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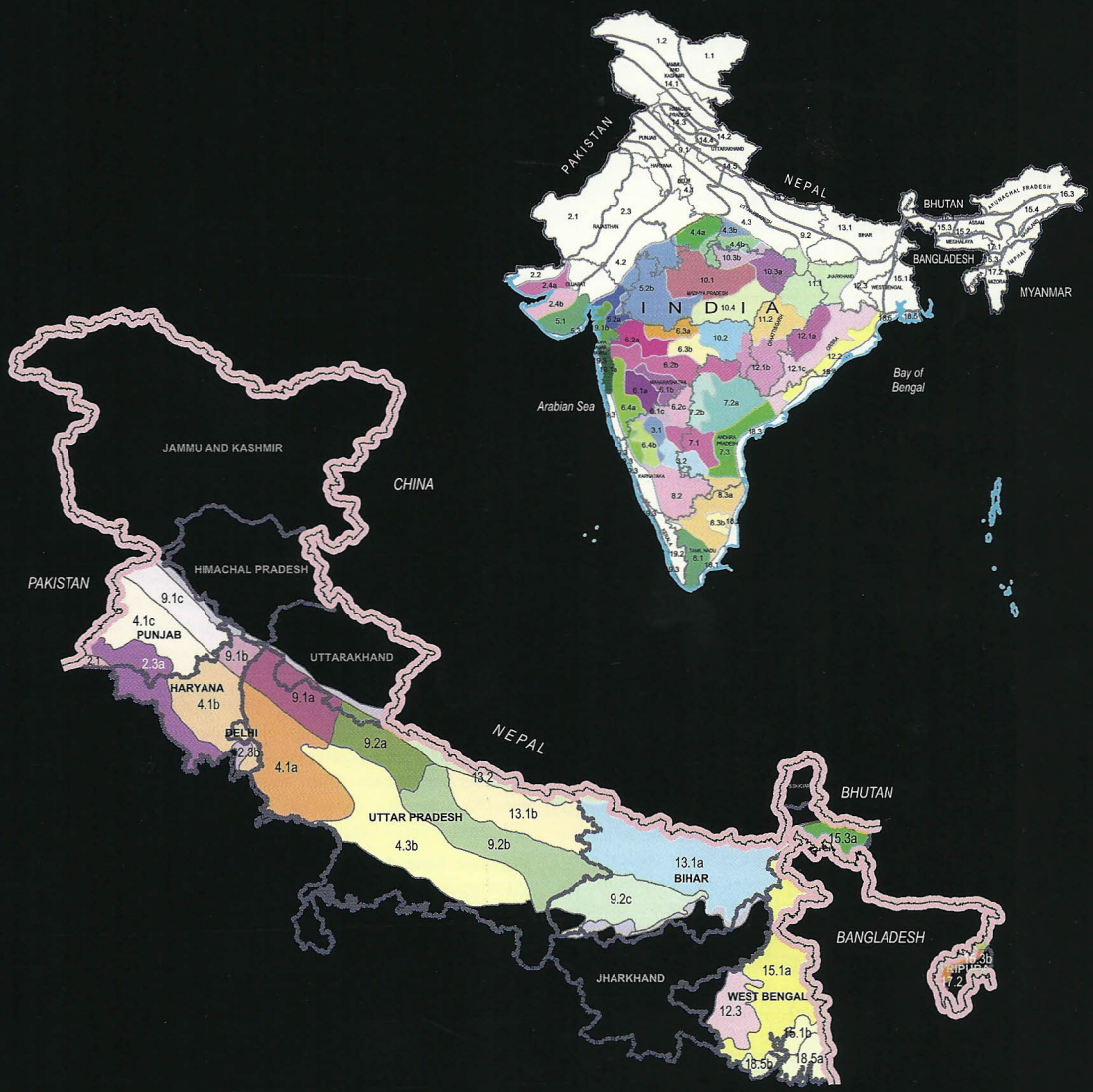

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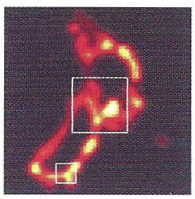

Payment for ecosystem services for water – case of Cauvery

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Preamble

Water is the most crucial and valuable ecosystem service in nature. Agriculture uses the largest proportion of water (92%) in irrigation. Water use discipline is vital in agriculture and potentially results in the saving of scarce water for wise use. Thus, irrigation water literacy and payment for ecosystem services (PES) are significant in educating users regarding water use efficiency and consumers of water-intensive crops that they make PES for water for system efficiency. This note discusses how the state can implement PES with high accountability and low transaction cost.

Use value or cost of surface water

Surface water is provided by an irrigation reservoir/dam which impounds runoff from rainfall. The cost or value of water can be determined from the supply side of the irrigation dam. The cost or value of conservation efforts by farmers and watershed efforts reflects the cost of water from the demand side. The supply side is illustrated here with the estimate of cost or value of water to reflect ecosystem service.

Time series data on cost of construction of an irrigation reservoir/dam, including canals and operation and maintenance costs are obtained. Yearly cost data are then compounded to the present, reflecting total cost of irrigation structure assuming that it can be built in the latest one year. The compounded total cost is then apportioned (amortized) over the life of the irrigation reservoir/dam, technically assumed to be 100 years. The social rate of discount of 2% is used to reflect the public investment made on a natural resource reflecting the time value of money. The amortized cost divided by gross area irrigated by the reservoir reflects the cost or value of irrigation water per acre (estimated at Rs 1000 per acre)[1]. Water is a natural resource. Public investment is being made to construct irrigation dams to store water for the purpose of irrigation over a period of at least 50 years. All the historical investments made are compounded to obtain the future value at present, which is distributed over the life of the irrigation dam in order to obtain an estimate of use value of irrigation water. The social discount rate of 2% is considered, since the choice of discount rate needs to reflect the criterion of sustainability and intra- and inter-generational equity in natural resource accounting.

Paddy and sugarcane are the commonly cultivated crops under canal irrigation by farmers in the Cauvery basin. The productivity of paddy is around 20 quintals and sugarcane is 600 quintals per acre. Thus, water cost of Rs 1000 per acre of irrigated land, works to Rs 50 per quintal of paddy and Rs 1.67 per quintal of sugarcane. If the crops are irrigated by groundwater through borewells, cost on volumetric basis works to Rs 500 per acre inch in dry agroclimatic zones[2]. With the consumptive use of 40 acre inches for paddy, cost of groundwater works to Rs 20,000 per acre. For sugarcane, consumptive use is 70 acre inches of water and the cost works to Rs 35,000 per acre. While surface water is an explicit benefit amenable for ecosystem service, groundwater is an implicit benefit which need to be accounted.

The Revenue Department in Karnataka charges water rate of Rs 100 per acre for paddy, Rs 400 per acre for sugarcane and Rs 66 per acre for semi-dry crops (jowar, groundnut, tur). However, due to a large number small and scattered holdings, the transaction cost of collecting water rate by Water Users Cooperative (or Association) or by the Revenue Department is colossal. Also due to political economy, Governments shy away from asking farmers to pay for water for irrigation. Therefore, irrigation charges are seldom collected by the state and seldom paid by farmers.

PES for water

Paddy is milled to rice in rice mills. At least 50% of sugarcane is crushed to sugar in sugar mills (while the balance goes to jaggery making). Considering water cost of Rs 50 per quintal of paddy and Rs 1.67 per quintal of sugarcane, rice mills can collect Rs 50 per quintal of paddy processed and sugar mills can collect Rs 1.67 per quintal of sugarcane processed as PES. With the conversion of paddy to rice being 60%, this amounts to Rs 50 for 60 kg of rice and PES works to 83 paise/kg of rice. Similarly, considering the sugar recovery of 10%, PES of Rs 1.67 per quintal of sugarcane amounts to Rs 1.67 for 10 kg of sugar or 17 paise/kg of sugar. Thus, for rice mills and sugar mills, collecting 83 paise/kg of rice or 17 paise/kg of sugar will not be a burden and will entail low transaction cost. As the number of rice mills and sugar mills is small, there will be accountability in collecting processing fee with negligible transaction cost if the payment vehicle is robust. The PES in both paddy and sugarcane is ultimately transferred to farmer beneficiaries, including consumers.

Robust payment vehicle in PES

In PES, payment vehicle (which is the mode through which payment is sought or generated) is crucial as transaction cost of collection should be low and accountable. Surface irrigation water is mainly used for cultivating paddy and sugarcane. With the advent of rice mills and sugar mills, processing paddy in rice mills and sugarcane in sugar mills is indispensable. Hence, processing fee on rice and sugar reflecting use value of surface water can be an effective robust payment vehicle.

The processing fee can also be collected as a fee in electricity bill by the state. Since collection of electricity fee through electricity bill is easy, transaction cost of collecting PES will be negligible. Finally, PES is transferred to beneficiaries/consumers on per kg basis, but generates sizeable revenue for the state to honour conservation efforts of farmers. PES generated can be shared with farmers/planters responsible for the flow of clean water downstream. A part of the PES funds can be used for capacity building regarding economic use of water and water budgeting.

Water flow in the Indian peninsula is largely from rainfall. Soil and water conservation, watershed management and

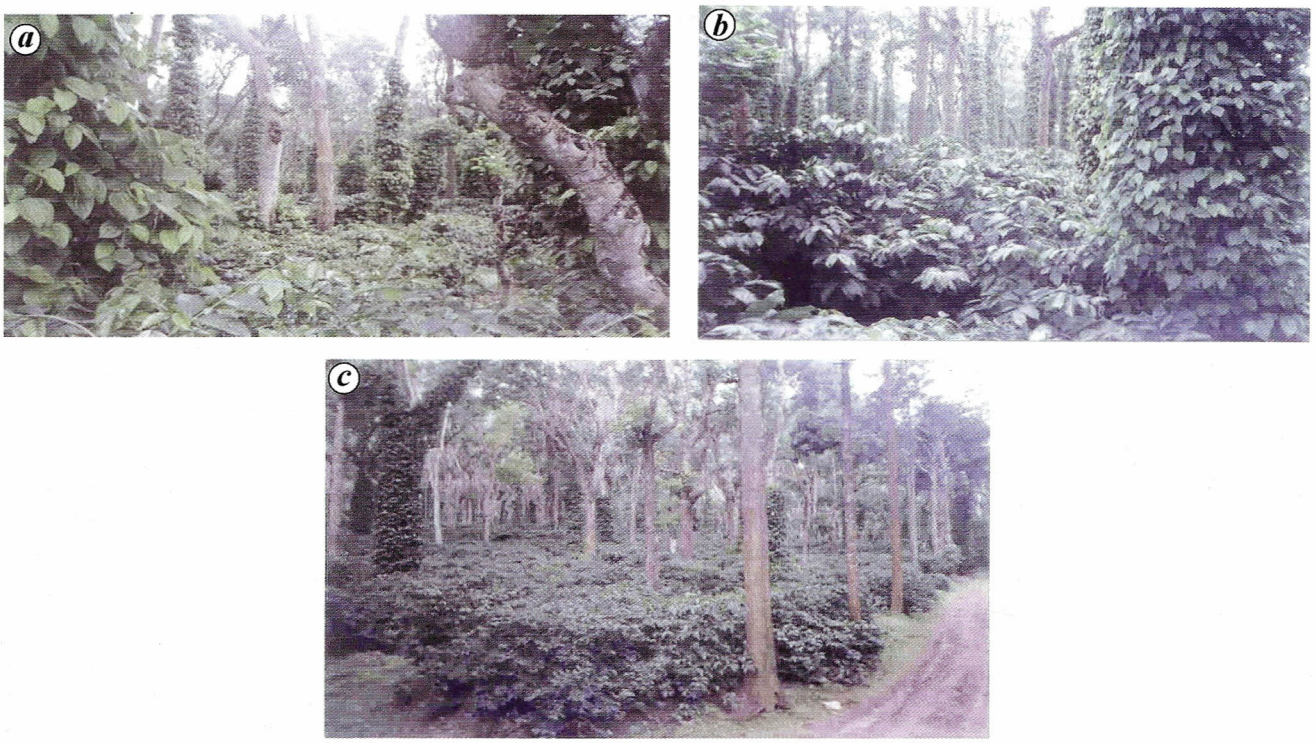

Figure 1. ***a***, Efforts of Kodagu farmers in soil and water conservation through shade management in coffee estates with pepper. ***b***, Shade management in coffee plantations contributing to water flow in Cauvery basin. ***c***, Diversity of shade trees in Arabica coffee estates of Kodagu. (Pictures by P. P. Muttanna.)

agro forestry efforts in upstream contribute to water flow in downstream. Economic valuation of ecosystem services is crucial to value conservation efforts. Cultivation practices in coffee estates in Kodagu, Karnataka, *inter alia* soil and water conservation measures, conservation of Devara Kadu sacred groves, management of shade in coffee plantations using a wise combination of tree species, and maintenance of topography, influence quality and volume of water flow in the Cauvery basin (Figure 1).

A part of the PES collected through electricity fee from rice mills and sugar mills can be shared with farmers in Kodagu as a reward for their conservation efforts in contributing to the flow of clean water in downstream Cauvery basin.

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2. Chandrakanth, M. G., Karnataka State water sector reform: current status, emerging issues and needed strategies. International Water Management Institute, Hyderabad, 2009; http://toenre.com/downloads.html

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