The resource crunch in academic institutions and research organizations is a worldwide phenomenon. In developed countries, due to paucity of funds, the positions of those researchers who do not carry out useful research are often declared redundant and their services terminated. At least in India, still substantial amount of Government funding is available for research, which in other countries, funding is largely industry-based and highly competitive. Hence, it becomes imperative on our part to use research funding judiciously in solving practical problems as well as in conducting basic research with applied value for meeting stakeholders’ needs. This calls for careful and thoughtful identification, formulation and implementation of research programmes with well-defined objectives and outcome. In forestry research, where we deal with long duration crops, it becomes all the more important to address the problem with a multidisciplinary approach to have desired results of research in the fast changing scenario in tropical regions facing numerous challenges due to deforestation and climate change. This requires a reexamination of how forestry research is organized in the country. Forestry research in India is guided by the policies of Indian Council of Forestry, Research & Education under the Ministry of Environment and Forests, Govt. of India. The poor linkage and apprehensions between forestry scientists and forest managers has affected the quality of forestry research considerably. Unless this is addressed, realizing the importance of both the scientific expertise of scientists and field-based exposure and expertise of forest managers, forestry research in the country will continue to be of poor quality and not stakeholder driven. Though in most of the developed/temperate countries the organizational structure of forestry research is theme-based (i.e., natural forest ecosystem management; productivity improvement & management of plantations; conservation of biodiversity; forest information management, etc.), in India we continue to have classical approach in research organization, where each discipline such as botany, wildlife, silviculture, non-wood forest products, wood science, entomology, pathology, etc., is compartmentalized, working independently without meaningful interactions and linkages among allied disciplines. Even if a research programme is taken up with a multidisciplinary approach, it often turns out to be personalized, component-wise, “cut and paste research”, thus lacking the real essence of multidisciplinarity, which is so crucial for addressing any forestry problem effectively from the point of view of stakeholders. Even if research results of practical value are generated they are seldom implemented in the field due to lack of a proper mechanism for transfer of technology in the forest departments/forest based industries and the blame goes to scientists. The policy makers can certainly bridge the gap between researchers and stakeholders to make forestry research more meaningful and stakeholder driven.

INTRODUCTION

Asia has a relatively long history of forestry research and a well-developed network of institutions and universities with forestry related research activities. However, the capacities and capabilities are quite diverse; some are relatively strong institutions but the majority are weak (Salleh, 1992). In India, although silvicultural research started in 1840s the first laboratory research started in 1878 and a Forest Research Institute (FRI) was established in 1906, which moved to Dehra Dun in 1914. The FRI and its regional stations used to be directly under the control of Central Government (Ministry of Agriculture/Ministry of Environment & Forests) until 1986 when FRI and regional centers were upgraded to full fledged research

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institutes and were transferred to the Indian Council of Forestry Research & Education (ICFRE) under the Ministry of Environment & Forests. Though some of the State Forest Departments such as Madhya Pradesh had a separate research institute under them, Kerala took a pioneering step in establishing KFRI as an autonomous institute under the Science, Technology & Environment Department. In addition, a large number of non-forestry research institutions, forestry faculties of universities and silvicultural/research wings of the State Forest Departments also carry out forestry related research. The Universities initiated organized forestry research only in 1987, when 14 State agricultural and five general universities established forestry faculties following the recommendations of the National Commission on Agriculture. But the emphasis has been on agroforestry, social forestry and joint forest management. In the private sector also, forestry research was taken up belatedly as forestry has been the responsibility of the Government. At least 43 private sector organizations are also engaged in forestry research (Nair et al., 1998).

In spite of having one of the largest numbers of researchers engaged in forestry research in India, as compared to other countries, on the whole the quality of forestry research and transfer of technology to stakeholders has been at the lowest ebb. This despite the fact that research funding by the Govt. of India in forestry has been quite substantial, though may not be at par with Malaysia or the US. This paper examines the reasons for the poor status of forestry research in the country and suggests ameliorative measures for bridging the gap between researchers, stakeholders and policy makers for bringing about a change in the quality of the forestry research scenario in the country which is stakeholder driven.

**APPROPRIATENESS OF FORESTRY RESEARCH**

Forestry is a multidisciplinary field and issues and problems can be addressed effectively only through a thematic and holistic approach. For this the organization of research is very crucial. In India, traditionally the organization of forestry research is disciplinewise. In the Forest Research Institute, Dehra Dun, during the initial years, the research work was carried out in five branches namely Silviculture, Economics, Botany, Entomology and Chemical. This arrangement continued up to 1925. Later, during 1929 the research set up was reorganized and the Directorate of Research comprised of ten branches namely, Silviculture, Botany, Entomology, Wood Technology, Composite Wood & Wood Preservation, Wood Chemistry & Minor Forest Products, Working & Timber Machineries, Cellulose & Paper, Chemistry and Minor Forest Products and the Wood Seasoning and Statistical Branch. Subsequently, the Directorate of Biological Research and Directorates of Forest Products were created and branches were regrouped. After independence Regional Centres of FRI were also established at Jabalpur, Coimbatore, Shimla, Ranchi, Hyderabad and Bangalore.

Since, during the formative years, new information needs to be generated in every discipline, such an organization of research was probably the best. Valuable scientific knowledge was generated and documented which formed the basis of applied field-based research in the country. For example, the Arsenic–Copper-Chromate treatment for wood preservation developed in FRI is well known worldwide. Similar is the case of significant contributions in paper technology. However, over the last 75 years, the forestry scenario has changed due to industrialization and population pressure bringing about the shrinking of forest cover, deforestation and degradation of forests leading to climate changes. Under the circumstances, the approach of forestry research required reexamination and restructuring so that new emerging problems could be tackled more effectively by conducting problem solving multidisciplinary research. While such an approach to research was found essential in most of the parts of the world and appropriate reorganization was effected, in India the same traditional discipline-wise, compartmentalized research continued even after the reorganization of research in 1986, after the creation of ICFRE under the Ministry of Environment and Forests (MOEF). Even in the Kerala Forest Research Institute (KFRI), established during 1975, a similar pattern was adopted and the research was undertaken in discipline-focused Divisions: Agroforestry, Botany, Ecology, Economics, Entomology, Genetics, Non-Wood Forest Products, Plant Pathology, Plant Physiology, Silviculture, Soil Science, Statistics, Wildlife and Wood Science. Discipline-wise, compartmentalized research has led to a ‘cut and paste’ type of multi-disciplinary
forestry research which is unable to address the main issues and that is one of the reasons why quality of forestry research, especially field-based and stakeholder driven research, has suffered significantly. Having realized this mistake, KFRI will soon restructure the research with a thematic approach.

Following are a few examples of research organization prevalent in certain reputed forest research institutes such as the Oxford Forestry Research Institute, European Forestry Research Institute (Finland), New Zealand Forest Research Institute and the Forest Research Institute, Malaysia (FRIM).

**Oxford Forestry Institute, UK**
*Departments:*
- Temperate Ecology & Silviculture
- Forest Genetics & Tree Improvement
- Forest Biodiversity & Plant Systematics
- Forest Biotechnology
- Forest Policy & Management

**European Forest Research Institute, Finland**
*Programmes:*
- Forest Ecology and Management
- Forest Products Markets & Socio-economics
- Policy Analysis
- Forest Resources & Information

**New Zealand Forest Research Institute, New Zealand**
*Divisions:*
- Forest Health & Improvement (Health, Genetics & Tree Improvement, Propagation & Growth, Plant Protection Chemistry).
- Forest Management & Resources (Exotics, Social Science, Harvest Planning, Forest Mensuration & Management Systems, Soils & Site amendment, Trade, Marketing & Economics).
- Wood Technology (Wood materials & Biotechnology, Wood Processing, Wood Products).

Support Services (Administration, Engineering, Finance, Technical Services)

**Forest Research Institute Malaysia (FRIM) – Malaysia**
*Divisions:*
- Medicinal Plant Division
- Natural Forest Division
- Forest Environment Division
- Wood Chemistry
- Forest Plantation Division
- Techno-economics Division
- Forest Products Technology Division

A thematic approach to forestry research bringing together different disciplines for closer interaction has facilitated to a greater extent multi- or inter-disciplinary research within these research organizations than is presently the case in India. Such a structure also fosters holistic approaches to problems. For example, the goal of improving the productivity of plantations cannot be achieved unless there is a combined effort involving silviculture, forest genetics & tree breeding, forest biotechnology and physiology. It is high time that we review the organization of research in India and take necessary steps to restructure forestry research as per our requirements considering the socio-economic and demographic situation and conservation of forest resources.
The forestry research carried out in eight research institutes under ICFRE: Forest Research Institute, Dehra Dun (FRI); Institute of Wood Science and Technology, Bangalore (IWST); Institute of Forest Genetics and Tree Breeding, Coimbatore (IFGTB); Tropical Forest Research Institute, Jabalpur (TFRI); Institute of Rain and Moist Deciduous Forest Research, Jorhat (IRMDFR); Arid Zone Forestry Research Institute, Jodhpur (AFRI); Himalayan Forest Research Institute, Shimla (HFRI) and Institute of Forest Productivity, Ranchi (IFP) and some State forest research institutes are mainly supported through government funds. Universities and institutes like KFRI are predominantly sponsor-driven, and their sponsors are mostly various departments of state and central governments and international agencies; industry-based support is negligible.

ICFRE has formulated a National Forestry Research Plan (NFRP) to prioritise the research in the country (ICFRE, 2000a). Though excellent research priorities have been set, it is not clear how the forestry research will be regulated all over the country under the NFRP. An effective mechanism for implementation and coordination of NFRP at national level is required. In addition, the State Forest Departments have their Silviculture Research Wings to undertake research on practical forestry. Though silviculture research has been going on in the country for several decades its usefulness in terms of applied forestry adopting new prescriptions or modifying management practices has not been fully realized. The valuable data generated through this departmental research lie in files and records and they are never published or made available for scrutiny. How useful is this silvicultural research carried out by the Forest Department to stakeholders and policy makers? There is an urgent need to review the whole system and take appropriate action in the interest of the forestry research in the country which is helpful in solving the problems of various stakeholders.

MANAGEMENT OF FORESTRY RESEARCH IN INDIA

Unlike in other countries, forest research in India has traditionally been within the domain of the professional foresters. It was envisaged that after ICFRE was formed, all the forestry research institutions under ICFRE would provide a boost to forestry research in the country by inducting young, talented scientists and research-oriented qualified forest managers in various disciplines. But somehow this could not be achieved. Forest managers not necessarily with research aptitude join the institutions on deputation and serve in high-level posts and later return to their parent department after completing their deputation terms. If professional expertise and scientific background of forest managers are given due consideration for such research appointments certainly it will be a boon to forestry research. There are quite a few young forest managers available now in the country with appropriate research qualifications. But unfortunately forestry professional qualifications were considered sufficient to tackle research. Technical postings of forest managers not only brought discontinuity in research but also demoralized the scientists, affecting the overall research output and quality of forestry research, which requires a long-term perspective and commitment. Overall control of forestry research and planning by the professional forest managers and typical governmental administrative structures have provided little functional freedom for scientists to stimulate innovation. Some remedial measures are required to be taken in the national interest to address this issue. What is disturbing is that even the policy makers do not appear to be taking note of the status of forestry research in the country and, consequently, more and more forest managers are being accommodated in senior research positions, including research administration.

KFRI, which was established in 1975 as an autonomous Institute by the Govt. of Kerala under a Science Policy to establish a Centre of Excellence to cater to the needs of the State, has created a strong niche among the forestry research organizations in the world within a span of 25 years. This was possible due to time-bound, problem-solving research, freedom of scientists to work, and interaction with other leading forestry scientists in many institutions and with forest managers around the world. The scientists are able to attract a good amount of project grants from state, national and international sponsors and it has entered into an MOU with leading forestry organizations in the world for carrying out collaborative research. KFRI has emerged as a model forestry research institution in the region. A new forest research institute has
been established in Uttar Pradesh on the lines of KFRI, which is not directly under the Forest Department but registered as a Society like KFRI to provide functional autonomy without bureaucracy. Following the KFRI pattern, the State Forest Research Institute of Madhya Pradesh which was under the administrative control of the State Forest Department for long time was delinked and became autonomous in 1996.

**DIRECTION OF FORESTRY RESEARCH IN INDIA**

During the implementation of the World Bank funded project the ICFRE realized that setting research priorities is essential to focus properly on thrust areas and utilize the resources optimally. This was considered necessary especially in the wake of the following weaknesses and problems in forestry research (ICFRE, 2000a).

i. Meager investment in forestry research, both in central and state sectors.

ii. Absence of effective linkages between research institutes under the Central Government and State Forest Departments/States

iii. Researchers not able to keep pace with the current needs and problems of the forest department and forest-based industry.

iv. Absence of extension use for transferring technology effectively.

v. Lack/Absence of funding of forestry research by the Industry.

vi. Weak or no linkages between researchers and users of research.

vii. Isolation of forestry research from scientific stream.

Having realized the above drawbacks, ICFRE prioritized the forestry research and formulated the National Forestry Research Plan (ICFRE, 2000a) for a period of twenty years. No doubt it is a very important document, which can set the direction of forestry research in achieving the objectives of the National Forest Policy. It is stated that it has a built-in mechanism for periodical reviews to make the plan more responsive to changing needs. But the big question is about its implementation. This Forestry Research Plan needs to be implemented at the national level involving all stakeholders. In the absence of any clearcut, built-in mechanism and strategy for implementation, it is not clear how the objectives of NFRP can be achieved.

**Extension of forestry research to stakeholders**

For an applied science like forestry, extension of research results to stakeholders is the most important aspect that bridges the gap between the researcher and the stakeholder. It is generally accepted that close integration of research and extension activities is a critical necessity. Institutional and administrative integration along with functional integration based on close working relationships in practice, between researchers, extension officer and stakeholder may bring about desired results for meeting the needs of stakeholders.

In the whole history of Indian forestry, extension has never been taken professionally and organized as a special activity. Forestry research extension revolved around Silvicultural Conferences (later Forestry Conferences), Quinquennial programmes and periodical liaison meetings between FRI and State Forest Departments, which acted basically as a medium of communication with the forest departments.

Under the World Bank Supported Programme (ICFRE, 2000b), ICFRE initiated for the first time a Forestry Extension Programme during 2000 for dissemination of research findings, innovations and new technologies to user groups. The Extension Programme Document has been prepared in detail taking into account a modern approach to extension. However, it appears more like an Agricultural Extension Service as it deals with extension workers, farmers, home visits by extension staff, farmer scholar programmes, community training courses, etc. Forestry extension is certainly quite different from agricultural extension in approach and overall philosophy due to ownership of the land, in one case it is the government and in other the farmer themselves. Hence, a mechanism for transfer of the technologies/new information to the
main stakeholders like the State Forest Departments and forest-based industries for field implementation has to be different in approach. In effect, without any perfect mechanism developed for effective transfer of technology, the role Extension Directorate/wings in various ICFRE Research Institutes, in addressing the objectives remains unclear.

**Linkage between stakeholders and researchers**

For forestry research to be useful to stakeholders a strong linkage between the researchers and stakeholder is essential. In addition, mutual trust and recognition of expertise in their own field need to be realized and respected. However, in India such a linkage is not strong and it is superficial and even if it exists it is with apprehensions. Generally, stakeholders, especially professional forest managers, complain that researchers are not doing anything applied and not transferring the technology or new information to the end-users and vice versa the researchers feel that the forest managers do not appreciate scientific research. This attitude of forest managers and researchers, which has affected the quality of research, could possibly be due to some or all the following reasons.

1. Lack of close interaction between stakeholders and researchers that may provide an opportunity to understand each other’s philosophy.
2. Stakeholders not able to appreciate scientific output or publications which contain mainly technical information and scientists lacking communication skills in providing the scientific information in simpler form which is understood by forest managers.
3. Lack of appropriate extension mechanism in research institutions for transferring new technologies, in a form that can be understood by stakeholders/forest managers, and lack of institutional mechanism in the forest department for transfer of technology and its implementation on a continual long-term basis.

These apprehensions and can only be sorted out if there is frequent interaction and collaborative efforts on the part of stakeholders and researchers.

**Linkages between policy makers, researchers and stakeholders**

Generally, policy-makers (politicians, bureaucrats, Planning Commission, Ministry of Environment & Forests) do not have a clear or accurate perception of the potential contribution that forestry research has made, and can make, to the development of forestry in the country. Policy makers consider the work of researchers as irrelevant to their problems.

Unless the researchers convince the policy makers the usefulness of forestry research it may be extremely difficult to develop strong research systems with secured funding, to address priority areas of research. Usually, researchers do not attempt to exchange or transfer the information or outputs of research with policy makers. Consequently, policy makers are not able to appreciate the importance of research in solving problems. As long as policy makers remain skeptical about the value of forestry research it will be difficult to convince them to allocate sufficient funds. Forestry research will, therefore, remain ineffective, thereby confirming the skepticism of policy makers.

What is required is a clear understanding between stakeholders, researchers and policy makers, which will help to address the forestry problems more effectively.

**Sponsors - research funding**

Resource limitation in academic institutions and research organizations is a worldwide phenomenon. In many developed countries, funding limitations have led to significant staff reductions in research organizations and/or closure of research facilities. At least in India, a substantial amount of Government funding is still available for research, which in other countries is largely industry-based and highly
competitive. Hence, it becomes imperative on the part of researchers to use the funding judiciously in solving practical problems as well as in conducting basic research having applied value to meet stakeholder’s needs.

To ensure that the funding is utilized in priority areas of research and the same research is not duplicated elsewhere calls for some sort of coordination at the national level. In the absence of such a mechanism it has been observed that researchers obtain funding from different sponsors in the country for more or less similar types of research. This amounts to national wastage of precious resources and should be addressed urgently.

Forestry research is a long-term proposition considering long rotation of trees. But sponsors continue to fund projects for three years for administrative or other reasons, which is not sufficient for undertaking meaningful forestry research. For example, there is no long-term funding possibility for 10 or 20 years or more for research on tree improvement that is so crucial for improving the productivity of forest plantation and natural forests. In Europe and America, some of the tree improvement research is more than 50 years old. This is the reason that research on tree improvement of teak, the most valuable timber species is a non-starter even after 55 years of independence. Funding should be linked directly to research priorities at the state and national level.

A MODEL FOR LINKAGES FOR BRIDGING THE GAP BETWEEN RESEARCHERS, STAKEHOLDERS AND POLICY MAKERS

From the above account it is evident that forestry research in the country is at a crossroads. Forestry research is not able to effectively address the needs of stakeholders, society and people at large due to inherent weaknesses in the system that are in turn due to absence of proper linkages. Unless the issue is addressed with a holistic approach in the national interest, the future of forestry research in India does not look bright.

The linkage model proposed in Fig. 1 (see annex) to address the forestry research in a client driven mode, is likely to bring about significant change in the approach to forestry research in the country and bridge gaps to make research stakeholder-driven.

Forestry research & extension

Managing forestry research by researchers: The crucial and the most important issue to be considered is that forestry research in India should be managed by researchers or forest managers with proven research capabilities and qualifications as is done around the world and in many reputed forestry research institutes and not by professional forest managers. In Britain, for example, the Oxford Forestry Institute is not run by professional forest managers but by world-renowned and eminent forestry scientists. The research institutions that produce new holistic, strategic understanding of forests are unlikely to be the traditional Forest Research Institutes that are part of the structure of National or State forest services and governed by forest managers (Byron and Turnbull, 1998). Since it is a policy matter, policy makers can play a vital role in the interests of the nation and forestry research.

Restructuring of research: If forestry research has to meet the requirements of the stakeholders and bring in a multidisciplinarity approach, research needs to be restructured and reorganized under major themes such as Natural Forest Ecosystem/Management of Natural Forests, Productivity Improvement of Plantations/Management of Forest Plantations, Forest Information Management, Forest Resource Management, etc., rather than the present discipline-wise reorganization. A tentative reorganization of forestry research in India is shown in Fig. 2 (see annex). The proposed programme divisions should not be watertight
compartments but should be flexible and interactive. The scientists, depending upon their research interest and expertise may join any programme when the need arises.

As far as the implementation of such a restructuring is concerned when there is a mind set for a particular type of system in vogue for a long time in any organization it may not be easy to bring about change in the attitudes of researchers as short-term personal interests come to the forefront rather than long-term institutional interests. Hence, for successful implementation of any re-organisation in research it requires not only institutional commitment on the part of researchers but an overall paradigm shift in their approach which can be brought about through meaningful dialogue identifying pros and cons of old and new systems and a positive approach and assertiveness for a change for the betterment of forestry research addressing the issues and problems faced by the stake holder.

**Extension:** The job of researchers does not end just with the publication of research reports and scientific papers. The research results need to be applied in the field and transferred to stakeholders, similar to agricultural research where the technology for the green revolution passed on to farmers brought the desired results of increased yield. There should be a strong Extension & Training Division in a forestry research organization with a clear mandate to produce a package of practices, extension and training materials, and to train stakeholders. This Division should be headed by a professional forest manager with appropriate research qualifications. The technology developed in research institutions should be transferred to the stakeholder through field demonstration in close collaboration with stakeholders so that there is a validation of the technology under user’s conditions and, hence, acceptability becomes easier. The Silviculture Research Wing of the State Forest Departments could play a major role in the transfer of technology from researchers to forest managers.

**Stakeholder’s role**

The stakeholder should have open mind in accepting new proven technologies/information for the betterment of the forestry sector. Once the technology is transferred, the forest departments/industry should have an institutional mechanism for implementation of the technology and its continuance over the years. Without such a mechanism it cannot be sustained over a period of time. This is particularly important in view of the fact that there are frequent transfers and promotions in the Forest Department. Due to lack of any established mechanism or system in the State Forest Departments, there is seldom feedback on the effectiveness of the technology transferred. This adversely affects the enthusiasm of researchers to transfer the technology. Feed back on the performance of the technology should be provided to researchers along with other issue to be addressed on a priority basis through regular Interaction Meetings. In addition, stakeholders should also provide funding to address specific problems.

**Policy maker’s role**

The technologies/information generated by the researchers should be made known to policy makers so that these can be reflected in the policy documents or the National Forest Policy. In addition, the policy makers should also be informed about the requirements/needs of the stakeholders so the laws/acts or the National Forest Policy addresses their requirements effectively. There is no such mechanism or forum for any interaction between the researchers, stakeholders and policy makers. Therefore, the forest laws/acts or research priorities are not able to address adequately the stakeholders needs. This communication gap can be resolved by organizing a National Forestry Workshop involving researchers, stakeholders, policy makers and sponsors every 4-5 years. This Workshop would provide an opportunity for close interaction between all the beneficiaries to address the following.

1. **Researchers/Organisations:** New technologies/information generated and ready to be transferred; problems/issueto be addressed by stakeholders and policy makers; funding.
2. **Stakeholders**: Needs/requirements; technologies implemented, problems/issues to be addressed by researchers/policy makers.

3. **Policy makers**: Taking into account research output and stakeholders needs set research priorities/National Forest Policy/laws/acts, identify areas/issues to be addressed by researchers; involve sponsors for funding in priority areas identified; coordination of research funding to avoid duplication.

**CONCLUSION**

Forestry research in the country is way behind agricultural research, which has made technological strides and brought about a green revolution through an excellent extension network. What we need is a paradigm shift in the attitudes of researchers and stakeholders. If we aim to increase the forest cover, conserve biodiversity or improve the productivity of forest plantations, and afforest the degraded land, all this requires an integrated holistic approach with the concerted efforts of all the actors i.e., researchers, stakeholders and policy makers. It is hoped that the framework of linkages provided in this paper, if implemented, will bridge the gaps between them that may help to change the forestry scenario in the country in a positive way.

**REFERENCES**


**Annex – Figures referred to in text.** [link to Figures]

**Fig. 1.** A Model of linkages for bridging the gap between researchers, stakeholders and policy makers

**Fig. 2.** Proposed restructuring of forestry research in the country.