

Green roads: Building environmentally friendly, low maintenance rural roads through local participation

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Until 1990, Dadeldhura was totally inaccessible by vehicle and though a paved road now passes through the eastern side of the district, transportation and accessibility continue to be the critical issues especially in the western part of Dadeldhura. Over 65% of all RCIW resources in Dadeldhura district have gone into FfW rural road construction activities. Rural roads are often selected as FfW projects because they are very labour intensive and are high on the priority list of the local communities.

Eka Raj Bhatta, the Chairperson of Nawadurga VDC, describes the importance of these activities: "Rural roads are important to provide transport in our remote area. They help because it will be easier to take our agricultural products to market and to improve the economic condition of the local people. It is also important that they are built to protect the environment and to minimise landslides. In the short-term, the roads also bring opportunities for the villagers to work and to find employment."

The DDC Chairperson, Gajendra Bhadr. Shahi, discusses the importance of developing Rural Roads in Dadeldhura district, "The DDC is working with RCIW to build the linkages for access to markets, services, and government offices. Our first plan is to link all twenty VDCs in Dadeldhura. There are places like Bagarkot with lots of citrus fruit and vegetable production. The cost of carrying is higher than the cost of production. The farmers, who are 95% our population, will save money and have greater profit. The Rural Roads will save time. Now it takes all day to come here and go back to Bagarkot. In a vehicle it takes half an hour each way. The time saved can be used productively. For people in Rupal, it is impossible to carry their produce to the market. It is changing here. Eight to ten years ago there were no vegetables available here. The government has started a vegetable seed production centre. CBED is also working in this. These agencies are working together to increase production of cash crops."

Evolving the basic principles of Green Roads

The rural roads constructed through the RCIW Programme use Green Road principles that have evolved over the past twenty years. The Green Roads

approach is a road building technology that is appropriate for Nepal's fragile mountain topography that aims to be low cost, and uses manual labour to generate off-farm employment. "Green Roads could do so much throughout Nepal to improve the standard of living of local people, and not damage the environment," says Shankar Chaudari, a consultant Senior Overseer. "A Green Road costs only Rs 10-12 lakh / km to build, and the benefits go straight to the local people."

The Green Road concept aims to:

- Develop rural road and trail networks that reduce transportation costs.
- Use a participatory approach with local authorities and stakeholder communities from the preparation phase onwards, to promote a sense of local road ownership for its operation and maintenance. The beneficiaries make the decisions on the selection of the project, its alignment, labour management, group formation, and resource distribution and utilisation.
- Use environment-friendly road construction and maintenance techniques that protect the natural environment, its agricultural potential, and its natural resources against excessive erosion.
- Use locally available resources in terms of labour, material and finances.
- Generate short-term, off-farm employment opportunities especially for local people by using manual labour intensive road construction and maintenance techniques.

"The (Green Road) system (used by RCIW) now is good because it is us local people who do the work," says Dambar Singh Budhaair, a local farmer and User Committee member. "If we do equal work, then we get equal pay. The UC decides on how to divide the work. If they brought in a dozer, it could do in one hour what we do in fifteen days, but we would not earn any food. This way is better for us. If they had made the road in one year, it would probably also have washed out and we would not have had any employment. We do the work in phases, the first year we cut a one-metre path from the earth and we use the earth to fill in the low places. Then we build the dry walls and the check dams. The next year we dig out more. Each year we see whether each place on the road will be good or not. We also plant trees to help hold the soil."

Minimising environmental damage-the engineering principles of Green Roads

Preventative measures are cheaper than curative ones to reduce the risks of recurring landslides and increased soil and water erosion. Aligning the road along a ridge, especially with a south-west aspect, helps to avoid water drainage problems, avoids exposure to excess moisture and frost, and uses sunlight to keep roads dry. Phased construction, such as gradually increasing the width of the track, avoids having to manage large amounts of excavated material and allows for the natural compaction of earthwork by monsoon rains. Through a technique called mass-balancing, material that has been excavated

is used as fill or construction materials. When this is not possible, the excavated earth is carefully deposited to minimise damage to forests and fields. Maintaining the vegetation cover reduces soil erosion and bio-engineering, the planting of shrubs and trees along the edges of the road, helps to stabilise the earthen banks. The roots of the plants help anchor the soil to reduce landslips. The most commonly used plants are *Utis* (*alder*), *Berberis* (*berberry*), and *Katus* (*cactus*). *Utis* naturally recolonises bare ground after landslips or floods. Dispersed water drainage systems avoid the natural destructive forces of collected rainwater. To avoid excessive gully erosion, the road surface is given a slight outwards slope to disperse rainwater. Roads are usually closed in the monsoon to prevent damage to the road surface. Local technologies and materials are used, except for the wire to construct gabion boxes. The most common local technology is the construction of dry stone walls, without cement, to fill the roadbed. These walls are built by local labourers who are skilled at trimming and fitting the rocks. Using local construction materials makes Green Roads more economical and sustainable. Road building material such as excavated stone, chips, soil, and plants are found locally. Most of the tools are also produced locally, as are low-cost intermediate equipment such as wheelbarrows. The Heat and Cool Method is another local technology used to crack large rocks or cliff faces. Blasting is never used because it causes fractures deep in the rocks that later can lead to large landslides. A large fire is built under the rock face to heat the rock. When the workers pour cold water on the hot rock, it usually cracks, and is easier for the workers to manually break apart.

Creating ownership and employment-the social principles of Green Roads

Promoting local participation opens the way for districts and villages to become more involved in road construction and maintenance. Participatory planning processes are used through- out the planning, preparation, construction, and maintenance phases. Using labour-based construction methods generates massive local employment opportunities. The construction of a Green Road requires about 12,000 person days per kilometre. In addition, road maintenance requires about 200 300 person days per kilometre per year. The annual construction period is coordinated with the local agricultural slack season so that people are not taken away from agricultural production. Encouraging women to participate in the decision-making role of committees contributes to gender balanced community development. Women are also able to earn in the construction work, and they are paid the same as men for equal work. Children under sixteen years of age are not allowed to work on the projects. Drawing on local knowledge during the field surveys helps to identify an alignment based on traditional routes that the local people know well; they know where the soil is soft, slippery or moist and where rock falls are dangerous. Surveys apply simplified and standardised drawings and estimates. Phased construction methods adapt the road construction process to the

availability of funds, labour, and other self-help inputs, and attempts to institute a functional and sustainable maintenance system.

Compensating labourers based on the amount of work they accomplish, rather than by a fixed daily rate, creates a major incentive for work to progress quickly. Problems do sometimes arise in the distribution of the work when people want to reserve pieces of the work for themselves.

Decentralising implementation and decision-making from the initial request phase helps local communities feel ownership of the road and responsible for its maintenance. Clarification of the road ownership by the DDC, VDC, and other public institutions is important to ensure compensation for construction damage, and to develop sustainable maintenance systems. Using participatory planning exercises in the districts builds political consensus from the villages up in order to prepare the District Transport Master Plan. "Local Road Co-ordination Committees" are established to act as mechanism for resolving local disputes. The landowners who provide land for the road are compensated indirectly by higher land values following road construction. Promoting local capacity building and self-help efforts by investing in social mobilisation to build local skills and create a local "self-help" attitude. Various levels of training are provided during the construction process and trained local people become a source of local manpower for neighbouring road projects, and for later maintenance, rehabilitation, and upgrading works. Using collective financing from the central, district, and village governments and institutions creates the attitude that it is possible to build and maintain infrastructures with local resources and to generate a sense of local ownership. Public audits make people aware of how the funds are utilised by providing information on project plans, and expenditures and sustaining maintenance of the road by creating a sense of local ownership of the road from the very beginning of the construction. Local committees are encouraged to generate resources for maintenance through saving/credit groups, the sale of rice sacks, and road user fees. Some districts, such as Dadeldhura, have started committees to manage the future maintenance of roads throughout the district.

From the Perspective of the Beneficiaries-the Baghbazaar Rupal Rural Road, Bagarkhot VDC

Tek Bahadur KC, the UC Chairperson, and Prem Bahadur Sawad, the UC record-keeper, discuss the need for this rural road and the benefits they expect after its completion. "We started this road five years ago because once it is built we will not have to carry loads and it will save time to get our farm products to market. If someone is sick, we will be able to take them out to the hospital. Our work as the UC is to register the group, organise the work, and distribute the rice and cash. We have a labourers group, but have not yet formed a general beneficiaries group. Most of us can grow only 3-6 months of food in our fields, so we are working on this road. As well, it will be our road so

we should work to build it. Without this roadwork, we would go to India or the Terai for employment. If people work on this road for 3-4 months, then they usually will have enough food for the year. We will make a fund to which we contribute from our earnings from the roadwork. We will use the fund to maintain the road. We will start a maintenance committee this year. Now each vehicle pays Rs 50 for trucks and buses, or Rs 20 for smaller vehicles."

Padam Sawad has been trained to work as a local supervisor. He describes his involvement with the project, his challenges, and his hopes for the future: "This is my first year doing this work. I had two days of training from the GTZ office in Dadeldhura to learn to do this work. The GTZ people show me where we should dig the road and how much we should dig. If people do not want to work, I remind them that they can earn rice and that the road will help us in the future. My job is to show the workers what to do, to make sure that they are doing it properly and if not, to correct it, to check how many people are working and to measure the work that they have done. I earn 6 kg of rice each day and Rs 2/kg. Having learned to do this supervision work, perhaps I will be able to get employment in the future."

Kalabati Devi Budhaair, a woman worker on the road, describes her experiences: "We have done this work for three years. The first year we worked twenty days, last year four days, and this year nine days, because there are so many people who want to do this work. On this road, we earn the same as men, but we women also have to take care of the house."

It is often difficult for many of the workers to foresee the long-term benefits of the road. Others, such as Dambar Singh, are already involved with activities that will be facilitated through the construction of the road. He describes the benefits to his activities: "When the CBED project came here, they helped us to do vegetable gardens, community forests, sanitation, drinking water systems, smokeless stoves, and savings and credit groups for women and men. We are earning money from selling vegetables and fruit, and then each of us puts in Rs 25 each month to our group fund. CBED has helped us organise a co-operative where we sell the vegetables. We still carry our goods on the road, as there are not yet public vehicles on the road yet. When we carry the fruit and vegetables, there is more damage to them, but in a vehicle, we can pack them so that there is less damage. It costs Rs 120 to carry a load, and it will cost Rs 20 in a truck for that same 40 kg. Now, we are very interested to have irrigation, but we could use some help to show us how to do it and to help us with materials. We could do a lot if we had irrigation, since we are close to a market for our vegetables and we would have enough food."

Prem Singh Budhaair, a young farmer, describes how growing fruit and vegetables have improved his family's livelihood. "I have worked on the road for five years, for 20-25 days each year. We planted the citrus trees seven years ago. It took five years to have any fruit. The first year we earned Rs 4,000, the

second year Rs 10,000. Before, my father and grandfather had always had a couple of trees for our own consumption, then I planted some more. Slowly, I have learned about taking care of the trees and vegetables. At first, I learned from training at the Agricultural Office, and then I learned more from the CBED project. It has varied on how much I have sold as to how profitable this is. CBED has started a co-operative to buy and sell the vegetables. It is ok, because we do not make as big a profit, but we also do not have to sometimes take as big losses. There will be more profit once we can transport our produce by truck."

Mr. Shahi, the DDC Chairperson, discusses the long-term advantages of the Green Road concept: "with a Green Road the maintenance costs are lower and the local people can maintain it themselves. We have also started a Roads Maintenance Committee to manage the maintenance of roads here in Dadeldhura. When the district receives the HMG funds for district roads, we have decided to set aside 30% at the start for maintenance, and just use 70% for construction. We are also taking 25% from the sale of the rice sacks for the maintenance funds."