



AGRICULTURE

READING THE AGRICULTURAL LANDSCAPE IN A RIVER BASIN: INTEGRATING AGRO-ECOLOGICAL AND SOCIAL PERSPECTIVES

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Abstract

Agricultural landscape of a river basin is constituted by interlinkages between resources used and social relations, both within the basin and linking the basin to the non-basin areas. Expanding scarcities of land and water resources, and the human response to these scarcities, make it imperative to freshly examine these concepts of resource interrelationships, basin unity and stewardship concerns in an agrarian landscape of a river basin from an integrated agroecological and social perspective. The trajectories of change in agricultural resource use at the river basin is conceptualized as influenced by and carried out within multilevel networks of social relations that exchange resources and engage in reciprocal interactions within and outside the river basin.

Keywords: River basin, Agricultural landscape, Resource interlinkages, Stewardship, Agro-ecology, Agricultural production networks

Introduction

The greatest symbolic appeal of river basins was recognized to be the concepts of resource interrelationships, basin unity and social values emphasizing stewardship concerns acting as an effective instrument for conservation of resources of water, soil and vegetation in the basin (Steele, 1949; Kraenzel, 1957). The agroecological patterns of a river basin manifest in the diverse agro-environments, resource interactions and resultant agrobiodiversity is related to multiple socio-economic processes and networks that together shape the agrarian landscape in a river basin. Such an understanding of the structure and functions of a river basin agricultural landscape is important for the success of integrated management of resources at a river basin level. Current and expanding scarcities of land and water resources, and the human response to these scarcities, make it imperative to freshly examine these concepts of resource interrelationships, basin unity and stewardship concerns in an agrarian landscape of a river basin from an integrated agroecological and social perspective.

Resource interrelationships

Rivers support all forms of life, shape topography over a variety of scales and historically, have determined the location of settlements and agriculture. The basin of the rivers have long been recognized and acknowledged as basic and optimal units for planning, management and conservation of natural resources (Wengert, 1957; UNCED, 1992; Howe, 1997; Brooks and Eckman, 2000). A river basin is the land area between the source and the mouth of a river including

all of the lands that drain into the river (Ramsar, 1999). River basins are significant as key sites of land-water interactions both of which have become scarce resources today (Bandaragoda, 2006). Agriculture which is one of the earliest and major human transformations of the natural landscape (Vitousek et al., 1997; Verburg and Chen, 2000) accounts for a high share of land use in most of the river basins world wide, along with accounting for the highest proportion of all water uses (FAOSTAT, 2001). Agriculture is regarded as a detrimental force in transforming and degrading river basins and altering plant and animal communities of many ecosystems throughout the world (Howe, 1997; Kindler, 1998; Gordon et al., 2007). Upland agriculture through land clearing and subsequent operation has a major negative impact on water quality and has also led to significant changes in flood and dry season flows (FAO, 2000; Costa et al., 2003). Lowland agriculture can lead to the drainage or conversion of floodplain wetlands leading to loss of biodiversity and natural functions and benefits. At the same time, agriculture also acts as a powerful interface between people and nature potentially ensuring food and livelihood security. These contested views on agriculture have given rise to debates on reshaping agriculture through a reshaping of the resource use relations, thus reshaping agricultural landscapes to adapt to growing resource constraints and environmental concerns (Gasteyer, 2007). Therefore, understanding resource interrelationships in agriculture in the various stretches of a river basin, which plays a significant role in shaping the river basin landscape, becomes important in planning for river basin management.

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Expansion of irrigated agriculture and development of the less endowed rural spaces to transform them into highly productive and populated landscapes were the main drivers of earlier initiatives of river basin development which took off during the mid twentieth century everywhere including the American West, Europe and Asian countries (Steele, 1949; Kraenzel, 1957; White, 1963) when water was in abundance. The focus of the river basin development approach on the regulation and management of the river had led to a project-by-project piecemeal approach to agriculture in the past and an upstream-downstream conflict resolution approach without necessarily understanding the larger landscape framework in which these agricultural systems are situated. The effects of piecemeal management and a project-by-project approach are found in nearly every river basin: degradation of the Nile Delta, desiccation of the Aral sea basin, degradation of the Danube river and the Black sea, increases in salinity concentrations in the Colorado river etc. (Howe, 1997; Kindler, 1998). During the last two decades, the importance of an integrated approach to water resources management has been widely recognized implying an inter-sectoral approach, representation of all stakeholders, all physical aspects of water resources and sustainability and environmental considerations (UNCED, 1992; ICWE, 1992). In this context, it is imperative to clearly understand the land-water linkages and the territorial identity of a river basin which involves a broader context of overlapping social, economic, political and physical spaces and not just as the hazy 'background' where uses of water and conflicts over water takes place. Foregrounding the landscape brings to focus the close linkages between agriculture and other resources and the complex nature of human interactions, which craft the characteristics of a river basin. Such an approach liberates water in a river basin from the 'jealously guarded exclusivity' (Bandaragoda, 2006: 175) that the international crusades in the water sector has promulgated and helps weave back into the fabric the overall resource context within which water is used.

Basin unity

The appeal of a river basin approach of being an organic whole having peculiar and often mystical unifying characteristics offered a basis for resource development and conservation in North America at the start of twentieth century. Phrases such as 'comprehensive', 'integrated', 'partnership policy', 'the power in the river belongs to the people' etc. were used to bolster up the entire conceptual structure (Wengert, 1957). But a broader understanding of the complex factors involved in river basin approach to agriculture, going beyond common misconceptions as to the nature and role of river basins is required to suggest a

framework for further analysis of agriculture in a river basin.

Within a river basin, which is made up of sub basins and watersheds, there are diverse biophysical regions, which form various distinct agro-ecological zones (Ramsar, 1999). An agro-ecological zone is a unique combination of landform, soil and climatic characteristics and/or land cover having a specific range of potentials and constraints for land use (FAO, 1996; Patel et al, 2000). Crops, cropping calendars and elaborate subsistence techniques were attuned to natural conditions of soil, topography, climate and hydrology in the respective agro-ecological zones. Successive phases of settlement and water management techniques were also closely related to the morphological elements of the landscape (Van Liere, 1980; Molle, 2003). While the site of settlement and its consequent growth and fate are chosen based on favorable environmental conditions, these settlements also change the landscape through the patterns of land and other resource uses (Chakravarti, 1998). Socioeconomic processes such as those induced by growing population pressure, changing opportunities created by markets, policy interventions, changes in social organization, resource and labour availability drives and decides the agriculture and resource interactions and therefore the agricultural landscapes (Peluso, 1996; Marsden, 1997; Stone, 2001; Lambin et al, 2003). These processes link the locality of the basin to surrounding basins, to the state, the national and international spaces and therefore often act beyond the boundaries of a river basin. Resource transactions between basins such as inter-basin water transfers also challenge the notion of the river basin as an exclusive entity. Allan (2006) note that economies, whether they fit hydrological boundaries or not, cope with resource deficits and challenges with remedies deriving from beyond immediate watersheds.

Even within a river basin, which is a complex comprised of sub-basins and watersheds of various sizes with the existence of multiple political jurisdictions, there are serious challenges in accomplishing or even envisaging unitized management. River basins can be seen as geographies of uneven development wherein different regions intensify or de-intensify their agricultures and their use and availability of water and land (Howe, 1997; Marsden, 1997; Zimmerer, 2007). Hence mapping the resource links within the basin as well as of the basin to the non-basin and agricultural network linkages that operate across discontinuous spaces is imperative to critically analyse the concept of basin unity.

Stewardship concerns

Environmental concerns have been part of the agricultural discourses since the 1930's (Gasteyer, 2007). Improved understanding of processes of

resource use change has led to a shift from a view condemning human impact on the environment as leading mostly to a deterioration of earth system processes to emphasis on the potential for ecological restoration through resource use management (Lambin et. al. 2003). Worldwide, ecological requirement of agricultural landscapes in preservation of biodiversity, maintenance of wetlands, soil and water conservation etc. are being increasingly recognized (Buttel and Zepeda, 2002; Posner, 2005; Cocklin et. al., 2006; Glebe, 2006). Since almost 40% of the world's land area is under some form of agriculture, the involvement of ecology in agriculture is very crucial in mitigating the environmental assaults of agriculture through deforestation, soil erosion, overdraw of water, abusive use of pesticides and other agro-chemicals. The complexities of circumstances that surround food production, involve ensuring global food security and at the same time preserving the environment (Ormerod et. al., 2003). By the mid-1980's, agriculture began to be seen in the West not only as a socio-economic venture, but also as an ecological endeavour. This agroecological focus has resulted in a further expansion of the performance criteria for agriculture beyond production and family economics to include minimizing the environmental impact of agricultural systems and the recognition of agriculture as the steward of vast national landscapes and as a potential sustainer of nature itself (Altieri, 1987; Marsden, 1997). In the West, these concerns are addressed through concepts such as multifunctionality of agriculture, stewardship of traditional agricultural landscapes and policy interventions such as agri-environmental policies (Ormerod et. al., 2003; Dobbs and Pretty, 2004; Glebe, 2006). But often the food production or food and livelihood security function of agriculture is subsumed under ensuring ecosystem and aesthetic services of agricultural landscapes giving scope for the deployment of WTO-legitimate green box policies (Theobald, 2001; Swinbank, 2001).

The international concerns over agriculture and environment spearheading an agricultural transition (Buttel, 1995) is relevant in developing countries also in the context of mounting conflicts and resistances over resources and emerging competing uses for them (Bryant et. al., 1993; Edmonds, 2001). While farmers are facing increasing ecological concerns over land, the amount of arable land for agriculture is shrinking as other sectors successfully competes for land and international competition is destroying market for local crops. (Edmonds, 2001). Also involved is the change in the values on which agrarian spaces are constructed and organized, social meanings of and relations to land and water manifested in the nature of the society, their livelihood and everyday life. Agriculture has been pointed out to be situated in a locally differentiated and changing rural social backdrop. There is an ever-

widening range of income sources for members of the farming household coupled with rising land values and water use due to other demands on them and relative decline in the income derived from land under agriculture (Marsden, 1996; Marsden, 1997). In this context, the role of farmers as primary managers of productive agricultural land, which is an increasingly vulnerable natural resource, becomes important (Coxhead et. al., 2001). Unlike the developed nations, food security and livelihood concerns continue to be equally important along with ecological role of agricultural landscapes. Resistance of the relatively powerless as they fight to protect the environmental foundations of their livelihood is also mounting (Bryant, 1991; Parajuli, 1994; Wright, 1998).

Therefore understanding the ways in which ecological concerns in agrarian landscapes are raised and addressed in developing countries becomes important. Ultimately both cultural and natural landscapes as a dynamic entity can be protected and sustainably used only by people who have an appreciation of a balanced human habitat (Nair, 1994). River basins offer a contiguous spatial scale to address these issues in a broad range of farming types and scales. Multilevel network linkages can provide evidence as to the actors involved and the extent of intra and inter-basin links that exist in agricultural resource conservation and stewardship initiatives in a river basin (Ferreyra et. al., 2007). Such a perspective can provide useful insights regarding the potentials and problems of the river basin as a suitable scale for natural resource management.

Conclusion

In summary, we propose that the agricultural landscape of a river basin is constituted by interlinkages between resources used and social relations, both within the basin and linking the basin to the non-basin areas. For this, one needs to capture the multiple processes of change in the use of land and water in the agricultural landscape of a river basin. In this context, agricultural change is conceptualized as influenced by and carried out within multilevel networks of social relations that exchange resources and engage in reciprocal interactions within and outside the river basin. In order to read a landscape influenced by such multiple processes, the current situation has to be located within the historical process and therefore landscape history as manifested in the history of natural resource management needs to be reconstructed and understood (Nair, 1994; Gasteyer, 2007). Understanding the different versions of environmental and social history becomes important, as landscapes are perceived to be cultural as well, subject to multiple interpretations, visions and memories (Peluso, 1996; Theobald et. al., 1996; Burgi

and Turner, 2002; Lambin et. al., 2003). There is also a need to define and differentiate the diverse biophysical conditions of agricultural production and agrobiodiversity within a river basin. Hence reading an agricultural landscape in a river basin requires integration of agricultural ecology and social processes within a temporal and spatial spectrum.

Acknowledgement

The first author acknowledges Prof. Narender Pani, NIAS and Madhusoodhanan C.G. for valuable comments on the first draft. The usual disclaimers apply.

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