



REVEGETATION FOR SALINITY AND ENVIRONMENTAL MANAGEMENT IN PAKISTAN

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NATURE OF SALINITY AND OTHER ENVIRONMENTAL PROBLEMS

Pakistan is a land of much splendour. The scenery changes northwards from coastal beaches, lagoons and mangrove swamps to sandy deserts, desolate plateaus, fertile plains, dissected uplands and high mountains with beautiful valleys, snow covered peaks and eternal glaciers. This variety of landscape divides Pakistan into six major physiographic units - Northern High Mountainous Region, Hindu Kush and Western Low Mountainous Region, Potwar uplands and Salt Range, Balochistan Plateau, Indus Plain and Cholistan - Thar Desert. The whole land, excluding most of Balochistan is drained by the Indus River System. It has excellent climate and crops are grown year round in most of the country. Unfortunately, environment in Pakistan is subject to moderate to severe types of degradation in both agro and urban areas.



Physiographic map of Pakistan

*Knowing how to get to where
you want to be requires
knowing where you are now.*

Major problem in agro-environment is land degradation. Common forms of land degradation are soil erosion, soil salinization/sodication, waterlogging, soil structure deterioration, soil contamination, soil fertility depletion, surface sedimentation/burial, surface scraping/excavation and permanent soil loss. However, the salinity problem in Pakistan has been ranked highest among the factors responsible for restricting the pace of agricultural development in Indus Plain — the prime land in the country — and is certainly one that needs special attention. About six million hectares of land in Pakistan are affected by moderate to severe salinity problem of various kinds.

In general these areas have immense socio—economic problems. Crop production is very low. Livestock is underfed and malnourished. Majority of the people do not have access to education, basic health facilities, clean drinking water and other basic amenities of life. sanitation



View of salt-affected lands in Pakistan

Let the Plants Rule the Environment

system is non-existing or is sub-standard. As a result, incidence of diseases is high in both humans and livestock. Soil salinity badly affects infrastructure also. The buildings and roads crumble premature.

In urban areas environmental degradation is mainly due to pollution of traffic, industry and domestic origin and highly congested monotonous concrete buildings. Socioeconomic problems in urban areas are almost similar as mentioned before for rural areas. Afforestation or a linear planting of trees on a large scale can perhaps take care of environmental problems both in Agro and Urban environment for a variety of reasons. This might also ease socio-economic conditions to some extent. However, we are here concerned about mitigation of environmental problems.



Smoke generating vehicles in urban environment

PLANTS FOR ENVIRONMENTAL MANAGEMENT

Beneficial influence of plants (trees, shrubs and herbs) on soil and surrounding environment and human and animal life is adequately proved. They have protective, productive and aesthetic values for us. Many civilizations have disappeared because of lack of understanding for plants. Powerful empires have vanished under the stress, not of invading armies but of the reckless destruction of their vegetation and consequent degradation of land and water resources. A classical example of this process is the fall of Western Roman Empire in the first millennium B.C. A neglect of and a severe damage to the vegetation accelerated soil erosion from sloppy and valley land and its fertility was asked away and dumped into ocean. Trees are part of our heritage that contribute to a large extent to the prosperity of our nation. They are the sources of history and beauty, gift of God and friend of man. Our holy Prophet taught his followers to respect trees 15 centuries back.

The effective role played by plants in environmental protection and amelioration have been immensely appreciated and planting campaigns form an integral and effective method amongst various environmental ameliorative measures. Such planting is cheaper and lasting and is preferred to various expensive engineering methods.



Plantation refreshes the environment

The vital impact of plants on the microclimate, soil erosion and floods are known to all. Large plantation makes conditions more favorable for obtaining rainfall. The effect on microclimate moisture

Plants are precious gift of nature

regime in turns affects soil, the amount and type of plant life in different soil layers and depth of rooting. The plants reduce the force of raindrops and splashes and ultimate effect is reduced water erosion. The soils under plantations have greater porosity, encourage absorption and infiltration of water and thus help recharge aquifers. If salinized soils under vegetation tend to reduce salt concentration in the top soil because of increased infiltration and reduced capillary rise of water.



Old fashioned factories in developing countries

Dense vegetation effectively checks excessive runoff, thus it may have a market effect on the manner in which water is released from catchments and tampering the floods.



Trees are the best shelters on sunny days

Reduced sediment from catchment area under dense vegetation protects waterways and dams from silting up. Dense vegetation due to its sheltering and blanketing effect interrupt incoming and reflected light and reduces extremes of soil temperature by its canopy action and interaction of surface litter layers. Diurnal fluctuations in temperature also significantly reduce under dense plant cover. Atmospheric humidity increases in plantations due to higher evapotranspiration, reduced temperature and air movement. Plants provide shelter to both human and animal life. Global temperature is increasing because of green

house effect; CO₂ is one of the major components of green house gases. To prevent global warming, trees need to be planted in billions as they absorb CO₂.

A thick stand of vegetation controls wind erosion as the soil is protected from blowing winds mainly because of binding action of roots and reduction in wind velocity by mechanical barrier of plant canopies. Rather a dense stand of trees serves to remove and settle wind borne dust. The leaves, branches and stems acts as mechanical barriers and when dust laden wind blows into vegetation, loses much of its velocity resulting in the precipitation of much of



Trees provide fodder for animals

its dust. Depending upon the plant species, one hectare plantation has been reported to collect 36-68 tons of dust. Filtering of dust by plants remove water condensation nuclear particles and reduces fog which contain gases injurious for life.

PLANTS AS A POLLUTION SCAVENGER

Trees act as natural filters as they remove (scavenge) pollutants from the atmosphere and thus improve the air quality by absorbing hazardous gases, particles and soot from the smoke.

When plants grow in association, an eco-system develops, a new environment is created and then a plant succession / along with animal succession is initiated and in years they are in perfect balance with each others.

Plantation act as pollution sinks in two ways – as air filters and as air ventilators. Trees cause air current and eddies that help to ventilate an area that might otherwise have very still air. The forest soil with its microbes and vegetative cover also acts as

natural filters by absorbing noxious materials.

Dense stand vegetation is helpful by absorbing and reducing noise and in mitigating effects of noise. Its significance may be gauged from the fact that noise increases blood pressure, pulse rate and affects the frame of mind leading to depression and dulling of ones spirits, resulting in excessive fatigue, headaches and loss of hearing.

A dense stand of plants with its flowers and foliage is ideal for mental recreation. The continuously changing views inside a plantation divert him from the tension of daily life. In its quiet solitude, man finds peace and solace which lulls him into an inner contemplation.



A scence of road side plantation

PLANTS FOR ECONOMIC BENEFITS

Plantations are sustainable sources of raw materials necessary for a variety of industries e.g pulp or paper, panel products, match manufacture, sports goods, plywood, fiberboard, saw wood, constructional timber. Thus trees are high yielding and productive and of major economic interest. The use of fuel wood from plantings will also save huge quantity of dung which can enrich agricultural fields.

PLANTS IN ENVIRONMENTAL PLANNING

Although plants are of great economic value but, the environmental planning and implementation costs cannot be reckoned merely on economic basis. The assessment should include external cost such as damage to the environment. It should consider aesthetic effects derived from conserving environment. The Japanese law relating to pollution insists that polluter should pay for the cost of environmental protection. This would include restoration of normal environment where pollutants are deposited. This law must be adopted in Pakistan and applied to all types of agro, urban and other industrials areas. Cities, highways, and airport environs must also be heavily planted by judicious taxing to environment polluters.

Experts say more than 25% of landscape of the country should be covered with trees. In our country, it is just 4-5%. This too is mostly in the northern area. The gigantic Indus plain is intensively used for crop production. This plain do not have tree cover to ameliorate hot winds blowing form south – west to north – east and to resist cyclonic winds and flow of dust. Only few ‘Kikar’ and ‘Shishum’ trees are dotted here and there. This vast plain needs large scale planting of trees for shelterbelts, soil reclamation and other environment benefits. Our deserts are expanding because of reckless removal of vegetation for forage and fuel needs. Deforested hilly areas are unstable and contribute a lot of sediments which is silting up dams and river beds. Land sliding problems in earth quake hit areas in Pakistan would have been much less problematic, had these have been properly covered with trees. Judicious planting can help solve these problems.

Tree farming system should be properly blended with crops and livestock production. Micro-environment at farm-level has to be maintained in this way.



Trees and crops can co-exist

COMMUNITY REVEGETATION PLAN

Massive environmental problems are agro or urban in Pakistan cannot be solved unless governments work cooperatively with NGOs and communities. Local residents have a major role to play in managing and maintaining a healthy environment.

In recent years, governmental agencies, educated elite and common citizens have shown increased concern for the environmental problems and have become increasingly interested in working together for lessening the impact of environmental problems on our lives. The result is rapidly coming up Citizen Community Group (CCB) and NGOs like Environment Watch.

Revegetation plans by local communities supported by governmental departments, local governments may constitute a new approach to sustainable land use and vegetation planning. This new approach may be based on current best scientific expertise available in research institutes and motivating the community members individually or collectively.

Government departmental or local governmental responsibilities may include:

- Land use planning (via strategic plans, zoning schemes, policies, and development);
- Managing public land and vegetation (including city parks, road sides, water supply and drainage).

Traditionally, planning in Pakistan has not properly responded to predictions of population needs and the pressures of developments. Decisions made are either un-thoughtful, adhoc or totally lack in vision. Planning for development generally has not taken environmental information into account. There has been no community involvement. Local revegetation plans be agro or urban can add a new dimension to planning. Firstly, they would bring together aesthetics with current best practices for vegetation management, and integrate these into planning policy. Secondly, a revegetation plan would be developed in partnership with the community. Both of these dimensions help resolve conflicts over potential land use with acceptable results for the people and the environment.

WHAT MAY BE A COMMUNITY REVEGETATION PLAN?

A local Revegetation Plan may be a mapped and publically endorsed vision of a future landscape, providing a method of monitoring progress towards community goals. A revegetation plan would include not just maps of “would be” vegetation assets but also those areas that are most important for conservation and rehabilitation. In addition, the plan would provide useful land and vegetation management information and allows for implementation using overall planning control and policies.

Revegetation plan can be used to:

- Identify areas that need to be protected or rehabilitated
- Link conservation to economic benefits
- Link planning to land management and community education
- Reduce community conflict over development

BENEFITS OF A REVEGETATION PLAN

Revegetation plans can provide valuable information both in rural and urban areas for people, developers, planners, council staff, business, and community groups. In developing revegetation plans, governmental agencies can show leadership by taking a practical strategic approach. If Revegetation Plans can be developed through a process of wide community

consultation and deliver a long term strategy, the conflict can be diminished by community education and ownership.

LINKING VEGETATION MANAGEMENT TO ECONOMIC BENEFITS

Governments are in a difficult position having to respond to conflicting short (economic) and long (environmental) term demands from their constituents. There are ways to achieve development while minimizing the cost to the environment.

Revegetation plans in agro environments may create benefits by:

1. Identifying areas for revegetation unsuitable for traditional agriculture.
2. By avoiding drastic changes in existing cropping system and adopting gradual diversification of the system.
3. Linking environmental improvement with incentives.
4. Arranging value addition and marketing facilities for the new farm products.

Revegetation plans in urban environments may create benefits by:

1. Identifying areas suitable for commercial timber production.
2. Reducing damage to infrastructure (roads, drains, water supply etc.)
3. Improving amenity and creating a more attractive and comfortable street scope and preserving scenic quality.
4. Encouraging more creative land use, subdivisions and site design.
5. With revegetation programmes, buildings can be developed in a planned way in clusters.

COMMUNITY INVOLVEMENT

Forging community support is crucial to developing a revegetation plan. All sectors of the community including landholders, public representatives, community groups, business, schools and governments must be partners in producing the plan.



A scene of community meeting

A well-designed participation process must include a combination of community-based advisory and steering committees. A strategy for two-way communication is essential.

Most of the necessary skill and enthusiasms can usually be found in governmental agencies and the community. As the plan progresses, these skills would improve and become a lasting community asset. The Revegetation Plan process must be designed to encourage involvement of local students.

Skills that are valuable in developing a Revegetation Plan include: project planning, monitoring and evaluating, motivating people, media and public relations, identification and acquisition of funds, locating information about the environment, and facilitating group meetings and negotiations.

Community involvement helps to shape policy for greater acceptance

THE MANAGEMENT PLAN

A management strategy can be developed at a level that suits the resources and community and governmental agencies expectations. For example, at the simplest level, it should underpin broader strategic and environment plans providing regulations and guidelines; At higher levels of detail, the management package would contain individual conservation and rehabilitation strategies.

The management plan may have:

- Description of area characteristics
- Statement of significance and value
- Description of issues to be addressed
- Statement of objectives for its management

Political acceptance may be usually the final determinant of what mechanisms governments use to protect and manage environment.

AN EXAMPLE FOR COMMUNITY REVEGETATION PLAN

An elegant example of this approach is “Saline Agriculture Farmer Participatory Development Project in Pakistan”. Moreover, a local group of educated people in Faisalabad under the banner of “Environment watch” is also planning a greening and depolluting drive for the city.

Saline Agriculture development work in Pakistan began with outreach activities of Saline Agriculture scientists concerned



Training course for farmers on nursery raising

about addressing the issues of sustainability of agriculture in saline environments. The first contacts were made in Jhumra-Shahkot area. In 2002, the Pakistan Atomic Energy Commission, aiming to expand on its experience in laboratories, at field stations and some farmers' fields introduced a broader community programme under the banner of "Saline Agriculture Farmer Participatory Development Project in Pakistan" (SAFPDP) to tap into the growing awareness and concern of the wider scientific and farming communities for reduced farm incomes and land and environmental degradation in saline environments.

The mandate of SAFPD is to help identify salinity associated problems on private farms in project areas and to initiate participatory development processes leading to rehabilitation of farming communities and thus encourage farmers to ultimately solve their problems on their own by improving their perception on agro-environment and enhancing their skills, capabilities and capacities. The focus of these early Saline Agriculture Farmer Associations (SAFA) is firmly on practical ways to achieve environmental restoration while economically utilizing saline land and water resources. Pakistani farmers have good technical understanding and expertise that allow them to internalize what we share with them. We wish to see later, the same process beginning with farming communities, an independent development of Saline Agriculture Development work, when planning and development would be supervised by themselves.

The soil in Indus Basin, the prime agriculture land in Pakistan, almost all alluvial deposits laid down over thousands or millions of years, is good for growing a variety of crops but salinized recently or since ancient times on millions of hectares.

SAFPDP wish to empower SAFAs to have a positive role in salinity and environmental management.

SAFPDP project sites at Shorkot, Lodhran, Badin, Lukky Marwat and Naseerabad in all four provinces of Pakistan is an example of this process in action. Saline Agriculture Farmers feed in their experiences creating a network throughout the community. It is these networks that are going to be the heart of the project.

Farming on salt-affected land is not easy. So why do farmers cultivate crops in these extreme conditions. For many there is simply no alternate, with parcel of good land and water in very short supply. These farmers have long recognized the symptoms associated with problems at early stage and even the causes, but have been poorly equipped to deal with them. While some



SAFPD Project sites in Pakistan

farmers have migrated, several were taking their own positive action, but an efficient approach was lacking. They have been also failed to comprehend the holistic approach and widespread adoption. For farmers who understand and agree with the message, the task is just too big and complicated. Throughout the inception of the project, we ensured that farmers need measures they can adopt on their own land with existing resources. The rest technical people should do.

Sustainability and constant improvement in farm management are the lifeblood of the project.

The project concentrates on group creation, through a participatory model utilizing adult learning. SAFPD in some cases emphasize on shifting from a production model to a broader recognition of the value of environmental management. A specific monitoring and evaluation component is being built into the project to measure expansion at and around the project areas.

Success of SAFPD is linked to engaging local people in a way that is meaningful to them. The success is shifting the focus from merely on technology to people also; it's all about people outcomes and improving social capital.

SUSTAINABLE FRAMEWORK

The sustainable rural livelihood framework calls for creating a greater understanding of just what farmers' value. There is no pre-conceived / ready made package.

The farmers' key principle is that rural households do not necessarily focus exclusively on increasing crop or livestock production and incomes, rather they utilize available resources to shape strategies that allow a sustainable living.

The approach is akin to gathering together a set of tools to deal with salinity problem based on a suite of techniques derived from research programmes at NIAB and other sister organizations. Each farmer or a farming community, having identified a problem to address could then exchange ideas with the field officer to select the appropriate tool from within the complete toolbox. This approach, backed with training is likely to bring a high level of ownership towards the problems and resources to address it. It also ensures local knowledge is included in the development of solutions. The focus is not merely on technology but on people; beginning by listening to farmers as they identified problems of importance to them. Only later new technologies are introduced. Of course the field officers have a technical focus, but they also have the skill to "stand back" and "let it happen". They lead in a subtle way.

Farmers thrive on good stories and SAFPD encourages them to share their success stories with each other and visit each other's successful plantations. Learning by seeing other community groups (Saline Agriculture Farmers Associations, SAFAs) in action and through training courses, farmers are hoped to be better convinced and learn from each other through sharing successes and lessons learnt.

SAFPD is proving a success, equipping thousands of farmers with a simple and easy-to-use set of techniques.

Increasingly, “Saline Agriculture Farmers” are diversifying their cropping patterns with new crops/varieties, trees, grasses and fruit plants both for better economic returns and environmental management. Participatory nursery raising is also in progress. Logistical support for salt tolerant varieties, soil/water amendments, animal vaccines and feed blocks along with training programmes is also being provided.

Just at the outset of project activities a comprehensive training programme was organized for our field officers at NIAB. It was in-fact train the trainers exercise as these officers were expected to train the farmers on their turn. These officers by now have completed several training courses at Shorkot and Lodhran on participatory nursery raising, animal health care, grafting techniques and Plant Production technologies.

SAFPDP programmes for schools, colleges and ‘madrassa’ students have also been initiated encouraging the development of Saline Agriculture Volunteer Corps for Saline Agriculture community work. Charity organization will also be consulted to do their bit for poverty alleviation in the project areas. If some one can provide the funds for arranging farm inputs, SAFPDP would enhance its impact with technical support for the economic uplift of the poor in the project areas.

There is also some analogy between the SAFPDP model and social structures in Pakistan. Smallest SAFA groups are often based on familial ties, so working together on SAFPDP initiative was a logical extension. It may also help maintain group longevity. SAFA groups are now likely to start exert influence on a bigger level. The village level SAFAs are tied into site level SAFA. A further upward chain of influence by SAFA can be materialized by scaling up of groups to union council, tehsil council and district level governments, which are now more autonomous.

The spread of Saline Agriculture in Pakistan must be facilitated by the recognition of its value at the national level culminating in the development of Pakistan Saline Agriculture as a national initiative.

SAFA and governments working at any of these levels can work out a complimentary role for serving the farming communities. SAFA has also taken on some other community roles also, like collective purchase of farm inputs (seeds, fertilizers etc.) and other marketing arrangements.

The initial success achieved by SAFPDP is heartening suggesting that the right mix of people, technology and extension approaches can deliver genuine and lasting benefits for increased economic returns and improved environmental conditions in degraded areas.



Conclusion:

Revegetation programmes in Pakistan can be best executed by adopting participatory approaches and ensuring that such programmes can provide both economic and environmental benefits.