

CRITERIA AND INDICATORS FOR SUSTAINABLE AGROFORESTRY MANAGEMENT: HOMEGARDEN AGROFORESTRY SYSTEM

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ABSTRACT

Iterative filtering and generation method (IFGM) process was adopted for developing and testing criteria and indicators (C and I) for sustainability of homestead farming in Kerala. It includes three processes viz., Filter I, Filter II and Filter III. Two hundred and forty four candidate sets of C and I were screened from various sources with Filter I and were re-clustered into four guiding principles viz., a) Farming community well-being is assured, b) People well-being is assured, c) Homestead farmings' landscape health is assured and d) External environment is supportive to sustainable home gardens. At the end of field testing, 201 C and I were screened, which were subjected to Filter III. At the end of third process of IFGM, 176 appropriate C and I were identified for sustainable management of homestead farming. The maximum number of C and I were encountered under 3rd principle (homegardens' landscape health is assured) with 24 criteria and 68 indicators. At homestead management unit level, C and I may be used as a tool for monitoring direction of change towards/away from sustainability and undertaking corrective action.

Key words: Agroforestry, Homegarden, Sustainable Management, Criteria, Indicators, Farming

Introduction

Agroforestry is a sustainable land use system, which have the potential to improve economic and environmental sustainability in the tropics and in the temperate regions (Jitsanguan and Jitsanguan, 2002). A tree based farming system has considerable potential to provide sustainable income to the farmers (Solanki and Bisaria, 1999). Humid tropics like Kerala (India) alone possess a bewildering array of agroforestry systems in the world. In Kerala, the most prevalent agroforestry system is homegardens/homesteads (Jose, 1992; Kumar *et al.*, 1994). Homegarden is an operational farm unit in which a number of crops are grown with livestock, poultry and /or fish mainly for the purpose of satisfying farmers' basic needs (Nair and Sreedharan, 1986). The tropical homegardens in Kerala have provided sustenance to thousands of farmers, ecological stability to the region and at times high economic returns. Kerala consist of nearly 3-4 million homegardens, where 30 million people reside, earn a living and also enjoy the direct and indirect benefits of the system (Sankar and Chandrasekhara, 2002). The ecological and social interactions show the complexity of an agroforestry system and make it distinct from other land use system (Padhyaya *et al.*, 2001). Because of multipurpose activity of agroforestry, it is complex in structure and involves a

high degree of biodiversity (Torquebiau *et al.*, 2002), or which sustainability also depends (John and Nair, 1999). In contrast, the recent trends in agrarian structure and the high market orientation exert pressures on the home garden and its sustainability as a human ecosystem's question (Jose and Shanmugaratnam, 1993). Often human interventions do tend to upset fewer stables and trigger off new cycle of changes and sustainability. On different types of balances are established. Due to constant human interference, the complexity of the 'food web' and the number of trophic levels are reduced and only a small proportion of the energy passes through the detritus route in an agroecosystem (Tivy, 1990). The nutrient cycling is disrupted and it becomes an open system with considerable energy export in the form of harvest, leaching and erosion (Jose, 1991). Low production and low productivity along with market failure and labour crisis are the core problem in Indian agriculture (Mishra *et al.*, 1994). Since a few decades, the productivity and sustainability of homegardens are deteriorating un-hinderly due to the loss of local species diversity, climate change, environmental degradation and over-exploitation. The progress in developing criteria and indicators (C and I) for SFM, or developing and implementing better management practices, is considerably from one country or region to another.

At the end of third process of iterative filtering and germination method (IFGM), 176 appropriate criteria and indicators (C and I) were identified for sustainable management of homestead farming.

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C and I would facilitate the understanding of and communication about sustainability of system (Pokorny *et al.*, 2001). It offers the best monitoring mechanism to measure the direction of change due to participatory forest management practices (Prasad and Prasad, 2001). Currently, over 100 countries are involved in developing national-level criteria and indicators (C and I) and an increasing number of national and international initiatives have defined C and I sets for certification, monitoring and auditing of forest management (Eronhemimo *et al.*, 2001). Though, a few authors have tried to develop a set of C and I for community forests, but so far no study has been undertaken in the field of agroforestry in India. Therefore, the present study was initiated to find out minimum set of C and I for sustainable homegardens management (SHM).

Material and Methods

The present investigations were carried out in central Kerala. It lies between 10° and 10°47'N latitudes and 75°55' and 76°54' E longitudes. It has three natural divisions, viz., high land, midland and low land. The climate is humid tropics with an oppressive hot season and plentiful and fairly distributed rainfall. The average annual rainfall is 2868.5 mm (KSLB, 1997). The temperature ranges from 31 °C to 32 °C. The air has high relative humidity throughout the year.

Iterative Filtering and Generation Method (IFGM) process was followed for testing and developing a set of C and I for SHM. A multi-expert team was constituted to carry out this study. It includes a forest ecologist, environmentalist, botanist, sociologist and journalist. The team was familiarized well with the IFGM process, which includes three stages (Prabhu *et al.*, 2000). The first stage of IFGM, with the help of a format, identifies candidate set of C and I from various sources based mainly on professional judgment. At second stage, the candidate set of C and I was evaluated at the site based on discussions and interviews with stake holders, field surveys and documented information and post-field workshop process to review and revise the proposed C and I. At the end of the third process, workshop was held and a final list of C and I was prepared by the team for SHM. First stage provides a preliminary evaluation of all C and I to determine those most appropriate for assessing SHM. As the strategy of grouping C and I under policy, ecology, management and socio-economic principles by CIFOR is not able to capture diversity, complexity and inter-relatedness of factors concerning sustainability when dealing with community managed forests like homesteads and also failed to reflect the perceptions of many forest dependent communities. The socio-economic principles get paramount importance in

community managed forests where as in plantation forestry or industrial forestry, ecology and management principles get higher weightage. Therefore, the candidate set of C and I was re-clustered under four guiding principles viz. a) Farming community wellbeing is assured, b) People's wellbeing is assured, c) Homesteads landscape health is assured, and d) External environment is supportive to sustainability of homesteads. The first and second principles belong to the original principle "social" and the 3rd principle includes the original principle "ecology and management" of CIFOR, where the last guiding principle belongs to the original principle policy and other related issues.

Second stage is the key evaluation exercise, which was carried out in homesteads with close involvement of farmers and other stakeholders. The evaluation is done in 43 randomly selected homegardens. It included 20 small (< 1acre), 15 medium (1-3 acre) and 8 large homegardens (> 3acre). The experts filtered out all redundant C and I, modified existing ones where necessary to make them more relevant or applicable, and proposed new C and I to fill gaps identified during fieldwork. Periodic visits, questionnaire surveys, interviews and PRA (Participatory Rural Appraisal) were used to collect information needed for this stage. Each C and I were evaluated individually in the field by the team members. Opinions and scorings of the team were used to find out practical sets of C and I. The C and I set developed during second stage was reviewed again by the team in the final post- field work workshop (Filter No. 3) to formulate final set of C and I for SHM.

Results and Discussion

A two hundred and forty four (244) C and I were screened from various published reports through Form No. 1 of IFGM, which were subjected to field testing. The summary of the C and I accepted by team before and after field testing is provided in Table 1. The 244 C and I was minimised to 201 for third stage of IFGM (post -field work shop). Finally, 176 C and I were accepted from 201 C and I at the end of post-field workshop. Thus, there was an overall reduction in C and I from 244 to 176 following stage 2 and 3 of IFGM.

Ranking of C and I during stage 2 of IFGM

As the part of the stage 2 evaluation, C and I were given ranks for each of nine attributes considered to be important as a measure of suitability and utility of a particular indicator. A scale of 1-5 was used to rank C and I, where 1 means unimportant or no utility and 5 means important/ high utility. The ranking of C and I field tested were summarized and average scores were given for each attribute (Table 2). Maximum score was

Table 1 : Changes on C and I at pre- field and at post-field evaluation

Sl. No	C and I	Guiding Principles								Total (Accepted)
		A		B		C		D		
		Pre-Field	Post-Field	Pre-Field	Post-Field	Pre-Field	Post-Field	Pre-Field	Post-Field	
1	Criteria	09	07	16	14	30	25	15	11	057
2	Indicators	25	15	39	33	78	72	32	24	144
	Total (Accepted)	34	22	55	47	108	97	47	35	201

Where,

A - Farming community wellbeing is assured

B - People's wellbeing is assured

C - Homesteads' landscape health is assured

D - External environment is supportive to sustainability of homesteads

Table 2 : Average scores achieved by base sets of C and I against nine assessment criteria

Sl. No	Attributes of Cand I	Guiding Principles*			
		A	B	C	D
1	Summary/integrative measure	3.75	4.77	4.97	2.2
2	Closely and unambiguously related to assessment goal	3.75	4.5	4.75	2.5
3	Response range to stress	2.18	4.75	4.72	2.92
4	Diagnostically specific	1.64	4.12	5.0	3.3
5	Appealing to users	3.5	4.75	4.9	2.75
6	Easy to detect, record and interpret	3.25	4.02	4.95	2.98
7	Precisely defined	3.12	4.75	5.0	2.64
8	Produces reliable results	3.5	4.68	4.85	3.0
9	Relevant	3.05	3.75	4.98	3.65
	Total	27.74	40.09	44.12	27.71
	Average	3.082	4.454	4.902	3.078

(* as in Table 1)

achieved for indicators addressing homesteads' landscape health related issues as the C and I were generally considered to be "integrative measure". High values for people's well-being were obtained for "C and I response", "appealing to the users" and "precisely defined". Low scores were achieved for both community well-being and external supportive environment as they are not diagnostically specific and poorly defined and also poorly responded. Thus, the evaluation against these standard attributes showed some of the strengths and weaknesses of C and I. It also highlighted the importance of accepting a degree of overlap between C and I to ensure that specific aspects of sustainability are addressed thoroughly (Table 2).

Final set of C and I for SHM

Finally, one hundred and seventy six C and I were

developed for SHM with the help of standard IFGM process. The final set of C and I is presented in the standard PCIV- Principle with sub-principle, Criteria, Indicators and Verifiers. Out of 176 C and I, maximum number of C and I falls under the principle, "homesteads landscape health is assured" with 24 criteria and 68 indicators followed by "People's wellbeing is assured" "External environment is supportive to sustainability of homesteads and Farming community wellbeing is assured". The C and I developed under the present study may be used as a tool to monitor the direction and amount of change towards/away from sustainability of the homesteads. As homestead is a type of community forest and mimic as an evergreen forest, the developed C and I might be equally applicable to similar type of ecosystem with certain modifications.

सतत कृषि वानिकी प्रबंधन : गृह-उद्यान कृषि वानिकी पद्धतियों के लिए मापदण्ड और सूचक

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सारांश

कमल में धरो के आसपास की कृषि की निरंतरता के लिए मापदण्ड और सूचकों का परीक्षण करने हेतु चार-चार फिल्टर और उत्पत्ति पद्धति की प्रक्रिया को अपनाया गया। इसमें तीन प्रक्रियाएँ शामिल हैं यथा: फिल्टर I, फिल्टर II तथा फिल्टर III। फिल्टर I के विभिन्न स्रोतों से सी. और आई के दो से चार्लोस कन्ट्रीट सट्स के सी. और आई का विश्लेषण करके उन्हें चार मार्गदर्शी सिद्धान्तों के अनुसार पुनः स्वीकृत किया गया यथा: (क) कृषि करने वाले समुदाय के हित सुरक्षित रहे (ख) सामान्य जनों के हित सुरक्षित रहे (ग) धरो के पास खेती करने में भी दुर्घटना यथावत रहे तथा (घ) गृह उद्यानों के लिए वाह्य पर्यावरण हमेशा मददगार बना रहे। कार्य क्षेत्रीय परीक्षण के बाद 201 सी तथा आई (Criteria and Indicator) का विश्लेषण किया गया, जो फिल्टर-III के अनुसार थे। आई.एफ.जी.एम. की तीसरी प्रक्रिया के अन्त में धरो के पास खेती के लिए सतत प्रबंधन करने हेतु 176

उपयुक्त सी और आई की पहचान की गई। तीसरे सिद्धान्त (गृह उद्यान के भू-दृश्य की स्वस्थ परिकल्पना) में अधिकतम सी और आई का पता चला, जिसमें 24 प्राचल और 68 सूचक शामिल थे। गृह-उद्यान प्रबंधन एक स्तर पर निरंतरता और सुभागत्मक कार्रवाई को मॉनीटर करने हेतु सी और आई को उपाय के रूप में प्रयोग में लाया जा सकता है।

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