

**Planning, Management, and Evaluation
of Forestry Research: An Annotated Bibliography
With Special Reference to Developing Countries¹**

compiled by

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Contents

	<u>Page</u>
Introduction	2
The Overall Research and Extension Planning Process	2
Classification System Used in This Bibliography	5
Forestry	7
Selected References: Agriculture	21
Selected References: Industry and Other	22
Index	23

Introduction

The importance of a nation's scientific and technological capacity in the process of economic development -- and the key role of research institutions in developing this capacity -- has long been recognized. But few developing countries have been successful in creating viable indigenous research systems. Efforts to strengthen research capacity in developing countries have, with some exceptions, been ineffective.

Part of the explanation for this disappointing performance may be that few studies have attempted to assess the importance of various factors that determine research capacity and performance in developing countries. Scholars of technical change and development have begun to examine this topic only in recent years.

Another part of the explanation may be that the process of building indigenous research systems is seldom considered in a systems context. Certain aspects of this process are typically considered in isolation from other key elements. For example, most of the forestry literature dealing with this topic consists of descriptive case studies of the barriers to effective research programs in individual research institutions, without consideration of important factors outside of the forestry research system (e.g., national science and technology policy, linkages with agricultural research institutions, cultural values regarding science and technical change, etc.). Without a systematic framework, it is difficult to draw generalizations from this literature that may be useful in designing strategies for overall strengthening of forestry research institutions in developing countries.

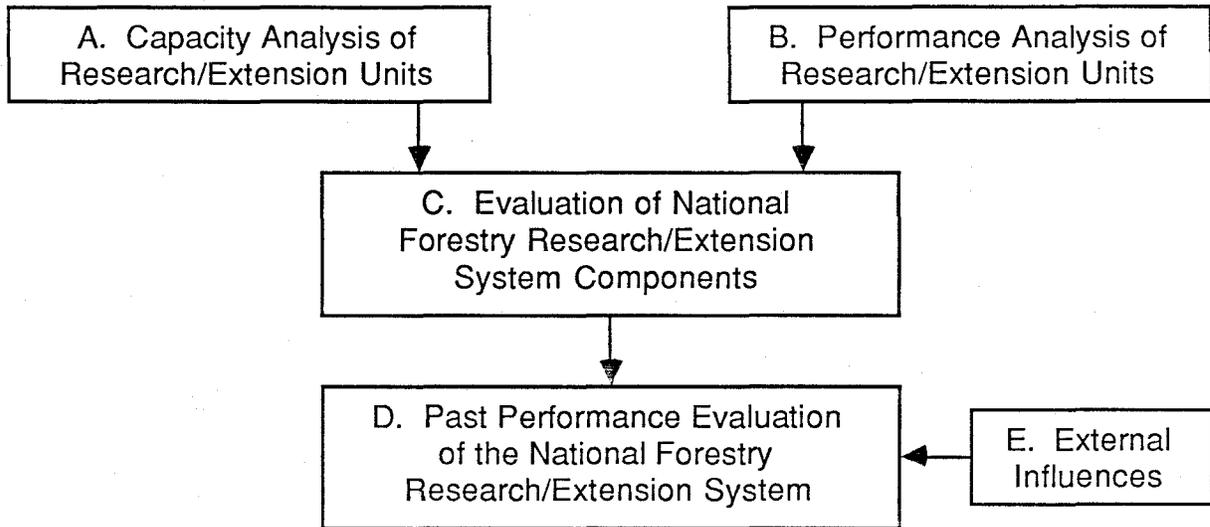
The Overall Research and Extension Planning Process

This bibliography addresses the above mentioned concerns by collecting the scattered documentation on the planning, management, and evaluation of forestry research in developing countries and relating it to the systematic framework for forestry research and extension (R&E)

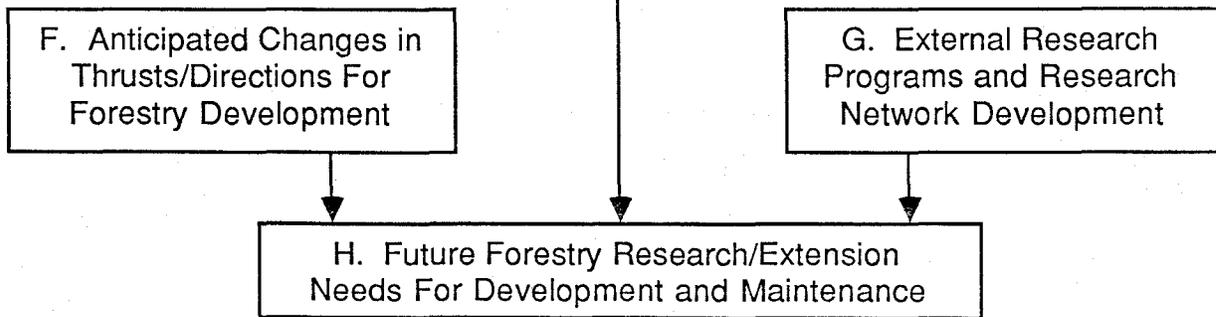
Figure 1.

Forestry Research & Extension Planning Process

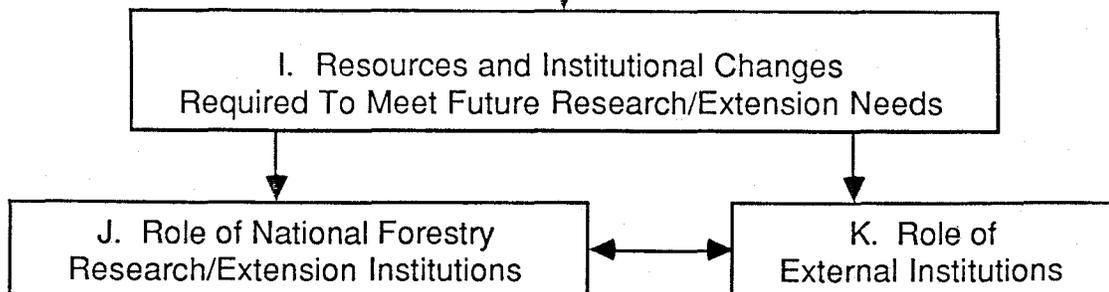
Phase I. Past Performance Evaluation



Phase II. Future Needs Assessment - The Problem Analysis



Phase III. Program Design - Meeting the Needs



planning outlined in Figure 1. This planning process essentially involves answering the following series of questions as the planner goes through the steps illustrated (letters match the letters in Figure 1):

Phase I. Past Performance Evaluation

- A. What are the capacities of the components of the R&E system?
- B. How have the R&E components performed in the past?
- C. How does performance of each component relate to its capacity?
- D. How has the system as a whole performed in relation to what was expected of it and what was needed?
- E. What have been the external influences on the system and how have they affected performance?

Phases II. Future Needs Assessment - The Problem Analysis

- F. What are the anticipated changes needed and desired in the forestry sector; or what are the major thrusts of future sector development?
- G. What are the likely and desired influences of external institutions in terms of future developments of the domestic R&E system?
- H. Given D, F and G, what are the future R&E needs of the country, both in terms of R&E for development and in terms of research to maintain productivity?

Phase III. Program Design - Meeting the Needs

- I. What resources and institutional changes are required to meet the needs identified in Phase II? How should they be phased and organized?
- J. What should be the specific role of the various national forestry R&E institutions?
- K. What should be the role of various external institutions (both national and international)?

Classification System Used in This Bibliography

Based on this planning framework, the present bibliography reviews selected documentation on the planning, management and evaluation of forestry research with special reference to developing countries. The bibliography classifies the literature in the following six categories:

1. Research Capacity and Performance Evaluation (Phase I in Figure 1)
2. Research Needs Assessment (Phase II in Figure 1)
3. Research & Extension Program Planning and Design (Phase III in Figure 1)
4. International Technology Transfer / External Influences (boxes E, G, and K in Figure 1)
5. Domestic Technology Transfer / Extension
6. Descriptions of Research and Extension Systems

The numbers in brackets after each entry in the bibliography refer to these categories. Entries are listed alphabetically by author and sequentially numbered. An index of entries relating to the six categories follows the bibliography. Note that the assignment of categories to each entry should be used only as a guide, since perceptions of the meaning and scope of these categories will differ among users.

Documentation on forestry research is reviewed as comprehensively as possible. Recognizing the much more extensive work carried out in other fields, selected key references from agriculture and industry are also included. Perusal of the bibliography reveals that relatively little work has been published in the area of forestry R&E program planning and design (category 3, and Phase III in Figure 1). Another feature of the literature is an abundance of descriptions of existing research and extension systems (category 6). Researchers and research administrators with first-hand experience in building forestry research systems in developing countries have written extensively on factors influencing the capacity of their institutions, and, despite its limitations, this documentation contains many insights that may be of value in efforts to strengthen forestry research.

We welcome comments and additions from the users of this bibliography. They can be sent to either of the following addresses:

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Forestry

1. Addo-Ashong, F. W. 1972. Problems in relating research programmes to the needs of management. pp. 4677-4680 in: *Proceedings of the Seventh World Forestry Congress, Vol. IV.* Oct. 4-18, 1972. Buenos Aires, Argentina. [2, 6]

"The flow of information between management and researchers should be reciprocal: the research objectives should be clearly defined by management, yet flexible enough to allow incorporation of new research results. Management should state its priorities in research and provide certain basic facilities to enable progress, while on the other hand the researcher should be able to lead management into new areas of development." (p. 4680)

2. Ali, S. 1984. Forest research in Honduras. p. 109 in: *Technology Transfer in Forestry*, G. H. Moeller and D. T. Seal (eds.). Forestry Commission Bulletin No. 61. London: Her Majesty's Stationery Office. 113 p. [6]

This paper briefly describes the major problems hindering forestry research in Honduras, including lack of research policy, coordination, priorities, and communication between management and research. A work plan to address these problems is outlined.

3. Amsalem, M. A. 1983. *Technology Choice in Developing Countries: The Textile and Pulp and Paper Industries*. Cambridge, MA: MIT Press. 240 p. [4]

Several issues relating to technology choice in developing countries are examined by means of a survey of pulp and paper and textile equipment manufacturers and an analysis of actual technology choices made for production facilities in developing countries. It is found that the scope for technology choice in these industries is fairly wide and that a variety of considerations in addition to factor costs lead a firm to adopt a specific technology.

4. Anderson, Dorothy H. and Victoria L. Morck. 1986. Factors affecting information utilization and change: the case of recreation research and river management in the public sector. *Journal of Technology Transfer* 10(2): 53-70. [5]

"This research looked at the information transfer process between recreation researchers and managers. The objective was to identify personal and organizational constraints to managers' efforts to use new information and, consequently, to positively change resource management practices. It suggests some ways to eliminate or reduce constraints." (p. 53)

5. Babcock, H. M. 1974. Deciding on priority projects. *Forest Products Journal* 24(9): 52-54. [2, 3]

"The Canadian Forestry Service has initiated a program evaluation process as an aid to deciding on research priorities. The methodology includes: 1) development of a hierarchy of objectives; 2) development of discriminating and evaluating criteria; 3) weighing of these criteria; 4) rating research projects and proposals against these criteria; 5) quantification of tangible and intangible benefits; and 6) developing benefit / cost ratios." (p. 52)

6. Beer, J. 1984. Research and development work by Costa Rican farmers: lessons for agro-foresters. pp. 43-46 in: *Technology Transfer in Forestry*, G. H. Moeller and D. T. Seal (eds.). Forestry Commission Bulletin No. 61. London: Her Majesty's Stationery Office. 113 p. [2, 5, 6]

"The stages in the empirical development of some agro-forestry techniques in Costa Rica ... are discussed in order to demonstrate the importance of seven research and development techniques used by farmers. These are: demonstration plots; adaptation of existing techniques; preference for multiple-use species; identification of desirable tree characteristics; directed succession; and observation of crop phenology as a silvicultural indicator." (p. 43)

7. Bengston, David N. 1984. Economic impacts of structural particleboard research. *Forest Science* 30(3): 685-697. [1]

This study evaluates the economic impacts of past research on structural particleboard using a consumer surplus model. Average internal rates of return from investment in this line of research were found to range from 19 to 22 percent. Estimated marginal returns ranged from 27 to 35 percent. It is concluded that structural particleboard research in the United States has been a highly attractive investment.

8. Bengston, David N. 1985. Diffusion of innovations in forestry and forest products: review of the literature. pp. 69-77 in: *Forestry Research Evaluation Current Progress, Future Directions*. Christopher D. Risbrudt and Pamela J. Jakes (eds.). General Technical Report NC-104. St. Paul, MN: USDA Forest Service, North Central Forest Experiment Station. 140 p. [5]

This paper reviews and assesses the diffusion of innovations literature with a focus on the forest-based sector. A framework for interpreting diffusion research is presented, forestry and forest products diffusion research is reviewed, and a concluding section discusses the implications of this review and needs for future work in this area.

9. Bengston, David N. 1986. Research capacity in developing countries: an evaluation of public forestry research institutions. Ph.D. thesis, University of Minnesota. 205 p. [1]

Factors influencing the capacity of public research institutions are examined, and a method for evaluating research capacity is developed and tested. The case of government and university forestry research in 72 institutions worldwide is examined, including 31 institutions from developing countries and 41 from developed countries.

10. Bengston, David N. and Hans M. Gregersen. 1986. Forestry research and income redistribution. pp. 117-122 in: *Evaluation and Planning of Forestry Research*, IUFRO Proceedings, S6.06 - S6.06.01, Denver P. Burns (Compiler). General Technical Report NE-GTR-111. Broomall, PA: USDA Forest Service, Northeastern Forest Experiment Station. 156 p. [2]

Five major issues relating to the income redistribution impacts of research and technical change are examined, with examples and empirical evidence drawn from case studies in forestry and agriculture. It is concluded that income redistribution impacts should be explicitly included in evaluations of forestry research programs, and that evaluation techniques should be developed which can address distributional issues.

11. Bethune, James E. and Jerome L. Clutter. 1969. Allocating funds to timber management research. *Forest Science Monograph* 16-1969. Washington, D.C.: Society of American Foresters. 22 p. [1, 2, 3,]

"This study seeks to adapt and develop quantifiable criteria and objective methods to assist in allocating funds to timber management research. . . A dynamic programming model is used to allocate research funds among broad forest types. Projections of forest growth under varying levels of management intensity consistent with implementation of research accomplishment provide the measure of expected benefits." (p. 1)

12. Burch, William R. Jr. 1984. An interpretation of discussion at a workshop on: The human

factors affecting forestry / fuelwood projects: An agenda for research and development. Working Paper, Topical Resources Institute, Yale School of Forestry and Environmental Studies. 98 p. [2, 3, 4]

"A small group, of around 40 experts from within and outside of USAID gathered to identify the crucial socio-economic research issues related to forestry / fuelwood projects. Discussion considered the relevant social opportunities and constraints, social science theories and models, existing and potential methods of data collecting, ways of interrelating biophysical and socioeconomic factors, the development and use of database systems, and the institutions for implementing the research and for disseminating the findings of research." (p. 8)

13. Burns, Denver P. (compiler). 1986. *Evaluation and Planning of Forestry Research*, IUFRO Proceedings, S6.06 - S6.06.01. General Technical Report NE-GTR-111. Broomall, PA: USDA Forest Service, Northeastern Forest Experiment Station. 156 p. [1,2,3,6]

This collection of papers includes sections on identifying research needs, strategies to meet forestry research needs, evaluating research at the organizational level, evaluating the individual's research and productivity, and research evaluation case studies.

14. Callaham, Robert Z. (technical coordinator). 1981. *Criteria for deciding about forestry research programs*. General Technical Report WO-29. Washington, D.C.: USDA Forest Service. 52 p. [1,2,5]

Four criteria for evaluating research program alternatives in the Forest Service are discussed: response to needs; contributions to productivity and other returns; response to national policies; and relation to historical trends.

15. Callaham, Robert Z. 1985. *Evaluating social benefits of forestry research programs*. *IEEE Transactions on Engineering Management* EM-32(2): 47-54. [1, 2]

Several approaches to evaluating the impacts of forestry research on society are discussed, including tracing techniques, evaluation of economic costs and benefits, and *ex ante* evaluation of expected benefits.

16. Callaham, Robert Z. 1986. *Evaluating forestry research: an overview*. pp. 67-82 in: *Evaluation and Planning of Forestry Research*, IUFRO Proceedings, S6.06 - S6.06.01, Denver P. Burns (Compiler). General Technical Report NE-GTR-111. Broomall, PA: USDA Forest Service, Northeastern Forest Experiment Station. 156 p. [1, 2]

"A framework is given for evaluations, with particular attention to management and conduct of forestry research and development. Many and diverse considerations must be taken into account during evaluations. Special care must be taken to assure utilization of findings from evaluation. Additional sources of information and definitions of terms are provided." (p. 67)

17. Callaham, R. Z. and R. E. Buckman. 1982. *Some perspectives of forestry in the Philippines, Indonesia, Malaysia, and Thailand*. Final Report, USDA Forest Service, Pacific Southwest Forest and Range Experiment Station, unnumbered bulletin, Dec. 74 p. (Reproduced by National Technical Information Service, PB82-201591). [6]

"This is a report of brief visits during two weeks in September 1981 by two Forest Service executives, concerned with forestry research, to 25 important forestry organizations in four countries in Southeast Asia. The organizations visited in the Philippines, Indonesia, Malaysia and Thailand included those responsible for: national forestry programs, forestry research, Man and the Biosphere Programs (MAB), forestry education, and the U.S. AID projects concerned with forestry." (p. iii)

18. Cox, L. A. 1974. Transfer of science and technology in successful innovation. *Forest Products Journal* 24(9): 44-48. [5]

"A few simple innovation models have been constructed in order to show how a successful innovation system should be organized within a company, and to stress the importance of people in the system. A brief description of the characteristics of an entrepreneur or venture manager are reviewed, and the best environment in which entrepreneurs flourish is examined. Concluding remarks are concerned with some barriers to successful technological innovation within a company -- such as size and location of the creative, productive, and marketing units." (p. 44)

19. Creighton, J. W., J. A. Jolly and S. Laner (eds.). 1985. *Technology Transfer: A Think Tank Approach to Managing Innovation in the Public Sector*. U.S. Forest Service and U.S. Navy. Monterey, CA: Naval Postgraduate School. 96 p. [5]

This book contains papers by mid-to-upper level research managers in the Forest Service and Navy. The focus is on the emergence of technology and its transition into use. Individual chapters include: "Potential contribution of education to technology transfer", "Emerging innovations: consideration for implementation", and "Matching technology to customers' needs."

20. Dada, G. O. B. 1984. The Extension and Research Liaison Unit: the new organization machinery for transfer of forestry research results in Nigeria. pp. 24-30 in: *Technology Transfer in Forestry*, G. H. Moeller and D. T. Seal (eds.). Forestry Commission Bulletin No. 61. London: Her Majesty's Stationery Office. 113 p. [5, 6]

"The Extension and Research Liaison Unit acts as a link between the Forestry Research Institute of Nigeria and users. The Unit is expected to bring results of research to the state foresters, and forestry problems from state foresters back to the research institutes. Three issues that influence the effectiveness of the Extension and Research Liaison Unit in the transfer of research findings include: organizational framework; calibre of staff in the Unit; and status of the Unit within the research institute. Since the extension and research liaison concept is based on having an effective link between research and utilization, the Liaison Unit seems to be a promising method to encourage adoption of forestry research in Nigeria." (p. 24)

21. FAO. 1978. Needs for forestry research in the tropics and what international action can do to meet them. Discussion Paper, Eighth World Forestry Congress, Jakarta, 16-28 October, 1978. 20 p. [2, 6]

This paper reviews problem areas and research priorities in tropical forestry, the institutional alternatives to the organization of forestry research, strengths and weaknesses of national forestry research institutions in developing countries, and concludes with a proposed course of action for strengthening forestry research in the tropics.

22. FAO. 1984. Survey of wood energy research and development capabilities in Africa. Technical Consultation on Wood Energy Research and Development in Africa, Addis Ababa, Ethiopia, November 27-30, 1984. Paper FO: WERD/A/84/9. Rome: Food and Agriculture Organization of the United Nations. 11 p. + appendices. [1,3,5,6]

The results of mail survey of forestry research institutions in Africa are summarized. Research resources were the main focus of the questionnaire, including annual research budgets, staff, and research facilities. Principal methods of disseminating research results, current research programs, and institutional links are also summarized. Recommendations for strengthening forestry research in Africa are discussed in a concluding section.

23. FAO. 1984. Cooperation in wood energy research and development in Africa. Technical

Consultation on Wood Energy Research and Development in Africa, Addis Ababa, Ethiopia, November 27-30, 1984. Paper FO: WERD/A/84/10. Rome: Food and Agriculture Organization of the United Nations. 17 p. + appendices. [4]

"The present document explores the problems, potentials and limitations of regional cooperation. After having briefly reviewed the major difficulties and the methods used, or that could be used, to deal with them, it outlines the possible contribution of regional cooperation. It then touches on the possible nature, structure and modalities of such cooperation." (p. 1)

24. FAO. 1984. Forestry research in Asia and the Pacific Region -- a review. Report of Ad Hoc Study Group on Forestry Research. Twelfth Session, Asia-Pacific Forestry Commission, Bangkok, Thailand, 19-23 March, 1984. FO: APFC/84/4. Rome: Food and Agriculture Organization of the United Nations. 13 p. + appendices. [1, 2, 4, 6]

The status of forestry research in the Asia - Pacific region, priorities for strengthening research, the role of regional cooperation, and the role of international agencies are discussed.

25. FAO. 1985. World list of institutions engaged in forestry and forest products research. FAO Forestry Paper 62, FAO Forestry Department. Rome: Food and Agriculture Organization of the United Nations. 166 p. [6]

"The present publication is an expanded and updated version of the Provisional List of Institutions Engaged in Forestry and Forest Products Research published in 1982. . . It is hoped that the World List will facilitate contacts between research institutions and thus help to improve inter-institutional cooperation and exchange of information on research of common interest." (p. iii)

26. Government of Kenya and USAID. 1983. *Proceedings of the National Workshop on Strengthening Forestry Research in Kenya*. Nov. 1-4, 1983, Eldoret, Kenya. Government of Kenya and U.S. Agency for International Development. 294 p. + appendices. [1, 3, 6]

The purposes of this workshop were to bring together representatives of all organizations involved in forestry research in Kenya, to encourage cooperation and collaboration, and to discuss ways to increase research efficiency. A large number of papers discussing the forestry research needs and potential contributions of each organization are included, as well as papers discussing problems and opportunities for strengthening forestry research in Kenya.

27. Gregersen, Hans M. 1983. Assessment of alternative approaches to forestry research evaluation. College of Forestry, University of Minnesota, Final Report for USDA Forest Service, Project Number 23-81-17. 283 p. [1]

This study reviews the field of research evaluation. An evaluation framework is presented, followed by a discussion of research evaluation approaches from agriculture, industry, and other research sectors. Examples of forestry research evaluations are presented, and a concluding section summarizes findings and gives recommendations for future research.

28. Gregersen, Hans M. 1984. Forestry research planning and evaluation: an international comparison. pp. 157-171 in: *Policy Analysis for Forestry Development*, Vol. I. Proceedings of an International Conference held in Thessaloniki, Greece, August 27-31, 1984. International Union of Forestry Research Organizations. 520 p. [1, 2, 6]

"The approaches used in planning and evaluating forest-based research projects and programs are compared for some 117 institutions in 58 countries. While some significant differences exist between countries in terms of research

planning, management and evaluation approaches, there are also some striking similarities which exist in highly diverse countries, and between developed and developing regions as a whole." (p. 157)

29. Gregersen, Hans M. and David N. Bengston. 1986. Comparison of forestry research planning and management in IUFRO member countries. pp. 35-43 in: *Evaluation and Planning of Forestry Research*, IUFRO Proceedings, S6.06 - S6.06.01, Denver P. Burns (Compiler). General Technical Report NE-GTR-111. Broomall, PA: USDA Forest Service, Northeastern Forest Experiment Station. 156 p. [1,2,6]

Summarizes item 28 above and describes a follow-up study to examine factors associated with the effectiveness of forestry research in developing countries.

30. Gregersen, Hans, John Haygreen, Irv Holland and Dan Erkkila. 1983. Impacts of forest utilization research: an economic assessment. Final Report submitted to the USDA Forest Products Laboratory, Project No. USDA-FP-1981-0395. St. Paul, MN: College of Forestry, University of Minnesota. 97 p. + appendices. [1]

Total costs for all public sector forest utilization research (including logging and marketing research) were compared with expected benefits from seven major forest products utilization breakthroughs associated with that research. After adjusting for private sector research expenditure, rates of return to public investment were calculated. Rates of return varied between 26 and 18 percent, depending on the assumptions made.

31. Gregersen, Hans, John Haygreen and Scott Sindelar. 1986. The contribution of foreign research to the U.S. forestry research system: an exploratory study of impacts and policy issues. College of Forestry, University of Minnesota, Final Report for USDA, Cooperative State Research Service. Project Number USDA 58-3159-4-30. 51 p. [4]

"In sum, we conclude that, at least in the two cases studied, the benefits from use of foreign research are significant. We further conclude that present formal efforts to expose U.S. researchers to foreign research and researchers has been minimal and inadequate when compared to efforts undertaken in other countries and when looked at in terms of the potential benefits from increased interaction." (p. 35)

32. Groulez, J. 1972. The status of forestry research in Africa. pp. 5077-5082 in: *Proceedings of the Seventh World Forestry Congress, Vol IV*. Oct. 4-18, 1972. Buenos Aires, Argentina. [6]

This paper describes alternative institutional frameworks for the establishment of forestry research, forestry research resources in African nations, and the possibility of cooperative research efforts.

33. Haygreen, J., H. Gregersen, I. Holland and R. Stone. 1986. The economic impact of timber-utilization research. *Forest Products Journal* 36(2): 12-20. [1]

Summary of item 30 above.

34. Hobbs, S. D., J. C. Gordon, and G. W. Brown. 1983. Research and technology transfer in southwest Oregon. *Journal of Forestry* 81(8): 534-536. [5]

"A cooperative program designed to intensify research and technology transfer has developed as a result of local demand to address severe reforestation problems in southwest Oregon. The Forestry Intensified Research (FIR) Program, begun in 1978, has two distinct, interrelated phases: (1) Fundamental FIR, in which scientists conduct basic research at off-site research centers, and (2) Adaptive FIR, in which forestry specialists conduct adaptive

research and education programs as an interdisciplinary team in the problem area. Establishing the local team has done more to ensure effective technology transfer than any other single factor." (p. 534)

35. Hyde, William F. (ed.). 1983. *Economic Evaluation of Investments in Forestry Research*. Durham, NC: The Acorn Press. 106 p. [1]

This volume contains papers originally presented at a conference held at Duke University in August 1982, and includes chapters on methods for evaluating forestry research, a case study of forestry research evaluation, and issues relating to the appropriate roles of the public and private sector in forestry research. See item 38 in this bibliography.

36. Iyamabo, Dominic E. 1975. *Managing forest research in developing countries*. pp. 57-66 in: *Managing Forestry Research for Results*. Proceedings of the First Meeting of Subject Group S6.06, Management of Forestry Research, Paris, France, September 1975. IUFRO. 146 p. [3, 6]

Special problems in organizing and managing effective forestry research institutions in developing countries are discussed. Suggestions for overcoming each of these problems are outlined.

37. Iyamabo, Dominic E. 1976. *Forestry research in developing countries*. *Unasylva* 28(111): 12-17. [3, 6]

Revision of item 36 above.

38. Jolly, J. A., J. W. Creighton and P. A. George. 1978. *Technology transfer process model and annotated selected bibliography*. Naval Postgraduate School, I.D. Number NPS-54CF780901. Monterey, CA: Naval Postgraduate School. August. 72 p. [5]

"The material in the following pages is an organized analysis and presentation of the technology transfer process. The focus of the analysis is on the human interaction. A model is used as the basis of the discussion. The model provides a framework for a better understanding of the processes and concepts of technology transfer." (p. iii)

39. Jolly, J. A. and J. W. Creighton (eds.). 1975. *Technology transfer in research and development*. Naval Postgraduate School, I.D. Number NPS-55Jo75121. Proceedings of the Briefing on Technology Transfer Projects, 9 June 1975, Naval Material Command Headquarters, Wash. D.C. Monterey, CA: Naval Postgraduate School. August. 90 p. [5]

Papers in this proceedings review progress being made in understanding the processes, concepts, framework and methodology of technology transfer. Chapters specifically related to technology transfer in forestry research include: "Application research effects in the Forest Service," and "A study of research utilization in the U.S. Forest Service."

40. Kigomo, B. N. and G. M. Kinyanjui. 1984. *Forestry research, organization and technology transfer in Kenya*. p. 110 in: *Technology Transfer in Forestry*, G. H. Moeller and D. T. Seal (eds.). Forestry Commission Bulletin No. 61. London: Her Majesty's Stationery Office. 113 p. [5, 6]

This paper briefly describes forestry research in the Forest Research Department, Kenya Agricultural Research Institute. Problems encountered in the dissemination of research results are also discussed.

41. Lamichhaney, B. P. and M. Joshi. 1984. *Co-ordinating research activities in Nepal*. p. 111 in: *Technology Transfer in Forestry*, G. H. Moeller and D. T. Seal (eds.). Forestry

Commission Bulletin No. 61. London: Her Majesty's Stationery Office. 113 p. [6]

This paper very briefly describes a lack of coordination of forestry research in Nepal and resulting problems. In 1976, the Forest Research and Information Centre was created to coordinate all forestry research activities, help set research priorities, and help obtain the necessary staff and financial support for research.

42. Langdon, Steven. 1984. **Indigenous technological capability in Africa: the case of textiles and wood products in Kenya.** pp. 355-374 in: *Technological Capability in the Third World*, Martin Fransman and Kenneth King (eds.). New York: St. Martin's Press. 404 p. [1]

Indigenous technological capability (ITC) is examined in two industries in Kenya, based on field research. "Overall, the study shows that ITC has developed in both Kenyan textiles and wood manufacturing -- and has contributed to enterprise growth, profitability and external benefits in the country. But powerful impediments to policy shifts toward an overall ITC industrial strategy are also identified in Kenya, despite the evidence of how positive such shifts could be." (p. 355)

43. Lingwood, David A. 1979. **Producing usable research: the first step in dissemination.** *American Behavioral Scientist* 22(3): 339-362. [1, 5]

This paper examines the relationship between contributions to scientific and applied knowledge and those to applications, and the conditions required to maximize applied contribution. The case of U.S. Forest Service research is considered. It is concluded that several barriers exist to improving the ability to get R&D results put into use: (1) organizational support and legitimacy for applications work; (2) the difficulty of blending applications efforts into the current scientific work of researchers; and (3) the problem of how to measure applications work in evaluating and rewarding researchers.

44. Lundgren, Allen L. 1982. **Research productivity from an economic viewpoint.** pp. 256-262 in: *Increasing Forest Productivity*, Proceedings of the 1981 Convention of the Society of American Foresters. SAF Publication 82-01. [1]

Challenges involved in measuring the productivity of basic and applied research are discussed. It is concluded that the value-in-use of new knowledge produced by research must be established in order to estimate the economic productivity of research.

45. Lundgren, Allen L. 1983. **Methods for evaluating forestry research: a prospectus.** pp. 12-22 in: *Economic Evaluation of Investments in Forestry Research*, William F. Hyde (ed.). Durham, NC: The Acorn Press. 106 p. [1]

This paper outlines a research program of the USDA Forest Service to develop methods to evaluate forestry research, and reviews the research evaluation literature.

46. Lundgren, Allen L. 1986. **A brief history of forestry research evaluation in the United States.** pp. 83-96 in: *Evaluation and Planning of Forestry Research*, IUFRO Proceedings, S6.06 - S6.06.01, Denver P. Burns (Compiler). General Technical Report NE-GTR-111. Broomall, PA: USDA Forest Service, Northeastern Forest Experiment Station. 156 p. [1, 2, 3]

"The evaluation of forestry research is not new... Sporadic attempts have been made over the years to develop improved methods for evaluating forestry research projects, but these have never been widely applied or accepted. Only recently has the forestry research community supported a sustained, systematic scientific approach to evaluating forestry research." (p. 83)

47. Lundgren, Allen L. 1986. A resume of forestry research priorities in the Asia / Pacific region. Working Paper, East-West Center Environment and Policy Institute, Honolulu, Hawaii. May. 33 p. [2]

"Over the past five years priorities for forestry research in the Asia / Pacific region have been presented or developed at meetings, workshops, and conferences throughout the region. Many of these priority statements were never formally published, and copies of them are increasingly difficult to obtain. This paper summarizes a number of forestry research priority statements that date from 1981 to 1986. These summaries should be useful to people interested in planning and funding forestry research in Asia and the Pacific region." (p. 1)

48. Lundgren, Allen L., Lawrence S. Hamilton and Napoleon Vergara. 1986. Strategies for improving the effectiveness of Asia-Pacific forestry research for sustainable development. Workshop Report, Environment and Policy Institute, East-West Center, Honolulu, Hawaii. 84 p. [1, 2, 3]

Summarizes a workshop at which representatives from 21 forestry research organizations in the Asia-Pacific region met with representatives from 13 international, regional, and national donor and technical assistance organizations. Topics of discussion included new forest development initiatives in the region and their implications for forestry research; ways to improve the effectiveness of forestry research; obstacles to improving research effectiveness; and strategies for overcoming obstacles to improving research effectiveness.

49. Lundgren, Allen L., Lawrence S. Hamilton and Napoleon Vergara. 1987. Asia-Pacific forestry research. *Journal of Forestry* 85(1): 44-45. [1, 2, 3]

Summary of item 48 above.

50. Meki, C. 1984. Forest research in Zambia. p. 111 in: *Technology Transfer in Forestry*, G. H. Moeller and D. T. Seal (eds.). Forestry Commission Bulletin No. 61. London: Her Majesty's Stationery Office. 113 p. [6]

This paper briefly describes the history and organization of forestry research in Zambia and major current problems in research, including a lack of promotional opportunities for researchers and inadequate budgets.

51. Moeller, G. H. and D. T. Seal (eds.). 1984. *Technology Transfer in Forestry*. Forestry Commission Bulletin No. 61. Proceedings of a meeting of the International Union of Forestry Research Organizations, Subject Group S6.08, Edinburgh University, 25 July - Aug. 1, 1983. London: Her Majesty's Stationery Office. 113 p. [5, 6]

A collection of papers on the dissemination and application of the results of forestry research. See items 2, 5, 17, 34, 35, 42, 46, 47, 53 and 55 in this bibliography.

52. Menon, K. D. 1980. Research and development: identification of priorities for international action on forest management and reforestation. UNCTAD Paper TD / B / IPC / TIMBER / 29. Geneva, Switzerland. 23 p. [1, 2]

"An outline of a programme of research and development for forest management to support management measures aimed at countering those factors which adversely affect tropical forests is presented in this report. Priority research areas are identified and the improvement of institutional aspects needed to operate the research efficiently and speedily is also dealt with." (p. 1)

53. Mergen, Francois, Robert E. Evenson, M. Ann Judd and J. Putnam. 1985. Forestry

research: a provisional global inventory. Discussion Paper No. 503, Economic Growth Center, Yale University. May. 42 p. [1]

"This paper presents a first attempt to construct an international inventory of spending and scientist man-years devoted to forestry research. The problems inherent in collecting internationally comparable data are discussed. Country data for about 40 countries are presented and regional estimates for investment levels world wide are given. The data show consistently low levels of research investment in the developing countries and regions of the world." (taken from the abstract)

54. Moeller, G. H. 1985. Enhancing application of research results: reducing the communications gap between researchers and users of research information. In: Symposium on Forest Products Research International -- Achievements and the Future, 22-26 April 1985. Volume 7, Forestry Research Management. Organized by the National Timber Research Institute (NTRI) of the South African Council for Scientific and Industrial Research (CSIR). Pretoria, South Africa. [5]

"One of the major reasons why research is not applied is that a communications gap exists between researchers and users of research information. This paper describes some reasons why the gap exists and suggests some approaches that can be used by researchers and their organizations and by research users and their organizations to reduce the communications gap." (taken from the abstract)

55. Moeller, G. H. and E. L. Shafer. 1981. Important factors in the forestry innovation process. *Journal of Forestry* 79(1): 30-32. [5]

"Analysis of 81 innovations by scientists of the USDA Forest Service and their cooperators delineated 22 factors or elements that tended to be present in successful research. Adaptation of existing techniques or technology, pilot testing, cooperation with private industry, and acquisition of underlying theory were the four factors appearing most often." (p. 30)

56. Mohammed, H. R. S. 1984. Forest research in Sierra Leone. p. 112 in: *Technology Transfer in Forestry*, G. H. Moeller and D. T. Seal (eds.). Forestry Commission Bulletin No. 61. London: Her Majesty's Stationery Office. 113 p. [6]

"Sierra Leone is thus a good case in point where local budget limitations and lack of foreign financial sponsorship are major deterrents to progressive forest research and consequently to technology transfer in the field of forestry." (p. 112)

57. Muth, R. M. and J. C. Hendee. 1980. Technology transfer and human behavior. *Journal of Forestry* 78(3): 141-144. [5]

This paper summarizes a large amount of information on the diffusion of innovations, produced by social scientists in many fields over the past 50 years, including findings on characteristics of the innovation, communication methods, individual and group processes, and social structure. Lessons for foresters are discussed in a concluding section.

58. Ochaki, J. R. 1984. Forest research in Uganda. p. 112 in: *Technology Transfer in Forestry*, G. H. Moeller and D. T. Seal (eds.). Forestry Commission Bulletin No. 61. London: Her Majesty's Stationery Office. 113 p. [6]

This paper very briefly describes the organization of forestry research in Uganda, and the most important barriers to research, including a lack of funds, inadequate identification of priority research areas, and the need for a training

program and coordination system.

59. Oseni, A. M. 1972. Budgeting and planning of forest research in a federal country with particular reference to Nigeria. pp. 4796-4799 in: Proceedings of the Seventh World Forestry Congress, Vo. IV. Oct. 4-18, 1972. Buenos Aires, Argentina. [6]

Special problems in financing and planning forestry research in developing countries are discussed, using Nigeria as an example.

60. Pee, T. Y. 1977. Social returns from rubber research on penninsular Malaysia. Ph.D. dissertation, Michigan State University. [1]

A consumer surplus model is used to estimate the economic impact of rubber research in Malaysia. The average annual internal rate of return from this research during the period 1932 to 1973 is calculated to be 24 percent.

61. Putti, Joseph M. 1986. Problems in managing research institutions in the public sector. *Journal of the Society of Research Administrators* 17(4): 39-41. [3, 6]

This paper summarizes the results of a mail survey of the administrators of forest research institutions from Bangaldesh, China, India, Indonesia, Malaysia, Nepal, Papua New Guinea, Pakistan, Philippines, Sri Lanka, and Thailand. Problems in the management of these institutions included a lack of policy direction, poor planning, severe budget constraints, lack of appropriate methods to monitor and evaluate research, inadequate facilities and equipment, shortage of trained personnel, and inadequate incentives to attract and retain researchers.

62. Risbrudt, Christopher D. and Pamela J. Jakes (eds.). 1985. *Forestry Research Evaluation: Current Progress, Future Directions*. Proceedings of the Forestry Research Evaluation Workshop, August 20-21, 1984, St. Paul, MN. General Technical Report NC-104. St. Paul, MN: USDA Forest Service, North Central Forest Experiment Station. 140 p. [1]

A collection of papers on the economic evaluation of forestry research. Research evaluation needs and users are discussed, recent and ongoing evaluations are summarized, and important areas for future forestry research evaluation efforts are identified. See items 7 and 62 in this bibliography.

63. Romm, Jeff. 1982. A research agenda for social forestry. *The International Tree Crops Journal* 2(1): 25-59. [2, 4, 5]

Social forestry research priorities are discussed under three main headings: systems design, the economics of design and management, and the role of government. "Great emphasis is placed on the need to establish state, national and international networks of comparative and experimental social forestry projects, to be used by forest departments to determine what does and does not work in different conditions, and why; and the consequent implications for project selection, design and management." (p. 25)

64. Sharma, S. C. 1984. Research needs of forestry in India. p. 113 in: *Technology Transfer in Forestry*, G. H. Moeller and D. T. Seal (eds.). Forestry Commission Bulletin No. 61. London: Her Majesty's Stationery Office. 113 p. [2]

The following broad research priority areas are identified to support massive tree plantation programs needed to meet fuel wood requirements in India: "1. Identification of suitable species...for fuel wood, fodder and other needs of the rural community. 2. To evolve suitable nursery and plantation techniques for these species. 3. To work out silvipastoral and silviagricultural combinations to ensure maximum utilization of land. 4. To standardize seed collection and seed storage techniques, including tree improvements. 5. To determine proper harvesting age and

techniques. 6. To improve the utilization of forest produce. 7. To develop rural cottage industries. 8. To quantify indirect benefits of forests and their dissemination to rural community. 9. To evolve suitable extension methodology." (p. 113)

65. Shea, Keith R. and Les W. Carlson. 1986. **Increasing productivity of multipurpose tree species: a blueprint for action.** IUFRO Planning Workshop for Asia, July 16-28, 1984, Kandy, Sri Lanka. USDA Forest Service, unnumbered bulletin. 100 p. [2]

Summarizes a planning workshop on forest research and technology transfer attended by representatives from 12 Asian countries and 10 donor and technical assistance agencies. The intent was "to provide guidelines for research to be pursued by participating countries and their institutions involved in research and development on multipurpose tree species and particularly for the establishment of 10 regional, species-oriented networks, to donor agencies for opportunities to fund selected projects and to other international agencies for information." (p. iv)

66. Shepherd, K. R. and D. M. Griffin. 1984. **The Nepal-Australia forestry research project: a case study of research and development.** pp. 16-23 in: *Technology Transfer in Forestry*, G. H. Moeller and D. T. Seal (eds.). Forestry Commission Bulletin No. 61. London: Her Majesty's Stationery Office. 113 p. [4, 6]

"Research into social and cultural attitudes as these affect the forest, into the ecology and development of regenerated forests and into questions of land-use have been fostered by the project to supply answers raised by management. The project provides an example of close integration between applied research and development within an international context." (p. 16)

67. Sila-On, Amaret. 1978. **The transfer of technology.** *Unasyva* 30(122): 2-6. [4]

Discusses the case of a pulp and paper mill in Thailand under foreign and domestic management.

68. Tagudar, E. T. 1972. **Forest research in the wood industry in the Philippines.** pp. 4829-4832 in: *Proceedings of the Seventh World Forestry Congress, Vol. IV.* Oct. 4-18, 1972, Buenos Aires, Argentina. [6]

"Five lumber companies located in Eastern Mindanao, Philippines, realizing the importance of forest research, organized themselves into an organization called: the "eastern Mindanao Cooperative Forest Research", EMCOFOR for short. It is undertaking many applied research projects, and in addition it strives to accomplish the following: 1) allocation of more funds for forest research; 2) bring the research and executive staffs in closer contact with each other; and 3) coordination with research agencies in the Government." (p. 4832)

69. Tamolang, Francisco N. 1980. **Research and development: identification of priorities for international action on wood utilization.** UNCTAD Paper TD / B / IPC / TIMBER / 30. Geneva. 17 p. + annexes. [2]

"This report outlines a programme of research and development aimed to expand further the areas of wood utilization and to bridge the relevant gaps. In this programme, priority research areas are identified and some pertinent projects are considered for international action. The report also touches on the institutional aspects that would enhance an efficient and rational implementation of international priority research and development." (p. 1)

70. Torres, Filemon. 1985. **Networking for the generation of agroforestry technologies in Africa.** Working Paper No. 31, International Council for Research in Agroforestry, Nairobi, Kenya. 24 p. [4]

The development of four agroforestry research networks is proposed, based on major ecozones in Africa. Their objective would be to coordinate agricultural and forestry research institutions in order to achieve a more effective use of existing research capacity, and to coordinate cooperation between research institutions and international organizations providing technical and financial assistance.

71. UNCTAD. 1977. **Consideration of international measures relative to research and development on tropical timber. Preliminary report prepared by the UNCTAD Secretariat.** TD / B / IPC / TIMBER / 7. Geneva. 19 p. + annexes. [2, 3, 6]

"The aim of the present report is to identify major problems of research and development relative to tropical timber products which require sustained international action if they are to be solved." (p. 3)

72. Wadsworth, Frank H. 1968. **Public forestry research in Latin America, its status and needs. Research Paper ITF-6, Institute of Tropical Forestry, U.S. Forest Service, Rio Piedras, Puerto Rico.** 12 p. + appendices. [1, 2, 6]

"Evidence of problems confronting forestry research in Latin America led to a survey of the 16 major institutions. Their research programs were found to be broad and overlapping. Program orientation is weak. Training opportunities are too few. Regional coordination of research is needed, and these institutions appear ready for it. Stronger support of expert advisors, voluntary coordination of programs, and a series of regional training courses are suggested." (p. 1)

73. Wadsworth, Frank H. 1972. **Status of forestry research in Latin America.** pp. 5128-5131 in: *Proceedings of the Seventh World Forestry Congress, Vol. IV.* Oct. 4-18, 1972, Buenos Aires, Argentina. [1, 2, 6]

This paper summarizes the conclusions of Wadsworth (1968), and reports the findings of a follow-up study based on responses to a mail survey carried out in 1972. "The programs of most of the institutions are expanding, as are the numbers of scientific personnel dedicated to research. Nevertheless, the volume of abstracted scientific literature produced from within the region is not only far less than proportionate to the forest area by world-wide standards, but is actually falling further behind. Deficiencies include inadequacy of libraries, communications among scientists in different countries working on related problems, and professional training. The prospects for regional coordination of research programs are considered good and international assistance in personnel training is suggested." (p. 5131)

74. Wallender, Harvey W. III. 1984. **Technology transfer in the forest industries.** pp. 32-40 in: *Private Enterprise Initiatives for International Forestry Development. Proceedings of a Workshop and Commissioned Papers, November 1982, Raleigh, NC.* Jan G. Laarman and George F. Dutrow (compilers). General Technical Report WO-40. Washington, D.C.: U.S. Department of Agriculture. 78 p. [4]

"Acquisition and exploitation of effective technologies is a critical process for the development of forest products industries in developing countries. . . The following material will strive to: (1) define the overall technology (knowledge) flows into a developing country, (2) describe the major factors inhibiting developing country enterprises, (3) identify the characteristics of the U.S. supplier, and (4) suggest strategies for new assistance programs that can improve the technology transfer process to the forest products sector of developing countries." (p. 32)

75. Westgate, Robert A. 1985. **Returns to investment in forestry research: the case of containerized forest tree seedlings.** pp. 117-118 in: *Forestry Research Evaluation Current Progress, Future Directions.* Christopher D. Risbrudt and Pamela J. Jakes (eds.). General Technical Report NC-104. St. Paul, MN: USDA Forest Service, North Central Forest Experiment Station. 140 p. [1]

Summary of item 76 below.

76. Westgate, Robert A. 1986. Benefits and costs of containerized forest tree seedling research in the United States. pp. 143-152 in: *Evaluation and Planning of Forestry Research*, IUFRO Proceedings, S6.06 - S6.06.01, Denver P. Burns (Compiler). General Technical Report NE-GTR-111. Broomall, PA: USDA Forest Service, Northeastern Forest Experiment Station. 156 p. [1]

The economic impacts of research which led to the development and adoption of containerized forest tree seedlings in the United States is examined. Average internal rates of return from this line of research ranged from 37 to 111 percent, depending on several assumptions concerning research benefits and costs.

77. World Bank & FAO. 1981. Forestry research needs in developing countries -- time for a reappraisal? Paper presented at the 17th IUFRO World Congress, 6-17 September, 1981, Kyoto, Japan. 56 p. [1, 2, 3, 4]

"This paper is a summary of a study of future developing country forest research needs carried out jointly by the World Bank and FAO in early 1981. . . This shortened version reproduces, in full, chapters of the original study dealing with: Changing emphasis in forestry in developing countries and identification of research needs; Institutional strategies for strengthening forestry research in developing countries; Financial implications." (p. iii)

78. World Resources Institute. 1985. *Tropical Forests: A Call for Action*. Report of an International Task Force convened by the World Resources Institute, The World Bank, and the United Nations Development Programme. Part I: The Plan, 49 p.; Part II: Case Studies, 55 p.; Part III: Country Investment Profiles, 22 p. Washington, D.C.: World Resources Institute. [2, 3, 4]

"This Task Force initiative seeks to advance the argument for increased action against deforestation from the narrow confines of the forestry community to the wider arena of public policy. The primary audience includes political leaders and decisionmakers in national governments and development assistance agencies who can influence policies and allocation of resources to promote the conservation and sustainable development of tropical forests." (p. 1)

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- Moravcsik, Michael J. 1976. *Science Development: The Building of Science in Less Developed Countries*. Bloomington, IN: International Development Research Center, University of Indiana. 262 p.
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Index to Bibliography Entry Numbers**1. Research Capacity and Performance Evaluation**

7, 9, 11, 13, 14, 15, 16, 22, 24, 26, 27, 28, 29, 30, 33, 35, 42, 43, 44, 45, 46, 48, 49, 52, 53, 60, 62, 72, 73, 75, 76, 77

2. Research Needs Assessment

1, 5, 6, 10, 11, 12, 13, 14, 15, 16, 21, 24, 28, 29, 46, 47, 48, 49, 52, 63, 64, 65, 69, 71, 72, 73, 77, 78

3. Research and Extension Program Planning and Design

5, 11, 12, 13, 22, 26, 36, 37, 46, 48, 49, 61, 71, 77, 78

4. International Technology Transfer / External Influences

3, 12, 23, 24, 31, 63, 66, 67, 70, 74, 77, 78

5. Domestic Technology Transfer / Extension

4, 6, 8, 14, 18, 19, 20, 22, 34, 38, 39, 40, 43, 51, 54, 55, 57, 63

6. Descriptions of Research and Extension Systems

1, 2, 6, 13, 17, 20, 21, 22, 24, 25, 26, 28, 29, 32, 36, 37, 40, 41, 50, 51, 56, 58, 59, 61, 66, 68, 71, 72, 73