

Glimpses into Impacts



FES

FOUNDATION FOR ECOLOGICAL SECURITY

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1. Impacts of Watershed Interventions: A case of Kalyanpura in Rajasthan

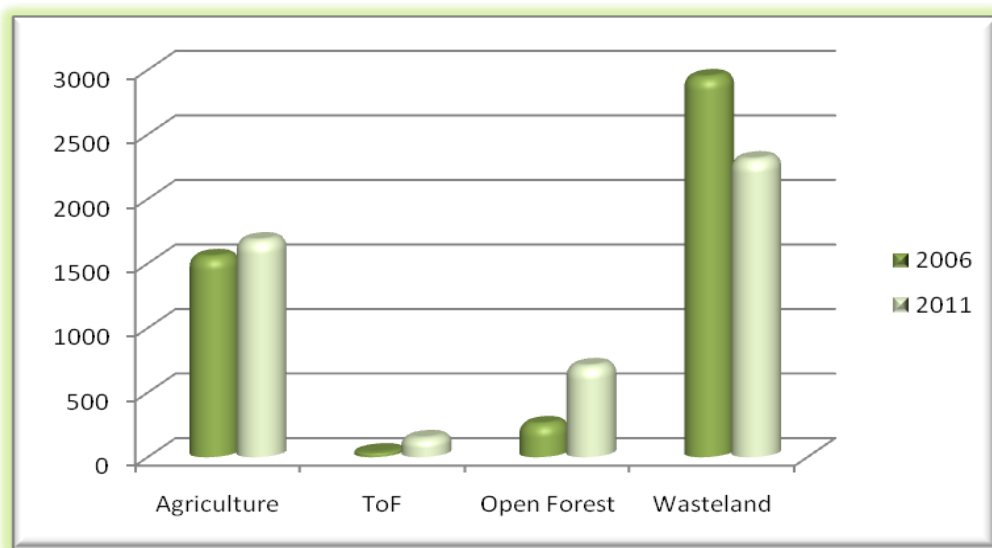
In order to assess the ecological health and assist the communities in making informed decisions, FES undertook the 'Ecological Health Monitoring' of Kalyanpura Watershed, covering an area of 12,788 acres across 16 revenue villages in the watershed. The study included understanding of floral and faunal assemblages, soil and geo-hydrological status and assessing the catchments status of the existing water bodies. All the information was collated and imported into GIS domain to produce the status maps.

The study showed that the soil nutrients such as nitrogen, phosphorus and potash increased by 44%, 6% and 43% respectively and a total 1454.20 tonnes of carbon dioxide was sequestered during a period of three years.

The organic carbon increased from 0.34% to 0.43%, leading to the an increase in the organic matter by 969.47 tonnes, which in turn increased the microbial activity from an average of 5.33 pkat/g to 7.56 pkat/g over a period of three years (2006 to 2009).

As compared to a total of 8 trees species, 8 shrubs/climbers species, 41 grasses/

herbs species in 2006, 17 trees species, 12 shrubs/climbers species and 45 grasses/herbs species were recorded in 2009, thereby indicating an increase in the floral diversity in the watershed area. Among the faunal group, 86 bird species including pollinators, seed dispersers and biological pest controllers were recorded in 2009 as against only 40 species in 2006. The pre and post monsoon water column data between 2007 to 2011 indicates a small increase in water column, despite the increase in water extraction for agricultural activities in the area. 54% of total land, which was left fallow earlier, is now being cultivated. The double-cropped area has also increased from 41% to 89%. Net cropped area shows a steady increase from 20% in 2007-08 to 80% in 2011-12, a fourfold increase after the watershed development project was initiated.



Satellite imageries supported by ground truthing show that there has been a rapid improvement in the watersheds in almost all categories of land use and land cover. As per the graph, there has been a decrease in the wastelands category by 12 %, as this land category has improved to either open forest, agriculture land or trees outside forests (ToF).

2. MGNREGS for restoring natural resources and reducing vulnerabilities of the poor

FES in collaboration with Indian Institute of Sciences (IIS) undertook a study in 10 villages of Bhilwara district in Rajasthan, covering impacts of MGNREGS works on natural resources such as soil, ground water, surface water and forests, and production systems such as crop and livestock. This was a part of a larger study being undertaken by IIS in collaboration with GIZ, a German technical and funding agency.

The study showed a positive impact on the ground water recharge, leading to increase in number of borewells by 67% over 5 years along with an increase in the number of days of water availability in these borewells. Additionally, as a result of the desilting activities, the average depth of open wells increased from 67 feet to 71 feet approximately from pre-MGNREGS to post MGNREGS scenario, increasing the water storage capacity of these wells, leading to a subsequent increase (in the range of 25% to 100%) in the area under irrigation in 2 village within the command area. Also, as a result of canal repair and desilting works in 7 out of the 10 villages, the canal irrigated area increased in the range of 4% to 60%.

As a result of soil and moisture conservation works and revegetation works like seeding, planting, coupled with protection mechanisms, the Soil Organic Carbon percentage at 15-30 cm soil depth has increased by nearly 88% in 4 villages, with a reduction in soil erosion by over 50% along with a 23% decrease in the runoff, resulting in an overall increase in the soil fertility. The revegetation measures also led to an increase in the area under tree cover in the range of 0.7% to 38% or 6 acres to 104



Soil and moisture conservation work being undertaken in a village under MGNREGS

acres and as subsequent increase in plant diversity, from weeds and thorny species to species such as Acacia, Neem, Butea, Indian Rosewood, etc.

Further, due to improved water availability and soil fertility, farmers introduced new crops. 19% overall increase in crop yield was reported, with the yield increase in cereals such as wheat, barley and maize being in a range of 4 to 22%, increase in pulses mainly lentils and grams being the range of 21 to 57% and increase in the cash crops like cotton and soya beans in the range of 5% to 50%, across villages.

The findings suggest that the MGNREGS activities such as soil and moisture conservation and revegetation measures in the semi-arid Bhilwara district have reduced the vulnerabilities due to fluctuating water availability and agriculture production. The vulnerability of crop production systems has been reported to have reduced in all 10 sample villages in the range of 4.7 – 28.7%. Implementation of MGNREGS has led to significant additional employment generation as well as increase in wage rates and reduction in migration in the range of 20% to 100% in 8 out of the 10 villages. The wage rates have also gone up from about Rs.65/day in the pre-MGNREGS period to Rs.135/day at present, an increase of approximately 107%.

3. Harnessing water from forests for providing irrigation to the remote tribal villages in Odisha and Rajasthan

FES started implementing the 'Diversion Based Irrigation (DBI) System' project in 2009 in remote tribal villages of Semliguda Block of Koraput District in Odisha and Gogunda & Jhadol Block of Udaipur District in Rajasthan, owing to the improved flows in the streams due to the conservation work being carried out



The Diversion based irrigation system is not only providing water for irrigation, but is also being used to providing drinking water for livestock. in the upper reaches in these villages, providing an opportunity for using these waters for irrigating the parched agricultural lands in the areas.

The Diversion Based Irrigation system diverts a portion of the water course through gravity flow and uses it for the purpose of irrigating crops and for other human needs. This method of irrigation is very useful in remote undulating areas without electrification and is also affordable by the poor as the energy and maintenance costs are negligible. The 30 completed DBI schemes have led to assured irrigation for 1184 acres of farm belonging to 1018 farmers and the ongoing 19 DBI schemes would provide irrigation to an additional 680 acres of farmland belonging to 782 farmers in these villages.

The DBI has provided critical irrigation to monsoon crop (Kharif) and also supported the farmers to cultivate two crops (a winter crop as well) a year instead of leaving the land fallow, leading to an increase in the production of both the crops and household incomes. Efforts have also led to the communities cultivating low input crops, suitable to the area, for maximising household's income. Seeing the usefulness of the DBI structures, the communities have increased the ecological restoration efforts in the upper catchment reaches of the DBI water sources. Some of the communities have also taken up steps to reduce shifting cultivation practices in order to improve the vegetation cover, hoping to maintain the perennial flow of water. The project has created a demonstration impact at the local level as well as the government authorities as a viable option for land development and assured irrigation, opening up scope for wider replication.

4. Experiences of Common Land Development

A study on common land development was conducted by FES in partnership with the Gujarat Institute of Development Research (GIDR) and the BAIF Research Foundation, supported by South Asia Pro Poor Livestock Policy Programme (SAPPLPP), a joint initiative of NDDDB and FAO. The study covered 17 villages in six districts in the states of Rajasthan and Madhya Pradesh and showed that common land development has substantial economic and ecological benefits.

Owing to ecological restoration activities and community-led management, the regenerated common lands registered a substantial increase in the vegetative cover. The trees per hectare increased by a range of

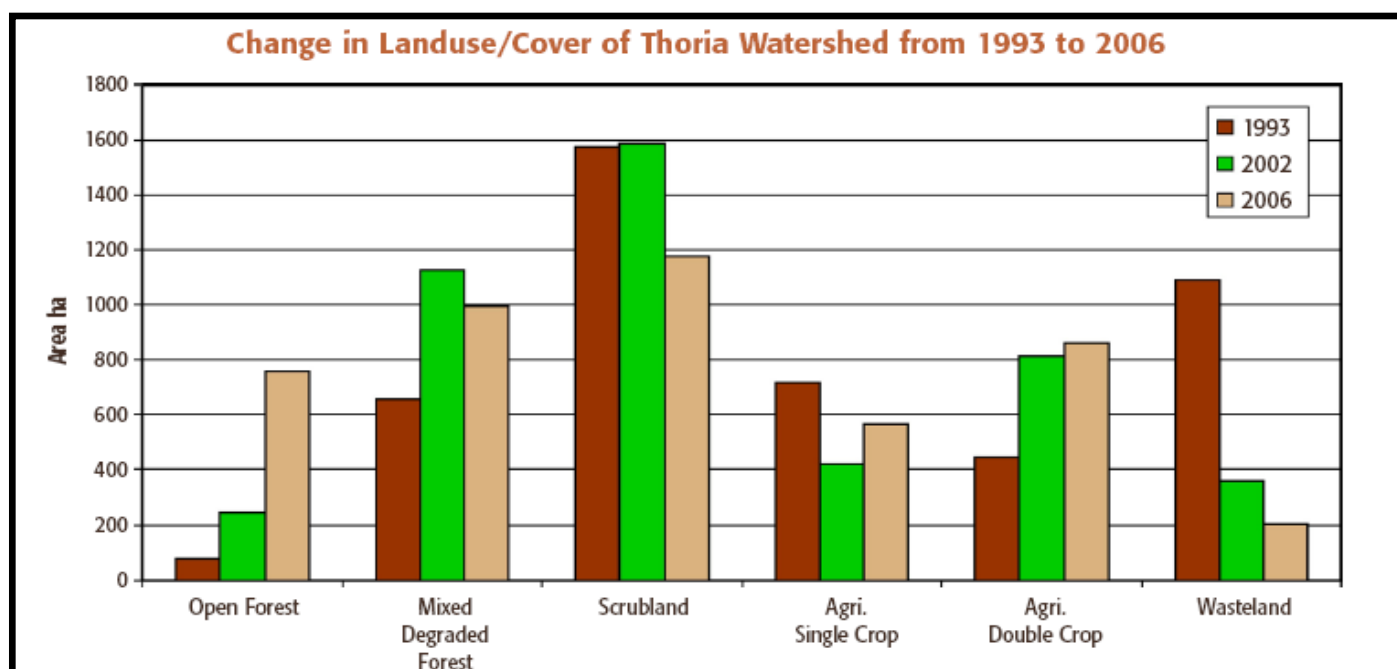


by 100 to 350 in Rajasthan and 100 to 120 in Madhya Pradesh. A high density of shrub species and a greater diversity and palatability of grass species complemented this. Given that the vegetative cover and composition being crucial for feed and fodder availability for livestock, it is significant that the aforementioned vegetative growth led to an increase of almost 450% in palatable biomass in Rajasthan and 300% in Madhya Pradesh. Further, the dry matter from the Commons constituted 60% of the total fodder availability in Rajasthan and 50% in Madhya Pradesh. The average value of the fodder derived by a household from the Commons was estimated at Rs.10, 700 per annum and Rs. 7,600 per annum in Rajasthan and Madhya Pradesh, respectively. At the same time, the improvement in the moisture regime contributed to an increase of 14 ha of irrigated area in rabi (winter crop) in Rajasthan and 22 ha. in Madhya Pradesh, with concomitant increases in returns from major crops.

5. Water and Common Land Development: The Case of Thoria Watershed

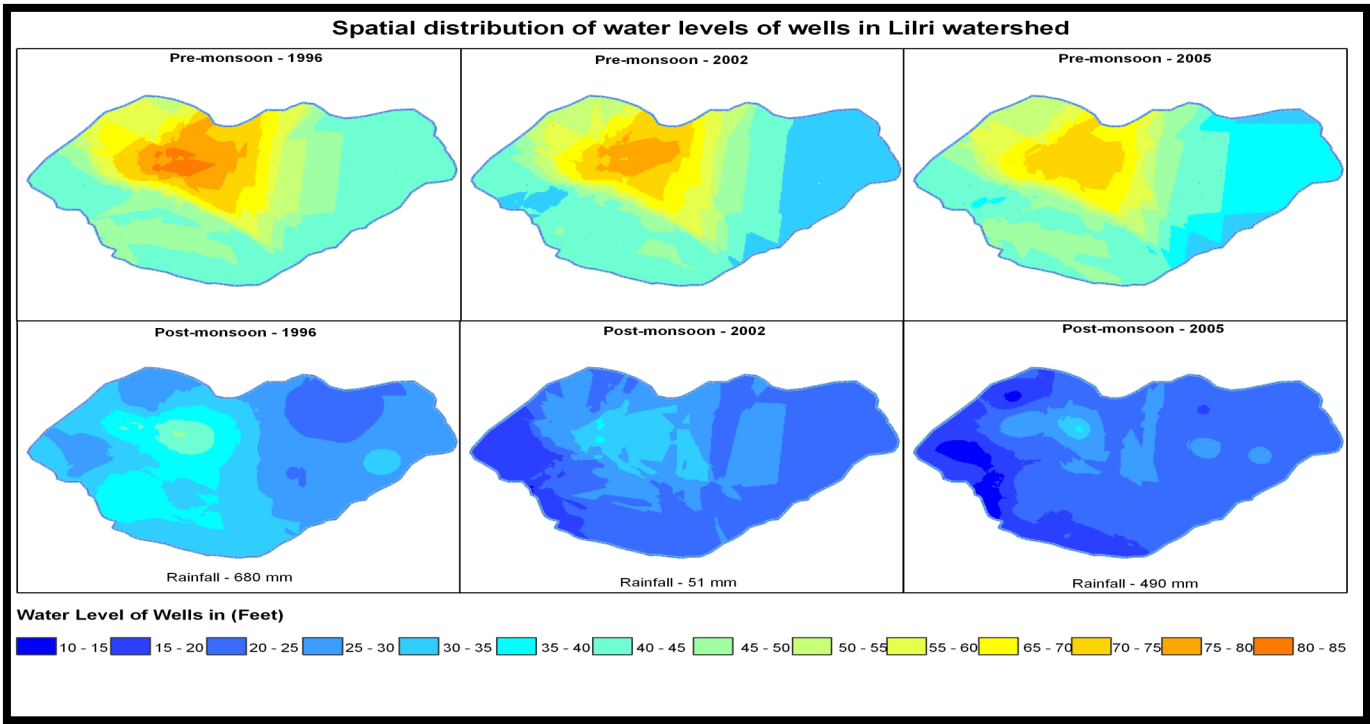
As a part of the aforementioned study, changes in land use and other ecological parameters in the Thoria Watershed were monitored in 1993, 2002 and 2006 through satellite imageries supported by ground truthing. Intensive soil and moisture conservation was undertaken in the watershed both, on the common lands and outside them and vegetative growth was promoted through protection and planting of various tree and fodder species. About 100 check dams were constructed on drains across the watershed to check soil erosion, to recharge the aquifer by storing water and also to provide drinking water to livestock.

It was found that as a result of these efforts, the open forest area in the watershed increased by



over 9 times (from 80 ha. in 1993 to 756 ha. In 2006), while mixed degraded forest improved by 52% over the study period. Scrublands, on the other hand, registered a decrease of 25% since some parts were promoted to the mixed degraded and open forest category. The organic content in the soil increased by 45% and similarly other nutrients like nitrogen, phosphorus and potassium also increased by 9%, 7.5% and 22%, respectively.

At the same time, there was also an improvement in the surface water and groundwater availability. In comparison to water levels in 1996 which were 33 ft. below the ground level after the monsoons (October), average water levels between 2002 and 2006 were around 23.25 ft. below ground level, indicating a gain of around 10 ft. in the water column, offering higher irrigation potential and reducing shortage of water in dry months. In fact, the watershed registered an increase of almost 94% in the agricultural area under double crop.



6. Pollination Studies in a Deccan Agricultural Farm

Pollination is a large cost factor in agricultural production and, globally, it is estimated to be worth £141bn (\$224bn) each year. A study was undertaken in select sites in the Kadiri Watershed in Anantpur district to examine pollinator assemblage (bee populations) in sunflowers and tomatoes. The study showed that a rich bee assemblage was found even in a dry and drought-prone area such as the Kadiri watershed and in the case of sunflower, no farmers were seen hand-pollinating their inflorescences. The results also indicated a potential decline in pollinator movement as the distance from native vegetation increased and that crop fields are themselves potential bee nesting

habitats. At the same time, the non-pollinator assemblage was found to comprise of a diversity of invertebrates such as spiders and leafhoppers that have critical functional roles in the farming system such as predating on pests, thereby reducing the cost of pesticide application. It has been observed that when natural pollination is poor, farmers have to resort to costly techniques to enforce fruit set and for pest control, often with poor results. The loss of such services could have a long-term impact on the farming sector, which accounts for almost a fifth of India's GDP.

In the Indian sub-continent, abundant pollinator and other insect populations are supported by natural agro-ecosystems, which are often farm-forest matrices with considerable habitat heterogeneity. Even highly managed agro-ecosystems, such as monocultures, are dependent on wild pollinator sources from neighbouring natural habitats.

Such studies are important as there is an increasing alienation in the way the general public and the farmers view agriculture and forest ecosystems. This is probably a result of widespread agricultural intensification and the colonial remnants of the forest administration where local communities are not seen as partners in conservation. Considering the vast expenditure incurred on agriculture, there is a need to better understand forest hydrology, floral biodiversity, the role of insects, soil microbes etc and their linkages to agriculture to highlight the dependence of agriculture on forest ecosystems.

7. The Jan Kalyan Mandal Yojana

As a part of our strategy of promoting volunteers, local youth in the Panchmahal district of Gujarat are being engaged in various development processes, especially the MGNREGA, since 2006. Witness to the increasing involvement of the youth in these processes, the government decided to involve them in improving the local infrastructure and service delivery and together with the Government, we conceptualised a Programme called Jan Kalyan Mandal Yojana in 2009.

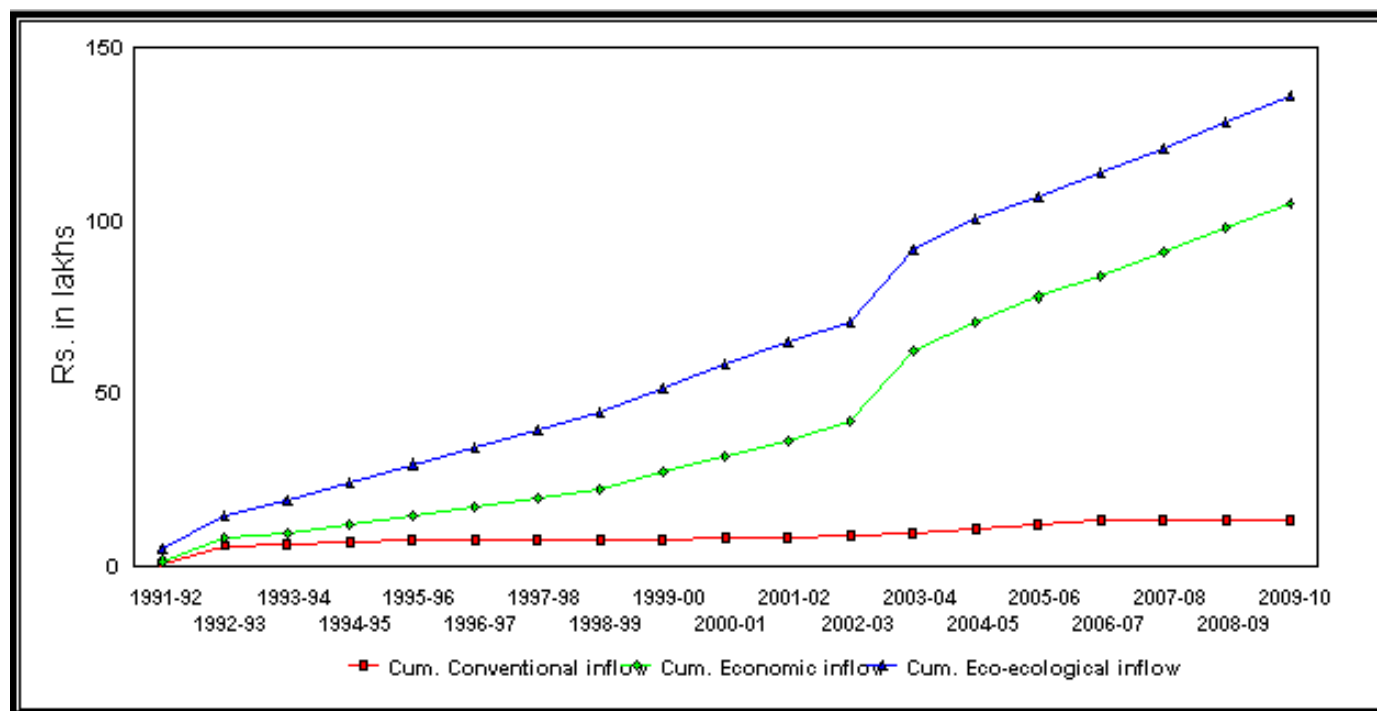
Under this initiative, which is being implemented in the Santrampur and Kadana blocks of Panchmahal district, 80 Jan Kalyan Mandal Coordinators (JKMC) have been trained to cater to 320 Jan Kalyan Mandals – clusters of 15-20 tribal households each. In assisting communities, the JKMCs have worked for 46 schemes promoted by the Government for the socio-economic and ecological development of their area and reached out to 13,175 beneficiaries.

The total amount leveraged by the JKMCs over the implementation period on schemes for health, education, livelihood promotion, social security, ecorestoration, insurance and other financial entitlements over a period of two years has been estimated at Rs. 53.357 million. The expense

incurred over the same period on the training, remuneration and logistical requirements of the JKMCs and the Jan Kalyan Mandal Supervisors (JKMS) amounts to Rs. 6.487 million. Since they are a part of the local community, this expenditure must be understood as a long-term investment as their services in enabling the people to access government programmes would be available in the region for several years. The encouraging results of their involvement in local development have led the government to expand the scale and scope this scheme.

8. Valuing the Commons

In order to understand the true value of the benefits from the restoration of commons, we initiated the Natural Resource Accounting System (NRAS). While monetary transactions are easily monitored through the conventional accounting systems, the economic valuation captures the value of all the goods and services provided by the environment such as fuel wood, fodder and biomass, irrespective of whether market prices are available. NRAS goes a step further as it allows for the valuation of even indirect benefits from the regeneration of the Commons such as increased soil fertility, carbon sequestration and soil erosion prevented. The 'Natural Resource Accounting System' (NRAS) helps in accounting such benefits by using various valuation techniques. The development of the resource in some of the project villages are being monitored through the NRAS, particularly by estimating economic values based on the costs of avoided damages resulting from lost ecosystem services or cost of providing substitute services. The parameters of enquiry include a range of ecological aspects including green biomass, fertility of the soil, soil erosion, carbon sink, and other direct and indirect social



and economic benefits accruing from the common land. A remarkable increase of 230.89 tonnes/ha has been registered in the total green weight. The amount of carbon sequestered in the plantation site has increased by 62.97 MT/ha. Alongside the improvement in green cover, the decrease in the amount of soil lost has been around 30 tonnes/ha over a 17-year period. The health of the soil has improved with nitrogen, potassium and phosphorus (NPK) values registering an overall increase and alkalinity reducing to a fraction of the original extent. The valuation of these benefits accrued on common land is Rs. 0.33 million per hectare. The valuation of different economic and ecological benefits generated from 25 hectares of common land during the period of 17 years is Rs. 8.253 million. The total estimated value and benefit from the developed land is more than 8 times the investment.

9. Commons Make Economic Sense: Highlighting the Value of Commons

Jodha's study of 1986, which is based on data from 82 villages in 21 districts in the arid and semi-arid zones of the country, highlighted the relevance of the Commons to India's rural economy at large and its importance as a 'safety net' to the poor in particular. This was further confirmed by the 54th round of the National Sample Survey Organisation (NSSO 1999) which estimated that an average of 48% of households across the country collect CPR products. Over the two decades since Jodha's pioneering study, there have been significant changes in the land use patterns across the country owing to demographic changes, government policies etc. In order to re-assess the contribution of the Commons to rural livelihoods in the changed scenario, in 2010, FES undertook a study on the Commons, *A Commons Story: In the Rain Shadow of the Green Revolution*. Conducted in partnership with seven NGOs, the study covered 100 villages spread over 22 districts in 7 states and representing eight agro-ecological regions of the country.

The study showed that around 98% of the surveyed households access the Commons for different purposes. 53% of households collect agricultural inputs from Commons, 69% graze their animals on the Commons, 23% collect fodder from the Commons, 74% collect fuel wood, 37% collect food products, 37% collect non timber forest produce (NTFP) and 62% use common water bodies for domestic and livestock purposes.

The imputed value of the contribution of the Commons to household incomes through the collection of these products in the arid, semi-arid and sub-humid regions ranged from 20-40% of the household's annual income. This contribution was found to be the highest in the sub-humid regions followed by arid and semi-arid regions. The share of agricultural inputs from the Commons in total agricultural expenses was estimated at around 17%. The Commons were also found to contribute 46% of the total fodder requirement of households. This is particularly

significant given that agriculture and livestock contribute over 21% and 14%, respectively, to the net household income.

While the Commons provide more than 50% of the fodder requirement of small ruminants, the corresponding figure for archetypical stall-fed animals like buffaloes and crossbred cattle is also a substantial 20%. Further, the Commons were also found to contribute directly to household consumption requirements. While more than 58% of the total fuel wood requirements of a household are met from the Commons, the share of NTFP in the total value of the produce collected from the Commons ranges from 10% to 14%.

The study findings clearly re-established that Commons contribute significantly to strengthening household resilience by contributing, directly and indirectly, to agriculture and livestock production as well as food and nutritional security of rural households. The contributions from the Commons, therefore, must be understood as subsidizing the cost of subsistence of rural households and as supporting the growth and sustainability of rural production systems. At the same time, the importance of community institutions to improve access of the community to the Commons and to establish rules and regulations, which help in improving resource flows, needs to be recognized.