

Extended Abstract

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Paper Title	Economic valuation and challenges of Agricultural ecosystem services in Eastern India
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Abstract	<i>200 words max</i>
<p>The present study is an attempt to assess the economic valuation of ecosystem services from the agricultural landscape and to identify issues in eco-compensation for ES in Eastern India. The study was based on both primary and secondary data. The valuation of ecosystem services of the agricultural ecosystem (paddy and fallow land ecosystems) was done using conversion factors and benefit transfer method. The total value of the ecosystem services under rice-ecosystem was estimated at US \$ 61964.57 per year whereas US\$ 9667.8 per year was under fallow lands. Thus, the total value of agricultural ecosystem services of the village had worth US\$ 71632.37 per year. Further, meta-analysis indicated that lack of knowledge about ecosystem services, absence of property rights, small and marginal holdings, lower community participation, high dependence on common properties for subsistence, nested institutional structures, and diverse political interests was identified as the most critical challenge for devising a suitable eco-compensation in India. Thus, agricultural ecosystems are crucial for both food security as well as ecological balance. Therefore, designing an appropriate policy mix by including synergies and trade-offs ES is necessary for sustainable intensification in Indian agriculture.</p>	
Keywords	Ecosystem Services, PES, Eco-compensation, Valuation, Agriculture
JEL Code	Q51, Q56, Q57
Introduction	<i>100 – 250 words</i>
<p>An ecosystem is a dynamic complex system in which biotic and abiotic components interact with each other and function in unison. They produce goods and services that benefit human populations either directly or indirectly. As per the United Nations Millennium Ecosystem Services Assessment (MA), 2005, ecosystem services (ES) are the “benefits people get from the ecosystem” and are categorized as provisioning services, regulatory services, cultural services, and supporting services. Contrary to other ecosystems, agricultural ecosystem is one that is mostly driven by humans. Agroecosystems are complex systems of climate zones that play a dual role by both providing and relying upon ES. The sustainability of the ecosystems can be increased, rural incomes can be enhanced and climate change can be mitigated, if the rural masses and farmers are incentivized. Thus, valuation of ecosystem services can form the basis for payments of ecosystem services (PES) or eco-compensation in agriculture and other ecosystems. Thus, the current study is undertaken to estimate the economic valuation of agroecosystem services of paddy and fallow land</p>	

ecosystems of eastern India and to identify issues and challenges of the ES in India, and suggests the promotion of payment for ecosystem services.

Methodology

100 – 250 words

Data: Both primary and secondary data using FGD, Delphi techniques and meta-analysis.

Valuation of agroecosystem services: Conversion factors and Benefit transfer method.

Provisioning services from paddy

Value of Marketed goods = Yield (kg/ha) * Market Price (US\$/kg) = v \$

Total value of marketed goods= V * total area (ha) = w \$

Regulatory and Supporting Services from paddy

Mean value of the non-marketed goods from review = y \$

Total value of non-marketed goods = y * total area of the present study (ha) = z \$

Net ES from paddy:

$ES_{TP} = (\sum ES_M + \sum ES_{NM})$

Net $ES_P = ES_T - EDS$

Where ES_{TP} = total ES value from paddy ecosystem, ES_M = marketed (tangible) ES values, ES_{NM} = non-marketed (non-tangible) ES values and EDS = value of dis-services. ES = Ecosystem Services

ES from Fallow land

Willingness to pay (WTP) for a particular ES by individuals (per ha) = W_1, W_2, W_3 W_N US\$

Total number of respondents = N

Average WTP for a particular ES by all the respondents (per ha) = $\sum W_i / N$ US\$ = W_A

Total WTP for a particular ES by all the respondents (per ha) = W_A * total area of fallow land = W_{T1}

Similarly, values are computed for all the ES from the fallow land and added.

Total ES from Fallow land = $W_{T1} + W_{T2} + W_{T3} \dots \dots \dots + W_{TN}$

The dis-services were then subtracted to get the net value.

Net $ES_F = ES_T - EDS$

Net ES_F = Net Ecosystem Services from Fallow Land

Results

100 – 250 words

The value of marketed services from rice ecosystems is \$ 51827.27 per year and that of the non-marketed services is \$ 10137.30. Thus, the net value of rice ecosystem services is estimated at \$ 61964.57 per year. The fallow lands provide ecosystem services worth \$ 9667.8 per year. Therefore, the total economic value of the agricultural ecosystem services in the study area mounts to \$ 71632.37 per year. However, in this study we have not considered the values of the cultural ecosystem services. Consequently, the actual ecosystem services may be higher than the estimated value in this study. Further, Lack of knowledge about ecosystem services, absence of property rights, small and marginal holdings, high dependence on common properties for subsistence, and lower community participation in ecosystem management institutions, nested institutional structures and diverse political interests were identified as the most critical challenge for devising a suitable eco-compensation in India. Therefore, initiating the PES programmes in such areas requires tenure-based rights over lands for getting long-term benefits and use of land resources and developing markets for the ecosystem services. Also, the failure of adoption of



technology in the right way particularly under the imperfect market conditions creates a major issue in framing the policies related to PES.

Discussion and Conclusion

100 – 250 words

From the valuation of the agro-ecosystem services, it is clear that despite the negligence of agriculture, the services render a good amount of economic benefits which may be used as a tool for incentivising and framing suitable payments for ecosystem services. The results are similar to that of Nayak et. al., 2019. The results from this study were also in sync with a recent study by Das et. al., 2022 that suggests that the provisioning services had the greatest importance and that the tribal communities are the most important and vulnerable groups for sustainability of both ecosystem services and livelihood security. The values of ecosystem services from agriculture clearly state the need for incentivising the conservators of nature and developing eco-compensation or payments for ecosystem services by the government for a sustainable future. As ecosystem services have the potential to become an important policy and decision-making tool at every scale, possible applications and implementations must be made for sustainable management of natural resources along with economic inclusion for livelihood security. Institutionalization of improved farm practices is another solution for making better at the local, regional, and national levels. Further, the integration of ES services using system-wide approach in decision-making and in national agricultural policies. In lieu of environmental benefits, strong network linkages between farmer communities and carbon credit markets should be established to incentivize CDR technologies. Thus, creating programmes on the payment for ecosystem services that aim to provide economic incentives to conserve the depleting natural resources in India.