NOTES

Effects of Small Sustainable Land Use Systems in Developing Countries

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ABSTRACT

Especially when viewed in the context of the ongoing market liberalization, small land use systems are often considered to be inefficient in terms of commodity production because further externalities, which might also be welfare-relevant, are not sufficiently accounted for. The assessment of all outputs connected with small land use systems can deliver a more comprehensive view on their economic, ecological and sociocultural impacts. This paper reports on a case study carried out in India which investigated the outputs of small sustainable land use systems. Based on the empirical evidences, we show the high complexity of outputs—commodities and externalities—linked with small sustainable land use systems in developing countries.

INTRODUCTION

Due to the increasing focus on participation and competition in international markets, the assessment of land use systems is often restricted to the evaluation of commodity production. Consequently, small farming systems are often regarded to be inefficient mainly because positive side-effects beyond commodity production are not taken into consideration. For a more realistic assessment of land use systems, it is imperative to adopt a comprehensive approach that takes into account all related outputs—ranging from commodity production, to the associated externalities. We attempt to carry out this objective by conducting a case study in a small village called Dhola Khakara in India. In the sample village, several development schemes, such as soil- and water-conservation measures, were implemented. After applying these combined measures, the resulting changes in agricultural production brought about several effects that impacted not only on the farmers or the rural population, but also on the environment. This paper intends to analyze these effects that emerged alongside the agricultural production changes, and to show the various values of small sustainable land use systems beyond the provision of commodities.

CASE STUDY[1]

Geographical Background and Agricultural Production in Dhola Khakara

The chosen village which served as the research site is Dhola Khakara. It is located in Jhalod, which is one of the *talukas*[2] in the northeast region of the Dahod District (Gujarat/India). The region is characterized by dry, semi-arid climatic conditions. The topography is undulating to hilly. Until the 1940s, the project area was mainly covered with a dense teak forest. The natural potential of the landscape has been enormously stunted due to the logging activities in the 1950s and 1960s, which had reduced the tree cover to the minimum level of 20%. As described by Singh and Gupta (1997, p. 6): "The forest cover is sparsely distributed and most of the area is under thin vegetative cover." The climate in general can be considered as subtropical with two distinct seasons, namely, summer from mid-March to October, followed by winter. The period from June until October is characterized by the occurrence of the southwestern monsoon. The cold and dry winter period lasts from November until February each year. The rainfall pattern—often erratic and unreliable—is compounded by severe drought periods. The major problem lies not only in the low amount of rainfall, but also its uneven distribution throughout the year. The soil in the area is shallow, with low fertility (Castillon 1992). The combination of these difficult conditions has hindered an effective agricultural commodity production.

Erosion is a major problem that needs to be addressed in order to support the development of sustainable resource management. The improper cultivation practices, in combination with unsuitable cropping patterns in order to force the yield out of the land, have stretched the soil's limits. Many negative external effects have arisen due to the soil erosion problem. The general effects that result from erosion may be classified into on-site and off-site effects. Among the on-site effects are soil loss, decrease of organic matter, lack of nutrients, loss of soil depth, decrease of soil fertility, and reduction of moisture in the soil; on the other hand, the off-site effects consist of sedimentation, eutrophication of nearby waterbodies, risk of flooding, damage on irrigation systems, and the reduced capacity of rivers, lakes and drainage systems (Rajora 1998). These effects have been observed in the project area.

Given the circumstances described above, it seems logical to conclude that intensive agricultural production has resulted in the accumulation of more negative effects than positive ones. The natural resources have been exploited beyond their natural potential for regeneration. It was therefore deemed necessary to implement programs, which would halt this worsening trend. It was believed that proper agricultural practices could substantially reduce the erosion effects and improve the quality of the land.

Methodology

The tribal farmers in Dhola Khakara served as participants in the study. Interviews were conducted in 30 households. Their responses to the survey questionnaire constituted the primary data collected. A major part of the data collected focused on the effects of the soil and water conservation measures that were implemented in the village from the initiative of either government or non-government agencies. Secondary data were collected from different government offices in order supplement the data gathered on the demographic background and other pertinent information.

RESULTS AND ANALYSIS

The findings of the case study would show that the village community in Dhola Khakara has benefited immensely from the various development programs that implemented afforestation,

[1] The following results are part of the study on the "Effects of Soil Conservation in Agriculture", which was initiated by an Indian NGO, the NM Sadguru Water and Development Foundation. This NGO operates in three states, namely: Rajasthan, Gujarat and Madhya Pradesh. The organization receives funds from the state and central government, as well as national and international funding agencies, for its rural/tribal poverty alleviation [Natural Resource Management] programs (NMSWDF 2004:.i). The data were collected and analyzed by Schindler (2005) from November 2004 until March 2005.

[2] A taluka is a political administrative unit between village and district level.

lift irrigation schemes, and soil- and water-conservation. In order to participate in the planning and implementation process, the inhabitants, supported by the NGO, founded several village institutions. Furthermore, several training sessions and lectures on sustainable agriculture were held. The contents of the lecture and training materials combined traditional knowledge with new scientific results.

Before the implementation of these conservation and other development programs, the farming practices in the village focused solely on increasing commodity supply, thereby, causing an accumulation of negative external effects in the long term. The goal of the implementation of the various development schemes was to harmonize the various potentials present in the rural production systems, and therefore bring about an improvement of the livelihood in the community. Since the implementation of those development schemes, several positive externalities have compensated for the negative ones.

The predominant farming systems found in this region were small-scale, since the farmers worked on four or even less acres of land for their agricultural production. In most cases, those few acres of land were all that they owned. These small farming systems need to be conserved in order for every farmer to gain maximum benefits from these positive effects earlier described. Therefore, what emerged as the basis of the successful implementation of conservation measures are these small land use systems.

According to the villagers, one of the main accomplishments that resulted ten years after the completion of the watershed- and conservation program was the decrease of erosion, which meant that the fertile topsoil has remained in the field and the soil depth has risen. The uncontrolled runoff of water has been stopped, thereby preserving the soil-moisture content. Due to these improved conditions in the fields and the benefits derived from irrigation, the yield has risen and crops could be successfully grown twice in a year, instead of one, in a year. Also, as an offshoot of the forestry program implementation, the community of the beneficiary village has planted 306.468 trees belonging to eleven different species. This has enhanced the microclimatic conditions as well as the rate of biodiversity of the area, and provided extra fuel.

The most obvious sign of success has been the increase in the amount of agricultural yield in the sample village. The average maize yield in the monsoon season has reached 540 kg/acre while that of the rice yield, 565 kg/acre[3]. Also, the wheat yield in the dry season has amounted to 989 kg/acres. The villagers in Dhola Khakara claimed that, in general, they no longer suffered from the lack of food provision, as they did in the past. Another indicator of the yield increase in Dhola Khakara has been the availability of fodder. The majority of farmers stated that they have done away with purchasing fodder for their livestock because they produced enough for their needs.

Almost every farmer in Dhola Khakara grew pigeon pea as intercrop, which has been beneficial for soil fertility because it has raised the soil's nitrogen level. In one cropping season, some cropping patterns had allowed the cultivation of as much as five different types of crops, namely: maize, pigeon pea, rice, groundnut and black gram. The farmers have also applied a wide variety of biological fertilizers such as: organic manure, biomass, livestock waste, poultry manure, compost material, and biogas slurry which have benefited the soil quality in a more natural and, therefore, sustainable manner compared to chemical fertilizers.

The farmers attributed the increase in the yield to the soil conservation measures. They claimed that their first priority lay in producing enough yield for their personal use. The excess production has been sold in the markets. In fact 47% of the respondents in the beneficiary village explained that they were now selling 50% of the production in the nearby local markets. A farmer could earn up to Rs12.800[4] (US$290) a year from the agricultural production. Some 96% of the respondents in the beneficiary village claimed that they have realized a constant increase in their income during the past ten years. About 70% of the respondents in Dhola Khakara mentioned that it was now possible for them to save a portion of their increased income, and even

[3] The acre (equal to 4046.86 m2) is the common unit of measure of rural property in western India.

[4] Rs (or Rupees) is the Indian currency.

invest, for example, in technical equipment and livestock.

Due to an increase in income, the cycle of migration has changed. There has been no instance of continuous migration exceeding four months in the beneficiary village[5]. Another major barometer of success has been the literacy rate. Roughly 80% of the respondents could now afford to send their children to school. The general literacy rate of the Dahod District was estimated to be around 45 percent (Census of India 2001). The rise in school attendance can therefore be considered as a major accomplishment since it bodes a brighter future for the village population.

The case study shows that the ecological and social benefits (refer to the table below) which have simultaneously emerged, alongside the rise in production, could indeed constitute positive externalities. In fact, although it may be difficult to measure precisely the value of such benefits as the appearance of a higher degree of biodiversity, the improved microclimatic conditions, the increased fertility of the soil, or the lower migration rate, it cannot be denied that these factors have definitely upgraded the living standard of the rural community and promoted the social welfare[6].

CONCLUSIONS

The study has shown the wide variety of effects—ranging from the directly observable results on commodity supply, to the not readily measured externalities—linked with small sustainable land use systems. The first major effect has been the rise in agricultural employment and the production of marketable goods. Also, the full supply function has been restored, since enough fodder and fuel were being produced simultaneously. Owing to the increase in income, less villagers resorted to migration, and social life has improved. Further, the literacy rate has increased dramatically, and the vitality of the entire village has increased in general.

The findings of the case study imply that agriculture in developing countries provides various positive externalities, which are elements of complex causal chains. Therefore, the assessment of agriculture in these countries should not only take into account the effects on commodity production, but should also factor in as well the resulting externalities (e.g. sustainability, biodiversity, food security, migration), which are also welfare-relevant.

Effects of Small Farming Systems in Dhola Khakara.

	Effects
Economic	- higher yield (surplus goods marketed) - higher income - sufficient fodder for livestock - allowed investments and savings - ownership of livestock
Ecological	- decrease and prevention of erosion, - higher ecology potential - greater biodiversity - allowed cultivation of wasteland - improvement of soil conditions
Social	- higher literacy rate - reduced migration (shorter duration) - enhanced family and community relations - promoted the people's identity

[5] It is common for the farmers in that region to migrate for a duration of about 8 months spanning the hot and dry summer (March–June) and the winter season (October/November – February). During the monsoon season (from June/July until September/October), most farmers work in their fields, but leave right after the harvest. Some farmers even migrate for a whole year and return only for the harvest and traditional festivals.

[6] The study has shown the causal relation of this phenomenon.

REFERENCES

Castillon, D.A. 1992. Conservation of Natural Resources: A Resource Management Approach. Dubuque: Wm. C. Brown Publishers.

Census of India. 2001. http://www.censusindia.net/results/popul.html.

NM Sadguru Water and Development Foundation (NMSWDF). 2004. Annual Report. Dahod, India.

Rajora, R. 1998. Integrated Watershed Management. Field Manual for Equitable, Productive and Sustainable Development. New Delhi: Rawat Publications.

Schindler, J. 2005. Effects of Soil Conservation in Agriculture. Dahod: NM Sadguru Water and Development Foundation.

Singh, K. and K.K. Gupta. 1997. The Sadguru Model of Community-based Natural Resource Management". Occasional Publication 14. Anand: Institute of Rural Management. .