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LEISA INDIA

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Managing water for sustainable farming

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Address : AME Foundation
No. 204, 100 Feet Ring Road,
3rd Phase, Banashankari 2nd Block, 3rd Stage,
Bangalore - 560 085, India
Tel: +91-080- 2669 9512, +91-080- 2669 9522
Fax: +91-080- 2669 9410
E-mail: amebang@giasbg01.vsnl.net.in

LEISA India

Chief Editor : K.V.S. Prasad
Managing Editor : T.M. Radha

EDITORIAL TEAM

This issue has been compiled by T.M. Radha, K.V.S. Prasad and Poornima Kandi

ADMINISTRATION

M. Shobha Maiya

SUBSCRIPTIONS

Contact: M. Shobha Maiya

DESIGN AND LAYOUT

S Jayaraj, Chennai

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Dear Readers

There is an increasing recognition and concern that water as a scarce and vital resource needs to be carefully conserved, judiciously utilized and effectively managed. In agriculture, where water use is the highest, it is linked to food security, economic well being as well as ecological stability. Improper management of this resource also erodes the other natural resources such as soil and biodiversity. While it becomes the limiting factor in several contexts, in certain other situations, communities have to manage nature's wrath in terms of recurring floods. There are several specific traditional as well as local alternatives and communities of practice. Some of them are included in this issue.

You may be aware that we are bringing out special translated editions in Hindi, Kannada, Tamil, Telugu and Oriya with the support of our partners. They are meant for non-english speaking readers who are comfortable with the local language. You may suggest names of those groups who may be interested in them eg. Farmer clubs.who could be sent a copy. You may also visit our new website. (details on page,p.13).

Many of our readers are contributing voluntarily and we thank them for their support. Contributions are exempted under 80G of Income tax regulations. Kindly donate generously. We are also interested in prospective donors interested in supporting this movement.

The Editors

LEISA is about Low-External-Input and Sustainable Agriculture. It is about the technical and social options open to farmers who seek to improve productivity and income in an ecologically sound way. LEISA is about the optimal use of local resources and natural processes and, if necessary, the safe and efficient use of external inputs. It is about the empowerment of male and female farmers and the communities who seek to build their future on the bases of their own knowledge, skills, values, culture and institutions. LEISA is also about participatory methodologies to strengthen the capacity of farmers and other actors, to improve agriculture and adapt it to changing needs and conditions. LEISA seeks to combine indigenous and scientific knowledge and to influence policy formulation to create a conducive environment for its further development. LEISA is a concept, an approach and a political message.

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Managing water for sustainable farming

There is an increasing recognition and concern that water as a scarce and vital natural resource needs to be carefully conserved, judiciously utilized and effectively managed. The role of water in serving diverse needs, such as drinking water, agriculture, cleaning and washing is well known. Traditionally too, in some cultures, water has been associated with divinity.

In agriculture, where water use is the highest, water critically influences the food security, economic well being as well as ecological stability. Also, improper management of this resource also erodes the other natural resources such as soil and biodiversity which are so crucial for the survival of all living forms including human beings.

There is greater realization that water and poverty are linked, with those having access to water having a distinct, significant advantage. Thus, availability, access, practices of judicious use and governance of water resources is gaining importance. However, water use systems born out of technological advances enabling indiscriminate and easy use of this resource rather than conservation, greed based rather than need based use, lopsided development policies are threatening the availability of this community resource for the future. Raising temperatures, recurrent droughts and unpredictable rainfall patterns are compounding the challenge.

There is an increasing awareness on the need for harvesting and handling carefully the rain water, judicious and sustainable use of water in agriculture. This realization is not new. Traditionally, societies, for centuries, have evolved location specific practices as well as social norms to handle this precious resource. Some of them are still alive. There is conscious effort too by agencies and communities to revive and improve some of these water conservation practices, innovate, while coping with emerging situations.

On the other hand, in several other situations, abundance of water is a problem, for instance, floods. Owing to natural or man made situations, these communities struggle not only for life but also to minimize farm losses. These rural farm populations are evolving coping mechanisms to deal with recurrent disasters like floods.

Thus, in diverse contexts, for instance, mountainous regions, rain fed dry lands, flood prone regions, saline areas etc., the challenges of dealing with water have been different in terms of its management.

Water conservation, use and governance

Traditional water conservation measures are deeply interwoven with local cultures, architecture, traditions, norms and rituals. For the local populations water is both a utilitarian and a symbolic resource. Besides being used for drinking, cleaning and irrigation, water is also seen as a divinity, and plays a central role in all village rituals. Traditional structures, surrounded by cold tolerant species considered sacred are grown around water bodies to avert drought and ire of Gods in hilly region. Traditions are closely linked with local norms and institutions for governance. For instance, during festivals, local irrigation committees plan coming year's water allocation schedules while planning the new agricultural year for the village.(Nilhare Neupane, p.8).

Similarly, traditional tank management systems indicate interesting governance structures and mechanisms. The traditional management of Mudiyanur tank provides an interesting example of a system of management that ensured fair distribution of water to the land of all households, promoted respect for different roles in society, and sought to resolve conflict between different parties in as harmonious a manner as possible. The practices were found effective not only to meet the irrigation needs of the villagers but also to conserve ground water levels. (STS Reddy, p.10)

An efficient allocation system is essential when rainfall is limited. Various norms are evolved by the communities, sometimes based on the social status in the villages, sometimes even through lottery. Crop choices are made on the quantity of water available. In some areas, water allocation also depends on the type of crops cultivated, with preference given to using water for growing staple food crops of that area. As has been seen, water use is judiciously regulated, paddy varieties chosen carefully, and the method of cultivation adapted to low water availability. An additional important point is that shortages in water supplies are shared in a manner that is accepted by the community members as equitable.(p.8, p.10)

However, all these mechanism survive as long as the social norms developed over centuries are not ignored, locally sanctioned norms of dealing with common resources not replaced. The challenge today is to develop more equitable formal rules that build on existing social capital. "The irrigation system used to function properly in the past because of a strong internal cohesion and because the different groups of people understood each other very well." The social hierarchy and the informal rules and relationships ascribe different roles and responsibilities to different social groups. However, modern approaches undermine the strength of the systems. (Nilhare Neupane, p.8).

Traditional and modern governance mechanisms can co-exist. In Holland, for instance, the successful polders or reclaimed land below sea level, date back to the 12th century, when rising water levels threatened agricultural land. They are governed by Water boards, organised in a similar way as many water user committees in Asia today. They are still functioning. They do clash with the

local governance structures (such as municipalities). For example, the provinces regularly propose to take over the water boards themselves; but the water boards in turn want to take over water regulation functions from the provinces and municipalities. Inspite of these challenges, the history of the Dutch water boards shows that this is a real possibility.(Frank, p.28).

Local perceptions and situation analysis form a strong basis while evaluating what is needed to address the problems. For instance, while dealing with water and energy needs, women decided to take up tree planting as degradation of forests led to reduced groundwater recharge. The plantation and water conservation activities have led to recharge of the village spring after two months of rainfall. This small effort has had such an impact that the water availability has increased three times. (Rakesh Prasad,p.14). Experience of MITTRA is another such example which depicts communities taking charge of developing water sources and managing them well too. As a group they planned what crops to grow based on water availability. Also members agreed not to grow high water consuming crops and banned growing crops like sugarcane. (R C Kote, p.30).

There have been several location specific creative ways of harvesting rainwater and using it effectively – *Khatris, diversion based irrigation channels, jalkund* (p. 24).

People and communities living in mountainous areas often have more difficulties in accessing sufficient water. Simple technologies are evolved. Though sometimes simple, these technologies can be a great help – their application requires co-ordinated efforts among all stakeholders. (Auke, p.26). It can be passion driven communities of practice, who innovate and create alternative mechanisms, for instance, *Surangas*. Surangas are man made caves of water which work on gravitational forces requiring no external power to operate. Many farmers in the regions adjoining Karnataka and Kerala are relying on Surangas, the traditional water harvesting structures, for meeting water requirements of their crops. They strongly feel, *"If we have to resort to pump based lift- irrigation like most of the arecanut farmers of our area, we might have to say good bye to farming."* (Shree Padre p.34).

While there have been lot of investments being made in watershed development, 'doing in a big way' need not necessarily be the prerequisite nor is always efficient. Small scale watershed development is a viable way to improve degraded ecosystems, create diverse livelihood opportunities for rural people and build stable ecosystems based on the pillars of water, soil and biodiversity. (Raghavendra Rao, p.6). Similarly, the sub soil biodiversity, crucial for productive farming systems is often nurtured in maintaining humus. The water preserved by humus would be constantly available for the innumerable soil organisms available at different levels in the soil. Without increasing the soil carbon or humus content in the soil, it is very difficult to improve crop production. (Narayana Reddy, p.31).

Water abundance - management of a different kind

Local communities have always found ingenious ways to overcome adverse conditions like floods, which affect not only farming but also lives and livelihoods. Owing to climate change influences, monsoon periods and flood periods are also varying, accentuating the problem. Some of the coping and adaptive strategies being adopted by the farming communities include, choosing alternative varieties, cropping periods and preparing for disasters in terms of alternative grain and fodder storage mechanisms besides several others. (GEAG, p.19).

Also, communities have evolved alternative practices which make use of the prevalent situation. Floating agriculture is a good popular practice in the low-lying areas in the south-western parts of Bangladesh where lands remain submerged most of time in a year. Not only to cope during floods, floating agriculture is also a potential means of increasing the food production in the country. However, efforts in spreading awareness about the practice and support from the government are required in sustaining such time tested alternative practices. (Sukanta Sen, p.22).

There are many such examples of location specific adaptive capabilities of communities offering potential solutions to water conservation, judicious use of water resources as well as dealing with floods. Some examples have been presented here. There are many more. Dealing with food security, environmental degradation and climate change challenges require strong resolve of the communities and enabling environment for fostering creativity as well as joint action based on conservation rather than careless and exploitative use of resources.

Producing more with Less

SRI is based on principles of using less resources for producing more. Compared to conventional methods, paddy grown based on SRI principles requires 80-90% less seed, 40% less water. By enabling better conditions for plant growth in terms of aeration and soil health, yields have increased by 16-30% while costs of cultivation have come down in the areas AMEF has been promoting SRI.

The biggest challenge has been changing mindsets of farmers. AMEF has been successful, owing to promoting Participatory learning processes like FFS, PTD; Creating groups of trained rural farm youth; and scaling up through appropriate strategies. Beginning with 61 farmers in (2005), gradually the numbers have gone up -109 in 2007; 1867 in 2008, 7005 in 2010 across three southern states through support of DF and WWF. Also, AMEF has been successfully promoting SRI under rainfed paddy in Dharwad area, SRI principles in Ragi, Redgram, and sugarcane to a limited extent.

Source: AME Foundation, November 2010

Oases of productivity

A case of Small scale watershed development

K Raghavendra Rao

Small scale watershed development is a viable way to improve degraded ecosystems, create diverse livelihood opportunities for rural people and build stable ecosystems. Aseema trust demonstrated this on a small area of 14 acres in the tribal villages of Maharshtra.

Photo: Author

Rainwater impounded in contour trenches

The monsoons are up once again and the reports in the newspapers are familiar. Heavy rains are flooding some parts of the country and in other areas the rainfall is less than normal and forebodes lower productivity, crop loss and agricultural distress. This state of affairs need not always be the case. One can harvest the rain water and make sure that it percolates into the soil and replenishes ground water. The experience of Aseema trust in Maharashtra demonstrates this.

Aseema Educational Trust, a development organisation, has been working in parts of Maharashtra district focusing on promoting quality education to children from disadvantaged groups. With the intention of reaching children of tribal communities, it established a primary school in Awalkhed village in Nashik district, which is surrounded by six tribal hamlets. The 14-acre school campus has an open well fulfilling the drinking water needs of the communities around. However, communities faced acute drinking water shortages during summer months, even though the region received an annual average rainfall of 3000 – 3500 mm. It was therefore important to keep the well recharged at all times. Our intention was to conserve the plentiful rain water to sustain water availability for drinking as well as for irrigation purposes. The effort was also to demonstrate water conservation in the hope that the villagers could adopt these practices on their own lands.

The work was initiated in the summer of 2008. The entire plot was surveyed and a comprehensive rain-water harvesting plan was drawn up. This was done by walking around and deciding on appropriate places where run-off rainwater could be harvested. Since the topography is undulating and the hill sides are steep, contour lines were marked and trenches/ bunds were dug along them. The bunding was done starting from the ridge to the valley. This ensured that the rainwater was harvested where it fell, and the run-off, if any, did not acquire erosive force to wash the top soil away. In the valleys between the hillocks, a series of check dams were constructed to slow down the run-off water and give it a chance to percolate into the ground.

All the basic soil and moisture conservation measures (trenches and bunds and small gully plugs) were completed before the monsoon of 2008. Some portion of the work was done with the help of the villagers from the surrounding villages. Since the work was done in the summer months when their fields were fallow (as agriculture in the area is rain dependent) they got employment locally and prevented out migration.

As of now the technologies are slowly being taken up. Along with the basic work of soil and moisture conservation, bund stabilisation work - vegetative stabilisation has also taken place. Small scale plantation with nitrogen fixing species has also been done.

The crop growing has not started yet, as the Aseema Trust is busy in getting the school building completed and conducting classes for tribal children in temporary structures. Once the school building is completed, the work on creating a kitchen garden will be initiated. Also an area of about 3000 square meters has been identified where cereals (coarse millets) and pulses (red gram, green gram, black gram) can be grown.

Emerging positive results

The impact of the soil and moisture conservation work is already becoming evident as one can see water collecting in the trenches. If the trenches were not there this water would have just flowed off and been lost. Similarly, the water in the cascading gully plugs also demonstrates that small, low cost structures appropriately located, can harvest run-off rainwater which would otherwise be lost. In addition to harvesting rain-water which is a very valuable resource, the structures also prevent valuable fertile top-soil from being washed away. The idea is to make the water "walk" not "run". Holding the water in trenches encourages infiltration of

water and promotes recharge of underground aquifers. Also more moisture in the sub-surface soil regime will promote better growth of vegetation without the need for supplemental irrigation.

The larger check dams are also holding copious amounts of water. Underground stream flows have restarted - this is evident by looking into the well. Clear water flows into the well long after the rains have stopped, thus keeping water in the well at all times.

The fruit species plantation has started on a modest scale - jamun, mango, guava, sitaphal have already been planted. Lot more needs to be done - this will be taken up after the construction is complete. Similarly, greater numbers of multi-purpose and nitrogen fixing tree species will be incorporated into the ecosystem - these will provide for fodder, fertilizer (green manuring from nitrogen fixers/ leaf fall), fuel-wood, timber and fibre. As the ecosystem evolves, there will be birds, reptiles, insects, which will increase biodiversity and improve the stability and resilience of the ecosystem.

Rainwater harvesting is easily accomplished if one follows the ABC's of watershed management which are:

A: Agricultural Practices

- ploughing across the slope, to help rainwater infiltrate into the soil
- planting a diversity of crops and creating layers in the field to intercept rainfall and reduce the impact of rain on the ground
- Mulching to cover the soil and prevent evaporation
- Organic practices like composting, to improve the tilth of the soil
- Growing crops appropriate to the agro-ecological zone
- Planting more trees in agricultural ecosystems to serve multiple functions – windbreaks, nitrogen fixing, fuel wood, habitat for birds and reptiles, timber, etc.

B: Bunding

- Trenches/bunds to harvest rainwater and conserve top soil
- Contour/field bunds even on seemingly flat land to prevent water from running off.

C: Check Dams

- Made at appropriate places from ridge to valley to ensure that the water "walks" and does not run off from the hill sides.
- Vegetative stabilization is necessary on the upstream side of each check dam so that the pressure of the flowing water does not damage the new construction. Bamboo rhizomes and other grasses are excellent for this.
- Check dams can be constructed entirely from materials available at the site.
- Large check dams with spillways to drain off excess water may be placed at wider ends of large gullies.

Photo: Author

Digging of trenches along contour lines

All this has been accomplished in less than two years. As the ecosystem evolves and gets more complex, it will produce a diversity of food, fodder for livestock and serve as a habitat for birds, reptiles and insects.

Hope for the future

Small scale watershed development is a viable way to improve degraded ecosystems, create diverse livelihood opportunities for rural people and build stable ecosystems based on the pillars of water, soil and biodiversity. This demonstration disproves the GOI guidelines that a watershed area should be a minimum of 500 hectares to make an impact. At the same time, this initiative which was accomplished with the participation of the local communities will encourage people in the surrounding villages in adopting similar approaches on their lands. Similar work can be accomplished in all the vastly degraded areas of our country. With a little effort we can convert unproductive lands into oases of productivity - a mission for a greener, food and water secure India!

K Raghavendra Rao
Email: raghu_oasisfarm@hotmail.com
Mobile: 97406 19891

The role of a local committee in changing times

Irrigation management in the Himalayas

Nilhari Neupane and **Gopal Datt Bhatta**

The Trans-Himalayan region of Nepal is often referred to as the country's desert. Water is a scarce resource that has traditionally been managed through local norms and institutions. The remoteness of the region has limited the role and influence of the central government. Although the locally managed irrigation system has been running for centuries, recent developments make people wonder if this approach is sustainable in the long run.

Photo: Author

Local communities taking part in irrigation management

Mustang, in the Trans-Himalayan region of Nepal, is one of the country's most remote districts. The upper part of the district, at altitudes that start at 3,800 metres above sea level, looks like the Tibetan Plateau, with wind-eroded, rolling, yellow and grey hills. Rainfall is less than 200 mm per year, so even though farmers have sufficient land, they must keep part of it fallow due to the shortage of water. The upper Mustang area used to be headed by a local king called Jigme Palwar Bista, but since 2008 (when Nepal became a republic) his role is now chiefly ceremonial. Local people respect him, and he still plays a significant role in the distribution of water, as part of a system that builds on the local hierarchies and stratification which divides society into an upper ruling class and a lower working class.

Lomanthang is one of the many villages in this district. As in most villages, it has an irrigation committee which, in this case, consists of nine members. While the local king is its head, the committee is run by a chairman known as the Ghempo. There are two Mithue or secretaries (one of whom is appointed by the king and the other one by the Ghempo), and six Tshumies or messengers. After the King, the Ghempo is the person with the most influence, and he is the authority in issues related to irrigation and agriculture. All cases of conflicts, fights and robberies are brought to the Ghempo to adjudicate on. Ghempos are always members of the Bista family, and although they do not get a salary, they receive 25 percent of all the fines imposed.

The Mithue are next in the chain of command: only literate males are appointed to this position. Serving as secretaries to the Ghempo, the Mithue keep all the records related to the irrigation system. They also have the responsibility of managing the committee's finances. They do not get a salary for this work, but do not have to contribute any physical labour. The Ghempo also appoints a number of Tshumi who act as the supervisors of the irrigation system, and as such they have important responsibilities. They have to stay close to the canals during irrigation (even during the night), and are responsible for reporting anyone caught stealing water to the Ghempo. Similarly, if they find livestock grazing in a field with

Culture and traditions

For the local population water is both a utilitarian and a symbolic resource. Besides being used for drinking, cleaning and irrigation, water is also seen as a divinity, and plays a central role in all village rituals. Most villages have constructed a chorten near the source of water, on top of which they fly a flag. These chortens are small edifices made of stones and mud, and have different styles which reflect the local architecture. Villagers also plant various cold-tolerant species around the sources of water. These plants are considered to be sacred and are never cut. This is all done to ensure that the gods won't become angry and to avert drought.

The clearest example of how culture governs the management of water is seen during the Sakaluka festival which is celebrated on the third day of the first Tibetan month (February/March), and represents an auspicious moment to begin the agricultural activities of the new year. During this day, all villagers go to the king's fields. They plough the field, add manure, and start the agricultural season by sowing wheat seeds. Both the king and the queen take part in the festival. And then the new irrigation committee is formed, and the coming year's water allocation schedules are hammered out. The whole village is ready for a new agricultural year.

crops, their owner is also taken to the Ghempo. They are also responsible for collecting all the fines, by going door to door. While they don't get any salary for their work they do receive part of the collected fines. Being part of the committee brings them prestige, as well as giving them priority in the irrigation rota.

Water allocations and local culture

An efficient allocation system is essential when rainfall is limited. In general, the most common method in the upper Mustang region is a lottery. The Ghempo throws the dice in the presence of the Mithue, Tshumi and all the local villagers to determine the sequence for distributing water. However, the Ghempo can give priority to a specific plot regardless of the results of the lottery. Members of the committee and other upper class farmers have priority over other villagers. Water allocation also depends on the type of crops cultivated. The first priority is given to wheat and naked barley, followed by peas, buckwheat, mustard and potato. All the villagers know that wheat and barley are highly sensitive to water stress, and that yields suffer if irrigation is delayed (showing that the water allocation patterns have a scientific basis). Another reason for giving priority to these crops is that they are the main staple foods in the region, and are also used for making chhyang, a popular drink.

But the committee's roles extend beyond the allocation of water. One frequent concern is to ensure the maximum efficiency when watering plots, diverting the water to the next plot as soon as possible. In addition, the committee members need to be permanently alert in taking care of the irrigation infrastructure. The sandy soils which predominate in the region mean that the canals frequently break, and the committee needs to respond to this immediately. If there is a small breakage, the Tshumis have the responsibility of repairing it. But if they cannot, then they ask each household to contribute with labour. Those who refuse to help have to pay a fine, or run the risk of being excluded from the system altogether.

Unequal relationships

Critics of this system point out that it is based on an unequal or asymmetric relationship between the upper class villagers, who run the system, and the lower class farmers. Others argue that this is justified as farmers depend on the upper classes for food in times of scarcity, and also for loans and land. The irrigation canals were built on the initiative of the upper classes, and they still play a crucial role in the day-to-day management of the system, in terms of decision making and networking. While farmers provide the manual labour, the upper classes provide the necessary cash and infrastructure.

This mutual interdependency has kept the system functioning as an efficient way of dealing with water scarcity. According to Narendra Lama, leader of the Annapurna Conservation Area Project, the system is based on local knowledge, and because of this it works efficiently.

At the same time there are also many voices demanding that farmers get more water, that their income increases, or that roles and responsibilities within the village change, giving them a stronger voice. Irrigation projects and programmes, in Mustang and in other parts of Nepal, have tried to improve the availability of water. Running with the support of the national government or of donor organisations, they all hope to benefit farmers. But they seldom recognise the existing, locally-sanctioned norms, so they run the risk of destroying the social capital that has developed over centuries. Many studies show the crucial role that such social capital plays in the governance of common resources. It takes a long time to develop accepted rules and norms of governance for these resources, but relatively little time to erase them. A frequently mentioned example is the tank irrigation systems in southern India, which were based on social hierarchy and were the prevalent mode of irrigation before British colonial rule. When the British government implemented a new set of formal rules, it completely wiped out the existing social capital (based on the informal relationship between the ruling and the working class), and the authorities were unable to replace it and keep the irrigation system working. The challenge today is to develop more equitable formal rules that build on existing social capital.

Others recognise additional risks elsewhere. Amji Bista, the Ghempo in Lomanthang, has expressed his concerns about the future. Many young people are reluctant to follow the traditional regulations and norms, and he sees increasingly frequent violations of the irrigation norms giving rise to conflicts. "The irrigation system used to function properly in the past because of a strong internal cohesion and because the different groups of people understood each other very well." There is a general feeling that, in the past, nobody dared to violate the rules, but that this is not so anymore. These changing attitudes are partly related to the interest of the younger generation in migrating to the cities and not wishing to continue farming. More difficulties may emerge as a result of the stronger presence of the government in the area, and the increasing presence of development projects.

A balancing act

The Lomanthang irrigation system has developed over hundreds of years and is rooted in a specific political, social, cultural and economic environment. It has proved to be an efficient model for a semi-arid region. The social hierarchy and the informal rules and relationships ascribe different roles and responsibilities to different social groups. However, the changes occurring recently in Nepal are undermining the hierarchical organisation and the social capital on which this system depends. A difficult balancing act must now ensure that private and public efforts succeed in improving the livelihoods of the population, while at the same time ensuring that water continues to be available, and that farmers are able to irrigate their land.

■

Nilhari Neupane works at the Giessen University, in Germany. Gopal Datt Bhatta is with the Himalayan College of Agricultural Sciences and Technology, Purbanchal University, Kathmandu, Nepal. E-mail: bhattagopal@gmail.com

Learning from traditional social institutions

STS Reddy, NV Hiremath, Raja Mohammad and **Ashok Alur**

The traditional management of Mudiyanur tank provides an interesting example of a system of management that ensured fair distribution of water to the land of all households, promoted respect for different roles in society, and sought to resolve conflict between different parties in as harmonious a manner as possible. The practices were found effective not only to meet the irrigation needs of the villagers but also to conserve ground water levels. Much can be learned from them to build more effective and sustainable systems of community-based tank management for today.

Photo: S Jayaraj

Group discussions by village communities

Tanks of South India are potentiality best suited to recharge ground water and to extend safe drinking water to the families in the command area. In spite of this, they have lost their significance over the last few decades due to many factors such as - emphasis of the state governments on large-scale irrigation projects and well irrigation, introduction of superior water lifting technologies; take over of management of tanks by the Minor Irrigation Department, marginalisation of age-old social institutions constituted by the communities for tank management and alienation of the community for the outputs from tanks and subsequent transfer of such rights to respective departments.

Despite all the above listed causes, there are documented and reported cases of tanks such as Mudiyanur of Mulbagal taluk, which are being effectively managed by communities as a source of irrigation. Mudiyanur is part of a chain of tanks in Mulbagal taluk in Kolar district of Karnataka, serving seven other villages for irrigation purpose. The catchment area of the Mudiyanur tank comprises about 993ha.

The system of irrigation

The command area of Mudiyanur is structured in such a way that it conserves every drop of water harvested into the tank. The structure is so well designed that its efficiency in distribution of water is achieved by a good network of canals and drainage system. Water distribution is through two sluices located on either side of the tank. The canal extending from the sluice runs all along the command area, and is named *Rajakaluve*. From this canal, distributaries are drawn both vertically and horizontally. At the lowest point of the command area and at the tail end, arrangements are made to collect the drained water from the fields on either side of the command area.

Fields receiving water from the left bank canal are called *vanamu gadde* (garden land) as this portion is elevated compared to the rest of the command area. The surplus from all these portions flows to the lowest point, irrigating a few fields. This collected water is then reused for irrigation purposes. Apart from the canal used in utilising drained water, there are three other points where small bunds called *ooddu* are created to tap the surplus water flowing out of the tank along with the seepage from the fields. Water collected at each of these *ooddu* is reused for irrigation. Along with these the surplus water flowing from the dry lands around the command area and from small ponds in the vicinity of the command area is collected at the *ooddu* and used for irrigating the land at the tail end.

Complementing the good network of canals in the command area, the cultivation of crops is also efficiently planned. As the tank is located in a low rainfall region, a catch crop is planned to allow the collection of water to its potential capacity during the monsoon season. This catch crop is partially irrigated and that too for one and half a months in the later stages of the crop. The catch crop is followed by irrigated paddy only during summer months if the tank is holding water to its total potential.

Informal but recognised social institution

Mudiyanur tank which was built around 828 AD, was the exclusive property of the *Jodidars (*are those appointed by the British during colonial times to collect revenue and also administer law and order in the village) residing at Mudiyanur village. There were 56 families having rights to the *Jodidar* system and each family head took it in turn to be the head of the village, bearing the name *Patel*. As the tank was an exclusive property of *Jodidars*, the entire command area was also exclusively owned by them. The villagers

in the neighbourhood villages were hired in as tenants. After the abolition of the *Jodidar* system in 1957, the *inamathi* system in 1976 and subsequent land reforms in the 1970s of the last century, the *Jodidars* started selling their holdings within the command area to the farmers within the Mudiyanur village and other villages in the neighbourhood. Even today, about 40 per cent of the land in the command area is cultivated by tenants.

To achieve efficiency in water use, farmers dwelling in the command area of Mudiyanur tank respect the decisions of an informal institution. This informal institution whose genesis dates back to colonial times, comprises of a council of elders from all the seven villages. They make decisions on both the tank and water management.

The structure of the council of elders is two-tiered. Representatives of each caste group residing in each village constitute the first tier, and the village functionaries constitute the second tier. The council is first constituted at the village level by inviting representatives from each caste residing in the village. Normally this representative will be from the largest group and also from that which commands the largest area under cultivation.

Traditionally, the council of elders is headed by one of the *Jodidars* from Mudiyanur. Normally, it was the *Patel* who heads the council of elders constituted for the temple. Although the post of *Patel* was abolished in 1976, the son of the last Patel is recognised as the head of this council. This continuation is not challenged, although people do recognise the emergence of another capable person. Though this emerging person is not invited officially to the meetings, he is consulted on various issues pertaining to the temple and the tank.

In the case of village functionaries, the head of the office changes every year on the basis of an understanding arrived at by the families of the scheduled caste. These village functionaries include *Thooti* (village guard), *Neerganti* (the man responsible for releasing water and delivering messages) *and Talwara* (originally the personal attendant to the village head). In Mudiyanur there are four households of scheduled caste and each family takes up a different role each year. Only these four families have the right to be the *Neerganti* for the Mudiyanur tank, and to claim *inam* land (although this is independent of performance of duty as a *Neerganti)*. No other family from any other village has the right to be a *Neerganti.*

Most decisions are on the release of water for irrigation, attending to repairs required for the infrastructure for effective delivery of water and, above all, conflict resolution. Decision making with regard to water and infrastructure management are largely guided by well-established patterns of behaviour. No one is aware of the genesis of these patterns, but they are well understood and practised by each and every one related to the tank. Any deviation from the pattern is considered as a risk factor and is normally avoided.

Water management

The council of elders follow the established patterns on release of water and the consequent practises to be followed in each season.

At the end of the harvest, the *Thooti* gets 6 bundles of paddy, *Neerganti* gets 12 and *Talwara* 3 from one unit or half acre (*dala*) of land. During a good harvest, *Neerganti* may end up getting 25–35 bags (each bag of 60kg) of rice and other two get half and quarter of that. In addition, the four families of *Thooti, Neerganti* and *Talwara* have been given 16 acres of dry land and 5 acres of irrigated land.

Accordingly, during the rainy season no farmer, irrespective of the level of water stored in the tank, is allowed to draw water for raising a seedbed or puddling the field. Water is not released for irrigation purposes till the commencement of *Magge* (early summer) rainfall. By this time the crop sown would have reached earhead formation stage and irrigation will definitely boost the yield.

Water is released for irrigation after the consultative meeting of the council of elders in the first week and last week of December during which the council of elders with the assistance of the *Neergantis* and other farmers estimate whether water accumulated in the tank is sufficient for a crop or not. To estimate the sufficiency, there are indicators, which are proven to be practical over the years. According to these indicators, if the water level in the tank is up to the uppermost division marked on the exclusive stone pillar erected for the purpose of measuring the depth of water which is located closer to the sluice, or if the water level touches the horizontally laid stone slabs over the sluices then it is estimated as sufficient to raise a crop of paddy. If the level is far below the set pattern then no crop is raised and water will not be released for irrigation. If the level of water is just few feet lower than the marks for the full tank, then the opinion of the *Neerganti* is sought. If the *Neerganti* expresses his confidence on the water stored in the tank to help in raising a crop, then the council decides to release water for irrigation. Based on these estimations, the dates for the release of water are decided. Normally, it is the *Neerganti* who will advise the council of elders on the exact day for release of water. This suggestion of *Neerganti* is essential, as he has to attend to the repairs and maintenance of canals before the release of water.

Using water efficiently

Farmers mainly grow traditional varieties of paddy using customised seeds during the *Kharif* season. Direct sowing or broadcasting of seeds is carried out during mid-June as soon as the monsoon sets in. The soil, being clay loam, holds lot of moisture. The tank sluices are not opened until the end of July, at the time of weeding. This saves nearly 30% of the tank water. In former times (fifteen years or so), if the tank overflowed before June or if the storage reached the optimum level, farmers would transplant the seedlings. Over the years, farmers have experienced water shortages even after the tank filled up in June. Hence they have resorted to direct sowing which better suits the water scarce situation. More over, it is very difficult to cultivate other crops in this stretch during *Kharif*, since the clay loam soils can quickly become waterlogged if there is a sudden outburst of rains.

During the summer, there is no restriction on the variety to be grown and individual preferences of farmers are honoured.

Photo: S Jayaraj

Disscussions with local Neerganti

However, the preference is for short-term varieties as they reduce the risk of shortages at the end of the season and the chances of losing a crop due to stray cattle grazing, if the duration is beyond the cropping season.

Of late, farmers have started experiencing water shortages for growing paddy in *Rabi* season (summer crop) even with the tank overflowing in the month of December. Consequently, better wisdom prevailed on the farmers and from last year the council of elders arrived at a conclusion to irrigate only part of the command area. i.e., 80 acres out of the total 240 acres. The command area was divided into three divisions of 80 acres and in the first year, the first division was irrigated during summer. In the second year the second division was taken up for irrigation and in the third year the last division was taken up for cultivation. It is reported that all farmers in the command area have accepted this change.

Maintenance of structures

Basic infrastructure for the delivery of water in the command area is regarded as the property to be managed by the council of elders and the rest, including sluices, bunds and other structures in the catchments are not regarded as the properties to be managed by the council. With such options the council of elders seek the opinion of *Neerganti* in the maintenance and management of these properties. Based on the suggestions of *Neergantis,* the council advises the farmers to attend to the repairs of the tank infrastructures.

Structures that require repairs are the sluices and the delivery canals. As the sluices are built of stone pillars, no repairs are required. But to tap every drop of water in the tank, silt accumulated around the sluice has to be removed. Normally this will be accomplished by the concerned *Neerganti.* If the canal has to be drawn from the point where water is accumulated within the bed, then the farmers receiving water from considered sluice will be summoned to make a canal.

Farmers attend to the major canals and distributaries on a regular basis. Works in these canals are attended to only if the *Neerganti* summons all the farmers served by the canal. Farmers are summoned for two kinds of activities. Firstly, to remove weed and desilt the canals regularly in each season prior to the release of water, secondly, to attend to major repairs like breach in the canal or strengthening the canal bund with additional reinforcement, etc. To attend to regular weeding and desilting during each season, through informal consultations, the *Neerganti* collects the opinion of several farmers, especially those who hold land on a large scale, and fixes the day for weeding and desilting. Normally, the day fixed will be a Monday - as no farmers engage animals for any activity in the field on that day as a custom. All canals are weeded out and desilted in each season from top to bottom with the collective participation of all the farmers served by that canal. If the work remains incomplete, farmers could be summoned on the next day or on the following Monday.

A person failing to participate in the desilting and weeding activities without prior permission is liable for punishment. Punishments are decided by the council of elders based on the complaint filed by the *Neerganti* identified for the respective canal. The council of elders has the right to stop the supply of water to the fields of the offender. In some cases, release of water may be delayed in order to exact a change in behaviour, although

the extreme step of cutting off irrigation supply entirely is not generally exercised.

Water management challenges in current times

The water availability in the tanks has reduced over the years for various reasons. Also there are changes in social norms. The council of elders themselves note that there are many changes in the villages, and that these changes pose a major challenge to them. According to them, such changes include an increasing number of absentee landlords, the emergence of new leaders, external political influences, and government institutions themselves.

Mudiyanur tank, an example of strong traditional system is gradually dying out. Even with an understanding that the system is very well related to the status of the catchments, the institutional structure is not able to address the issues of the catchment effectively. The council of elders has not taken up the issue of changes in the land use pattern or the diversion of runoff from the tank. Though admitting the tank is the lifeline of the poor villagers around the tank, the present system has totally failed to check silting of the tank. Though the government agencies have taken appropriate steps to provide drinking water facilities, the problem of declining ground water and consequent impact on the availability of water are addressed neither by these agencies nor by the council of elders.

However, many lessons can be learnt from this traditional social institution. The management of Mudiyanur tank provides an example of a still-functioning traditional system of decision-making, a system that was common in the area in earlier times but which is to be found less and less. Whilst the system has flaws – and may be particularly criticised for the lack of participation of women and the manner in which roles are caste-determined – it can nevertheless provide interesting lessons. Building on and enhancing traditional systems of management are often more effective than introducing completely new mechanisms.

Understanding the traditional system provides an insight into the tank as a natural resource that is the focus of a social system. The tank at Mudiyanur, and other tanks in the chain are particularly useful to the poor as a means of sustaining livelihoods. In a drought prone region, the availability of water for production purposes is crucial for crop irrigation, for livestock, for bathing and washing clothes. Having access to tank water means that the poor can avoid situations of seeking favours from the rich farmers owning wells. Women's domestic drudgery, in particular, is reduced if they have ready access to water.

The way in which water shortages are shared not only in Mudiyanur, but also in the tanks of Mandikal, Kothamangala, etc, provides insight on how farmers tailor paddy cultivation to short and uncertain water supplies. As has been seen, water use is judiciously regulated, paddy varieties chosen carefully, and the method of cultivation adapted to low water availability. An additional important point is that shortages in water supplies are shared in a manner that is accepted by the community members as equitable.

Since seven villages share the Mudiyanur tank, they provide an example of the management of a resource used by more than one community. The formation of the council of elders at different levels and the power shared by each council at each level may provide insights in developing a system for the management of a resource owned or used by many communities. The council at each level being responsible to its members is also an example of decentralisation of power.

This article is an extract of the original publication Intercooperation in India (2005) Tradition meeting modernity: A case study on the management of Mudiyanur tank, Kolar District, Karnataka Working Paper 2 Intercooperation Delegation, Hyderabad, India. 33 pp.

Communities revive traditional water springs

Rakesh Prasad

Women of Bajeena village are taking active role in managing water resources. With TERI's support, besides their access to drinking water being improved, communities feel that the people's knowledge and skill levels in managing water resources has been enhanced.

Photo: Author

Water source in Bajeena village.

Traditional springs, called naulas, are the main source of drinking water in Bajeena, a village in Almora district in Uttarakhand. The continuous felling of trees and other different reasons have had a major impact on the availability of drinking water in the region. The discharge of naula has not been sufficient to meet the village water demand. The degrading forest eco-system had led to increase surface run off and reduced water recharge. With no possibilities of irrigation, around 90% of the households in the village have been dependant on rainfed agriculture. Migration is a common phenomenon, as the crop productivity is low and there are no alternative income generating sources.

To address this situation, TERI in collaboration with HOPE, an NGO systematically studied the situation of the region. It found that women had enormous knowledge on water management issues. Based on the study results, a water conservation programme was designed in such a way that it facilitated women participation. The programme was implemented in several villages.

Understanding the community needs

With the help of local NGO, key informants were identified and some basic information about the village was collected. Meetings were held with the key personnel from the village. The village level rural development activities and possible programme were discussed with them. A few more meetings helped in establishing rapport with the important people in the community.

Subsequent meetings were organised with all the villagers. Women and men attended and took part in discussion. Women raised the day to day energy and water issues. Keeping these points in mind it was decided to address the issue of energy and water by facilitating the locally available technology with the local support. Lots of suggestions from the participants were discussed in detail for future action.

Women had different perceptions on energy and water situation (see box on p.15). Women felt that earlier the forest was close to the village and they could fetch fuel wood easily. But now the forest is degrading and they have to travel 3 km uphill to collect fuel wood. According to them, depletion of forests is also a cause for the reducing water discharge from the water springs. Depleting underground water sources is presently able to cater 15 to 25% of the water requirement.

Mobilising communities

Men and women with leadership qualities were identified for facilitating community mobilisation. One woman and one man were selected as a key persons to sensitize communities about the project. Contact was established with each household in the village by door to door visit by the project team.

Women's perceptions on water and energy situation at village level

Parameter	Situation
Ground water	Depleting
Availability of surface water	Low
Forest cover in the forest land	Reducing
Soil productivity	Reduced
Drinking water sources in the village	Inadequate
Irrigation water	Inadequate
Availability of fuel wood	Decrease
Crop production	Reduced

Before the intervention process, support was sought from the village level institutions like the village Panchayat, forest Panchayat, youth groups and cooperative societies. As local institutions like the Panchayat were playing a key role in village level development programmes, it was considered necessary to involve them in the project. Intensive dialogues and interactions took place with the panchayat members to know their strength and possible collaboration under the project. The panchayat members were also guided to realise the needs and priorities of different households for different types of energy and water resources and technology.

Village level community meetings were organized at the time convenient to most of the people, especially the women. Efforts were made to ensure participation of atleast one member from each household. These meetings enabled understanding the view of the community regarding the energy and water related situation, their interest in participation, cost sharing and choice of technology.

Group discussions were organized to analyse the situation in terms of the status of natural resources and the knowledge and perception of the women on its use. A number of meetings were organized to create awareness among women on the water and energy situation, natural resource management practices and importance of self help mechanisms in addressing these problems. The women were informed about the potential of income generating activities and renewable energy resources. Specific skill based trainings were organized both on technical as well as managerial aspects. The project facilitated in building linkages.

Implementation

A detailed study was carried with a group of experts to suggest the possible interventions to improve the situation. Visits were also made to different locations of possible sites to understand the ground water situation in the village. The site of naula was visited to explore the possibility of reviving them. On visiting the sites it was found that the water level had depleted owing to factors like open barren land above the water source. The experts observed that the slope of the land was more than 40 degrees and 90% of the forest land was degraded. This implied that tree plantation had to be taken up as one of the interventions to improve water situation.

The village community decided to take up plantation in the forest area during the monsoon months. While the village Pradhan had the overall responsibility of programme implementation, a committee was formed to help in planning, implementation, supervision, operation and maintenance of the programme. Committee members were trained in technical as well as management aspects.

Villagers also agreed to contribute to the activities, each household paying around Rs.200. During monsoon, *Van Panchayat* forest and barren land were taken for plantation and about 14 water harvesting structures and water recharging ponds were constructed on the upper location of the spring. Community members also constructed improved chulhas to reduce the use of firewood and smoke from the kitchens.

Photo: Author

Water conservation measures

Impact

The plantation and water conservation activities have led to recharge of the village spring after two months of rainfall. This small effort has had such an impact that the water availability has increased three times. The visual impact can be very well seen in the village. Access to drinking water has improved. Above all, the communities feel that there has been an improvement in the knowledge and skill levels of the inhabitants due to the capacity building activities of the project.

This effort is well acclaimed at the local level. The local newspapers too carried a story on this initiative of TERI - though small but with a great impact.

Acknowledgement

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Rakesh Prasad
TERI (The Energy & Resources Institute)
IHC, Lodhi Road,
New Delhi 11003
E-mail: rakeshp@teri.res.in

Land grabs are cheap deals for rich countries

Based in Oakland, California, the Oakland Institute is a policy think tank with a mission to increase public participation and promote open debate on important social, economic and environmental issues. It aims to stimulate public discussion and debate and to "reframe the basic terms on which public debate takes place". Anuradha Mittal established the institute in 2004 and is now its executive director.

Anuradha Mittal established the Oakland Institute in 2004 and is now its executive director. As a native of India living in the United States, Anuradha Mittal finds that it is useful to be in "the belly of the beast", building an international chamber for progressive ideas and helping influence policy. She stirred up a heated debate with "(Mis)Investment in agriculture", published last April by her institute.

Why this publication on the role of the World Bank in global land grabs?

Access to natural resources such as water, land and seeds, is of utmost importance for small-scale farmers. The sharp rise in food prices in 2008 and the financial crisis gave rise to an unprecedented increase in hunger, resulting in renewed calls for investment in agriculture. But indiscriminate foreign investment in land has resulted in land grabbing – the purchase or lease of vast tracts of land in poor, developing, countries.

In recent years food-insecure nations and private investors have acquired nearly 50 million hectares of farmland. The impact of this global phenomenon on small farmers is huge and negative, as they lose access to, and control over, natural resources. Our report provides evidence of the key role that the World Bank Group has played in land grabbing.

The International Financial Corporation has actually increased the ability of foreign investors to acquire land in developing country markets by promoting profitable deals, creating "investment promotion agencies" and rewriting national laws. As a result, fertile land has been offered, or given away, to investors at ridiculously low prices, especially in Africa. In promoting land investments, the World Bank has overlooked the urgent problem of hunger that persists in client countries, and lost sight of its main mission, which is to alleviate poverty.

We felt that it was extremely important to highlight the role of multilateral investment and financial agencies in facilitating this trend so they can be held accountable.

And what has been the reaction of the international audience?

We have been successful in getting our message heard. While the media has helped highlight the trend and impact of land grabs, our report is unique in that it shows that it's not just China or Saudi Arabia creating this trend, but international agencies are involved as well in promoting it as a development paradigm.

The report is now being used by campaigners who work on international financial institutions. Usually, civil society tends to focus on projects by the World Bank, but this time we're looking at the broader provision of technical advice, which is a growing field in the World Bank's portfolio. The performance standards of IFC are under review as well. So our report came out at a perfect time and is helping question the application of performance standards to the advisory services of the IFC.

In the Philippines and Laos, for instance, groups are questioning what the performance standards imply when there is so much devastation in their countries caused by the so-called investment advisory services. They are demanding that the mandate to end poverty should be applied to all services of agencies such as the IFC.

Can you give me an idea of how important the problem of land grabbing is for smallscale farmers compared to water, climate change, global pricing and competition?

Seventy-five percent of the world's poor are smallscale farmers. We have an agricultural system which is upside down and backwards, which has replaced diversity with monocultures and self-sufficiency with increased dependency on markets. It has

created the myth of cheap food, without taking into account the destruction of the environment and the livelihoods of small scale farmers, for whom access to land is a matter of life and death. Some of the land deals involve the best agricultural land, not degraded soils. Land grabs also raise concerns in terms of climate change. These deals are about creating large monoculture farms, where the work is done by machines.

Scientific assessments have already shown the large social and environmental footprint of agriculture, including its contribution to climate change and the degradation of natural resources: the loss of habitats and biodiversity, and increased water scarcity. Take the case of the Addax Bioenergy project in Sierra Leone, where cassava and sugarcane are grown, with an enormous amount of pesticides and chemicals, to produce ethanol for Europe. This does not meet the food needs of local people. The company does not employ many local people and when their lease expires, in 99 years, they will leave a barren land with loads of chemicals. Industrial farming is a recipe for disaster when it comes to climate change.

So is foreign investment a recipe for disaster too?

We are not against foreign investment, but you have to question who benefits. In the foreword to our report, Howard Buffett, the eldest son of billionaire Warren Buffett, tells of a deal that he was offered by a government prepared to provide 70 percent of the financing and all utilities, a 98 year lease requiring no payment in the first 4 years, and all this at the cost of US$ 2.91 per acre per year. This is not investment; it's exploitation, depleting the resources of third world countries. If the World Bank is advising governments of poor nations to provide these schemes for the rich, why can't they be advised to support smallholder farmers to grow food on their fields for their families and communities?

Don't you believe in the good intentions and corporate responsibility of large companies?

The Oakland Institute is not in the business of judging big corporations, but we do believe it is important to question why foreign investors take precedence in land acquisition in poor countries where so many people lack land rights.

If land can be found to provide ethanol for Europe, why can't measures be taken to deal with food insecurity among local communities? Is there any evidence that land deals are transparent or democratic? And, even with a brilliant code of conduct, what kind of measures will be taken to minimise environmental and social damage? None of these questions have been answered by any of those involved. And these same questions apply to contract farming. What is grown? For whom? And how?

For us, it is important that the benefits first accrue to the local population. Africa has been repeatedly colonised and exploited. This is not a new trend. There is 400 years of history!

The IFC plays an ambiguous role. What does this say about the World Bank as an institution?

Don't get me started. I think it shows that an agency which at the time of the food price spikes committed itself to putting in place policies to mitigate hunger and improve food security, is just doing the opposite. The policies promoted by the World Bank over the past 20-30 years have in fact undermined food insecurity in developing countries.

Net food exporters have turned into net food importers. And now there is talk about the vast amounts of unused arable land in Africa: but what is this unused land? Is it the corridors that pastoralists need for moving? Is it the land left fallow for conservation? Or is it the 800,000 hectares of prime land in Ethiopia, where the government owns all the land and where they can decide to lease it?

It's astonishing that promoting investment in developing countries is done by ranking countries on the basis of labour laws: if labour is paid well, the country gets a low ranking. But a country with a corrupt government, where workers' rights and environmental standards are not respected, gets a good business ranking, because business is conducted easily. That's not the world we want to live in!

Your report says that the IFC should be held accountable when its advice leads to land grabbing. How can this be realised?

There are several ways in which this could be done. One is through the Compliance Advisor Ombudsman of the IFC, an independent accountability mechanism. They have done a brilliant job in the past. For example, the Ombudsman investigated community complains about palm-oil plantations in Indonesia funded by IFC, and this led to all funding for palm-oil plantations by the entire World Bank Group being suspended. So we are asking for an investigation into the advisory services of the IFC.

The World Bank Group states that its mission is to end poverty, so let's question their role in causing poverty. Our publication has mobilised a lot of civil society groups. We have put the agencies on alert, and the most beautiful thing is that grassroots communities around the world are questioning the IFC during the consultations about technical advisory services and performance standards. It's almost like dragging Dracula into the sunlight. People have always been focused on projects, and suddenly the entire portfolio of giving advice to developing countries is being questioned.

"The voices of smallholder farmers are the most important when talking about feeding the world in 2050"

What can be done to stop land grabbing?

When the first reports came out, FAO and other UN and World Bank agencies expressed their outrage. But they soon changed their tone and started talking about concerns that can be turned into opportunities. I think we must question this whole jump into creating "win-win situations" and a code of conduct. We also need to question the role of private investors and other agencies.

Non-agricultural actors and hedge funds are getting into the business, because they see that there is money to be made. We need to talk about these cases, in terms of what is really happening and the implications for local people, and not dress it up as a win-win situation.

FAO should hold sessions in Ethiopia and Sierra Leone and ensure that the concerns of the local population are being heard, to make sure that all the projects provide detailed and accurate information to local communities and get their free and prior informed consent. And, of course, we should provide support to movements for land rights.

Grassroots organisations are struggling for land, people are dying for it. But what is even more important, is that poor nations get the space to draw up and implement policies that benefit their own people. Governments have a role to play in this, although we cannot ignore the fact that African governments often lack the means to play that role. That's what the IMF's structural adjustment programmes have caused. Many corrupt regimes have been supported by western powers.

And how can smallholders be supported to play their role?

It's very important, whether we are civil society, donors or academics, to acknowledge that the voices of smallholder farmers are the most important when talking about feeding the world in 2050. It's incredible how the voices of poor farmers are left out. Instead of designing plans to feed the world in Geneva, Brussels, Washington DC or Seattle (in case of the Gates Foundation), the solutions have to come from farmers' groups themselves. The questions and solutions are there! Except that they do not have a platform to stand on to be heard and they don't get any funding.

You'll find that the big money goes to promoting technological solutions that put farmers on the track of chemical inputs and GMO seeds. But it should be about social reform and connecting farmers' organisations. It's also to our benefit to listen to small scale farmers. The social inequality that brings about land grabs is not going to bring longterm prosperity to anyone.

How can developing countries move towards food security?

There are several ways. We can start by looking at the recommendations of the IAASTD report from April 2008. This very clearly stated that business as usual is not an option and outlines the options for governments.

Photo: Jorge Chavez-Tafur

Is this really "unused" land?

We have just released a new report "The high food price challenge", which shows that countries that ignored the World Bank's advice at the height of the 2008 food price crisis did much better in combating and controlling hunger. So I think it is very important that countries have the policy space to define self-sufficiency as a policy goal.

At the end of the Cold War, food self-sufficiency was not considered to be a priority. The free market and the free movement of commodities was to allow every country to meet its needs. Therefore, all services to support small farmers were dismantled: extension services, credit facilities, assuring markets for small farmers.

Countries should be allowed space to draft policies which focus on food sovereignty. Another way would be to set food prices differently so that they include the costs of air, soil and water pollution. We need multi-stakeholder processes at local, national and regional levels to discuss this. It may be time-consuming, but I cannot think of better work for governments: it's what democracy looks like.

■

"Africa has been repeatedly exploited. This is not a new trend"

Recurring floods

Living with floods

Adaptive strategies of local communities

GEAG

Local communities have always found ingenious ways to overcome adverse conditions like floods, which affect not only farming but also lives and livelihoods. Over centuries, people have evolved ways and means to adapt to this natural phenomenon and have learnt to live with flooding situations.

The geography of eastern Uttar Pradesh makes the region naturally sensitive to floods. Spread along the *terai* region, there is a wide network of rivers, which originate in the mountains of Nepal and are known for their inordinate temperament. Heavy rains in Nepal result in a sudden rise in water level in rivers here. The rushing waters from the mountains slow down and spread out on reaching comparatively gentle gradient of the slopes and the low lying land in *Purvanchal* and induce water retention which becomes a menace as flood. Changes in the climatic conditions have only worsened the problem.

In the last several decades, the ferocity and frequency of floods in *Purvanchal* has considerably increased, recurring every 3-4 years. At places, it has even become a regular, annual feature, which greatly affects the livelihood of the people. The people inhabiting the flood-affected regions attribute this to climate change.

Indeed, the climate of eastern Uttar Pradesh has undergone a definite change in the last few years. For example, it has now become normal for the temperature to cross 45°C and remain so for long periods during the summers. Such temperature rise causes rapid melting of glaciers which is increasing the water level in the rivers. On the other hand, there has been a significant change in the monsoon period. The timings of rain have become very unpredictable. While earlier, August-September was the usual period of flood, today it is not. In 2007, there were heavy rains in

The Amba panchayat in district Bahraich is a living example of strength in collective action, whereby the people got together to physically clean and clear the drainage in their area.

Photo: GEAG

Drainage improvement work in progress

July itself causing sudden floods here, for which the people were ill prepared, had very little time to respond and there was considerable loss of life and property.

Large parts of eastern Uttar Pradesh are regularly affected by floods, which not only disturb the livelihood of the people but have a deep psychological impact on them as well. During the monsoon period, in flood prone regions, people get traumatized even before the floods actually come. Government and development organizations have tried to deal with the situation, but their initiatives have been more relief oriented and short period targeted. As a result there have been no long term solutions to the people's problems nor have such initiatives had a positive impact on the people's coping mechanisms and capacities.

Over centuries, local people have developed their own ways and means to deal with floods. These measures and techniques are local specific, require no external help and are inherently scientific. These ways and means have shaped people's lifestyles in these regions and strengthened their adaptive capabilities. Today such adaptive capabilities of communities are being seen as extremely important in dealing with problems of flood, water logging and climate change.

Documenting local adaptive strategies

There are a number of practices which local people have developed or adopted. The technologies and practices, developed by some resource organizations are tested, tried and adopted according to the suitability and local relevance. There are several other practices and techniques which have been developed and evolved, over a period of time, by the local communities in response to flooding situations. Such practices are locally developed and practiced for a long time. GEAG, an NGO active in the region along with 20 associated organizations have documented 100 such practices.

All the cases together bring out the fact that people have been adopting both agricultural and non agricultural practices, which can be classified as pre-flood, during flood and post-flood practices. There are a number of practices which help the communities to harvest before the advent of floods. This is generally managed by appropriate varieties and advancing the cropping period. Another way is preparing for disasters. This includes ensuring food and fodder security during the flood period by establishing grain and fodder banks, taking collective action to lessen the impact of floods by clearing drainage channels etc. After the floods, people are resilient enough to come back to normal life by pursuing whatever is possible to make a living. This is normally done by choosing right kind of crops and harvesting two short duration crops compensating for the loss during floods.

This article presents two cases wherein communities have taken up activities as a disaster preparedness measure.

Case 1: Improving Drainage

The Amba panchayat comprises three Tharu tribe dominated villages Bartia, Vishunpur and Fakisuri. These villages are surrounded on three sides by forests and in the north by the Gairuwa river.

Orai nallah in Amba panchayat (Block Mihinpurva, District Bahraich) carries rainwater from the mountains which works like nectar for agriculture, but with the coming of the monsoons, it gets over flooded and takes on disastrous dimensions, water-logging the entire area and destroying the crops. In the absence of any maintenance, the soil from the adjoining land washes into the nallah and chokes the drainage, so that even a little excess water spreads all over. Every year, the area faces the wrath of floods, affecting over a third of its area. Paddy and maize perish completely, while the sowing of rabi crops (wheat, peas, khesari, masoor lentils) is seriously affected.

To overcome the problem, Bhartiya Manav Samaj Kalyan Seva Sansthan (Bahraich) organized the people, held frequent meetings and sought to develop local leadership to find a solution to the problem. The organization provided the people with requisite information and contacts, and set up pressure groups in villages to plan the work strategy.

As a result, now every year in the month of May, 50 farmers from Bartia, 150 from Vishunpur and 95 from Fakirpuri collectively clear the nallah in their respective areas. This dredging allows the water in the nallah to harmlessly flow on to the main river and the kharif crops remain unharmed. Besides, in June and July, the nallah is the main source for irrigation.

Earlier, people would contribute their labour. However, since the last five years, this regulation has changed, and anyone not physically participating in the labour has to contribute Rs 60. This goes towards meeting the cost of dredging the nallah, and any shortfall in monetary collection is met through contributions. On the other hand, if there is a surplus, it is spent on community feasting. Such collective work has also promoted goodwill, unity and self-reliance among the people.

Photo: GEAG

Fodder storage on bund

Case 2: Deep tillage for aeration

Village Raghunathpur lying between Rohin and Basmaniya rivers, is a victim of both floods and drought, as the silt and sand spread over the fields by the overflowing rivers do not allow any cultivation. Extended duration of waterlogging and moisture retention in the fields not only delays the next sowing but causes poor seed germination as well.

Over a period of time, this has seriously affected land fertility, rabi crop cultivation and people's livelihood, forcing the 30-35 farming families living alongside the river to undergo severe deprivation and give up farming. Consequently, the fields are left fallow and are overgrown with weeds and other plants.

In flood prone area, deep ploughing of fields is seen as an appropriate land and water management methodology, whereby the nutrient rich silt arriving with floods is retained on the field and the humidity of the soil is maintained. The ploughed back weeds and plants lend further fertility and porosity to the soil. Post-flood, deep ploughing is done to turn the soil up and minimize the moisture in the field, to enable timely sowing of the next crop. However, sand deposition does not make such ploughing easy.

Shri Mohit, son of Shri Prabhu, of Raghunathpur village owning a mere one and half acre land, was constantly faced with economic hardships. In 2000, at the instance of Vikalp, before sowing the kharif crop, he deep ploughed his land thrice between May and June. The fields were deep ploughed (to a depth of 9 em) twice by either the local plough and left the field to dry. In June-July, he ploughed the field once more and took up sowing of paddy. It was very hard labour, but Mohit persisted. The money and labour saved in weeding compensated for the extra expenditure of double ploughing.

On 50 decimal land, Mohit was able to obtain 5 qtl paddy yield, which at the current market price worked out to Rs 2500. More importantly, it provided his family of six, food security for three months. Mohit says that he is satisfied, even though the deep ploughing of flood affected land is not easy. He strongly believes that this intensely laborious process if followed every year will result in one and half to two times more yield.

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This is an adaptation of the original document "Adaptive Capacities of Community to cope up with flood situations" (in English) brought out by Gorakhpur Environmental Action Group (GEAG) comprising 43 practices. The original version of this compilation is in Hindi with 100 documented practices.

GEAG
224, Purdilpur,
M.G. College Road,
Post Box # 60,
Gorakhpur- 273001 (U.P.) India

Communities cope with flooding situation with Gaota

Sukanta Sen and **Fahmid Al Zaid**

Floating agriculture is a good popular practice of the low-lying areas the south-western parts of Bangladesh where lands remain submerged most of time in a year. Not only to cope during floods, floating agriculture is also a potential means to increase the food production in the country.

Photo: Author

Floating gaota

Basudevpur village situated in Muksordpur Upazila (sub-district) in Bangladesh is surrounded by the Chandar beel (wetland) on all its sides. Beels are small saucer-like depressions that accumulate surface runoff water through internal drainage channels; these depressions mostly produced by erosion are seen all over Bangladesh. They dry up in the winter but during the monsoon season expand into broad and shallow sheets of water, covering a large area. Chander beel covers around 26 thousands acres of land.

During the rainy season, the entire village floats on the water and people adopt fishing as their alternative occupation. Abundant fishes are caught especially when water starts to decrease from the beel. Fishing fulfill the nutritional demand of each household as well as provide extra income for the household.

Basudevpur village remains submerged for a long period, almost six months, in an year. Majority of the villagers depend on agriculture for their livelihood. Almost all cultivable lands of the village are inundated for six months in an year. As the lands are submerged it is not possible to cultivate crops during this period. To cope with the flooding situation people in the region have been practicing a soil less agricultural production, locally, known as Gaota, meaning floating agriculture. This method has been a source of livelihoods and food security for many in the area.

Producing food on gaota

More than 20 varieties of vegetables like red amaranth, spinach, Indian spinach, coriander leafs, cauliflower, tomato, lady's finger, cucumber, bitter gourd, bottle gourd, snake gourd, ash gourd, sweet pumpkin, beans, radish, brinjal, potato and various spices grow on the floating bed in this locality.

Farmers are especially interested in producing tuber crops on the floating Gaota. They find that some tuber crops like turmeric, potato, ginger, and arum grow very well on the Gaota than in the soil. Soils have become hard and the tubers cannot penetrate into the hard soil. But the Gaota which is made up of straw or water hyacinth, is very soft and always wet enabling tubers to grow well. Also farmers do not use any kind of chemical fertilizers and pesticides while producing on Gaota. The Gaota being entirely

Rain water is not the only source for Chander Beel. Sweet water from the Padma River enters into Beel through Arial kha and Kumar Rivers. On the other hand, Posur and Madumoti rivers also supply water to the Beel from the south. Alongside these rivers from both south and north, there are fourteen to fifteen channels surrounding the whole Beel which circulate the water into the entire Beel from these rivers. During monsoon, its size and shape becomes bigger covering lands of atleast forty to forty five villages.

Floating Gaota

Floating agriculture is locally called as **Gaota.** Techniques associated with making a floating bed is almost indigenous. A piece of bamboo, boot, sickle etc are required to form a floating bed. First, farmers lay a bamboo pole on dense water hyacinth to make it compact. Thickness depends on duration of water logging so that it can float during that time. To quicken the process, farmers use old decomposed materials of earlier years.

It requires 20-30 days from the collection and preparation of materials for floating bed to start crop production. After preparing the bed, farmers may transplant seedling or broadcast seeds of vegetables. Farmers usually adopt inter crops cultivation technique and they harvest crops two to three times from the bed.

organic in nature, after the season is carried to the high land and mixed with the soil.

Some more benefits

Besides helping in food production, Gaota can reduce the economic vulnerability of the poor specially the landless households. The landless people who are deprived of producing their own food owing to their landlessness can produce food crops and vegetables by adopting the gaota method during the rainy season. They can also fish in the Beel fulfilling their family nutrition and extra income.

Gaotas are also the means to cope during the natural disasters like flood. During the severe flood in 1988 and 1998, local people of the adjacent villages of chandar Beel took shelter on floating Gaota with their household articles and even livestock. Some families survived for one to two months on floating Gaota putting a roof on it.

Challenges ahead

With all its merits and potential to grow, promotion of floating agriculture has some challenges too. Owing to certain development initiatives like construction of roads and numerous embankments along the northern rivers, the flow of sweet water into Chandar Beel has been decreasing day by day. On the other hand, due to the rise of sea level water, the rivers from the southern side carry saline water into the Chandar Beel. Increasing salinity is a threat to the biodiversity in the water. Also water hyacinth which is being extensively used as a base for crop production does not grow under saline conditions. Most importantly, lands submerged under saline water for a prolonged period renders it useless for crop production in the subsequent seasons threatening the food security of the region. Initiatives are therefore needed to stop the flow of saline water from the southern rivers by taking up activities like dredging the canals.

Floating agriculture has a great connection to the production of local deep water rice varieties. The straw of deep water rice grown in amon season has been an excellent base for practicing this method. But with farmers switching over to HYV paddy, the straw is no more available in abundance and people are using water hyacinth as a base material. Water hyacinth is slow to decompose and cannot survive under saline water conditions. Therefore it becomes crucial to emphasize the production of local deep water rice variety to sustain floating agriculture method.

Floating agriculture is a good popular practice of the low-lying areas the south-western parts of Bangladesh where lands remain submerged most of time in a year. Not only to cope during floods, floating agriculture is also a potential means of increasing the food production in the country. However, efforts in spreading awareness about the practice and support from the government are required in sustaining the practice.

Sukanta Sen
Executive Director
Fahmid Al Zaid
Associate Researcher
BARCIK
House No.50, Road # 27,
Dhanmondi R/A,
Dhaka, Bangladesh
E-mail: barcik@bdonline.com

Strengthening people-led development: A joint effort of local communities, NGOs and donors to redefine participation

Only self-reliant communities who control their resources and participate in local decision making process have the potential to create changes that go beyond the local project level. This can be best achieved by facilitating *people-led development processes*, which calls for a shift in the way development agencies address these issues. Open communication, peer learning and creating spaces for experiential learning are the important elements of such development approaches. MISEREOR has been supporting such development initiatives with tremendous impacts on the community level. During the past few years, several organisations in India and Bangladesh have shown very positive results in terms of farmer involvement and participation. Most importantly, the people-led approach has resulted in an empowerment process for small-scale farmers, women or minorities.

This document showcases the experiences of partner NGOs in India and Bangladesh in facilitating a people-led development process. These cases reflect that local communities, today, are more confident and are more aware of their own capacities. They are able to critically examine situations and provide local solutions.

This document is a joint effort by AME Foundation, Bangalore and ILEIA, The Netherlands. It is an outcome of an elaborate participatory process, with the active involvement and support of the local communities, partner NGOs and MISEREOR.

Some field initiatives

Go organic to conserve water

Lingubai, a 52 year old tribal woman farmer in Samaguda village, motivated by the water conservation methods adopted by her ancestors had cultivated the habit of saving water, first at her household level. She also assimilated the scientific concepts from field staff of Chetna Organic Farmers Association (COFA) which was promoting organic farming practices among farming communities in the village and started applying them in her field. She replaced application of chemicals with bio-fertilizers. She started using organic manures like vermi -compost, sheep manure, farmyard manure etc. She started growing green manures for enhancing soil moisture. She also practiced mixed cropping and used mulching to conserve soil moisture. Eventually, she could grow more from the same land with less water. Today, Lingubai, a 52 year old tribal woman farmer is a celebrity in her village, Samaguda.

She slowly started talking to all the women in her village. Seeing her success, farmers in her community began appreciating the importance of using rain water judiciously in agriculture. Gradually, they became a collective which reached zenith of activity by the year 2004. The current situation in the village is contrary to what it used to be earlier.

Five years ago Samaguda village in Sirpur mandal of Adilabad district was into conventional farming with low yields, completely dependent on rainfall alone. Today, the entire village practices organic farming with good yields and low external inputs. The yield per acre went up increasing their income and reducing their dependency on external inputs. Above all, the usage of water conservation practices also boosted their economic status.

For more details contact:
M. Ashok Kumar
Agronomist, FFID, Chetna OCP.
E-mail: ashokmahavadi@yahoo.com

Khatri: An Indigenous Technology of Rainwater Harvesting

People of Hamirpur, Bilaspur and Kangra districts in Himachal Pradesh have developed a unique indigenous technology for water harvesting called '*Khatri*'. *Khatri*s are hand -hewn caves located beneath the huge rocks where water is collected through seepage from rocks. The basic purpose of *khatri* is not to harvest the surface run off but the rainwater that flows through the rocks and soils of hilly regions. In the rainy season, water drops down continuously from the roof of the *khatri* which amounts to approximately 40-50 buckets per day.

*Khatri*s are owned by individuals as well as by a community. Each house has its own *khatri* and as the family expands, each unit constructs its own *khatri*. In other words, we can say that in a village, number of *khatri*s is generally equivalent to the number of families. The community *khatri*s are secular structures which are maintained and used by all community people.

In earlier times, villagers were totally dependent on the *khatri*s for their daily water needs. But today when facilities like hand pumps and taps are available at the doorstep, people still prefer to use *khatri* as the availability of piped water is quite unpredictable. Also during monsoons, these water pipelines brake down causing water shortages. Thus, Khatris continue to be a reliable source of water for many in this region. This rainwater harvesting structure is a testimony of the traditional knowledge of people to cope up with water scarce conditions.

For more details, contact:
Promila Kanwar and **Neetu Sharma**,
Department of Home Science Extension education,
College of Home Science,
CSK Himachal Pradesh Krishi Vishva Vidyalaya,
Palampur-176062, Himachal Pradesh, India.
E-mail: kanwar.promila@gmail.com

Lingubai, the driving force (left) Khatri - water harvesting (below)

Photo: Author

Photo: Author

Diversion Based Irrigation (DBI) Channels for better water management

Diversion channel based irrigation is a traditional system of diverting runoff water and delayed flows from the main flow line to the cultivable lands through arrangement of channels on contours. This system is more popular in tribal areas where the topography is highly undulating and it is difficult to lift water to the higher elevation lands. a temporary barrier made out of stones and mud against small or medium streams. Water is diverted from main flow to their lands through channels excavated on contour.

Maharashtra Institute of Technology Transfer for Rural Areas (MITTRA), an organization promoted by BAIF Development Research Foundation, Pune, has been promoting DBI channels in the tribal areas of Nandurbar district. Farmers are organized into a group called Water Users Group for each individual Diversion based irrigation system. They are involved in survey, planning, implementation, operation and maintenance of diversion based system of irrigation. These farmers have skills to excavate a channel along the contour line. Farmers' having contiguous land area (10 to 50 acres) form informal group and commonly share the water out of diversion channel.

MITTRA has supported 25 such water users groups to develop diversion based irrigation systems. This has resulted in increased crop production on 400 acres of land and benefited 320 numbers of tribal families.

For more details, contact:
R.C.Kote and **G. A. Patil**
BAIF Development Research Foundation, Pune
E-mail: kote009@rediffmail.com

Jalkund

Lack of appropriate rainwater management practices coupled with lack of suitable soil and water conservation measures lead to severe water scarcity, affecting crop productivity in the hilly villages of Arunachal Pradesh. The area having steep slopes, only small water harvesting structures can be made. GOI under the SWPAL project promoted water harvesting structures called jalkund to collect water from runoff.

Mrs. Yaju Yonio is one of the many women farmers of Belo village of Upper Subansiri district of Arunachal Pradesh who benefited from Jalkund promoted by GOI. Farmers in the region primarily on depend on agriculture, that too under rainfed conditions. To promote jalkunds, a series of training and demonstrations were given to farmers from three different districts namely *West siang*, *East siang* and *Upper subansiri* districts.

Having adopted jalkund, Yaju Yonio has been able to raise crops even during post-rainy season which was otherwise being infested by weeds. She could earn more income by rearing poultry, pig, growing legumes and high value crops viz., tomato, cabbage, cauliflower etc. during post rainy season. By growing sequential crops, weed population was reduced drastically and the yield of rainy season crops, mainly rice, also increased because of improvement in soil health.

For more details, contact:
Choudhary VK, Suresh Kumar P and
Bhagawati R
ICAR Research Complex for NEH Region,
AP Centre,
Basar Arunachal Pradesh- 791 101
E-mail: psureshars@gmail.com

Diversion channel

Photo: Author

Yaju Yonio explaining her efforts

Photo: Author

Running water uphill with a ram pump

Auke Idzenga

Gravity makes water run downhill, so people and communities living in mountainous areas often have more difficulties in accessing sufficient water. As this example from the Philippines shows, simple technologies can be a great help – but their application requires co-ordinated efforts among all stakeholders.

Life in mountainous areas can be hard: access to water sources is often difficult, soils are easily eroded, there is a lack of electricity and the roads are poor or non-existent, making it expensive to transport goods. Fetching water is a time consuming activity. Children sometimes miss school because they have to fetch water. Many old people who can no longer make the arduous trips down to the streams, have to pay others to get water for them. Women take their small children with them to do the washing, and spend much of their precious time.

High and dry

In the Philippines, as in many other countries, the lowlands are generally occupied by richer landowners, while small-scale farmers and their families are found in the higher areas. They often have to make daily trips to fetch water. These efforts demand much time and energy, and result in a reduced consumption and use of water (estimates suggest that where water has to be carried by 100 metres, consumption is limited to 40-60 litres per day for a family of six).

Lack of water can lead to many problems: skin diseases, diarrhoea and malnutrition. Water shortages also limit agricultural production: most upland farms rely on rainfall, which limits production to one crop per year. They also limit the possibility to raise livestock, to practise aquaculture or to process food products.

In short, water shortages pose a significant constraint to practising diversified or integrated farming. The Alternative Indigenous Development Foundation (AIDFI), a local NGO based in Bacolod City, on the island of Negros, has been working with small-scale farmers for many years.

Seeing and hearing about the recurrent water problems faced by many farmers, AIDFI decided to concentrate on addressing their basic need for water for drinking and irrigation. Since 1990, AIDFI has been working on different types of water pumps and now its flagship is the Hydraulic Ram Pump.

Pumping devices are usually based on wind energy, solar, diesel or electric power. The hydraulic ram pump is not as well known, but it is definitely the best option in terms of initial investment, operating costs and the availability of parts. The only condition is that it needs to be located close to free flowing water, as a ram pump utilises the energy of flowing water to pump a portion of the water running through it to a higher elevation. No electricity or fuel is needed. For every metre drop from the source to the ram, a ram can pump the water up to 30 times higher. For example, with a drop of 4 metres, a ram can pump water up to 120 metres – and for 24 hours per day.

Working with pumps

The ram pump is a technology which seems to have been bypassed by the industrial revolution. But its enormous potential lies in its simplicity. AIDFI's starting point was to work with locally available materials and parts (including spares), and also to generate local employment through manufacturing and installing the pumps, so as to make this technology cheaper and more easily available.

AIDFI started by visiting other ram projects and learning from the experiences and mistakes of others. It then started its own design process, following the idea coined by Antoine de Saint-Exupery, who stated that "a designer knows he has achieved perfection not when there is nothing left to add, but when there is nothing left to take away".

The ram model uses ordinary door hinges (available anywhere in the world) and a check valve made from a piece of a car tire. Adopting the ram to other countries is easy: it just involves adapting

it to the locally available door hinges. As seen in the villages of Murcia, in Negros Occidental, the installation of a ram pump starts with a demand for water.

In some cases this comes from an individual client or an NGO, while in others AIDFI takes the initiative to start talking about water in a community. In Anangue, for example, the first step involved talking with the leaders of the community about the importance of an autonomous but democratic structure for managing a water project. We then invited all villagers to see a ram pump working, with a miniature model demonstration.

The next step was to set up a water association, which plays a key role, distributing roles and responsibilities and deciding who will be the contact point with AIDFI. The whole group also decides which villagers will be trained to become the local technicians. The technicians report to the association, which pays them for their services usually on a monthly basis, using the fees paid by all users.

Each association decides how much this fee should be and how much to pay the technicians. A percentage of the fees collected is also meant to cover repair costs, spare parts and the general maintenance of the pump, things which are all arranged by the association. The training of the technicians goes hand in hand with the installation of the pump.

In Anangue, AIDFI staff came to the village for 3 or 4 weeks to build and install the pump. The local technicians worked with the project team during this period, learning how to operate, maintain and repair it. In some cases, these villagers have some technical background, but this is not necessary.

The pumps are fabricated in one place because this requires precision skills and machines, but spare parts can be readily bought from local hardware stores and replaced.

Always more

One of the most common results we have seen is that villages never have enough water: the need for water seems to increase in line with its availability. Once the pump starts working, all sorts of "new" uses are discovered, and demand grows. This is why the association needs to develop strict regulations which ensure equal sharing among all – for example by establishing common tap stands in the community to provide drinking water.

Irrigation is often the main water use and this water has to be shared and distributed evenly. Setting up irrigation schedules and internal regulations is one of the most important tasks of the water associations. AIDFI supports all the associations that ask for help in drafting these regulations, but feels that it must not interfere further; nor has this proved necessary.

Conventional pumps and dams have caused conflicts among many communities as they block some users' access to water (for example, those farming downstream). This is an important factor to consider in all discussions involving upstream and downstream users. But, unlike other forms of water pumping, the ram pump only pumps up a certain portion of the water passing (between 5 percent and 40 percent). The rest of the water goes back to the stream.

Water tips!

- Keep the design as simple and basic as possible, taking local materials as your starting point.
- Use a miniature of a ram installation during community orientations and for display purposes, at trade fairs, forums and workshops.
- The best promotion is an actual installation in the field. Imagine a site where people had to go down 100 metres daily, to collect a maximum of 40 litres, whom now have ten times as much free flowing water at tap stands near their homes.
- Have a good website and be at "places to be". For example, AIDFI took a demonstration ram pump to a Techno Park and welcomed 3,000 visiting farmers, associations, cooperatives, NGOs and government agencies since November 2008.
- Aim at different funding sources to avoid that the project is claimed by one group.

During dry seasons it is important that small streams are not emptied by individual villagers pumping up too much water from the dam or stream; the ram pump leaves enough water to flow downstream. This makes more elaborate systems possible: in Murcia there is a system with 11 kilometres of pipelines coming from four ram pumps. It passes through several different villages, each one with a reservoir and series of tap stands, controlled with gate valves. One water association covers these different villages, as there is a strict implementation of rules needed. Villagers are allowed to open the tap stands only at certain agreed times.

Scaling up

AIDFI has continued expanding its production and installation of ram pumps. This now accounts for almost 90 percent of all our work. Some installation teams have gone to work on other Philippine islands. We work with individual farmers, farmers' associations, co-operatives, large and small NGOs and governments.

The advantages of ram pumps have also been noticed abroad. This has led us to become active in Afghanistan, Colombia and Nepal. In Cambodia we have worked with a local NGO to set up a drinking water system in Koulen, a mountain village. Work proceeded in a similar way: the only difference was that women played a role in the construction of the pumps, while in the Philippines that is seen as men's work. But to get all stakeholders to work together remains of central importance.

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Auke Idzenga is a marine engineer who has lived in the Philippines since 1985. In 1991 he helped found AIDFI. E-mail: aidfi@hotmail.org; www.aidfi.org

Photo: Author

Modern Holland: built on centuries-old system

Holland is famous for its polders, or reclaimed land below sea level. The shaping of the Dutch landscape goes back to the 12th century, when rising water levels threatened agricultural land.

Frank van Schoubroeck

In response, farmers formed water committees that constructed channels, dykes and windmills to keep land arable and inhabitable. Even though the Netherlands is now an industrialised country, society is firmly built on the traditional water governance practices.

The Netherlands is a country shaped by the Rhine and other rivers flowing into the North Sea. A thousand years ago this area consisted of swampy lakes with an occasional dune or sand bank. People settled on the sandy land, and drained the swamps so that they could grow crops. But water was a permanent threat, both from the rivers and from the sea. As a response, farmers formed water committees to put up small dykes. This worked out well for a century or so, but as soil levels lowered further (peaty soils compress easily when dry), these small committees could not manage the threats anymore.

In the 13th century, Count Floris the Fifth ordered the building of larger dykes – along with strict rules to keep people responsible for their maintenance. At the time, windmill technology for grinding flour had already been developed. This technology was modified so as to use wind power for pumping water, allowing larger stretches of land to remain dry and arable. This is how the large, flat polder landscape with an occasional windmill was formed – which you can still see in Holland.

Many of the features of the modern industrialised state of the Netherlands can be traced back to these early farmers' innovations. One of these, for example, is the milk value chain. Farmers noticed long ago that the peaty wet soil was not fit for crops but good for cows, and started to produce milk for the nearby cities of Amsterdam or Utrecht. They figured out that you could prepare cheese with the help of fluid from the cow's stomach, and keep the nutritional value of milk for much longer. The process first took place on individual farms, but more than one hundred years

ago the first co-operatives took over the processing of milk and the production of all sorts of cheese.

Now, cheese manufacturing in the Netherlands is one of the richest aspects of the country's food culture. Every town has a weekly market with cheese stalls, and supermarkets sell more than a hundred different kinds of milk products, with new kinds of cheese being developed every year. The dairy sector today has an annual turnover of almost a billion euros, employs more than 60,000 people, and sells its products all over the world.

Old and modern

The early water control committees became permanent water boards, with responsibility for keeping the land free from flooding. The water boards are the oldest form of governance in the Netherlands, and compromise all the institutions that have an interest in maintaining the water level. Low water tables are good for grass, and thus for farm production. But they also cause the oxidation of peat, causing it to compress and thus lowering the soil surface.

High water tables are good for minimising this and also for biodiversity, as most wild field species are water-loving. The water boards weigh these interests and regulate water tables accordingly. They have helped develop a large-scale market driven agriculture, as well as a small-scale multi-functional agriculture with diverse economic activities.

Water boards were organised in a similar way to many water user committees in Asia today: richer farmers took the lead in setting up and maintaining the necessary water regulation infrastructure. Since their establishment, these boards have been handed to the local population – in clear contrast to the country's political structure. While they are still functioning, they often clash with the local governance structures (such as municipalities).

For example, the provinces regularly propose to take over the water boards themselves; but the water boards in turn want to take over water regulation functions from the provinces and municipalities.

Photo: Author

Dutch people experience a regular tug-of-war between traditional and modern governance structures.

Similar options

The Dutch approach to managing water shows that traditional governance structures can be vibrant drivers of technological and institutional development – if they adapt to new circumstances. In much of Africa, traditional chiefs continue playing an important role, even when ministries and local governments have taken over power. Is it possible that traditional chiefs play a role in the development of the farming sector in Africa? In many cases they already do.

Chiefs can develop constructive working relations with locally elected governance bodies and develop accountability to their people. For some tasks, traditional forms of governance are better equipped than elected governments, as in principle they can serve the interests of all people – men, women, rich and poor – in the area under their authority. The history of the Dutch water boards shows that this is a real possibility.

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Frank van Schoubroeck is an independent consultant on governance and policy issues.
E-mail: frankvanschoubroeck@yahoo.com

Themes for LEISA India

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Partnerships for learning

The hunger experienced by many people in the world, and the likelihood that their numbers are bound to increase further due to climate change, gives a sense of urgency to the need to involve different voices in developing a more sustainable approach to farming. There are many players in the field of agriculture development like farmers, extension agents, change agents, researchers, policy makers etc. Also there are input dealers and bankers who make a difference to farming.

Some farmers learn continuously; they carry out experiments and regularly develop new ways of farming. In many cases, they are supported by projects or programmes that seek to enhance this learning. But to what extent do the different players in agriculture development work together and more importantly learn? And, does working together increase learning?

This issue will focus on how all these different stakeholders are learning to work together to make agriculture more sustainable, by developing new ideas and solutions or disseminating them. We want to explore how different stakeholders deal with challenging situations, and whether by working together they are able to find solutions which lead to better farm practices.

We welcome your articles and contacts of people you think have expertise in this area. Please write to leisaindia@yahoo.co.in before December 31, 2010.

Integrated small scale water resources management in Maharashtra

R.C.Kote and **S.M. Wagle**

Involving local communities in identifying local solutions is the best way to address local water problems. Experience of MITTRA is one such example which depicts communities taking charge of developing water sources and managing them well too.

Photo: Author

Spring development

Domkhadak village located at 19 kms from Peint taluka of Nasik district has an undulating and hilly topography. Traditional crops like paddy, Nagli, Varai and Kulid are grown in Kharif. Despite an annual rainfall of 2500mm, rainfed farming was resulting in lower production of crops resulting in people migrating to Nasik in search of employment.

In the year 2001, MITTRA, an organization promoted by BAIF Maharashtra, initiated tree based farming model (wadi) to enable communities have a sustainable source of food and income. The local tribal families planted 47 acres of area with fruit trees and forestry along the borders. However, due to undulating topography and sloping lands, water became the major constraint in the plant survival. To address this issue, MITTRA organized participatory processes like PRA to help people understand the magnitude of the problem and identify local solutions. Communities enthusiastically mapped their water resources and analysed the water needs of the families. Communities with the guidance of MITTRA developed a strategy for development of the existing as well as new water sources in the village.

A water users group of 7 members was formed to plan, coordinate, implement and manage post project operation. The major responsibilities of water users group included providing support and monitoring implementation activities and maintenance and repairs of the check dams and structures. Wadi takadi members prioritized construction of permanent check dam on nalla and development of two springs.

The group members passed a resolution in gram sabha for construction of check dam. Initially it was decided to test the water storage by constructing a temporary check dam out of sand bags across the stream. Communities on their own, constructed a temporary barrier. This having given good results, people decided to construct a permanent check dam. All committee members and wadi holders have participated in implementation of check dam.

MITTRA has worked with about 95000 families in Maharashtra, promoting supportive irrigation on 62000 acres of land. The main impact is that tribal farmers are now growing crops like wheat, gram, onion and vegetables apart from their traditional crops. It resulted in increase of annual family income by Rs.10000 to 25000.

The water user group developed two spring sites into well like structure. Springs in hilly areas, depending upon their discharge are converted into small wells of 3.0meter diameters or connected to a small tank like structure of 2000 to 3000 liters for drinking water. Sometime springs are located at higher elevation. In that case, spring water is brought down through pipes to irrigate lower land area or for drinking water purpose.

The group also believed that the water saved had to be used efficiently. As a group they planned what crops to grow based on water availability. Also members agreed not to grow high water consuming crops and banned growing crops like sugarcane. As a result today, farmers are able to grow crops like wheat, gram, and vegetables like potato, brinjal, tomato etc. in rabi season.

Around 14 acres of land is brought under irrigation from benefiting 9 wadi holders. There has been an increase in paddy production. With ensured water availability, each wadi family has gained an improved income of Rs.20000 from wadis and additional Rs.8000 from other crops.

R.C.Kote and **S.M. Wagle**
BAIF Development Research Foundation, Pune
E-mail: kote009@rediffmail.com; smwagle@rediffmail.com

Acknowledgement

We are very thankful to Mr. Mahajan S.K. and Mr. Chetan Patole for their contribution in documenting the above article.

Humus – key to soil water conservation

Next to air, water is the most important for the survival of any living organism. In agriculture, water plays an important role in crop production. Day by day, water is becoming scarce and even the available water for agriculture is not of good quality as much of it is contaminated in many ways. It could be saline water, may have sodium salts in excess etc. So it is very important to use water very efficiently in crop production and see more grains from every drop of water used in crop cultivation.

During the past two decades even the underground water is going deeper and deeper by 3 to 6 meters every year. Main reasons for this acute scarcity of water is lack of adequate humus content in the soil enabling preservation of water. Owing to continuous application of nitrogenous chemical fertilizers to the soil the humus content has come down to 0.3% in 2010 from 3% during 1960. Another reason for reduction of humus content of the soil is negligence in conserving soil. So it is high time to protect the soil from direct hot sunlight by providing mulch (live or dead), by growing trees and bushes around the land and even along the bunds (if the land is longer or wider than 60 meters) as wind breaks. Every 10 meters of tree or bush can protect 100 meters of soil from fast blowing winds; the soil should always be crumby and not dusty or powdery. The soil particles are bounded into crumps only when the land is totally free from use of agro-chemicals of any nature. It is only then the soil organisms increase in numbers and work with plant exudes, physically, chemically and biologically and increase and regenerate soil productivity and binds and makes the soil crumby and bring down the soil erosion by wind and water.

It is also very important to understand that wind breaks reduce soil desiccation by fast winds more than the hot sun. The trees also encourage water infiltration by the pores created by their unimaginable roots in the soil. One can think the length of roots of a big tree, when a grassy plant like rye can have 6600 miles (10250 Kilometers) of root length. The most amazing thing is that the root tips withstanding the friction of the rock particles as if they are coated with diamond. So it is the humus content of the soil, which can hold 10 times of water of its weight and conserve from percolation and evaporation and provide that water for roots at rhyzosphere. This water preserved by humus would be constantly available for the innumerable soil organisms available at different strata levels of the soil. Without increasing the soil carbon or humus content in the soil, it is very difficult to improve crop production. All other efforts of building giant dams and plans to connect Ganga-Kaveri may prove futile and end up in more problems like submergence of vast fertile soils of the dam area and creation of wet deserts in the command area by salination. We should understand that crop yields are lost more by excess water than by less water. Water is only a mode of transport for minerals to be pumped into the plant system, having had dissolved in it, and transpo-evaporated through the stomata's (pours at the bottom of the leaves). If we plant sunflower plants at different spots in the cultivated land at every 30 meters distance and find them withering at 9 A M we should provide irrigation, otherwise common crops have enough water in the soil. So to increase the crop production, humus content is very important in the soil at least by 2%.

Again the most unfortunate practice is to grow paddy with submerged water even with bore well pumped irrigation, almost with the use of 5000 liters of water to produce 1 kilogram of paddy, not rice. With adaptation of System of Rice Intensification or also known as Madagascar method, use of water could be brought down to almost 50% to 60%, with higher yields atleast having doubled without damaging the soil health by salination. Since we have most of crop production by rain fed cultivation, we should encourage micro millets and tubers which are more drought and insect damage resistant than H Y V and hybrids and most harmful G M crops which can totally ruin the Indian agriculture production and the health of all living organisms of the creation. If the proposed seed bill is passed by the Union Government, then there is every danger of more G M seeds being permitted for commercial cultivation which may destroy our agriculture totally.

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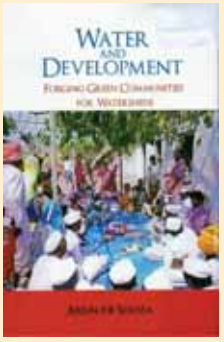
Shri Narayana Reddy is a legendary organic farmer and is one of the most sought after resource persons on ecological agriculture.

L Narayana Reddy
Srinivasapura, (near) Marelanahalli,
Hanabe Post-561 203
Doddaballapur Taluk,
Bangalore Rural District,
Karnataka, India.
Mobile: 9242950017, 9620588974

Water & Development: Forging Green Communities for Watersheds by Arun DeSouza, May 2010. ISBN 978-81-250-3992-1; 340 Pages Hardback; Price: Rs 595.00/US$ 34.95



This book shows how watershed development projects intervene in people's lives and the ways in which an entire community gets reconstructed around the implementation of a new resource. It challenges the popular view that rural communities are an unchanging entity, steeped in tradition and economically stagnant. The author deconstructs these preconceived notions through which rural India is perceived and establishes how a community, far from being static and autonomous, is fluid and changing.

In analyzing the processes involved in bringing together a heterogeneous group of people for a common cause, the study raises pertinent questions – is the mere fact of 'scarcity' enough to motivate them to come together? Can scarcity enable them to put aside their differences and invent a new method to conserve and manage their available water? Explaining the dynamics engaged in it, the author focuses on: The way narrating a myth helps build a community, creates a utopian space of united action and solidarity – one that transcends class-caste-factional divisions. The everyday political practices of the village and its relationship to the wider polity of the village and the state where factionalism is not just a divisive factor but also builds and sustains complex relationships. The image that a community portrays to outsiders who visit the village where all forms of contestations and plural interpretations are swept aside to present themselves as a distinct group with a sense of a 'we' feeling. The village community is, thus, forged in a relationship with the present and lives in continuity with its past. It is intricately linked to the larger processes (both global and local) beyond its boundaries – be it the global green movement, the changing aid policies, or the state's present efforts to encourage NGOs to work with the government

Water, Agriculture & Sustainable Well-Being by Unai Pascual, Amita Shah and Jayanta Bandyopadhyay, 2009. ISBN: 9780198061755, 360Pages. Hardbound Price: RS 750.00

Moving towards a more holistic view of ecosystems has become crucial to environment debates and shifting policy thrusts. This collection of scholarly articles spans various issues pertaining to water resource management and agricultural practices. While analysing the trade-offs between growth in agriculture and environmental sustainability, the volume focuses on the balance between private benefits and sustainable development, growing demand–supply gaps, inter-sectoral allocation and pricing of water, and trade and environment. Context-specific issues such as arsenic contamination in India and Bangladesh, and farmers' suicides in Andhra Pradesh are examined in this book

Water and Agricultural Sustainability Strategies Edited by Manjit S Kang, March 2010; ISBN: 9780415572194; 356 pages; Hardback Price: $119.95.

While enhancing water-use efficiency (WUE) is a major goal in irrigated agriculture, drought management is the principal strategy to enhance production from rainfed agriculture. Management, conservation, and recycling are crucial to sustainable use of water resources in both irrigated and rainfed agriculture. The challenge of enhancing WUE is moreover confounded by the severe problem of water quality either because of high concentration of naturally occurring salts in the aquifer or due to pollution and contamination by urban, industrial, and other anthropogenic activities.

This book covers the following aspects related to water management:

- Use of water management strategies to achieve agricultural sustainability under the current scenario of water scarcity;
- Use of the four kinds of natural waters, i.e., rainwater, surface water, groundwater, and soil moisture (soil water) as well as irrigation drain water, municipal and industrial wastewater, to promote agricultural sustainability. How irrigation with groundwater polluted with arsenic and industrial water could lead to toxicity in crops, and how to avoid/prevent/phytoremediate this;
- Water management in different agroclimatic environments, with particular reference to dryland/rainfed agriculture;
- Biotechnological applications to develop crop varieties and agronomic practices that endow crops with drought tolerance and greater water-use efficiency.

Managing Water in River Basins – Hydrology, Economics, and Institutions by M. Dinesh Kumar; ISBN 9780198065364, Hardback; June 2010; Rs. 795.

Managing water resources effectively is one of India's prime concerns today. This book provides an in-depth analysis of existing methods of water management and highlights the gaps in the use of water in various river basins. Underlying the futility of 'quick fix' solutions, it puts forward various alternative strategies for water management.

Using illustrative case studies, the author lists major challenges in water management—productivity improvement in key-use sectors, inter-sectoral allocation, trans-boundary resource management, and availability in deficient regions. Highlighting the opportunities for improving water productivity in agriculture, he also provides methodologies for generating country- and regional-level water balance scenarios.

The volume also discusses the problems involved in allocating water in river basins. Kumar gives a detailed account of some of the widely known economic tools. He examines the institutional and policy measures for ensuring sustainable use of water and economic growth, including the creation of new organizations.

Living planet report 2010 by Duncan Pollard, Emma Duncan, Rosamunde Almond& et al, Oct 2010. Source: WWF

WWF's 2010 Living Planet Report is the world's leading, science-based analysis on the health of our planet and the impact of human activity on the planet. The biennial report explores the changing state of biodiversity, ecosystems and peoples' consumption of natural resources. It also explores the implications of these changes for the future of human health, wealth and well being. This analysis has been produced in collaboration with the Zoological Society of London and the Global Footprint Network. It uses the global Living Planet Index as a measure of the health of almost 8,000 populations of more than 2,500 species and is one of the longest running measures of global biodiversity trends.

Agriculture, Food Security & Rural Development by Asian Development Bank; May 2010. Hardback; 384 Pages; ISBN # 9780198064664. Price: GBP 34.95/US$ 49.95/Euros 39.95

In recent times, the importance of agriculture in fulfilling the basic objectives of development has been increasingly reinforced. Why does the Indian economy continue to be vulnerable to weather-induced agricultural fluctuations? Why does India have widespread poverty and malnutrition despite being self-sufficient in food production? What are the responsibilities of the state, the public sector, and civil society in redressing the agrarian crises?

This book provides answers to such questions through a comprehensive review of India's experience in agricultural development. The focus is on key policy issues related to land reforms, sustainable water use, crop diversification, disaster management, and public–private participation in agricultural investment.

The book draws lessons from agricultural policies since Independence, both in terms of their relevance for the country's future course of action and their wider significance for the developing world. Arguing that policies need to be rooted in the history, geography, and polity of the country, the book carefully diagnosises the challenges in the current scenario and offer reasoned suggestions to achieve the twin objectives of agricultural development and poverty reduction.

Encircling the Seamless India, Climate Change, and the Global Commons by A. Damodaran; ISBN 9781098066750, Hardback; June 2010; Rs. 850.

This book explores global environmental negotiations against the backdrop of complex political relations, the climate change conventions and multilateral environmental assessments and their effect on special interest groups.

It weaves in the story of India's emergent economy, its sustainable development, and the multifaceted nationhood, the diversity of its rural scene, and the challenges of seamlessness brought in by the power of its information technology. Viewing global environmental movements, the book discusses the pattern of global negotiations from the environmental summit capitals of the world—Rio, Kyoto, Cartagena, Bonn, Stockholm, Montreal, Geneva, Basel, and Copenhagen among others to graphically portray the plight of a post-modern world that grapples with the problems of climate, land degradation, chemical transfer, and biodiversity.

Green Food An A-to-Z Guide by Dustin R. Mulvaney, May 2010 *SAGE Publications, Inc*; ISBN 9781412971874: *£70.00.*

Our food and agricultural systems have undergone tremendous change in the 20th century. Less common now are the pastoral ways we imagine, like the image found in a bucolic farm advertisement. Agriculture has beome thoroughly industrialized and increasingly globalized. A plentiful supply of cheap fossil fuels help power mechanization, produce fertilizers and pesticides, and lengthen distance from farm to plate. The result has been a carbon-intensive food system that keeps prices cheap while large retailers and processors extract value from farmers at increasing margins. The result of this transformation is an agri-food system that has done well in terms of productive capacity to feed many people but that causes considerable environmental burden and brings along its own problems in terms of poverty and food distribution.

This third volume in the SAGE Series on Green Society lays out the contours of the field of agri-food studies. It draws on scholars working in the fields of political ecology, rural sociology, geography, and environmental studies to paint a picture of the past, present, and future of agriculture and food. It provides readers with a basic understanding of the institutions, practices, and concepts to identify what is and is not a "green" food. Because food is so intimately connected to our daily lives, the food system offers perhaps the most promise to make change in a sustainable direction. What a sustainable and green food system would be like is still an open question. There are many unresolved issues about what policies would help realize it and what kinds of tradeoffs we face in deciding which paths to choose. Green Food: An A-to-Z Guide provides people interested in food and agricultural systems the basic analytical and conceptual ideas that explain why our food system looks the way it does, and what can be done to change it.

Challenging the Injustice of Poverty
Agendas for Inclusive Development in South Asia by Rehman Sobhan, October 2010, *SAGE Publications Pvt. Ltd*, ISBN 9788132104681 Hardcover, 516 pages, Price: £14.99.

This book explores issues related to poverty in South Asia in a two-pronged manner-by focusing on injustice created and perpetuated by the unjust nature of a social order as its source and then providing concrete suggestions about how policymakers may move to challenge these injustices.

Drawing research inputs from studies across various South Asian countries, the book redefines poverty as a process where certain sections of the society are excluded from equal participation in development opportunities as well as decision-making. It further identifies a variety of operational ideas for policymakers, political activists and civil society advocacy groups committed to build a more just and poverty free society in South Asia.

Farming without pumps

Shree Padre

Many farmers in the regions adjoining Karnataka and Kerala are relying on Surangas, the traditional water harvesting structures, for meeting water requirements of their crops. Surangas are man made caves of water which work on gravitational forces requiring no external power to operate.

A storage tank collecting water from surangas

"If we have to resort to pump based lift- irrigation like most of the arecanut farmers of our area", says this Karnataka farmer, *"we might have to say good bye to farming."*

Govinda Bhat Manimoole, 55, owns a farm in Buntwal taluk of Dakshina Kannada district that according to his own words, "is luckily hundred percent water secure." Karnataka's never ending 'power cut' doesn't worry him. He has no dependence on electricity or diesel for irrigation. Though painstakingly, the family has been successful in providing gravity irrigation for his 2.5 hectare farm. Arecanut and coconut are his main crops. Pepper, banana and cocoa as intercrop provide additional income.

Batteries of 22 surangas spread across his hills provide required water for 1200 arecanut and 300 coconut trees. Each suranga gives a small amount of water. For appearance, it is of a thumb finger thickness. If measured, this will be in a range of 200 to 600 liters per hour. Water from these surangas is collected in a decentralized way in five earthen tanks. One such tank on the topmost arecanut plot gets water from a total of nine surangas. The collected water is carefully fed to the trees through micro irrigation.

Govind Bhat uses three types of water emitters – the dripper, foggers for arecanut and bubbler for coconut. Dipper oozes water drop by drop at the rate of eight liters per hour. Each arecanut tree is given two drippers. Fogger, on the other hand, sprays water like a tiny fountain and has sixteen liters per hour output. Only one fogger serves a tree. The last, bubbler has still larger 'fountain' and feeds 20 liter per hour.

Bhats manage the whole irrigation schedule at the turn of a gate valve. Everyday, about a couple of hour's irrigation is given. Luckily for them, though the discharge from surangas gets reduced by summer, the reduction is marginal. It was only recently, in 2007, Govinda Bhat introduced micro irrigation. Till then they were managing with hose irrigation. Even before that, till nineties, manual splashing of water was in vogue.

Manual splashing

Manual splashing was really cumbersome and back-breaking. A rectangular bowl shaped container was made from arecanut leaf sheath. Water was transported in the garden site through long earthen channels that required laborious maintenance every year. One has to bend down in 'U' shape and splash water to each tree bottoms several times. Subsequently, a wooden implement that permitted the workers to splash water in a vertical standing pose was introduced. But Bhats were managing with their traditional areca sheath container till they switched over to hose irrigation.

Lands in this area are quite sloping. As such, only terraced farming was possible. Breadth of each terraced plot is very less. Wherever the breadth is very less coconut is planted. A few rows of arecanut can not be raised here due to the very narrow strips.

Extension of the farm was step by step. Using the savings, the family has gone on extending by leveling a small strip once in a decade or so. More interestingly, for each plot, the family had done a 'water availability' test in advance.

Around forty feet height from the proposed leveling of a new plot, a suranga is dug. Only if enough water is available, terracing is done below. But, luckily, all the 25 surangas dug by this family haven't totally failed them. Three are abandoned because their

Photo: Sudhir Tripathi

Irrigating root zones

output is very low. Water from each suranga is collected in a earthen tank constructed below. To prevent crab menace and to avoid evaporation, water is transported through PVC pipes. There are five such tanks at different heights. By just opening the gate valve fixed to the outlet of the tank, irrigation commences in the plots below.

Inter-connected tanks

All the tanks are inter-connected through underground pipe network. So, if there is a tendency in the upper tank to overflow, water is immediately diverted to a lower tank.

"At one stage, more than half century ago, we had severe drought in summer. Water from a tank situated in the lowermost plot had to be painstakingly brought up on head load for our domestic purposes too", recalls Achyutha Bhat, (81), Govinda Bhat's father, " Even later, after Shivarathri, - Shivarathri comes in February – we had very little water. So much so that if in a few years we irrigated by providing protective irrigation by physically carrying water in pots, there were years when we didn't have no water at all to irrigate."

The water crisis went up to 1987. Though the bore-well technology had by then arrived here, Bhats were least interested. They were fully aware that it is not a sustainable technology and would spell suicidal to their great blessing in farming – the gravity irrigation. Instead, the family decided to try their luck with more surangas.

Almost a suranga a year

In about a decades time therafter, 6-7 surangas are dug. Bhats were determined to bid good-bye to the history of drought. Because of this almost non-stop suranga digging (except in off season), the villagers used to say that "Manimoole Achyutha Bhat gets a suranga dug every year."

One step towards crisis management is the construction of huge storage tank. With an estimated lakh litre water capacity, this stores rain water. In a phased manner, the stored water is used alternatively with the freshly collected water from surangas. This step also helped to bring down the water shortage.

The results were positive. Their water availability increased considerably, though the hose irrigation wasn't satisfactory. Points out Govinda Bhat, "our soil profile is such that it doesn't hold water for long. We were able to give only two rounds of hose – irrigation in a week. The leaves used to drupe down a bit and the overall look of the gardens were far from healthy. Yield levels too showed considerable fluctuations.

Suranga

Suranga is a man made cave for water. Kasaragod district in Kerala and adjoining areas of Dakshina Kannada district of Karnataka has thousands of such traditional water harvesting structures. It is generally dug for drinking water. Of late, this skill is dying due to the advent of pump sets and bore wells.

Achyutha Bhat was instrumental in bringing this technology to his village Manila, way back in forties. By the time the skilled workers finished digging the first suranga in his farm, young Achyutha Bhat had picked up the intricacies. Now Manila village has around 300 surangas.

Completion of a suranga takes usually one season. Suranga digging is done only in the summer – say from February to May. Since the soil contains more moisture during monsoon and immediate post monsoon time, there are fears of it collapsing during digging. As such, in this period suranga digging is avoided. Generally surangas here have a minimum length of forty meters. Depending on the soil type, to dig this far, it might take anything from two months to three – four months. Width of the suranga is just enough for an ordinary person to pass through. Even today, the village has hand counts of labourers who know the skill. One 'kolu' (two and half feet) of suranga is charged at 150 Rupees. Longer the distance, this charge will go on increasing as it requires more labour once it reaches long distances.

Most important fact about suranga is that it provides crystal clear, non-polluted water round the clock without the requirement of a pump set. Secondly, it is the only water harvesting structure possible for people living on the upper reaches of a laterite hill. Even a poor farm labourer, in his spare time, can dig a suranga inch by inch. He can complete it in 2-3 months – with the help of an assistant, but without spending any cash!

Bayaru – a village of Kasaragod district in Kerala is 'Mecca of surangas'. That village has an estimated 2,000 surangas.

Photo: Author

Bountiful yield of arecanut

"There was a time when a gunny bag would accommodate 60-70 of our coconuts. Now, with just 25 coconuts, it is full", laughs Achyutha Bhat.

Good bye to drought

It was only in 2007, after switching over to micro-irrigation, the farm improved well. Since the requirement of water is less, they could irrigate daily. Crop also increased considerably, bringing down the level of fluctuation to a great deal.

"Now we have sufficient water for these 1500 palms and the intercrop. Though intercrops are there, they aren't irrigated separately. "Whatever moisture is available in the soil, that takes care of these plants and vines", explains Govinda Bhat.

What about the costs of these surangas? "We have to spend about the cost of a pumpset for each suranga. A little more on tanks. "But the recurring expenditure is, I would say, negligible. Maintenance of all the five tanks requires about 40 – 50 man days." Micro-irrigation doesn't need much labour. Just a round of checking, turning the gate-valve on and off etc would suffice.

Bhats have future plans of extending the cultivation for one or two plots more. But the present price of coconut and arecanut doesn't give confidence for big investments. As such, Govinda Bhat is studying two diversifications – floriculture that is possible inside the areca garden and educational home stay. A whole household and 2.5 acres of farm totally run by unique suranga water that too without the use of any fuel would attract many researchers, water activists and considerable interested people from outside. "We have plans to construct a couple of rooms, offer our traditional food & facilitate them to see and understand this dying art of strange digging and its sustainable uses", hoped Govinda Bhat.

Not quite far off, Dandeppady Achyutha Bhat, another old farmer, irrigates his 2 acre areca garden with suranga water. In about two kilometers vicinity of Bhat's farm, there are 18 families of farmers and farm labourers. All put together, these families will have a total of 50 surangas.

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Shree Padre
Post: Vaninagar,
Via: Perla,
Kasaragod Dt,
Kerala – 671 552
E-mail: shreepadre@gmail.com