- tools and techniques); Infrastructure (land, materials, equipment and machinery); Budget (recurring and non-recurring); Expected Output (monitorable targets for technology/ management practice, Intellectual Property (IP) generation, publications, presentation in Workshops/ Seminars/ Conferences, technology transfer efforts and training planned); Risk analysis (environmental and socio-economic); and Signature (Project Leader, Head of Department/ Research Station, and Director/ Dean). Suggested RPP – I covering all these information is given in Annexure I.

1.5.2 Progress Monitoring

The proforma for periodic monitoring of the progress contains details on: Identity (Code/ Number); Title; Reporting Period (Half-yearly/ Annual); Duration (starting and likely date of completion); Project Team (Leader and Associates including work components assigned and time actually spent); Activities (objective-wise achievement against those envisaged to be completed as per RPP – I); Shortfall (pendency of work done and the reasons thereof); Progress (broad research results and achievements); Outputs (technology/ management practice developed, special attainments/ innovations made, Intellectual Property

(IP) generated, publications, presentation in Workshops/ Seminars/ Conferences, technology transfer efforts made and training organized/ received); Constraints (operational problems encountered); and Signature (Project Leader, Head of Department/ Research Station, and Dean/ Director). RPP – II containing all these details is given in Annexure II.

1.5.3 Final Evaluation

The proforma reporting the accomplishments after completion of the project covers details on: Identity (Code/ Number); Title; Location (name of the Division, College/ Research Station); Project Team (Leader and Associates including work components assigned and time spent); Duration (starting and completion dates); Cumulative Output (technology/ management practice developed, special attainments/ innovations made, Intellectual Property (IP) generated, publications, presentation in Workshops/ Seminars/ Conferences, technology transfer efforts made and training organized/ received); Final Report (objectives, materials and methods, results and discussion, objective-wise achievements and conclusions); Follow-up (commercialization/ technology transfer/ action for technology upscalling efforts made); Spin-off (future line of research identified); and Signature (Project Leader, Head of Department/ Research Station, and Director/ Dean). Coverage of final evaluation proforma (RPP – III) is indicated in Annexure III.

1.6 PME Cells

Prior to the implementation of the World Bank supported National Agricultural Technology Project (NATP), scientists/ technical personnel provided (and continue to provide) necessary technical support to the Associate Directors of Research, Heads of Department/Deans and Directors of Research in managing the research activities at the Regional Research Stations/Sub- Stations, Colleges and University level, respectively. In order to make them more competent to provide necessary technical support towards making the Research Prioritization, Monitoring and Evaluation (PME) functions more effective, an idea was mooted to create PME Cells equipped with scientists having technical expertise and PME skills in the State Agricultural Universities (SAUs) as well as in ICAR Institutes. As a result, more than 30 such PME Cells were piloted in both SAUs and ICAR Institutes with NATP funding. While Social Scientists (SS) were made In-charge of these Cells in some SAUs, others were headed by Biological Scientists (BS). With a view to developing necessary skills in managing the PME Cells more effectively, many training programmes and workshops were organized for the In-charge of these Cells. Since the entire process could not

be fully institutionalized and integrated with the decision-making process, many of these Cells became ineffective after the NATP was over.

Realizing the importance of PME Cells and the critical role they could play in facilitating effective management of research projects in the NARS, greater emphasis was again made in the National Agricultural Innovation Project (NAIP) implemented with World Bank support during 2006-14. Under the NAIP supported VPAGe project, 14 PME Cells which functioned fairly well under NATP were supported in a few selected SAUs and ICAR Institutes and concerted efforts were made to institutionalize them in the NARS. Simultaneously, a high-level Committee under the Chairmanship of Prof. S.L.Mehta was constituted by the NAIP in 2010 to examine the status of PME Cells established under NAIP and to suggest measures to integrate and mainstream. The Committee has made very useful recommendations towards integration and institutionalization of PME in the NARS.

The ICAR has subsequently made it mandatory for the Institutes to create PME Cells to assist the Directors in managing the research activities in their respective Institutes more effectively. In addition, ICAR has also taken a conscious decision to institutionalize the PME Cell concept in the SAU System by providing necessary technical and funding support. Once these PME Cells are institutionalized, the project management functions are expected to become more efficient and effective in the NARS.

1.7 PME Manual

With the proposed integration and institutionalization of PME Cells in the Agricultural Universities, it becomes all the more necessary to strengthen the PME mechanism by streamlining its functioning. Keeping in view the saying that ‘whatever cannot be measured, it cannot be managed effectively’, it was felt necessary by the ICAR to catalyze the entire PME process followed in the Agricultural Universities by infusing objectivity. This could be achieved by:

- Identifying suitable parameters/ indicators for each of the three project management functions (Priority Setting, Monitoring and Evaluation); and
- Objectively scoring the individual research projects against the parameters/ indicators identified for the purpose.

In this context, ICAR was contemplating to develop an open, transparent, effective, user-friendly and more acceptable “PME Manual” for implementation in the SAU System.

This onerous task of preparing the Manual was assigned to the National Academy of Agricultural Research Management (NAARM) and Delhi Centre of the International Food Policy Research Institute (IFPRI) by the National Academy of Agricultural Sciences (NAAS). Keeping in view compatibility with the basic framework developed for the ICAR System and by incorporating the information gathered through interaction with a few Directors of Research as well as from the websites of some SAUs, a draft Manual has been prepared. It is proposed to fine tune it by incorporating the feedback from the In-charge of already existing PME Cells in some of the SAUs and the Directors of Research and Deans participating in the Workshop on "PME Indicators and Implementation Strategy" planned in the coming months. In this Manual, project management at the University level is dealt. All the three functions of project management, *viz.* Priority Setting, Monitoring and Evaluation of research projects included in the Manual are briefly described in the following Sections.

2. Prioritization of Research Projects

As an important economic activity, research in the State Agricultural Universities (SAUs) involves the allocation of scarce resources to generate technology/knowledge in order to increase agricultural productivity as well as to meet other societal goals in the area they serve. In order for the agricultural research be able to compete with other demands for the limited resources available with the State Governments, Agricultural Universities have to be competitive by paying increased attention to higher productivity, greater quality, cost-effectiveness and sustainability issues. These developments call for rationalization of allocation of current and future resources for enhanced research efficiency in agriculture.

In the majority of SAUs, research resources in terms of personnel, finance and physical facilities are becoming increasingly scarce. The availability of these scarce resources often does not commensurate with the actual needs to meet the emerging challenges. The research managers are often faced with the difficult task of identifying priorities and allocating resources among the competing research projects. They have to make critical decisions having a direct bearing on the relative importance attached to a particular crop or commodity or area of research.

In the light of increasing resource crunch coupled with more complex problems requiring appropriate solutions in agriculture, research managers in the SAUs are looking for more formal methods of research prioritization. There is a felt need for more systematic procedures, formal methods and tools in complementarity with informal exercises that are based on past experience and personal judgment for setting research priorities. Institutionalizing a systematic analysis of research priorities and integrating it with an effective monitoring and evaluation system, therefore, holds the key to making the SAU System more efficient and effective. This calls for sound institutional mechanisms at the Department/Research Station/University level in the SAUs to assist the research managers in establishing priorities and making suggestions to allocate the limited resources at their disposal among the competing research projects.

2.1 Expectations from Research Priority Setting System

- Promotion of innovation in research;
- Reduction of biasness in project proposal;
- Bring about more objectivity in the scope of the research project;
- Aligning the project objectives to the University/State priorities;

- Integration of projects in such a way that the research outcomes are clearly visible and measurable;
- Rationalizing the allocation of human and financial resources to increase the overall system efficiency and to avoid duplication of work;
- A mechanism for proper decision making;
- Integration of PME into research management process; and
- To address the need-based field problems of the farming community on a location-specific and crop-specific basis.

2.2 Priority Setting Mechanism

The goal of priority setting is to develop a common research agenda and action plan based on shared priorities. Since the financial resources are limited and there is never as much funding as is needed to address all problems and pursue all research needs, priority setting constitutes a fundamental step in the management of research in the SAUs. Moreover, these needs are far more dynamic; they change from time to time as they can be affected by current demands, environmental conditions, demographic trends, consumer habits, and new opportunities due to advances in science. In the process of priority setting, it is critical to decide who sets the priorities and what criteria should be used to determine them.

It is important to understand from the start that a single, universal concept of priority does not exist. A priority may look different from each stakeholder's point of view as the concept of priority varies with the purpose, the capacity, the resources, the mandate, and the culture of each stakeholder. Therefore, it is important to build a participative and dynamic process among the stakeholders to reach agreement during the priority setting exercise. A participatory appraisal can be undertaken periodically by a multidisciplinary team in close interaction with stakeholders like farmers, extension workers, private sector, *etc.* to understand fast changing scenario in the agricultural sector/production system.

2.3 Steps in Setting University Priorities

Priority setting of research at the University level is the key requirement for achieving the objectives and goal of the University towards realizing its Vision. Priority areas for research mainly emanates from the recommendations of Institutional Mechanisms such as discussion in Monthly Zonal Workshops, Quarterly District-level Meeting with State Department Officials, Statewide Farmers' Interactive Meeting by the University Scientists, Farmers' Days in various Campuses and Research Stations, Zonal Research and Extension Advisory Committee Meeting, State Research and Extension Council Meeting, State

Scientific Workers' Conference where State Development Department Officials and University Scientists participate, and Farmers' representation in the Decision-making Bodies of the University and Research Stations.

Identification of broad researchable areas for the University can be done by the Heads of Department (HoDs)/Deans from the Colleges, Technical Directors/Lead Scientists present for each Crop/Commodity/Resource Domain, and the Associate Directors of Research (ADRs) from the Research Stations. The identified researchable areas then have to be listed and a meeting of the major stakeholders selected for the purpose could be called for soliciting their considered opinion on a scale of 1-10. The stakeholders could rank them based on the importance of the work to be taken up to achieve the objectives and goal of the University in accordance with its Vision. Then the average score to be worked out for different area and put in the ascending/descending order. This ranking to be put up before the RPAC for vetting. Once this is done, the ranking of researchable areas are set. Depending on their specialization, the scientists are then required to propose projects in the priority researchable areas on the basis research resources at the disposal of the University.

2.4 Steps in Project Priority Setting

2.4.1 Planning of the Priority Setting Process

The process for setting priorities of projects proposed by the scientists in the priority researchable areas identified by the University requires to be taken up at regular intervals. Development of project proposal in the format prescribed in RPP-I (Annexure I) is the first step in the planning process. At the time of proposal development, due attention to be paid to details on the workload of Project Team, additional manpower requirements, inclusion of work plan/activity chart, the requirements of the equipment and infrastructure for the project and their availability in the Department/Research Station/University, so that the project once approved does not face any problem during its operation.

2.4.2 Elements for Priority Setting and Approval of Research Projects

2.4.2.1 Documentation at the PME Cell:

- The PME Cell on receiving a project proposal sufficiently in advance before the RPAC meeting planned needs to provide a temporary number to the project proposal document.

- The document has to be put up on a two-dimensional canvas (Annexure IV) for the purpose of evaluation. The canvass has the project details on the left and the criteria for marking on the right side.
- The canvass is then provided to the evaluator (Technical Director/ADR/HoD identified by the Dean/Director of Research), who may be asked to provide evaluation within a timeframe (may be a week or a fortnight) so that the next step in the priority setting process can be carried out in time. It is mandatory for the evaluator to provide objective evaluation.
- Average score of the evaluator will be taken into account. Average score = Aggregate of score divided by the number of criteria answered. (For example, if the evaluator has not evaluated the project on one or more criteria, then the total will be divided by 10 – (minus) the number of criteria he/she did not attempt to evaluate (Annexure IV).
- Once the priority score is compiled, it has to be placed before the RPAC for thorough discussion/decision and then approved. If the RPAC suggests change, it may be suitably incorporated and then the process is repeated again for the steps given above. Such projects, however, will be included after deliberation in the next RPAC meeting or with the permission of the RPAC Chairman to save time. But it will have to be ratified in the next RPAC meeting.

2.4.2.2 Criteria for priority setting:

Criteria for Evaluation of Project on a Scale of 1-10

Sl. No.	Criterion*	Score (1- 10) 10 is the Highest and 1 is the Lowest	What to See in This?
1.	**Relevance of research**	❖ Highly relevant = 8-10 ❖ Relevant = 5-7 ❖ Somewhat relevant = 2-4	How far the research questions are aligned to meet the societal needs? ***(This is basically perceived impact of research on the needs of the society)***
2.	**Addressing priority of the University/ Region and/or State priority****	Addressing: ❖ More than two University/ Region and/or State priorities = 8-10 ❖ Two University/ Region and/or State priorities = 5-7 ❖ Less than two University/ Region and/or State priorities = 2-4	Does the focus of the project is aligned to the University/ Regional/State objectives and goals like higher agricultural production (quality + quantity) for domestic consumption or for export; enhancing profitability to small holders (scale of production issues); value chain issues; input use efficiency; resilient to climatic changes; sustainability, *etc*.

Sl. No.	Criterion*	Score (1- 10) 10 is the Highest and 1 is the Lowest	What to See in This?
			(State/Regional goals are provided by the State Vision documents and strategic plans; University's objectives are provided by its Mandate, Mission and Vision documents).
3.	**New innovativeness and change expected in the study**	❖ Highly innovative = 9-10 ❖ Innovative = 6-8 ❖ New introduction = 3-5 ❖ Routine with new actions = 1-2	Out-of-box creative idea/method/practice to overcome the production constraints.
4.	**Extent of system review and meta-analysis**	❖ Extensive review coupled with critical analysis undertaken = 9-10 ❖ Extensive review undertaken without critical analysis = 6-8 ❖ Some review undertaken and no critical analysis done = 3-5 ❖ Neither review nor critical analysis done = 1-2	The focus here is on the rationale for the project arrived at based on the research gap identified through literature search and a survey through Participatory Rural Appraisal of different stakeholders (PRA report).
5.	**Multidisciplinary team work**	❖ More than two disciplines = 8-10 ❖ Two disciplines = 5-7	This covers the extent to which the project involves scientists from different disciplines that are required to tackle the problem in question and to avoid any personal bias
6.	**Adequacy of scientist(s) time allocation**	❖ Sufficient time allocation for both Leader and Associates = 9-10 ❖ Sufficient time allocation only for Leader and not for Associates = 6-8 ❖ Insufficient time allocation for Leader = 3-5 ❖ Insufficient time allocation to both Leader and Associates = 1-2	This looks at the extent to which the Leader (25% of his/her time) and Associates (15% of his/her time) of the project team propose to devote their time to the respective project activities assigned to each one of them in relation to the time needed to carry out the work.
7.	**Appropriateness of the design/techniques for the research questions to be answered**	❖ Very appropriate = 9-10 ❖ Appropriate = 6-8 ❖ Need some modifications = 3-5 ❖ Need major modifications = 1-2	Experimental design/ treatments/sampling design proposed; data collection methods indicated; and analytical tools/techniques included.
8.	**Effective control on experiments**	❖ Team has full control = 9-10 ❖ Team requires partial support from other sections for physical facilities (purchase/	All the required inputs, equipment, land, manpower and funds are available before start of the project; subsequently, controlled based

Sl. No.	Criterion*	Score (1- 10) 10 is the Highest and 1 is the Lowest	What to See in This?
		finance/farm and other sections) = 6-8 ❖ Partially dependent on others even for technical support = 3-5 ❖ Fully dependent on others for carrying out the work = 1-2	on the interpersonal relationship maintained by the project team.
9.	***Ex-ante* Economic evaluation and cost efficiency analysis/ Socio-economic evaluation -** employment generation, income generation, gender equity, *etc*./ **Environmental evaluation -** natural resource degradation, biosafety, impact on climate, *etc*. **(whichever is appropriate and feasible)**	In respect of economic evaluation, the project to be scored based on the extent to which the anticipated benefits/cost incurred ratio works out: ❖ If more than 2.0 = 9-10 ❖ If between 1.5 and 2.0 = 6-8 ❖ If between 1.0 and 1.5 = 3-5 In respect of socio-economic evaluation, the project to be scored based on the extent to which the anticipated socio-economic benefit works out: ❖ If more than 75% = 8-10 ❖ If between 50 and 75% = 5-7 ❖ If between 25 and 49% = 2-4	*Ex-ante* Economic evaluation using partial budgeting technique needs to be done for the project. The anticipated benefits in terms of productivity increase, quality improvement, water saving, input saving, labour saving, *etc.* accrue in relation to the cost to be incurred has to be considered. While the Universities having trained manpower can do this without any difficulty, others have to find ways and means to do this (See Section 2.6 and Annexure VI for example). Parameters for *Ex-ante* Socio-economic and Environmental evaluation need to be worked out and scored by the University concerned.
10.	**How appropriately the expected output answers the questions being addressed in the specific subject matter/area (Basic/Applied/Translational/Others)?**	❖ More appropriate = 9-10 ❖ Appropriate = 6-8 ❖ Somewhat appropriate = 3-5 ❖ Less appropriate = 1-2	The extent to which the expected output answers the questions being addressed under the respective subject matter areas to be considered.

Note: ** May be included or excluded as per the University need; Depending on the number of indicators applicable to the type of research projects implemented in a particular University, the scores may be proportionately made to 100*

**** * If the proposal is not in accordance with the University priorities, it may face outright rejection***

2.4.2.3 Evaluator of the project proposal:

The proposals submitted by the Project Leaders of various projects have to be evaluated using the above-mentioned criteria by the concerned Technical Director(s)/ ADR/

HoD. If the ADR/ HoD is part of any proposal, its evaluation could be entrusted to some other scientists/ Multidisciplinary Team not associated with it and specifically assigned by the Dean/Director of Research of the same University as per the need.

2.4.2.4 Flexibility in selection of projects:

Some proposals submitted for approval may have great potential (particularly basic/ strategic research projects) but do not satisfy majority of the priority setting criteria. In such situation, the Dean/ Director of Research should be able to exercise his/her authority and wisdom to approve such projects in the interest of the University in the long run. It may be necessary to earmark some budget for such novel projects.

2.5 Frequency of Exercise

Since the mandate and activities vary across the Universities (Agriculture/ Horticulture/ Veterinary/ Fisheries), the frequency of priority setting would also vary accordingly. Hence, the individual University may decide upon the frequency of carrying out the priority setting exercise as per the mandate and other activities.

2.6 Economic Evaluation

Given the limitations of sophisticated economic evaluation methods like Economic Surplus, Total Factor Productivity, Simulation, *etc*., a very simple, transparent, very user friendly, and easy to understand and compute by even biological scientists is proposed. The Partial Budgeting Method uses economic concepts and tools to estimate economic profitability of a technology. This method can be used during any phase of the research process: technology development, testing and evaluation on farm. With some training, the Partial Budgeting Method can be used by non-economists as well.

Partial budgeting allows a quick insight into the profitability of the technologies. Partial budgeting analysis is the tabulation of expected gains and losses due to a change (marginal) in farming method or technology, e.g. replacing traditional maize variety with QPM variety. The new technology or innovation could be technically feasible, but this is not a necessary condition for adoption by farmers; the new technology must also be profitable. Therefore, it is important for the scientists developing a new technology or improving an existing one to determine the profitability of the technology. Since the biological scientists often lack the ability to conduct detailed economic analysis, a simple module using the partial

budgeting analysis is suggested to determine the profitability of technologies at the research farm or farmer level.

Partial budgets list only those items of income and expenses that change. They i) measure change in income and returns to limited resources, ii) provide a limited assessment of risk and iii) suggest a range of prices or costs at which a technology is profitable. It is important to note that partial budgeting has the limitation in that it is appropriate where a single component must be analyzed, profitability is the major concern rather than issues like equity, and income analysis and fixed costs do not change, *etc*. Wherever skilled economists are available in sufficient number, the Universities could follow detailed economic analysis using higher order economic evaluation tools, project worth measures, which require detailed data on streams of costs and returns including fixed research and extension costs, depreciation of technology and rate of adoption, *etc*. In order to use partial budgeting to evaluate a potential change in a technology, the scientist has to first be able to answer four questions about that probable change:

- What new or additional costs will be incurred?
- What current costs will be reduced or eliminated?
- What new or additional returns will be received?
- What current returns will be reduced or lost?

The partial budget can be divided into three main Sections: I. Costs; II. Benefits; and III. Analysis. The Analysis Section includes net change in profits and a break-even analysis (also known as Benefit/Cost Ratio). The QPM maize variety example is given in Annexure V.

Section I – Cost	**Section II – Benefits**
A. Additional Cost: (These will be the costs incurred as a result of adoption of new technology) **B. Reduced Returns:** (These will be the returns that are given up as a result of no longer adoption of the current technology) **C. Total Cost (A+B)**	**D. Additional Returns:** (These will be the returns received as a result of adoption of the new technology) **E. Reduced Cost:** (These will be costs that will no longer be incurred as a result of giving up the current technology) **F. Total Returns (D+E)**
Section III-Analysis	
G. Net Changes in Profits (F-C) **H. Benefit/Cost Ratio (F/C)**	

2.7 Socio-economic and Environmental Evaluation

In the case of socio-economic evaluation of applied and adaptive research projects, parameters like income and employment generation, reduction in drudgery, gender equity, financial inclusion, *etc*.; and in the case of environmental evaluation relevant to natural resource management (NRM)/ basic and strategic research projects, parameters like resource degradation, biosafety, impact on climate, *etc*. may be selected. These parameters may be specified by the project proposers to the project proposed/ University requirement and be a part of the approved project so that project outputs/outcomes may be assessed against those approved parameters.

3. Monitoring of Research Projects

Monitoring is one of the key functions in the project management process and it helps to ensure that various activities included in the approved project proposal are implemented as planned. The progress made by individual projects during implementation needs to be assessed periodically (half-yearly/ annual) through proper monitoring so as to ensure that the objectives defined in the proposal are achieved. It is essentially a scientific assessment of the progress in accordance with the established priorities, as well as judgment about the accountability of the Project Team. From the project management perspective, monitoring is basically considered as an internal activity with limited participation of external experts. Most importantly, the entire process provides scope for identifying the constraints (technical, physical and operational), as well as for taking necessary on-course corrections for the successful completion of the project. Hence, a sound monitoring system is required for efficient management of research projects.

3.1 Setting Targets for Monitoring

Monitoring of project progress is essentially done based on the initially planned or targeted values for various parameters/indicators. Thus, it is important that the Project Leaders take great care in setting initial values and fixing activity-wise targets for each year of the project. Although a project may have a number of activities and associated targets, the Project Leader may identify monitorable targets for a few key outputs each year that would reflect the task performed and achievements made. The success of monitoring greatly depends on the Project Leader in identifying some targets for the work done (procurement, installation, data collection, experiments, *etc*.), as well as some targets for the quality of work/achievement (quantifiable indicators on performance like publications, crop variety released, animal breed/species developed, crop or animal or IT based product/process/method developed/ standardized, HRD efforts made, *etc*.). These indicators-dependent targets are to be critically examined by the PME Cell. For University projects, the PME Cell has to function like a facilitator and assist the Project Leader in fixing the targets at the proposal stage (RPP-I preparation). The entire monitoring process essentially focuses on the assessment of activity-wise achievement of targets under different objectives of the project.

3.2 Baseline Survey

In the case of applied and adaptive research projects, a systematic baseline survey has to be taken up within six months of the project approval to establish the benchmarks of

selected key parameters to be used for monitoring of the specific project concerned. The baseline survey has to be short and crisp having information pertaining to not more than 5-6 key parameters collected on a maximum of one page survey schedule. The key parameters may be productivity, quality, particular trait preference for markets, profitability, *etc*. The baseline survey should include all the stakeholders to be affected by the research in the region where the Project Team is located. As per the need, a reasonable number of representative respondents have to be selected for the baseline survey.

3.3 Levels of Monitoring

There are basically two levels of monitoring the progress of research projects, as given below:

3.3.1 Field/ Lab Monitoring

It is generally taken up to assess the quality of experimentation on field and/or laboratory and the progress of work carried out by the Project Team, as well as to understand the constraints faced during project implementation. In biological experiments, this type of monitoring can be done by the HoD/ ADR/ Technical Director/ Director of Research through visit to the project location for examining the project status, quality of experimentation, design and condition of experiments, observations, *etc*. For social science projects, monitoring can be carried out by the Director of Research/ Technical Directors through village visits by looking into the quantity and quality of data collected, as well as through discussion with the personnel from the data source. In both cases, it will always be helpful to supplement the assessment through documents and reports.

These monitoring visits could be done at appropriate timing as decided by the Director of Research/ Dean concerned. A brief note then can be sent to the PME Cell on their level of satisfaction, deficiencies/constraints and probable on-course corrections (satisfied/ need some corrections/ not satisfied). The PME Cell can put up this note before the RPAC along with other monitoring indicators for suitable directions.

3.3.2 Formal Monitoring

3.3.2.1 Targets and indicators:

Some of the output monitorable targets (as given in RPP-I) and key indicators that can be used for formal monitoring of the project progress include: number of lab experiments/ field trials/ demonstrations conducted; data collection/ documentation done; details of technology/ process/ product/ methodology/ tools developed; list of publications; presentation of papers in Workshop/ Seminars/Symposia/ Conferences (if any targeted); intellectual

property generation (if any targeted); trainings/demonstrations organized (if any targeted)**;** training received (if any targeted); and any other relevant information.

3.3.2.2 Scoring of indicators:

Project (Number/ Code and Name): _____

Starting year: _____ Monitoring Year: _____

Project Leader: _____ Project Associates: _____

Sl. No.	Indicator	Output Monitorable Targets	Targets Achieved (in %)	Score (Extent of Achieving Targets)	Remarks (Constraints and Action Suggested to Meet the Targets)
1.	**Activities planned**	Number of lab experiments/ field trials/ demonstrations		❖ If >75% = 8-10 ❖ If 50-75% = 5-7 ❖ If 25-49% = 2-4 ❖ If< 25% = 1	
2.	**Data and sample collection/ Documentation/ Machine prototype fabrication**	Variables for which data to be collected, type of analysis, records (no. and type) to be kept		❖ If >75% = 8-10 ❖ If 50-75% = 5-7 ❖ If 25-49% = 2-4 ❖ If< 25% = 1	
3.	**Technology/Process/ Product/Produce/ Technique/Software/ Knowledge developed or refined or evolved**	Number of technology/ process/product/ produce/technique/ software/know-ledge developed or refined or evolved (if any)		❖ If >75% = 8-10 ❖ If 50-75% = 5-7 ❖ If 25-49% = 2-4 ❖ If< 25% = 1	
4.	**Research questions answered**	Number planned (if any) to answer questions from RPP-I		❖ If >75% = 8-10 ❖ If 50-75% = 5-7 ❖ If 25-49% = 2-4 ❖ If< 25% = 1	
5.	**Publications:** Research Papers (Peer reviewed Journals), Reports/	Number and type of publications planned (if any)		❖ If >75% = 8-10 ❖ If 50-75%	

	Manuals/Working and Concept Papers/Popular Articles/Books/Book Chapters/Extension Bulletins/Databases/ E-learning material, *etc.*			= 5-7 ❖ If 25-49% = 2-4 ❖ If< 25% = 1	
6.	**Workshops, Seminars, Symposia, Conferences attended/presented**	Number and type planned (if any)		❖ If >75% = 8-10 ❖ If 50-75% = 5-7 ❖ If 25-49% = 2-4 ❖ If< 25% = 1	
7.	**Training imparted/ Demonstrations conducted**	Number and type planned (if any)		❖ If >75% = 8-10 ❖ If 50-75% = 5-7 ❖ If 25-49% = 2-4 ❖ If< 25% = 1	
8.	**Training attended**	Number and type planned (if any)		❖ If >75% = 8-10 ❖ If 50-75% = 5-7 ❖ If 25-49% = 2-4 ❖ If< 25% = 1	
9.	**Physical progress – Budget utilization and Procurement**	Percentage planned		❖ If >75% = 8-10 ❖ If 50-75% = 5-7 ❖ If 25-49% = 2-4 ❖ If< 25% = 1	

Note: *Depending on the number of indicators applicable to the type of research projects implemented in a particular University, the scores may be proportionately made to 100*

3.3.2.3 Persons monitoring the progress:

Periodic assessment of the progress of individual projects using the above-mentioned indicators to be carried out first by the Project Leader, followed by the HoD/ Dean/ ADR/ Technical Director/ Director of Research concerned. If HoD/ ADR is part of the project, some other senior level scientists/ Multidisciplinary Team not associated with the project

being monitored and specifically assigned by the Dean/ Director of Research from the same University may be involved in monitoring.

3.3.2.4 Constraints faced, if any:

In order to have better insights into the project, monitoring needs to take into account various constraints faced by the Project Team during its implementation. It becomes imperative to know the reasons/constraints that affected the progress of the project. These constraints may be technical, operational, financial, procedural, or any other. During monitoring, the following aspects need careful consideration:

- Constraints for not achieving or partially achieving the monitorable targets need to be identified and action to rectify/ on-course corrections to be suggested.
- If there are no constraints reported by the Project Leader and yet the progress is in the red zone (i.e. partially achieved or not achieved), then the competent authority (Dean/ Director/ Vice-Chancellor) needs to take appropriate action.
- If the progress of any project is not at all satisfactory even after provided with adequate resources, decision may be taken by the competent authority to terminate it and go for a new project.

3.3.2.5 Sequence of formal monitoring:

The Project Leaders submit the progress (half-yearly/annual) of their projects (RPP-II) to the PME Cells, and the progress reports along with all the supporting documentary evidences are put up by the PME Cells for discussion in the Annual Research Workshops of various Crops/ Commodities/ Resource Domains. In these Workshops, the Dean, Director of Research, Technical Directors and Vice-Chancellor thoroughly discuss the progress of various research projects and provide suggestions and necessary guidance to the concerned Project Leaders in their research pursuit.

4. Evaluation of Research Projects

Evaluation (not impact assessment) generally refers to systematic appraisal of a research project to determine its quality and contributions in terms of its relevance, effectiveness and efficiency. It basically involves systematic collection of information on predefined parameters/ indicators with reference to the activities and outcomes of the project. In addition to providing useful information on the final outcomes of the project, it also helps in assessing the performance of the scientists who undertook the research work and making them accountable to those who funded the project. It will be more effective if effective monitoring of the progress made by the project is undertaken at regular intervals during the course of its implementation. In addition, it has to situate the activity in the institutional, social and economic context in which it is carried out. If the project team becomes aware of the above before commencing the project, it will enable them design the evaluation process more effectively and develop more realistic expectation of the final outcome by implementing the project.

4.1 Timing of Evaluation

Evaluation can take place at any time during the project life. It can either be carried out during the course of project implementation (*Concurrent evaluation*) or at the end of the project (*Final/ Ex-post evaluation*). However, the most appropriate timing of evaluation in the Agricultural Universities is at the time of completion of the project which coincides with the submission of final report.

4.2 Basic Requirements

There are a few points to be kept in view before embarking on evaluation, as under:

- Carrying out an initial exercise through a baseline survey/study so as to enable comparison of the final outcome with the baseline data at the end of the project. The baseline survey has to be short and crisp having information on not more than 5-6 key parameters collected on a maximum of one page survey schedule. The key parameters may be productivity, particular trait preference for markets, profitability, quality, *etc*.
- Evaluating the project outcome at agreed milestones and on the basis of achievements made against the output targets set at the beginning including the baseline survey targets.

4.3 Undertaking Evaluation

There is no any particular way to carry out the evaluation, with inherent strengths and weaknesses apparent in most approaches. An effective and more suitable approach involves

participatory evaluation with active involvement of the stakeholders. It is important to ensure that all relevant stakeholders have proper understanding of the evaluation process including the anticipated outcomes. Basic steps involved in any evaluation process should include the following key elements.

4.3.1 Development of the Design and Plan

- The specific purpose or intended outcomes of the evaluation should be clarified first. Some of the questions to be asked include: Why the evaluation is done? Whether it has resulted in a productive outcome by way of technology or led to future line of research or both;
- Relevant questions requiring answers to be determined;
- Relevant stakeholders to be identified;
- Key indicators to be identified; and
- Relevant materials required such as questionnaires, field notebooks, *etc*. to be developed.

4.3.2 Analysis of Information:

The collected information have to be organized systematically and subject to rigorous analysis for drawing meaningful conclusions.

4.3.3 Use of Conclusions

Once the achievements and worth of the project have been evaluated, other researchers may have to be informed about what has been learned and achieved so that they too could benefit from the experience of the project. This might guide others to undertake similar projects without hassles in future.

4.4 Evaluation Methods

4.4.1 Desk/ Scoping/ Pre-Project Study

This type of study is mostly followed in *Basic and Strategic Research Projects* whereby the key parameters are mostly identified through review of literature. These are basically the lab data or field experiment data conducted before by other researchers. In such projects, what is needed during evaluation of the project is to report any significant change in the key benchmark parameters chosen.

4.4.2 Field Evaluation

It refers to field data collection through interaction with stakeholders (sample population) in most of the *Applied and Adaptive Research Projects* where the results would

immediately be useful to the society. For such field evaluation, particularly in Social Science disciplines, any of the following methods may be employed.

4.4.2.1 Structured interviews:

Appropriate questionnaires or schedules to be developed to collect information through mail or structured interviews. Questions are of two types, *viz.* closed and open. Closed questions limit the respondent to a yes/no type answer, or to indicate a rating/ ranking on a specified scale. Open questions, on the other hand, invite the respondent to provide an independent opinion. Questionnaires or schedules may contain both types of questions.

4.4.2.2 Semi-structured interviews – In person:

Semi-structured interviews are informally guided method of gathering information. Some questions are predetermined while others are developed from the points that emerge during the discussion. Questions may be mainly open, providing an opportunity for the respondent to provide an opinion. Semi-structured interviews are used to understand an interviewee's experiences and impressions.

4.4.2.3 Administration of questionnaires:

Questionnaires can be administered in person or by telephone, or by mail. They are used to quickly obtain information from people having different background, experience and interest. Questionnaires can: i) typically be inexpensive and filled in and submitted anonymously; ii) enable wider coverage; and iii) lead to easy comparison and analysis of the information collected. Though it is possible to involve many people, it may not appeal to all and responses may be limited.

4.4.2.4 Participant observation:

In this method, the required information are collected by listening, watching and documenting what are seen and heard. By asking questions, as well as by noting comments, behaviours and reactions, useful information are sought to facilitate the evaluation process. The Participant Observation Method gathers accurate information about how a group and project operates in the field.

Whatever method is used, it should be i) *Valid* – sound and correct, ii) *Credible* – acceptable and iii) *Feasible* – implementable.

4.5 Grading of Projects

The evaluation of research projects after completion is important to more objectively assess whether the project objectives have been achieved and the activities have been completed as per the plan envisaged at the beginning. The evaluation must take into account

qualitative and quantitative assessment of achievement of objectives and stipulated outputs like publications, product/process/technology/IPR/commercial value of the technology developed and timeliness of completion. Evaluation may use a relative scoring mechanism for grading of the project with well-defined range of scores.

The evaluation of research projects after completion can be based on the information provided, as per the following specified proforma.

Sl. No.	**Criterion**	**Methodology**	**Score (Output)**
1.	**Achievements against approved and stipulated outputs under the project**	***Qualitative and quantitative assessment of achievement of objectives and stipulated outputs under the project to be carried out:***	
		❖ Projected output achieved (%).	❖ > 90% = 10 ❖ 81-90% = 8-9 ❖ 71-80% = 6-7 ❖ 61-70% = 4-5 ❖ ≤ 60% = 1-3
		❖ Extent to which standard design, methodology, experimental designs, test procedures, and analytical methods followed.	❖ Fully followed, as envisaged in RPP-I/ RPP-II = 8-10 ❖ Modification done = 5-7 ❖ Major modification done = 2-4 ❖ Completely changed = 1
		❖ Extent to which the data justify the conclusions (%).	❖ > 90% = 10 ❖ 81-90% = 8-9 ❖ 71-80% = 6-7 ❖ 61-70% = 4-5 ❖ ≤60% = 1-3
		❖ Innovativeness and creating of new knowledge, new knowledge process, protocol, *etc*.	❖ Highly innovative = 9-10 ❖ Innovative = 7-8 ❖ New introduction = 5-6 ❖ Routine with some new actions = 3-4 ❖ Very routine = 1-2

		❖ Creation of linkages for commercialization of technology developed under the project.	❖ Very good linkages created = 8-10 ❖ Leads were found for linkages = 5-7 ❖ Not much possible = 1-4
		❖ Extent to which scientific input commensurate to output (manpower, financial input and time duration) (%).	❖ > 90% = 10 ❖ 81-90% = 8-9 ❖ 71-80% = 6-7 ❖ 61-70% = 4-5 ❖ ≤60% = 1-3
		Compute the average of the above; this will be the average score for the criterion under Sl. No. 1	
2.	**Publications**	Assessment will be done in respect of: Research papers; Reports/Manuals; Working and Concept Papers; Papers presented in Workshops and Conferences/ Books/Book Chapters; Bulletins/ Databases/ E-learning material, *etc*. including quality of publication (s).	Depending on the number, scoring to be done, as indicated below: ❖ If > 6 = 10 ❖ If 6 = 9 ❖ If 5 = 8 ❖ If 4 = 7 ❖ If 3 = 6 ❖ If 2 = 5 ❖ If 1 = 4
3.	**Awards /Scientific recognitions**	Number of awards/ scientific recognition received by the Member(s) of the Project Team	❖ If 2 or more = 8-10 ❖ If one = 5-7
4.	**Human resource development**	Scientists and Technical personnel trained in different areas committed and approved	❖ All committed were trained = 8-10 ❖ Few of the committed were trained = 5-7
5.	**Training imparted/ Demonstrations conducted**	No. of demonstrations/ trainings conducted to farmers and other stakeholders, *etc*. (against the targets given in RPP-I) (%)	❖ > 90% = 10 ❖ 81-90% = 8-9 ❖ 71-80% = 6-7 ❖ 61-70% = 4-5 ≤ 60% = 1-3
6.	**Team work**	Team working (Inter/Intra institutional) (Cordially working or there were conflicts/differences)	❖ Cohesively worked and achieved the target = 9-10 ❖ Cohesively worked, but targets partially achieved = 7-8 ❖ No Cohesive

			relations, but objectives achieved = 5-6 ❖ No Cohesive relations and objectives partially achieved = 1-4
7.	**Additional facilities created and maintained**	Facilities created in terms of laboratory, research set-up, instrumentation, *etc.* during the project.	❖ More than one created and well maintained = 8-10 ❖ One created and well maintained = 5-7 ❖ More than one created but not well maintained = 3-4 ❖ One created but not well maintained = 1-2
8.	**Revenue generated under the project/ Avenues created for revenue generation**	Resources and revenues generated and avenues created	❖ More than the cost of project = 10 ❖ Between 75-100 % of the cost of project = 8-9 ❖ Between 50-74 % cost of project = 6-7 ❖ Between 25-49% cost of project = 4-5 ❖ < 25% cost of project = 1-3
9.	**Product/Process/ Technology/ IPR / Commercial value of the technology developed**	Details to be provided on parameters e.g.: Products; Process; Technology; IPR; Registration of the varieties; Germplasm accession; Commercially viable value chains developed, *etc.*	❖ Two or more of the parameters achieved = 8-10 ❖ One parameter achieved = 5-7
10.	**Quality of available documents of the project duly authenticated**	Research Project Files (RPPs), Data, Reports, *etc.*	❖ Checklist complete and authenticated = 9-10

			❖ Checklist complete, but not authenticated = 7-8 ❖ Checklist not completed = < 6
11.	**Budget utilization**	Percentage of budget utilized	❖ For every 10%, score 1 to be added
12.	**Timeliness of the execution of the project**	Timely completion of the project with adverse marking/scoring for the extended period	❖ Timely completed = 10 ❖ Took six months extension = 7-9 ❖ Took one year extension = 4-6 ❖ Took more than one year extension = 1-3
Total Score			

Net Score: *Score obtained to be counted for 100: If the number of criteria relevant to the project is less or more than 10, the score to be adjusted to 100 (@ 10 criteria with a maximum score of 10 for each criterion)*

On the basis of net score obtained from the above criteria, the projects to be graded as indicated below:

Sl. No.	Score	Grading
1.	80 and Above	Excellent*
2.	70 to 79	Very Good
3.	60 to 69	Good
4.	50 to 59	Average
5.	Less than 50	Below Average

** If the research project is graded as Excellent, some incentives in terms of recognition/letter of appreciation may be issued*

Note: *The results of some projects may not confine to/ achieve the objectives as per the criteria chosen to evaluate those projects, yet they may lead to insights for greater scientific/ academic advancements. Such projects may be graded as per their merits by the Director of Research/ Dean concerned.*

4.6 Steps in Evaluation

The Project Leader should first prepare the final report (RPP – III) after completion of the project and submit to the PME Cell. Based on the outcome indicators identified for the

purpose, the project should then be objectively evaluated by the ADR/ HoD/ Technical Director concerned. If the ADR/ HoD is part of the project, final evaluation should be entrusted to some other senior level scientist(s)/ Multidisciplinary Team (internal and/or external as per need). Scoring of achievements against each of the indicators to be carried out and the aggregate score used for grading the project. The final grading then has to be communicated to the PME Cell, which puts it up to the Director of Research/ Dean for approval.

4.7 Economic Evaluation

Economic evaluation of *Applied and Adaptive Research Projects* is undertaken at three levels. First, the *ex-ante evaluation*, which is done to objectively assess the research portfolio and prioritize the research agenda. The second is the monitoring and *concurrent evaluation*, which is done to identify the constraints for achieving the targets and suggest steps to overcome the constraints. The third stage is *ex-post evaluation*, which is done to validate investment made on the research project. The *ex-post evaluation* is generally undertaken when the research outputs and technologies are largely adopted in the target domain to assess their contribution to social welfare, resource conservation, trade, *etc*.

The evaluation of *Basic and Strategic Research Projects* may have to be done keeping in view their potential for long-run benefits; and in the short-run they may be assessed against the targets fixed like development of useful genes, constructs, processes, patents, publications in high impact journals, *etc*. Similarly, the evaluation of *Social Science Research Projects* need to be carried out differently in terms of their value in improving decision making, policy communication, model building, data base development, *etc*.

For *ex-post evaluation*, the same module using partial budgeting technique, as explained in Section 2.6, can be made use for simplicity. Since the research team has real data at the end of evaluation, it should now be able to compute the economic benefit by replacing the earlier values with the real values of the project undertaken by it (as indicated in Annexure VI).

4.8 Socio-economic and Environmental Evaluation

Socio-economic and environmental evaluation would be *ex-post* activity to be performed after completion of the project. In case of socio-economic evaluation of applied and adaptive research projects, parameters like income and employment generation, reduction in drudgery, gender equity, financial inclusion, *etc*.; and in case of environmental evaluation relevant to natural resource management/ basic and strategic research projects, parameters

like resource degradation, bio-safety, impact/influence on climate, *etc*. may be selected. These parameters may be specific to the project completed.

5. Utilization of Manual

The research management process described in the Manual essentially focuses on research projects operating in the Agricultural Research Stations and Colleges of State Agricultural Universities (SAUs) and is not linked to the evaluation of individual scientists or teachers engaged in research activities.

5.1 Focus

The Manual has been conceived keeping in view the following:

- The Research Prioritization, Monitoring and Evaluation (PME) mechanism highlighted has been specifically focused on research at the micro-level, particularly the individual research projects in the Agricultural Universities. Separate PME mechanisms may be thought of for academic and extension functions of the SAUs eventually. But it may be essential to have information on all the projects of SAUs under MIS.
- In view of large number of projects in SAUs, the project evaluation may cover the University funded research projects costing more than Rs. 10 lakhs. Externally aided projects will have their own monitoring and evaluation guidelines. The selection of externally aided research projects may have to conform to the mandate and priorities of SAUs.
- The PME process described in the Manual is essentially based on the assumption that the scientists~~, particularly those~~ working in the Research Stations normally devote considerable time (about 50% of their time) and those engaged in teaching spend around 35 per cent of their time for research.

5.2 Facilitators

Active consideration of the following by the Agricultural Universities might facilitate in realizing maximum utility of the Manual and integration of PME processes in their decision making:

- It is important that the Agricultural Universities either develop distinct and more comprehensive Proformae for initial research project proposal (RPP – I), monitoring

on-going projects (RPP – II) and evaluation of the completed projects (RPP – III) or strengthen the existing ones in order to realize maximum benefit from the Manual. The Proformae followed in ICAR may be referred to in this regard.

- Well-equipped PME Cells need to be created in those Agricultural Universities where they do not exist, as well as the existing ones in others have to be strengthened/ empowered by placing or even recruiting the right person as In-charge of these Cells. To become effective, he/she should be given a respectable stature with a suitable designation like Coordinator, PME. Wherever available, the agricultural economist should be made In-charge of the Cells and it will go a long way in providing the required professional/analytical support more effectively to the University Officials. The In-charge of PME Cells should be trained periodically in the PME process, as described in the Manual, by NAARM at Hyderabad and NCAP at New Delhi.
- The PME Cells should not be overburdened with multiple functions outside the PME and if not rationalized, will make them further ineffective. Only functions related to PME mandate should be assigned to them. Following are the major professional activities envisaged for effective functioning of the PME Cells:
    - To coordinate and synthesize the recommendations of ZAREC, RPAC, RC and Vision Documents of the University and State Government for shortlisting of priority researchable problems across basic and strategic research, and applied and adaptive research in the Agricultural Research Stations and University Departments;
    - To facilitate research project prioritization using prescribed formats and agreed scoring scheme and submit to the Director of Research/ Dean for decision and present before the RPAC and RC;
    - To coordinate and arrange for annual monitoring of each on-going project and evaluation of the completed projects through Senior Officers of the University;
    - To coordinate and arrange for technology upscalling, as well as validation and/or evaluation/ impact assessment of successful technology claimed by the scientist(s) through internal and external experts;
    - Annual updating and presenting various PME related reports to the Director of Research, Dean and Vice-Chancellor; and

- Maintaining a data base on all research priorities, monitoring and progress reports, publications, technologies developed, IPs, consultancies, projects undertaken in the past 10 years and on-going projects.

- In order for the PME Cells to discharge their responsibilities more effectively, they should be provided with adequate and separate budget, manpower and physical resources.
- In order to ensure commitment and involvement of PME Cell persons wholeheartedly, they need to be sufficiently incentivized by giving due credit for the PME related work done by them in their assessment and promotion. In the absence of suitable incentives and rewards, PME service is considered as thankless job and a burden and the high rate of turn-over of scientists in the PME Cells may not be stopped.
- The PME exercise will lead to more efficient and relevant research in terms of investment made. It will certainly lead to avoidance of redundant and repetitive projects.
- At present, several institutional mechanisms such as SREC, ZAREC, SSWC, RPAC, and RC exist for monitoring and evaluating the projects undertaken by the University scientists. In the absence of proper linkage among them, it is bound to result in duplication of efforts. Utmost care is required to rationalize the multiple M&E processes and avoid impending duplication through establishment of effective linkage. Streamlining the data base to generate reports satisfying multiple M&E needs may be attempted to reduce the time of PME Cells in supplying information to repeated queries/requests.
- To institutionalize the PME practice and integrate it into the decision-making process in the Agricultural Universities in letter and spirit, it is necessary to implement *Project Based Budgeting* in the SAU System.
- The whole PME process is meant for incentivizing the good performance and not for punishing the poor performance. Rather it should help to improve *"not up to the mark performance"*. It is believed that through this process, poor performers will be indirectly motivated to perform better.

Annexure I

Research Project Proforma for New Project Proposal
(RPP – I)

1. Project Title:

(Title of the project to be simple, concise and self-explanatory)

2. Key Words:

(Specific keywords (5-8) relevant to title, objectives and outcomes like crop/animal/and area of research e.g., Rice/Buffalo, Nutritional studies, Pest/Disease/Post-harvest management, *etc*.)

3. Genesis and Rationale:

(Knowledge/technology gaps identified and justification

4. Critical Review of Work Done:

(Present status at National and International levels)

5. Source of Funding:

(Whether the proposal is part of University or external funded scheme (ICAR, DBT, S&T, Private agencies, *etc*.)

6. Name of the Lead Center:

(Regional Station/Sub-station/Department where the Project Leader is located)

7. Name of the Collaborating Institution(s):

(Regional Station/Sub-station/Department where the Project Associates are located)

8. Project Team:

(Name, designation and location of Project Leader and Associates, with time proposed to be spent)

Sl. No.	Name, Designation and Location	Status (Leader/ Associate)	Time to be Spent (%)	Work Component to be Assigned
1.				
2…				

9. Project Duration:

(Date of start and likely date of completion)

10. Objectives:

(Complete and logically arranged statement specifying briefly the aims and goals)

11. Activities and Output Details:

(Year-wise activities and outputs for different objectives with time frame, monitorable targets and scientists responsible)

Objective	Activity	Month & Year of *		Output Monitorable Targets	% to be Carried Out			Scientist (s)
		Start	Completion		Year 1	Year 2	Year 3…	
1.	1.							
	2…							

2…	1.							
	2…							

***Note:** * Time schedule chart (PERT Chart) may be given to indicate progress of activities*

12. Technical Programme:

(Methodology, techniques, analytical tools and materials to be used for performing different activities to achieve the objectives)

i) Details of laboratory and field experiments to be conducted.

ii) Data/observations to be recorded.

iii) List of statistical methodology including analytical tools to be adopted.

13. Budget:

(Includes recurring contingency, non-recurring contingency, HRD component, and Works)

Sl. No.	Item	Year 1	Year 2	Year 3 …	Total
1.	Recurring Contingency:				
	Travelling allowance (TA & DA)				
	Workshops				
	Contractual services/ salaries				
	Operational cost				
	Consumables				
	Sub-total				
2.	Non-Recurring Contingency:				
	Equipment				
	Machinery				
	Furniture				
	Vehicle				
	Others (Miscellaneous)				
	Sub-total				
3.	HRD Component:				
	Training				
	Consultancy				
	Sub-total				
4.	Works:				
	New				
	Renovation				
	Sub-total				
Grand Total					

14. Expected Outputs:

(Anticipated Technology/ Management Practice/ Process/ Product/ Methodology/ Technique/ Concept/ Software/ Database/ Knowledge expected or proposed to be developed/ refined)

15. Intellectual Property (IP) Protection:

(Amenability of project outcome for Patents, Trademarks, Copyrights, Designs, Registration of Variety/ Germplasm/Accession, *etc*.)

16. Expected Benefits and Economic Impact:

(Expected benefits quantifiable in monetary terms from the generated outputs like improvement in productivity/ production efficiency, reduction in cost of production/ technology/ process, import substitution, drudgery reduction, savings due to reduction in use of pesticides/ fertilizers, natural resource conservation, *etc*.)

17. Risk Analysis:

(Risk involved in not taking the research project and the risk associated with the execution of the project like reputational damage and legal and/or financial liability for the University and most probable threats that may be encountered during execution)

Comments by the HoD:

Signature of the Project Leader

Signature of the Head of the Department/ Research Station

RPAC Comments:

Approved Project Code/Number:

Director/ Dean

Annexure II

Research Project Proforma for Monitoring Half Yearly/Annual Progress (RPP – II)

1. Project Code/Number:

2. Project Title:

3. Name of the Lead Center:

4. Reporting Period:

5. Project Duration:

6. Project Team:

(Name, designation and location of Project Leader and Associates, with time spent for the Project)

Sl. No.	Name, Designation and Location	Status (Leader/ Associate)	Time Spent (%)	Work Component Assigned
1.				
2…				

7. (a) Completion of Activities Earmarked:

(For the reporting period, as per activities schedule given in RPP – I)

Objective	Activity	Scientist(s) Responsible	% of Activity Envisaged to be Completed (as per RPP – I)	% Achieved as Targeted
1.	1.			
	2…			
2…	1.			
	2…			

(b) Shortfall:

(Whether there is any pendency in the work carried out and if so, spell out the reasons and how to catch up with the intended activities)

8. Progress Report:

(Research results and achievements made during the period under report in bullets)

9. Outputs Generated:

(Achieved during the period under report – whichever applicable)

a. Special attainments/innovations

b. List of publications:

i. Research papers

ii. Reports/ Manuals

iii. Working/ Concept papers

iv. Popular articles

v. Books/ Book Chapters
vi. Extension bulletins/ materials

c. Intellectual Property Generation:
i. Patents – filed/obtained
ii. Trademarks – filed/obtained
iii. Copyrights – filed/obtained
iv. Designs – filed/obtained
v. Registration – Variety/Germplasm/Accession, if any

d. Presentation in Workshops/Seminars/Symposia/Conferences (relevant to the project)

e. Technology/management practice/process/product/methodology/concept developed:
(Crop-based, Animal-based including vaccines, Natural Resource-based, It-based including database/software, Biological including biofertilizer/biopesticide, any other to be specified)

f. Trainings/Demonstrations organized

g. Training received

h. Any other relevant information

10. Constraints Experienced:
(Operational problems faced, if any)

11. Proposal for the Next Year:
(As per the PERT Chart, if included in RPP – I)

12. Salient Findings up to the Reporting Period:
(Starting from the start up to the period of report to know the overall progress)

Signature of the Project Leader

Comments and Signature of the Head of the Department/ Research Station

Approval of the Director/ Dean:

Director/ Dean

Annexure III

Proforma for the Completion of Research Project
(RPP – III)

1. Project Code/Number:

2. Project Title:

3. Key Words:

4. Name of the Lead Center:

5. Name of the Collaborating Institution(s):

6. Project Team:

(Name, designation and location of Project Leader and Associates, with time spent for the Project)

Sl. No.	Name, Designation and Location	Status (Leader/ Associate)	Time Spent (%)	Work Component Assigned
1.				
2…				

7. Project Duration:

8. Objectives:

9. Final Report of the Project:

(Materials and methods used, results and discussion, objective-wise achievements made and conclusions)

10. Financial Implications (Rs. In lakhs):

a) Expenditure on:
- i. Recurring Contingency
- ii. Non-Recurring Contingency
- iii. HRD Component
- iv. Works

b) Total Expenditure

11. Cumulative Outputs Generated:

a. Special attainments/innovations

b. List of publications:
- i. Research papers
- ii. Reports/ Manuals
- iii. Working/ Concept papers
- iv. Popular articles
- v. Books/ Book Chapters
- vi. Extension bulletins/ materials

c. Intellectual Property Generation:
   i. Patents – filed/obtained
   ii. Trademarks – filed/obtained
   iii. Copyrights – filed/obtained
   iv. Designs – filed/obtained
   v. Registration – Variety/Germplasm/Accession, if any

d. Presentation in Workshops/Seminars/Symposia/Conferences (relevant to the project)

e. Technology/management practice/process/product/methodology/concept developed:
   (Crop-based, Animal-based including vaccines, Natural Resource-based, IT-based including database/software, Biological including biofertilizer/biopesticide, any other to be specified)

f. Trainings/Demonstrations organized

g. Training received

h. Any other relevant information

12. (a) Achievement of Objectives and Outputs Earmarked:

Objective	Activity	Envisaged Output Monitorable Target(s)	Output Target(s) Achieved	Extent of Achievement (%)
1.	1.			
	2…			
2…	1.			
	2…			

(b) Reasons for Shortfall, if any:

13. Technology Management:

a. Technology for Adoption:

b. Action taken for Technology Upscalling:

c. Action Plan for Technology Delivery:

14. Commercialization of Project Outcome:

a. Scope:

b. Action Plan:

15. Intellectual Property (IP) Protection:

a. Type:

b. Scope:

c. Action Plan:

16. Expected Benefits and Economic Impact, if any:

17. Suggestion for Future research:

Signature of the Project Leader

Comments and Signature of the Head of the Department/ Research Station

RPAC Comments:

Approval of the Director/ Dean:

Director/ Dean

Annexure IV

Method of Calculating Average Scores of Individual Project by an Evaluator

University's Vision:

University's Mission:

University's Mandate:

Project (s) No.	Relevance of research questions	Address-ing priority of the institute and/or National priority	New innovati veness expected in the study	Extent of system review and meta-analysis	Elements of bias address-ed in the study	Adequacy of scientist(s) time allocation	Appropriat eness of design/ techniques for the questions to be answered	Effective control to experi-ments	Economic evaluation and cost efficiency analysis/ Socio-economic evaluation/ Environ-mental evaluation	
A	B	C	D	E	F	G	H	I	J	
PROJECT 1 Details enclosed	7	6	5	7	6	7	6	5	6	
PROJECT 2 Details enclosed	7	-	6	7	6	-	7	8	7	
PROJECT 3 Details enclosed	6	5	4	4	5	6	5	6	7	
PROJECT 4 Details enclosed	5	6	8	6	7	5	-	5	6	

Priorities

I. Project 2
II. Project 1
III. Project 4
IV. Project 3

Annexure V

Example for Use in Priority Setting Exercise of Section 2

Ex-Ante Evaluation of Ordinary Maize Production against a Proposed Change to QPM Maize

Assumptions:

QPM will fetch higher price (Rs 1400/q) compared to present ordinary varieties (Rs 1000/q)

QPM yield will remain same

QPM will replace ordinary maize in 100 ha land in short run

Section I – Cost	Section II – Benefits
A. Additional Cost (These will be the costs incurred as a result of adoption of new technology) QPM Seed: Rs 1500/ha = 1,50,000 Fertilizer: Rs 2000/ha = 2,00,000 Pesticides: Rs 50/ha = 5,000 Labour cost: 1500/ha = 1,50,000 Research Cost = 3,00,000 **Total = 8,05,000**	**D. Additional Returns** (These will be the returns received as a result of adoption of new technology) QPM = 2.5 t/ha Rs 1400/q of QPM = **35,00,000**
B. Reduced Returns Ordinary maize = 2.5 t /ha Rs 1000/q maize = 25,00,000 (These will be the returns that are given up as a result if no longer adoption of current technology)	**E. Reduced Cost** Ordinary Maize Seed: Rs 1250/ha = 1,25,000 Fertilizer: Rs 2000/ha = 2,00,000 Pesticides: Rs 50/ha = 5,000 Labour cost: 1500/ha = 1,50,000 Research Cost* **Total = 4,80,000** *(These will be costs that will no longer be incurred as a result of giving up the current technology*) * **Research done in past and so no cost**
C. Total Cost (A+B) = 33,05,000	**F. Total Benefits (D+E) = 39,80,000**
Section III-Analysis	
G. Net Changes in Profits (F-C) = 6,75,000 **H. Benefit/Cost Ratio (F/C) = 1.204**	

Annexure VI

Example for Evaluation Purpose in Section 4

Ex-Post Evaluation of Ordinary Maize Production against a Proposed Change to QPM Maize

Facts:

QPM could fetch higher price (Rs 1300/q) compared to present ordinary varieties (Rs 1000/q)

QPM yield marginally decreased from 2.5 to 2.2 t/ha

QPM replaced ordinary maize in 100 ha land in short-run

Section I – Cost	**Section II – Benefits**
A. Additional Cost (This will be the cost incurred as a result of adoption of new technology) QPM Seed: Rs 1500/ha = 1,50,000 Fertilizer: Rs 2000/ha = 2,00,000 Pesticides: Rs 50/ha = 5,000 Labour cost: 1500/ha = 1,50,000 Research Cost = 3,00,000 **Total = 8,05,000**	**D. Additional Returns** (These will be the returns received as a result of adoption of new technology) QPM = 2.2 t/ha Rs 1300/q of QPM = **28,60,000**
B. Reduced Returns Ordinary maize = 2.5 t/ha Rs 1000/q maize = 25,00,000 (This will be the return that are given up as a result if no longer adoption of current technology)	**E. Reduced Cost** Ordinary maize Seed: Rs 1250/ha = 1,25,000 Fertilizer: Rs 2000/ha = 2,00,000 Pesticides: Rs 50/ha = 5,000 Labour cost: 1500/ha = 1,50,000 Research Cost* **Total = 4,80,000** *(These will be costs that will no longer be incurred as a result of giving up the current technology)* * **Research done in past and so no cost**
C. Total Cost (A+B) = 33,05,000	**F. Total Benefits (D+E) 33,40,000**
Section III-Analysis	
G. Net Changes in Profits (F-C) = 35,000 **H. Benefit/Cost Ratio (F/C) = 1.011**	