IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 10, Issue 2 Ver. II (February. 2017), PP 41-49
www.iosrjournals.org

Process Evaluation cum Impact Assessment of Agriculture and Veterinary Research Projects & Programmes

Morla Raja Krishna Murthy[1], S. Bindu Madhuri[2]
[1]*Outcome & Impact Assessment Specialist, PPOMU, Finance Department, Government of Odisha (GoO), Bhubaneswar, Odisha.*
[2]*Associate Professor, Department of LPM, College of Veterinary Science, Korutla, Karimnagar, Sri Venkateswara Veterinary University, Tirupati.*

Abstract: *Research institutions generally monitor their research projects for financial and book keeping purposes. In addition, many attempt to evaluate the quality of their research. Unfortunately, few research institutions commit significant resources to the process of evaluating the social and environment impacts of their research. There are several reasons for the reluctance to do so. Perhaps some of this unwillingness stems from the feeling that research resources are scarce; the benefits are obvious and we should therefore simply get on with the process. Perhaps some of the unwillingness stems from a fear that evaluation of research results would produce unfavourable benefit-cost ratios. And perhaps some of the unwillingness stems from the methodological difficulties encountered when establishing the benefits from some types of research. It is unfortunate that agriculture and veterinary institutions spend so few resources on attempting to measure the impact of their research on society because we ought to know the results of such spending. We ought to know if it pays and if so, how much it pays. Assessing the impact of research and development attempts to quantify the costs and benefits from research and development activities. The methods used are not particularly difficult to understand. Engineers and bankers regularly do benefit cost analysis. There is not reason to agriculture researchers shouldn't have the capability to do the same thing. The impact of applied research and development is relatively easy to identify and the payoffs are usually very high. The science of impact assessment has developed rapidly in the last few years. Despite significant advances, methods of impact assessment are required to be fine-tuned to site-specific nature of agricultural research. The multiple objectives of agricultural research like food security, poverty, livestock development, environmental protection; sustainability, etc. further complicate the outcome of such analysis of agriculture and veterinary research program and projects.*
Keywords: *Agriculture, evaluation, impact assessment, projects management, rural development, veterinary.*

I. Introduction

Appraisal and evaluation

The term appraisal means the process of identifying, defining and quantifying the likely or expected impacts of action (a practice) or closely related set of actions (a project). Some of these impacts are seen as benefits, while others as costs. Appraisal and evaluation helps the decision-makers who are saddled with the responsibility to prioritize measures in a situation with enormous needs and quite limited resources. Government planners as well as donor agencies are all in need of enough data in order to make rational choice or decision in selection of investment alternatives. Most of the economists believe that economic analysis cannot give the final answers. There will always be lack of data, uncertainty about the future, disagreement on the methods, and similar issues. However, economic analysis, if properly done, can indeed be of much help to decision makers.

What is impact assessment?

Impact assessment attempts to estimate the effects that research has/had in the past or that it may have in the future. There are many different kinds of effects or impacts and different ways to measure them. An impact assessment may look at whether farmers accept or reject new technology, or it may focus on increases in yields and production that can be attributed to new technology. It can also estimate changes in income, employment, nutritional status, pollution, erosion, or rural-urban migration.

Need for impact assessment

Agriculture and veterinary research is an economic activity. Like any other investment propositions, resource allocation to agricultural research needs to be justified. The society or the donors are always interested to know what happened to the money invested in agricultural research. It is important to document the returns and/or benefits accrued from the research investment. Objective assessment of research investment helps in making decision and allocating resources in high returns research portfolio. It also helps to know which research areas and programs benefit the poor and regions. In the paradigm shift, the donors are seeking evidences on

impact of past funding as a basis for future financial support. Systematic impact assessment forms the basis for efficient resource allocation in alternative research programs competing for financial support. Research programs demonstrate better historical performance, in terms of benefits generated for the society are rated higher for attracting required research resources. Impact assessment studies are also getting more prominence as the international environment is rapidly changing due to many emerging complex problems. Socio-economic and environmental problems, like poverty, international trade, degradation of natural resources are growing fast and the donors are looking for the research programs, which can overcome these challenges. Therefore, systematic impact assessment studies would form a strong base for higher research funding to overcome many regional, national and global problems.

Impact assessment of research is not a new phenomenon. Earlier, it was based on some partial evidences. Sometimes the changes in production, area and productivity enhancement were used as a proxy for contribution of research at regional or national levels. Other proxies used were increased export, import substitution, employment generation, and contribution towards improving nutritional security and conservation of soil and water resources. Such proxies were often questioned; as such changes were the result of numerous forces, including the research contribution.

Framework for research impact assessment

The framework for research impact assessment is shown in Figure 1. Impact assessment is undertaken at three levels. First, ex-ante assessment, which is done to objectively assess the research portfolio, prioritizes the research agenda. This is done to justify funding in different research options. In the figure, it is allocating resources in R&D for generating research outputs. The second is the concurrent evaluation, which is done to identify the impediments for larger adoption of the research outputs. The purpose is to correct the gaps and provide feedback for refining and tuning the technology as per the stakeholders' requirements. Often it is known as constraint analysis. In the figure, four circles are being shown. These are technology traits (e.g. duration, quality, etc.), policy environment (e.g. price support, procurement, etc.), institutional arrangements (e.g. seed sector, credit availability, etc.), and infrastructure (e.g. markets, roads, power, processing facilities, etc.). All these four components determine the adoption of any technology. It is just like four wheels of a vehicle. When all the wheels have optimum air, pressing accelerator will pick-up the speed of the vehicle at desired speed. Less air even in one wheel will limit the speed. If one wheel is flat, the vehicle has to be dragged by other means. The same is true for adoption of research outputs or improved technologies. During the green revolution period, all the four circles were favourable, which resulted in fast adoption of improved technologies. It was also true during the Oilseed Mission. On the contrary, the other promising technologies like watershed development, salinity management, Integrated Pest Management were finding difficult to be largely adopted despite of favourable policy environment and infrastructure. The absence of appropriate institutional arrangement is hindering the speed of these promising technologies. Therefore, determining constraints for larger adoption forms a part of the impact assessment. Such studies are characterized as part of the early impact assessment. These provide useful information on conditions for larger returns and benefits of research investment.

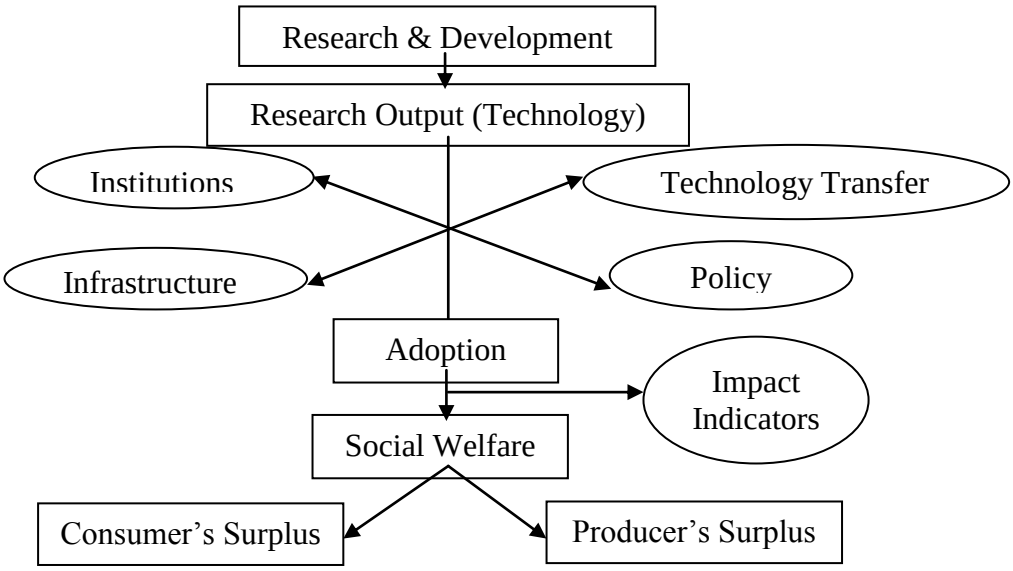

Figure 1: Framework for assessing research impact

The third stage of impact assessment is known as ex-post assessment, which is done to validate past funding on research. These studies are being undertaken when the research outputs and technologies are largely adopted in the target domain, and assess their contribution to social welfare, resource conservation, trade, sharing of benefits of research outputs among different stakeholders (e.g. producers, consumers, industry), etc.

Impact indicators

Impact indicators vary with technology and level of assessment. There are two types of benefits of research outputs: (i) tangible benefits are those which can be assigned monetary values, and (ii) intangible benefits are those which cannot be assigned monetary values but are important for the society. Examples for the later type are improvement of environment, better health, reduction in infant mortality, national defence, etc. These are important but difficult to assign any monetary value. These must be documented at least in physical terms.

Box 1: Farm-level Impact Indicators

- Efficiency
  - Income augmentation
  - Unit cost reduction
- Household food security
  - Nutritional security
- Poverty reduction
- Risk management
  - Improving yield or income stability in the absence of insurance
- Cropping intensity
- Gender related issues
- Natural resource conservation

The impact indicators will be different at farm, regional, national and global level. At the farm level, the direct beneficiaries are affected by adopting the technologies. At higher level, the society and the environment are being influenced and measured. Important farm-level and regional/ national-level indicators are listed in Box 1 and 2. The emphasis of the listed indicators would vary with the type of research outputs. It is not necessary that all indicators would be applicable for any kind of technological change.

Box 2: Regional/ National-Level Impact Indicators

- Agricultural production
- Food self-sufficiency
- Employment generation
- Equity issues
  - Inter-regional
  - Inter-personal
- Poverty
- Trade
  - Prices
  - Export and/or import substitution
- Inter-sectoral linkages
  - Forward linkages (like markets, transport, processing, etc)
  - Backward linkages (like seed sector, fertilizer industry, pesticide industry, farm machinery, etc.)
- Sustainability of natural resources

Measuring efficiency indicator

Following are the important methods for assessing the efficiency benefits of research impact:

Benefit cost analysis: The method compares the stream of benefits with that of stream of research cost.

Following are the indicators for the benefit-cost analysis:

- *Benefit-cost ratio*: It is the ratio of present worth of benefits stream and the present worth of cost stream.
- *Net present value*: It is the present worth of the incremental net benefit stream.
- *Internal rate of return*: It is the discount rate when net present worth of benefit and costs equal to zero.
- *Pay-back period*: It is the period during which the entire research cost is recovered after the benefits are accrued.

Econometric approach: The approach assesses the changes in marginal productivity of research investment at macro-level. The econometric methods are powerful that can discern the contribution of research and other determinants in total change in output.

Total factor productivity: It is the ratio of total output and the whole set of inputs. It shows the residual left after incorporating the contribution of input quantities. The total factor productivity can be decomposed into the contribution of research resource allocation and other qualitative determinants.

Economic surplus approach: The approach estimates the economic surplus generated as a consequence of research outputs. The benefits can be decomposed into changes in the economic surplus to consumers and producers as a result of research success. The information derived through economic surplus approach is also be used to estimate benefit-cost ratio, internal rate of returns and net present value of research outputs.

Impact can be examined from two perspectives: after research is completed (ex post) or during planning (ex ante). Agricultural research managers often use ex post impact assessments for positive information on results to justify requests for continued funding and support. Ex ante impact assessments may be done as an aid to priority setting - to estimate the future benefits of different research projects. Most impact assessments are sponsored by development agencies and serve their own decision-making and accountability needs. National Agricultural Research System seldom carry out impact assessments themselves, although many agricultural research priorities and demonstrating results. The most common types of impact studies carried out for agricultural research are adoption studies and economic evaluations (rate-of-return studies). Relatively few social or environmental impact assessments have been done, but there are increasing demands for them.

The subject matter of impact assessment consisted of

A. Economic Impact Assessment

Adoption studies

Economic studies (returns to investment)

B. Social and Environment impact assessment

Effect on poverty, gender issue, food security, etc.

Effect on pollution, sustainability and natural resources etc.

II. Doing Impact Assessment

Impact assessment involves estimating the effects of agricultural research or new technologies. Many different types of effects may be examined, but assessing any one of them in any depth can take considerable time and money. For this reason, the first task in impact assessment is to focus the study by asking, Why is it being done? What information is needed? What research effort or technology should be evaluated? And what types of effects should be assessed? The focus of an impact assessment should reflect the purpose of the evaluation, who is requesting it, what their interests and information needs are, and how the results will be used. It should also take available resources into consideration (including trained and experienced personnel).

If the principal purpose of an impact assessment is to estimate the benefits of research in a way that is comparable to other public investments (such as public health or credit programs), then an economic rate-of-return study may be appropriate. If, on the other hand there is an interest in understanding the distribution of benefits among different farming groups or different regions within a country, a more descriptive and illustrative adoption study may be called for. If there is a concern for the effects of a new technology (such as pesticide or new tillage system) on pollution or soil erosion, then an environmental impact assessment may be needed. In each of these cases, the impact assessment would attempt to estimate the effects of research on the selected variable, be it agronomic, economic, social or environmental.

Adoption studies generally trace the results of innovations from the research station or on-farm trials through networks of adopters. These studies analyze the underlying patterns of adoption and the use of new practices. Adoption surveys use interviews with farmers to see if they are using improved technology, to look at its effects on farm production, and to determine how research activities can be reoriented to make technologies more useful. They attempt to determine why a technology is or not being used and compare the benefits of old versus new technologies. Again, no single approach is best, but the general steps are as follows:

- Select the technology to be evaluated.
- Identify the central issues and questions to be asked.
- Design data collection and analysis.
- Field-test instruments and make adjustments if necessary.
- Collect the information.
- Analyze the information.
- Present the results and recommendations.

The results are normally presented in terms of percentages of adopters, changes in yield, and the reasons for the technology not being adopted or its use being discontinued. Analysis of the reasons for the technology being rejected can be used to guide or reorient research strategies.

Economic impact assessments generally estimate the economic benefits produced by research in relation to associated costs. The methods employed in economic evaluations are outlined in the following section.

Social and environmental impact *assessments* are concerned with the broader effects of a research project or activity on society and the natural environment. Such assessments go beyond the examination of economic returns and looks at the effects on such things as cash flow, labour, or health. There has been relatively little work in this area, partly because of its complexity. However, with increasing social and political concerns for environmental issues, this is now a growing area of interest.

Assessing the effects of agricultural research is complex and costly for three reasons. First, it is quite difficult to measure changes in yield, production, nutritional status, and erosion, and it requires costly fieldwork and analysis. Agriculture and veterinary research organizations often lack the personnel and operating funds needed for this, especially when several growing seasons are required for changes to be measured in most yield and production systems. Trends in dryland agriculture, for example, cannot be measured in fewer than eight cropping seasons.

Second, even where a change can be measured, it is extremely difficult to attribute it to specific research activities. For example, in an area where potato yields or milk production has increased, how can the contribution of research versus that of extension, credit programs and improvements in market conditions be estimated?

Third, research managers, policymakers, donors and the public all tend to be impatient and to want impact estimates when research is still underway or has just recently been completed. This is neither realistic nor possible. There is often a considerable time lag between the time research is started, a new technology is released, and impacts can be measured - often as long as 10 to 15 years.

More than other types of evaluation, impact assessments tend to be carried out as research studies leading to formal publications. They generally employ scientific methods drawn from economics and the social sciences and often use indirect measures or indicators of impact because the effects of technology on farm-level production, nutritional status, pollution, and the like cannot be directly measured. To cope with this problem, production-function models are often used to estimate the effects of research or technology on production, incomes and associated variables. Numerous assumptions are also often made to overcome data limitations and to simplify economic models.

Research managers and policy makers tend to be sceptical of the data and methods used in impact assessment; they may also find the reports difficult to understand, interpret, and apply. This highlights the need to plan impact studies in terms of real information needs (rather than peer interests), to pay close attention to data quality, and to make special efforts to summarize the findings. It is extremely important for results and recommendations to be presented in terms that are meaningful to policymakers, managers and scientists.

Approaches for Impact Assessment

A number of different approaches have been used to evaluate agricultural research. Some of these are now regarded as having little to commend them and have been largely discarded. For example personnel and programmes may be evaluated through the number of publications or reports issued, technical meetings held, committees established or seminars undertaken, although none of these criteria necessarily represents tangible activities in terms of bringing about changes in agricultural productivity.

Now there are two primary methods have been used to calculate returns to research and to estimate its impact on society:

1. The economic surplus approach (consumer - producer surplus, cost - benefit and index number (TFP) methods) estimates return on investment by measuring the change in consumer and producer surplus from a shift to the right in the supply curve due to technological change.
2. The econometric approach (production, profit and supply function and their derivatives) treats research as a variable and allows a marginal rate of return on investment to be calculated.

Impact-evaluations are often used to try to convince policymakers that to resource allocations to research represent good investments. Progress in terms of production, income, or marketable produce is usually the yardstick of success used by policymakers, so a high rate of return to research investment can be a strong selling point for research leaders when presenting the research budget for approval by government authorities.

Most evaluation studies have been unable to effectively distinguish between these three variables and have implicitly assumed that the returns from agricultural research also include the benefits from education and extension. The few studies that have sought to separate these activities have had to so subjectively. Because of the lack of sufficient theoretical instruments these studies have generally attributed most of the benefits to research alone, and in some cases this may have resulted in erroneously high rates of return being attributed to investments in research.

Yet another problem with the measurement of outputs relates to assessing the significance of the maintenance of research, which is required to overcome obsolescence, particularly that due to changes in disease and pest biotypes. In order to keep pace with these changes, the output of maintenance research may be just as important as that of research on innovation, but identifying and accounting for maintenance research is not an easy task since, for example, the pathogenecity of new strains of pests and diseases does not develop following a predictable pattern.

Problems of measurement can also apply to inputs, although many of these can be defined. However, inputs of highly skilled manpower may be hard to quantify. The pricing and measurement of previous research also represents an input problem unless prior research endeavours are treated as free goods. But this ignores the fact that someone paid for the prior research, and if this cost is not taken into account it can again give a result, which places an unduly high social rate of return on the research.

In spite of these problems a number of efforts have been made to use input and output data to carry out benefit / cost analysis of agricultural research. This has been done either in an *ex post* sense or *ex ante*.

Methods of Economic Evaluation

a) Ex ante evaluation
Scoring model
Benefit cost analysis
Simulation approach
Mathematical programming approach

b) Ex post evaluation
Economic surplus research
Production function approach
National income approach
Nutritional impact research

Schuh and Tollini (1979) have described a number of approaches and models that have been used to make *ex post* evaluation. They found that there was a rather rich set of research procedures that have been developed whereby research can be evaluated and its contributions and various effects analysed. Different approaches are useful for answering different questions and the particular question posed will vary a great deal depending on the individual problem situation. A major constraint to the use of *ex post* analysis is, however, the time period between undertaking research and being able to assess its benefits.

For ex-ante decision making there is a vast literature from industrial and military research but rather less from agricultural research. A number of models are available with methodological sophistication ranging from simpler scoring models to more complex mathematical programming models. Schuh and Tollini state that the advantages of these models are that they provide a basis for decision making with an eye to the future rather than the past. They pool information from a large number of qualified experts and they provide a means of explicitly relating the research effort to a set of goals. The disadvantages are that those methods which draw on the opinion of a large number of specialists can be quite costly and time consuming and the pooling of a large number of opinions may do little more than to pal ignorance. It is probably for these reasons that the more

complicated methods have rarely been used more than once, although selected models may provide a means of feeding some rigorous analytical research into the decision-making process.

Benefit: cost analysis is widely used by governments and funding agencies for deciding on and evaluating investment in development projects. It is based on the concept of discounted cash flow. Benefit / cost analysis should include, at a minimum, the sequential estimation of eight distinct characteristics of a research programme and its impact (Bottomley 1988). They are: the annual cost of research, its duration, its initially anticipated probability of success, on-farm implementation costs, on-farm benefits, the rate of adoption, the adoption ceiling, and the life of the innovation.

Measuring benefits of research has been approached through different methods. The benefits are estimated using economic surplus method. The economic surplus method is bit difficult to apply and complex to the evaluator who is not from the field of economics or statistics. There is another method to estimate benefits of technology called Gross Efficiency Index, which is a close proxy to economic surplus method.

Yet another problem in using a formal cost / benefit analysis is a developing country research institution is that the analysis may tend to under-emphasize issues of equity. These may be of considerable importance in countries where income, wealth and power distributions are highly skewed. In many countries food security is the central goal for agricultural research. Busch (1985) has drawn attention to the fact that this has implications in terms of a number of distributive issues such as:

(a) New labour-saving technology may add to *unemployment* and result in a complete loss of income for certain people.
(b) Labour issues can also be important in terms of the introduction of new crops or varieties that radically alter seasonal labour needs that interfere with other essential family activities. Such effects can reduce the demand for casual labour, thereby eliminating the traditional method of redistributing wealth and thereby contributing to reduce food security.
(c) New varieties of crops may encourage the use of marginal lands and lead to environmental degradation, undermining the food security of future generations.
(d) The role of women is significant in that they play a major role in each of the four aspects of household food use: procurement, handling, distribution and consumption. In many countries these four tasks are fully integrated and are part of the daily work activities of women. Changes in the labour patterns resulting from changes in production patterns may disturb this integration and effective agricultural research cannot ignore this intrinsic linkage, which is fundamental to food security.
(e) Broad issues of agricultural research policy may also effect food security, such as the introduction of feed grains or the encouragement of cereals as opposed to grain legumes. These can result in shifts in the protein/caloric balance, particularly of the poorer segment of the population, thereby affecting food security.

III. The Clients for Evaluation

The wide range of issues that can be looked at an in an evaluation indicates that there can be a broad spectrum of clients for this activity. Since different clients may have different requirements from an evaluation it is important that the specific client be identified when an evaluation process is being structured. The terms of reference for an evaluation review should clearly relate to the needs of the client for the review, recognizing that many reviews will serve more than one client. Among the clients for research evaluations are:

National policymakers who are interested in the role that research does or can play in national agricultural development. Their interest is primarily likely to be in terms of strategic reviews, which define overall research priorities and the resources to be allocated to research within the context of development strategy at large. Such clients are likely to be interested in the potential impact of agricultural research on production and productivity. They may also be particularly interested in the research potential when there is a major change in research capacity, technology potential, world economy or some other factor which modifies the agricultural and veterinary sector and, therefore, research needs.

Donor agencies, who now play a major role in supporting agricultural research in developing countries? Evaluation reviews provide them with information on the efficiency of a research system and may help them to justify their investments in it or to identify areas needing strengthening in which their assistance programs have a potential role to play. This role may involve either technology and / or management.

Senior research managers who are able to use the evaluation of past activities to assess the results achieved and to build the lessons of experience into the corporate memory of the institution and thereby to improve its future activities. Such manages have the task of selecting and designing of new programs. Evaluation reviews can be used to determine which programs need to be strengthened, modified or deleted.

Project or program managers within the research system, who can use evaluations of ongoing activities to assess progress, and to identify bottlenecks and problems, so that they can be remedied before causing further damage.

Individual scientists, who are able to use review findings to look at their own research activities within the context of an entire program or institution, and also to place this work into the perspective of adoption and impact as conceptualised by a review team.

Obviously, there is a great deal of scope for weighting the scope of a review to cater to one or more of these client groups and the composition of a review team, the nature of its work and the focus of its activities will all need to take this into account.

The Method of Choice

There is little doubt that where appropriate data, skills and time are available, more sophisticated methods could be applied. Unfortunately many NARS lack the appropriate data, skills and time to conduct even simple cost / benefit analysis and are likely to be in this position for some time. Another factor that needs to be taken into consideration when determining the method to be used is the fact that extent of accuracy is expected. More is the sophisticated method; more is the accuracy of results. In many instances, poor management, rather than a lack of funding, appears to be the principal constraint to research impact.

Other factors responsible for selecting a method for impact assessment could be the knowledge of economics principles and statistics, data availability, computational facilities and time.

Assessing the Impact-a different View

In the discussion above, two things clearly illustrate. One that impact assessment differs from general evaluation in terms of measuring the economic estimation of benefits of agricultural research. In other words, impact assessment could be conducted even before and after the completion of a research project. Accordingly, it is called *ex ante* and *ex post* impact assessment. It implicitly appears that impact assessment is analogs to economic evaluation of research outcomes. All the benefits generated by a research are counted. There I beg to differ from the usual definition of research evaluation and impact assessment. There is a need to differentiate between economic evaluation and impact assessment. While economic evaluation is measuring all kind of benefits of research to the society, the impact assessment measure benefits to particular section of the society and resource. For example, impact assessment answers the question, how research benefited poor or poor resources? Impact assessment analyses the effect of research on social parameters like education, employment, gender, sustainability, quality of natural resource, etc. Therefore, impact assessment mainly is the *ex post* evaluation and does not necessarily count all benefits but benefit to particular area, social group and welfare parameter. The research benefits on these could be positive or even negative. In that sense, the duration require to conduct impact assessment is more than the economic evaluation.

Usefulness of NARS

The main benefits of impact assessment for NARS are listed below:

- Impact studies can *motivate researchers* by providing feedback from the farm community and other research clients on the use and effects of research results.
- Adoption studies can *help researchers refocus their research efforts* by providing insights into farmers' assessments of new technologies (vis-à-vis their current practices) and into farm-level adoption processes.
- *Ex post* studies can provide managers with *evidence of the value of research* to argue for continued investments.
- *Ex ante* assessments can provide managers *with a basis for allocating resources* among competing research demands.
- Lessons learned from impact assessments can be used to *improve future research* strategies, plans and management.
- Impact assessments *show how economic policies and technology interact* in determining the ultimate benefits of agricultural research. This can be useful for discussions between research leaders and policymakers.
- In agricultural research, impact assessments have been used mainly to estimate economic returns to research investments and the diffusion and adoption of new technologies. Economic studies (generally of successful cases) have produced very positive results, which have been used to justify continued support for agricultural research organizations and programs. The systematic use of impact assessments in planning or reorienting research is less common.

- Research managers and policymakers need a better understanding of how impact studies can be used for decision-making. But they also need to understand what is required to do impact assessments; they tend to underestimate the time and resources needed for these kinds of studies.

IV. Conclusion

Impact assessment attempts to determine the extent to which research contributes to higher-level development goals, such as increased farm production or food self-sufficiency. One can differentiate two main types of impact assessment one is conducted during planning (ex ante) an other is conducted after the research results have been available for some time (ex post). Impact evaluations, which often indicate rates of return on the research investment, are primarily used to convince policymakers to allocate more resources to research. It can help in strategic planning, priority setting, and resource allocation, and can show how economic policies and technology interact. *Ex post* impact assessment usually has a time frame of 10 or more years after research results have been released, making it less of a management tool than the other types of evaluation. As with other *ex post* evaluations, the baseline data, targets and assumptions from planning (ex *ante* evaluation) are the basis for determining progress and ultimate impact. Research projects, which may be good candidates for impact assessment, such as those with potential national results or highly innovative research, must have their needs built into the original Monitoring and Evaluation (M&E) systems. For instance, if market prices need to be monitored periodically for use in a future impact evaluation, this must be identified at the planning stage and monitored during the course of the activity.

Evaluating the contribution of research to economic development is complex. Impact evaluations must distinguish research contributions made to national development from the contributions made by other factors, such as the existence of a good extension service, agricultural inputs, adequate infrastructure, and favourable marketing and pricing policies. Institutional and policy support to the veterinary sector in terms of investment, credit, insurance, extension and markets are not adequate with its economic contribution. The two most common types of impact assessment are adoption studies and economic studies. Adoption studies emphasize issues related to the spread or diffusion of technology, the number of people affected, reasons for adoption or non-adoption, and the implications of adoption for the system. Economic studies emphasize the costs of such things as research and extension, and the benefits of a change in the production areas, or a change in yield, price, or quality. The results of impact evaluations can have broad implications for future priority setting, not only for research but also for development support services.

References

[1]. Anderson, J.R. (1992), Measuring the efficacy of international agricultural research, CIMMYT 1991 Annual Report. Centro International de Mejoramiento de aizy Trigo Mexico, DF.
[2]. Anderson, J.R. Herdt, R.W. and Scobie, G.M. (1988), Science and food: The CGIAR and its partners, The World Bank, Washington, DC.
[3]. Avila, A.F.D. Irias, L.J.M. and Paiva R.M. (1985), The socio economic impact of investments in research by EMBRAPA: Results obtained, profitability and future prospects. Empresa Brasileira de Persquisa Agropecuaria, Brasilia.
[4]. Centre for Development Information and Evaluation (CDIE) US Agency for International Development (USAID), Washington, DC 20523 - 1082, USA.
[5]. Economic Evaluation Unit, Australian Centre for International Agricultural Research (ACIAR) GPO Box 1571, Canberra, ACT 2601, Australia.
[6]. Economic Advisor, Secretariat, Consultative Group on International Agricultural Research (CGIAR), The World Bank, 1818 H Street, NW Washington DC 20433, USA.
[7]. Management Systems International 600 Water Street, SW, NBU 7-7 Washington DC -20024, USA.