Gravity Flow: Ensuring Sustainability of Rural Water Supply and Livelihood

Sambit Kumar Garnayak

Water supply through gravity flow mechanism to rural homes, especially in tribal areas, can be regarded as a key component of rural development. It may be considered as nature's mechanism, given by nature for the benefit of rural people, where availability of energy from electricity or other sources is a problem. A simple and sustainable concept, it has successfully provided a continuous water supply to rural villages. In gravity flow, water is harnessed by estimating the flow of its pressure from the water source and storing it in a water tank from where it is supplied to all households. Gram Vikas, a rural development organization in Orissa, uses this eco- friendly technology to help the people of tribal and rural areas to generate livelihood resources and lead a life of dignity and quality.

Gravity flow is a mechanism by which water is supplied to homes without using electricity or any other form of energy such as diesel or solar pumps. The technology is cost effective, environmentally friendly and sustainable. Gram Vikas has successfully implemented this in nearly 80 villages covering over 3000 families, mainly in hilly and tribal areas of Orissa**.**

Gram Vikas is a rural development organization working with poor and marginalized rural communities since 1979. To increase the quality of life for rural communities, water and sanitation serve as a prerequisite livelihood-enabling programme. Taking water and sanitation as an entry point activity facilitates communities to lead a dignified way of life. Gram Vikas' core programme, **MANTRA** (Movement and Action Network for Transformation of Rural Areas) is a response to the abysmal quality of life prevailing in rural Orissa. The programme focuses on core values of **social inclusion, social equity, gender equity**, **sustainability and cost sharing**. These fundamental values stress the community rather than the individual and are innovative ideas for promoting **socio-eco-gender equity**, and **democratic governance** at the grass roots' level.

The problems of water and sanitation in rural areas:

Over 480 million people in India do not have access to safe drinking water. India has been ranked 133rd among 180 countries for its poor water availability (1880 cubic meters per person) by the United Nations. Lack of access to safe drinking water is a major cause of ill-health and loss of productivity. It is one of the major causes of life-threatening diseases among infants and children. Fetching water from far off places by women and girls is a burden, adding to their already long days of domestic hardship.

In cities the problem is worse. Open defecation and common bathing in ponds (for both humans and animals) is a major cause of health and hygiene problems. Toilets without water supply, makes the situation for women worse. Provision of piped water to homes and toilets lessens the burden for women and girls who fetch water from distant sources for household consumption. Water is a basic need of life to which every village has an inalienable right. More than 80% of households have no electricity connection and sanitation facilities are found in fewer than 5% of rural homes. Access is a particular constraint, especially in the central, hilly area of the state. In the 21st century, rural communities are far away from getting their most basic needs. Gram Vikas aims to ensure that all homes in rural/tribal areas have access to uninterrupted, protected piped water supply.

Rural areas have long been subject to an uneven development process where piped water supply to individual homes has never been seriously considered by the government. In a

few villages, where viable, the government provides funds for establishing water supply systems powered by electricity. However, over 90% of the tribal villages where Gram Vikas works, do not have access to electricity. Thus, availability of power to pump water and extend the supply to homes is a major constraint in rural/tribal areas.

To pump water through the use of electricity, diesel generators, diesel pumps or solar pumps in hilly and tribal areas is not cost effective or sustainable. The optimal solution is a gravity flow supply of water, by which water can be channeled into homes without using any form of mechanical/electrical energy.

Gravity flow water supply:

Water is channeled from a perennial spring, (a dug well if necessary), always using only a part of the spring's water flow. A sump is built at the source and water is diverted through pipelines (from as far as 5/6 kilometers) using the principles of gravity flow and siphoning to traverse small hills to reach an overhead water storage tank in the village and from there, to individual homes. With dug wells, the availability of water for the whole year should be ensured. The villagers take full responsibility for the maintenance of the entire water supply system, including safety of the pipeline. People contribute unskilled labour, stone and sand, while the cost of the pipeline, cement, masons etc. are sourced from outside (wherever possible, the government). Though the initial investment is high (depending on the length of pipeline and size of storage tank), the recurring costs are negligible because gravity flow eliminates the need for a pump and its associated power and maintenance costs**.**

During construction, care has to be taken that:

1. the pipes are well buried to prevent breakage;
2. the area around the source is kept clean to prevent pollution of the water and ensure the pipes are not blocked by debris;
3. the tree cover around the source of the spring is maintained for an area of approximately five acres to slow down surface-water run-off;
4. groundwater recharge is encouraged to prevent the spring from drying up**.**

Participatory Mechanism:

Consultative mechanisms need to be created at different levels to engage the community in decision-making regarding the provision and protection of the water supply and sanitation services. Communities need to be encouraged and empowered to take part effectively and independently in every stage of the decision-making process. Such a system demonstrates how local knowledge can be used to make optimal use of locally available resources. Establishment of a community-managed water supply system is a step towards decentralization and rural governance. People's participation and their decision-making at grassroots' level for the construction and maintenance of a drinking water supply system through gravity flow mechanism reduces their dependence on bureaucratic mechanism. They manage their own resources and ensure their proper utilization for the greatest benefit of the community. Participation by all, irrespective of caste, creed and sex, makes social cohesion and social capital strong and promotes gender equity at grass roots' level, which is a necessary prerequisite for democratic decentralization to be successful.

Benefits of gravity flow mechanism:

- Protected piped water is available to rural communities for 24hours a day, 365 days a year.
- Women have more time to do other income generating activities and care for their children. It provides a socio-

economic space for women and bridges all gender and social gaps.

- Safe drinking water and complete sanitation contribute to a healthier physical and social life.
- Drinking water supply and complete sanitation strengthen social inclusion, social responsibility, social capital and overall quality of life,
- Avenues for alternative livelihood opportunities are widened,
- It help in providing education to girls in rural areas,
- Nutritional inputs to all households can be ensured, so that malnutrition and malnourishment can be checked especially among underprivileged and marginalized sections of the society, particularly women and children.
- The social dignity and privacy of women can be protected,
- It helps tribal communities to protect their environment and make it clean and green for sustainable living,
- Food insecurity, which is the main problem of tribal areas, can be addressed effectively**.**
- Democratic governance and social management of natural resources at village level can be promoted.

Case study of Narayan Prasad, Jagannathprasad block, Ganjam

Narayan Prasad is a tribal village of the Ganjam district, with only 15 households. Gram Vikas works in this remote, inaccessible village. Walking is the only option in the rainy season. Tribals get 24 hours water supply through gravity flow mechanism to their homes and toilets which even people in the cities do not get. Besides using a piped water supply, they have developed kitchen gardens. These tribals are now happy and health-conscious. They get many benefits and their livelihood options have widened. The same is the case with two other villages in the project area, namely, **Khurudupali** and **Nuasahi.**

Water supply through gravity flow mechanism is a path breaking idea for regions which are hilly and inaccessible, where there is no provision of electricity or any other forms of energy. This mechanism is cost effective, clean and environment-friendly. The impact of the system has changed the way of living of many people in tribal areas where it is being implemented. The avenues for livelihood options have widened. Due to the availability of safe piped water to homes, consciousness with regard to health and hygiene has increased. By investing in the community's efforts, government and non-governmental organizations can ensure a sustainable water programme designed and maintained by the community.

If the government used this mechanism for providing water for domestic and agricultural purposes in hilly and tribal regions, where it is difficult to set up energy infrastructures, it would definitely bring smiles to the face of millions and at the same time strengthen participatory governance at grassroot level.