

Roadside planting: creating employment and economic benefits while protecting communities and the environment

Since 1997, the Government of Ethiopia has embarked on massive investment on road construction by executing the Comprehensive Road Sector Development Program (RSDP) which is now on its fourth phase. From 1997 to 2014, the government constructed around 72,971 km new additional roads of all type. Ethiopia has a vision of joining middle-income countries by 2028. To achieve this goal, the country needs to increase its road network to 201,750 km by 2028.

Road development is also a priority area in the African continent. Worldwide, it is expected that the world will need to add nearly 25 million road lane-kilometres (km) and 335,000 rail track kilometres by 2050. This huge expansion of the transport network will likely have beneficial impacts on the local economics, but it might also lead to negative effects such as erosion, flooding and dust from unpaved roads.

Research conducted in the Tigray region, Northern Ethiopia, showed that roadside communities are negatively affected by road construction in several ways. More than 500 people living by the roadside was interviewed and cited as main consequences of roads in order of importance: dust, flooding and erosion.

According to some studies, the major effects of road dust on agricultural and horticultural production are:

1. Reduced photosynthesis leading to loss of plant yield;
2. Increased pest and disease incidence causing yield losses;
3. Dust contamination reducing fruit production and vegetable attractiveness;
4. Dust hindering the pollination of small seeded fruits by insects.



Women taking part of a plantation ceremony in Ethiopia



The reduction of yield, as estimated by farmers in the study area, ranges from less than 10 percent to 50 percent. Among the households affected by road dust, the majority (55%) believe that road dust is causing 10 to 30 percent reduction of their crop production. A few (16%) even account the loss in crop production due to road dust 30 to 50 percent of their harvest.

Planting trees, shrubs and grasses alleviate these negative effects from roads on the adjacent environment. Roadside planting provides a wide array of socio-economic and ecological benefits.

The leaves of the trees have the ability to trap a large part of dust and particulate matter generated by traffic.

Moreover, roadside plantations can improve water quality by trapping sediments that would otherwise flow to adjacent land or streams. Vegetation can also increase road stability by lowering local water tables that may affect the road formation and pavement. In addition, vegetation can reduce flooding by slowing and absorbing road run-off. The table below gives an overview of the ecological and socio-economic benefits derived from roadside plantations.

The ability of a plantation to trap dust depends on a combination of tree and shrub species characteristics such as height, density and longevity. Height will influence the size of the protected area, with taller plantations protecting larger areas. Density influences the extent of downwind protection. As the trees mature, density near the ground will have to be provided by thick growing shrub species.

Ecological benefits	Socio-economic benefits
Contribution to soil formation by shedding dead leaves	Improve people's health by reducing dust
Increase water quality by reducing sediment flow	Increase yields in adjacent farmland
Reduced erosion by holding soil in place	Source of employment
Flood control: slow and absorb road run-off	Increased road stability by lowering local water tables that may affect the road formation and pavement
Wind break	Provide shade and keep the road cool for road users
Carbon dioxide sequestration	Direct benefits from trees such as timber, fuel and fruits
Defence against invasive species	
Provide important pollinator habitat	

Technical considerations

Spacing recommendations between trees, as well as between rows, varies depending on the species planted and mature crown-size. When planning a plantation next to farmland using an ox-plough, consideration should be given to leaving enough space for the ploughing maneuvers.

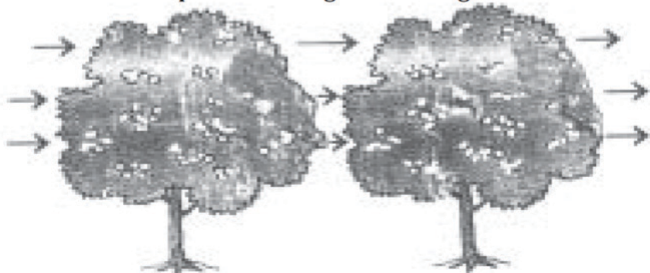
The type and location of the roadside plantation depends upon the width of the space available and the potential for management problems and safety hazards in the future. A minimum clear zone of 3 meter from the road edge is suggested for avoiding any road accidents.

To increase the filtering effects, roadside plantations must have some porosity to allow the wind pass through. The interference by trees makes the air move slower and become turbulent. This allows the vegetation to trap dust particles. Ideally, roadside plantations should be composed by a combination of grasses, shrubs and trees to trap the dust more efficiently.

Thick plantations – small filtering effects



Loose plantations – good filtering effects



A very important factor to consider when designing road side plantations is road safety. Trees can cause accidents and special mitigation measures are necessary at certain speeds to avoid them:

- 40 km/h: The impact force is unlikely to exceed human tolerances, so no specific mitigation is needed.
- 50 km/h: A minimum lateral distance from road edge of 1 m should be maintained to reduce incidental interaction between vehicles and trees.
- 60 km/h: at least 10 m beyond intersection; at least 3 m between driveway and tree; 3.6 m lateral distance from road edge; 3.6 m lateral distance from road edge for gentle curves
- 70 - 100 km/h: The impact force is highly likely to exceed human tolerances. Safety barriers are the most appropriate mitigation.

Roadside planting and employment generation

Besides providing a barrier to dust and other road side effects, road side tree planting can have a number of added advantages. Roadside tree planting is a labour intensive activity. It has the potential to provide wage employment and create productive assets for the rural poor.

Roadside planting provides opportunities for employment from nursery operations to plantation maintenance and management. For example, land preparation and planting can be carried out by unemployed people in the community who can be paid as daily labourers.

Employment generating activities from roadside planting	Type of employment
Pitting	Temporary: \pm 15 pits/person/day
Planting	Temporary: \pm 50 plants/person/day
Maintenance	Permanent 3-5 years
Preparation of fencing materials	Temporary
Nursery site	Permanent/temporary
Wood suppliers for fencing	Temporary
Transportation of fencing and other materials	Temporary

Policy recommendations

Roadside planting presents a solid solution to buffer the environmental damage from roads by trapping dust and reducing erosion, flooding and sedimentation.

When coupled with rural development programs, large implementation of roadside planting will create wage employment among the rural poor. By selecting species of commercial importance roadside plantations will create productive assets.

Special programs should be designed to target unemployed members of the community to benefit from the employment and the assets created.

With the current and projected expansion of the road network in Africa, the potential to systematically incorporate roadside planting is huge.

For larger implementation and sustainably carrying out road side tree planting activities, it is highly recommended and advisable to relate the activity to existing government and non-government development programs carried out in the rural areas.

The rural road side tree planting activities can be considered as part of the public work programs and it can thus be related for instance to the Productive Safety Net Programme.

In addition, roadside planting can be linked to private initiatives such as micro-credit organizations. Since the land adjacent to the road often belongs to the government, right to usufruct could be given to individuals or cooperatives who could then economically benefit from the plantation.



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