REVIEW OF RESEARCH ON
MULTIPURPOSE TREE SPECIES IN PAKISTAN

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The term multipurpose tree species with acronym of MPTS has been introduced in forestry literature only recently, though, the history of use of such tree species is very old. Almost all trees are multipurpose, some more so than the others. In the early fifties, the emphasis was placed on multiple use of forests for timber, fuelwood, fodder, watershed protection, water, grazing, recreation etc. Later, the idea of community forestry, social forestry and farm forestry was put forward. This was due to realization on the part of developed countries and the international donor agencies that social and economic benefits of development of state forests are not reaching small farmers in developing countries. Further, with increase in population, the pressure on natural forests was also increasing and pace of development was not fast enough to reduce it. Side by side, due to energy crisis, the demand for fuelwood was also increasing. This called for drastic changes in the aid policy of the donor countries, which could ensure development at grass-root level for individual farmers through development of his own resources. Since, trees provide numerous benefits to the farmers, hence they should be provided assistance to harness the increased benefits. This concept is now gaining ground with growing realization that farming and forestry are inter linked, which were often considered to be separate activities in the developing countries.

The role of multipurpose trees is to be considered in the context of small farmers holdings under the umbrella of community forestry, social forestry and farm forestry. Farmers have been growing trees on their farms through ages in the form of boundary planting, wood lots, single tree, etc. to meet their needs of fuelwood, fodder, timber, shade, medicines and food. Some of intangible benefits they have been drawing through growing of trees are soil moisture conservation, prevention of soil erosion through wind, improving productivity of land and reclamation of problem area e.g. saline and waterlogged land. Being illiterate, they are not in a position to articulate their views about many benefits from growing of trees. It is now the job of scientists and foresters to help them realise this situation and channelise their energies to enhance the benefits. This can only be achieved through integration of research and operational activities directed at farmers and their small land holdings.

Kandy Workshop 1984

Increasing productivity of multipurpose trees was first highlighted in a workshop held in Kandy, Sri Lanka, in July 1984 which was organized by the International Union of Forestry Research Organizations (IUFRO) under its Special Programme for Developing Countries. This workshop was the result of growing realization on the part of developed countries and international donor agencies that intensive planting of high yielding,

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multipurpose tree species can markedly reduce the pressures on natural forests and contribute to the well being of rural people throughout much of the Asian region. It was also thought that the appropriate use of MPTS on farmlands can not only help in alleviation of fuelwood shortage but would also contribute towards rehabilitation of watersheds and degraded lands, income and employment generation and reducing problems of human settlements.

In the above workshop, a detailed exercise was carried out to prepare ten years plan for development and dissemination of technology to increase productivity and usefulness of MPTS in sustainable land use systems, and to increase the income and supplement the basic needs of rural people. Seven sub-objectives with specific goals, research activities and sub-activities were defined in greater detail alongwith estimated time-frames for completing them. These were:

- To select, genetically improve and conserve MPTS
- To develop nursery establishment and tending techniques for MPTS
- To develop management systems for MPTS
- To develop protection systems for MPTS
- To develop techniques and systems for maintaining soil productivity
- To determine social, economic and environmental aspects
- To provide for institutional support and common services

The participants of the workshop also identified species of multipurpose trees of highest priority for three major climatic zones in southeast Asian region, namely, moist/wet, arid/semi-arid and mountainous zones. Top 5-6 species were selected for each zone, and highest priority research activities associated with each species were defined. Another accomplishment of the workshop was the development of 10 proposed species networks for the region. Each network pertains to a species or small group of species of highest priority. The participants proposed lead countries, participating countries, and lead and participating institutions. Potential participating international agencies and possible sources of funds were also identified.

Forestry Research Networks

Burley (1984) has discussed in detail objectives, problems and management of forestry research networks. The term “network” is commonly used in statistics, mathematics, economics and transportation. A road network refers to network of roads serving a given area, region or country. However, for the purposes of forestry and agricultural research in developing countries, a network is an informal or formal arrangement of cooperation between institutions with similar conditions and problems but without the resources to find solutions to these problems. Networking is a concept most recently accepted by development agencies and developing countries as being a cost-effective mechanism for strengthening institutional capability and increasing dissemination of research findings. More than 100 international agricultural networks are currently operating for testing of improved crop germplasm, agronomic problems, farming systems, machinery development and social-economic problems. Any one of the
international agriculture research centres develops a network of research trials in a number of countries through their research institutions or their own satellite field stations IRRI, CIMMYT, ICRI, SAT, etc. are such research centres.

On the other hand, co-operative research programmes approach has been adopted in forestry. Some of such earlier programmes are provenance trials of Norway spruce (Picea abies) and scotch pine (Pinus sylvestris) in Europe and North America and of teak and Gmelina in Asian and African countries. Nor and Tuck (1986) have also described a number of co-operative programmes of forestry research between ASEAN and other countries. It may be pointed out here that a forestry research network need not necessarily be international. A network of research trials could also be established within a country e.g. species, provenance/progeny trials, management trials established by the Pakistan Forest Institute in different parts of the country for shisham (Dalbergia sissoo), Eucalyptus camaldulensis, kikar (Acacia nilotica), chir (Pinus roxburghii) etc. (Siddiqui, 1980; Sheikh, 1981).

Forestry/Fuelwood Research and Development (F/FRED) Project

The F/FRED Project started in 1986 was the result of Kandy Workshop. In view of rapid depletion of natural forest and increased demand of fuelwood and other tree products by the farmers US AID identified forestry research as one of top four priorities. Consequently, the main objectives of the F/FRED Project are improvement of MPTS research and sharing of information through research networking between forestry research institutions and concerned scientists in the countries of southeast Asia to meet the needs of their small-scale farmers. The focus of F/FRED MPTS research networks include both biological and social questions associated with the cultivation and use of MPTS. The Project provides financial and technical assistance for network activities including defining MPTS research priorities, planning network experiments, developing training and workshops, providing logistics for network meetings and participant travel, and developing opportunities for small research grants.

The F/FRED Project has followed the recommendations of Kandy Workshop in delineation of Asian region into three climatic zones; humid/sub-humid, arid/semi-arid and mountainous zones. It has already established a network of trials of three tropical species in humid/sub-humid zone in 1987. The species are Acacia mangium, Acacia auriculiformis and Leucaena leucocephala; each with two seed sources under three management methods of lopping, pollarding and control. Research institutions in Malaysia, Thailand, Philippines and Indonesia have participated in establishment of the trials at 15 sites. Although, Pakistan does not fall in this zone, still, it was thought that these species would be of interest to us in irrigated plains. Therefore, one field trial was also established in Gwaltala, Faisalabad.

Trials for arid and semi-arid areas were planned and designed by researchers from India, Pakistan, Sri Lanka and Nepal at the F/FRED meetings in November, 1987, in Karachi and in March, 1988, in Kathmandu, Nepal. In arid zones (less than 550 mm of annual rainfall), four species will be tried in two cutting regimes. Three species, Prosopis
cineraria, Prosopis juliflora and Acacia nilotica, are network priority species. The fourth will be a local species selected by each participant. The two cutting regimes are a control and pruning. The same cutting regimes will be used in semi-arid zone (500-1200 mm of annual rainfall) experiments, and four species will also be included. Eucalyptus camaldulensis, Acacia nilotica and Dalbergia sissoo are the network priority species, and participants will select one local species. Scientists from PFI, Punjab Forestry Research Institute, PARC, Karachi University and Atomic Energy Centre, Tandojam have decided to participate in these research network trials. The entire cost of establishment from nursery to field planting would be borne by the F/FRED Project. In addition, the PFI is also collecting seed from different provenances of Dalbergia sissoo, Acacia nilotica and Prosopis cineraria on behalf of the Project.

The research networks of F/FRED project described above consist of testing of 3-4 species each with 1-2 seed sources and 2-3 treatments. These are rather simple experiments and apparently duplication of work done by the Pakistan Forest Institute over the years. However, there are a number of advantages for scientists of the Institute and other organizations to participate in these networks. Firstly, the germplasm of some local species (shisham, kikar and Prosopis) from countries of the region such as India and Nepal as well as of exotic species from other countries becomes available for local testing. The second advantage is that research data of the research trials would be shared by scientists from different countries. This would improve their knowledge. They would also be trained in conducting of data analysis of network trials.

MPTS Research Priorities

Currently, most of the research relating to growing of trees on farmlands is being done by the Pakistan Forest Institute in collaboration with other research organizations in the country under US AID Forestry Planning and Development Project and related projects. This covers both social and biological aspects of growing of multipurpose trees on the farmlands all over the country. Research progress on 32 such studies were reported in the Annual Research Review Committee meeting held in October, 1988. This along with studies carried out in earlier years has yielded large quantity of data some of which has already been published in journals, proceeding of conferences, special publications, etc. Lot of unpublished data is available. All this information has to be put in a form of package of technology which could be used by the farmers so that practical benefits of research results are derived.

The following MPTS research programme was approved in the first National MPTS Research Organizing Meeting held at the Pakistan Forest Institute in November 1987.

1. Priority species
   - Acacia nilotica
   - Dalbergia sissoo
II. Research proposals

1. Forest Genetics and tree improvement

   - Select and test superior germplasm for
     i. fast growth rate
     ii. superior stem form
     iii. salinity and water logging tolerance
     iv. frost and drought tolerance through
        (a) Species trial
        (b) Varietal/provenance/seed sources/progeny trials

   - Establishment of seed orchards
   - Investigation on seeding, seed production, seed collection, storage and germination
   - Vegetative propagation including tissue culture

2. Management and Farm Forestry

   - Optimum spacing for maximum biomass production
   - Optimum water requirement under irrigation and non-irrigated conditions
   - Management studies including coppicing, pollarding, lopping and pruning
   - Field plantation establishment techniques including preparation of site
   - Inter-cropping and interaction of trees and agricultural crops. Pattern of planting of trees would be studied as
     Fertilization study
     (i) Hedgerow intercropping (Alley cropping)
     (ii) Shelter belts and wind breaks
     (iii) As soil conservation hedges and soil improver
     (iv) Protein Bank (cut-and-carry fodder production)

   - Use of inoculants for nitrogen fixation in the nursery

3. Socio-economics

   - Tree protection from browsing and cutting
   - Methods of organizing local farmers involving them in growing trees on farmlands and on farm tree crop management
   - Determination of direct and indirect cost and benefits of producing trees on farmlands alongwith production of conventional agricultural and forage crops
Fuelwood supply and demand and marketing system

III. Collaborating institutions/units

- Pakistan Forest Institute, Peshawar
- Punjab Forestry Research Institute, Faisalabad
- Silvicultural Research Division, Peshawar
- Silvicultural Research Division, Hyderabad
- Forestry Research Unit, Balochistan, Quetta
- Forestry Research Division, Muzaffarabad, Azad Kashmir

This programme is related to few selected tree species which were considered to be important for arid and semi-arid areas in Pakistan and on which research could be started through F/FRED research network. As mentioned earlier, the arid and semi-arid research networks are expected to be established during 1989-90. The studies planned in the network would cover only two aspects, namely, comparative growth of four tree species under two management treatments. Many more studies would be needed to cover the entire programme formulated in 1988. The additional studies could be carried out in the coming years through assistance of the F/FRED Project as well as under Forestry Planning and Development and other related projects. In the meantime, the programme could also be examined and modified every year in the National MPTS Research Organizing meetings in the light of changing conditions and needs.

Literature Cited

