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Planting multipurpose tree species in community lands for biomass production through women self-help groups: Lessons from South India

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Summary

Planting multipurpose trees species such as *Pongamia pinnata* (Honge), *Azadirachta indica* (Neem), *Simarouba glauca* (Paradise tree) which produce high yields of biomass, biofuel and phytomedicines is attracting the attention of policy makers for propagation in Indian villages. This study highlights the results of an action research project involving women self-help groups (SHGs) in planting and caring for saplings on roadsides, school premises and community lands from 2010 to 2013. The training and capacity building programmes have assisted members in protecting plants even in summer with a success rate of 65%. The key issues impacting women SHG members are (1) Social capital among members of SHG, (2) Collective action and co-operation among members of SHG and (3) Empowerment lead action among SHG members. As a result, the action research complemented by the self-help group approach, have augmented efforts in the rural development process to plant relevant tree species by collective action thereby reducing transaction costs and addressing the challenges of climate change. Collective action by women SHGs towards tree planting reduces the transaction costs of convincing and organizing farmers.

Key words: Multipurpose tree species, women empowerment, social capital, collective action, empowerment lead action, transaction cost, self-help group

Introduction

Given the competition for alternative uses on marginal land and the low returns achieved by small farmers that have planted multipurpose tree spp., it is no wonder that it is so difficult to promote tree planting amongst farmers in India. In addition, the impacts of climate change such as untimely rainfall, unpredictable climatic factors, and a reduced number of rainy days, are challenging the economics of rainfed farming in India. Furthermore, the common lands around villages are gradually disappearing due to increased competition for land for housing, industrialization and other non-agriculture purposes. Due to peri-urban development, agricultural lands are gradually being converted to non-agricultural purposes including encroachment of irrigation tanks and other water bodies. As a result of this, planners and policy makers are finding it extremely challenging to motivate farmers to plant multipurpose trees to meet the needs for biofuel, small timber, green manure,

organic manure, staking support, fodder and medicine. In such a context, this paper highlights the strategies adopted to bring about grass root changes in the capacity building of women farmers in India through Self-Help Groups[1] (SHGs). This is seen as a win–win venture in semi arid tropics, fraught with challenges of climate change. Here, the multipurpose tree species such as, *Pongamia pinnata*, *Azadirachta indica* and *Simarouba glauca* have been identified as excellent providers of biomass. *S. glauca*, in particular was planted as biofuel tree but is now attracting attention for its medicinal properties as it is found to have quassinoids such as ailanthinone, glaucarubinone and holacanthone as the therapeutic constituents with proven antiprotozal, anti-ameobic, antimalarial, anti-toxic responses to cancer and leukemia cells[2]. *Simarouba* spp. is thus becoming a popular multipurpose tree in South Indian villages.

Why farmers hesitate to plant (multipurpose) trees

The lack of interest by farmers in tree planting is; first due to their focus on food and livelihood security devoting major area to food crops and commercial crops; second, uneconomic size of holdings not large enough to achieve economies of scale; and, third the net present value (npv) of returns from trees is modest at market discount rates. Thus, only through concerted effort by the Government or research institutions, will the planting of multipurpose trees become widespread. The multifunctional uses have yet to be recognized by the market, since there is market failure. This implies that the market recognizes only the end use value of trees, but fails to recognize the ecological and biodiversity services offered by them.

Potential for planting multipurpose tree species

A vast potential exists for planting multipurpose tree species considering their relative fast growth compared to timber species especially considering only around 15–18% of the geographical area is under tree cover in the different districts of Karnataka. However, the strategy should be to find farmers who are prepared to plant a few trees on their farms and may wish to contribute to community tree planting on commonly owned lands, avenues around roads, and in schools etc.

Methodology

In this study, results and experience from Action research on the empowerment (Social capital[3]) of women through planting of multipurpose biofuel trees, sponsored by Department of Biotechnology, Government of India are shared. For promoting planting of multipurpose tree species by the SHG members, the process and principles of action research approach was employed to achieve spiral research cycle consisting of four major phases: 'planning, acting, observation and reflecting' as suggested by Torbert (2006). The essentials of action research design include; (1) Reconnaissance to understand problems is done and plans are made for intervention (2) Then the intervention or action is carried out (3) During and after intervention, observations are collected in various forms. (4) Data is reflected and revisions are made on the initial plan (5) New interventional strategies are carried out and the cyclic process is repeated until a sufficient understanding of the problem is achieved. The process of action behavior of SHG members was measured using the standard methods for action/inaction and finally results are interpreted.

[1]SHG is a voluntary association of people formed to attain a common goal of development. In each group, members have similar social identity, heritage or traditional occupations and come together for a common cause and manage resources for the benefit of the group members. They agree to save regularly and convert their savings into a common fund for the utilization of the common good of all the members.

[2]http://www.rain-tree.com/simarouba-powder.htm#.Vda4KrKqpBc.

[3]Social capital is a network together with shared norms, value and understandings that facilitate co-operation within or among groups.

In this study, action research involving the encouragement of planting multipurpose tree species was implemented in the eight villages in the eastern dry agro-climatic zone of Karnataka. These villages were selected based on remoteness, severity of unemployment and deprivation among farm women. The deprived rural poor, belonging to scheduled castes (SCs) and scheduled tribes (STs), having marginal and small land holdings and/or living in drought prone areas were the target farm families.

Group approach

In this group approach, SC/ST farm women who are members of SHGs are involved in capacity building to improve their participation in the developmental process. Accordingly, an exclusive women SHG was established in each of the eight sample villages consisting of 130 SC and ST members. Each of these group members were motivated to pool their resources to gather biofuel seeds from common land, extract biofuel oil and sell this product. A series of demonstrations, group discussion meetings, field visits and training programs were organized to build their confidence in management and marketing of the products they produced (Table 1). The successful implementation of this project by adopting action research resulted in stabilizing the biofuel production process among the groups. The data was collected from all the farm women involved in the project.

Table 1. *Programmes organized under the project*

Sl. No.	Programs conducted	Number
1	Training programmes on nursery management, planting and maintenance of bio-fuel oil extraction units	8
2	Training programme on "Development of leadership abilities among the SHG members"	2
3	Training programme on "Development of communication skills"	2
4	Focus group discussion meetings	14
5	Training programme on the procurement of bio-fuel oil seeds and marketing strategies for selling biofuel oil	4
6	Study tour to participate in Krishimela at University of Agricultural Sciences, Bangalore (UASB), and a visit to the Bio-fuel park at Madenur, Hassan district	2
7	Field level workshop for officials of the Government department towards facilitating supply chains	2

Results

Empowerment of rural poor women through biofuel production

This project was implemented in eight sample villages in Tumkur district, (Karnataka state), India. Here 14 focus group meetings involving eight women SHGs were conducted. Nearly, 12,000 biofuel seedlings (2,000 Neem, 5,000 *P.pinnata* and 5,000 *S.rouba* seedlings) were procured and distributed for planting among the 250 marginal farmers. In addition, biofuel nurseries were raised in two villages with a capacity to raise 11,000 saplings during the first year. These saplings were planted during the second year as avenue trees on roadsides, school premises, community lands and also on the bunds and waste lands of farms. Farmers were fully engaged in this process and worked alongside the community, watering plants in summer months. This resulted in an impressive success rate of 65% even in a year with lower than average rainfall. The SC/ST women SHG members were trained in oil extraction from the gathered seeds of *P. pinnata* after the two biofuel extraction units were installed. The members of the SHGs used 1,000 kg of *P. pinnata* seeds to extract oil

Table 2. *Impact of extension interventions on Social Capital of women SHG members involved in biofuel plantation (n=32)*

Social capital domain	Category (values in parantheses)	Before Intervention		After Intervention		Before Intervention			After Intervention			Paired 't' values
		No.	%	No.	%	Mean	SD	CV (%)	Mean	SD	CV (%)	
1. Grouping and Networking among members of SHG	Low	13	40.6	9	28.1	7.22	2.03	28.1	8.12	2.25	27.70	2.15**
	Medium	9	28.1	11	34.4							
	High	10	31.3	12	37.5							
2. Trust and Solidarity among members of SHG	Low	14	43.8	13	40.6	4.69	1.13	24.09	5.96	1.40	23.48	2.01**
	Medium	9	28.1	10	31.2							
	High	9	28.1	9	28.2							
3. Empowerment lead action among members of SHG	Low	4	12.5	5	15.6	4.48	0.87	19.41	5.37	1.09	20.29	1.54**
	Medium	12	37.5	13	40.6							
	High	16	50	14	43.8							
4. Collective action and cooperation among members of SHG	Low	10	31.3	5	15.6	3.83	0.69	18.01	4.40	1.04	23.63	2.11**
	Medium	9	28.2	11	34.4							
	High	13	40.6	16	50.0							
5. Information and communication among members of SHG	Low	8	25	5	15.6	2.13	1.23	57.74	2.96	1.71	57.77	3.39**
	Medium	12	37.5	16	50.0							
	High	12	37.5	11	34.4							
6. Social cohesion and inclusion among members of SHG	Low	8	25	5	15.6	3.87	1.19	30.74	4.18	1.44	34.44	1.60**
	Medium	10	31.3	13	40.6							
	High	14	43.8	14	43.8							
7. Social capital among members of SHG	Low	9	28.1	8	25.0	29.64	4.79	16.16	31.03	5.08	16.37	4.88**
	Medium	11	34.4	11	34.3							
	High	12	37.5	13	40.7							

(seeds priced @ Rupees. 16(0.25US$) per kg) and obtained 330 kg of (Honge) oil and 670 kg of oil cake. They sold oil at Rs. 45 (0.72US$) per kg and cake at Rs. 6.50 (0.1US$) per Kg realizing an income of Rs.25570 (410.14US$).

Impact of extension interventions on social capital of women SHG members

In order to assess the impact of the interventions provided by the project, data involving six social capital dimensions were elicited from the members of the SHGs and analyzed. The dimensions considered are, grouping and networking among members of SHG, trust and solidarity, empowerment, collective action and co-operation, information and communication, social cohesion and inclusion among members of SHG. There was a significant increase in the mean score of all the dimensions of social capital of the SHG members before and after interventions with respect to group and networks (7.22–8.12), trust and solidarity (4.69–5.96), empowerment and action (4.48–5.37), collective action and co-operation (3.83–4.40), information and communication (2.13–2.96) and social cohesion and inclusion (3.87–4.18) (Table 2).

Income earning potential from multipurpose tree species

In rural areas of India, it is often difficult to convince farmers of the benefits of planting trees with long rotation length since the discounted value of final harvest is low. *P. pinnata*, *A. indica* and *S. glauca* are more likely to be planted as they have multipurpose functions providing biofuel and medicine. The income potential of different multipurpose tree species (Table 3) indicates that with the exception of *Santalam album*, most tree species have comparable/uniform income earning capacities. More than 70% of the holdings in India belong to marginal and small farmers, and therefore trees tend to be grown on the periphery of farms serving as boundaries, shelter belts, wind breaks and other purposes.

Table 3. *Income earning potential of multipurpose tree species in India*

Sl.no	Tree species	Age in years	Income per tree		Life span in years
			Rupees.	USD ($)	
1.	*Pongamia pinnata*	7–10	600–1000	9.16–15.26	50–100
2.	*Azadirachta indica*	7–10	500–800	7.63–12	50–100
3.	*Melia dubia*	4–8	1000–2000	15–30	10
4.	*Simaruba glauca*	4–8	500–800	7.63–12.21	50–70
5.	*Santalum album*	10/15	12000–120000	183–1832	30–50
6.	*Casurina equisetifolia*	2–4	50–100	0.76–1.527	2–4
7.	*Madhuca longifolia*	10–15	600–1000	9.16–15.27	100–200
8.	*Syzygium jambos*	8–10	500–1000	7.63–15.27	50–100
9.	*Phyllanthus emblica*	3–5	200–400	3.15–6.11	30–50

Source: Balkrishnagowda (2015), Department of Forestry and Environmental Sciences, UAS, GKVK, Bangalore.

Discussion

In this study, planting of multipurpose tree species with action research through women SHGs are highlighted to offer lessons for further expansion of this initiative. The key method used is capacity building of women SHG farmers in the villages. This required initial rapport with the SHGs in order to convince them that their participation in this programme would be productive and fruitful.

Of the seven traits shaping the social capital sphere, the impact of extension services is reflected by efficiency of dimensions of social capital. The efficiency of dimensions of social capital is inversely proportional to the coefficient of variation in each of the dimensions of social capital. Obviously, the domain which exhibits the lowest coefficient of variation in the specific social capital domain is the most efficient in deciding the impact of extension interventions on social capital for women.

The dimension with the least coefficient of variation is the social capital among members of SHG, followed by collective action and co-operation among members of SHG, empowerment among SHG members and so on. The Information and communication among SHG members had the highest coefficient of variation. Thus, considering both before and after biofuel plantation interventions, the domains which underscore the impact on the overall social capital of women SHG members are (1) Social capital among SHG members, (2) Collective action and co-operation among members of SHG and (3) Empowerment amongst SHG members.

Thus, women empowerment in rural areas through capacity building with emphasis on income, livelihood and employment generation on a sustainable basis paved the way for successful multipurpose biofuel/biomass production in villages.

The challenges in this process are the rising wage rates in the non-agriculture sector and developmental programs that are offering subsidized food. This means that developmental works in rural areas are inhibited due to the non-availability of labour and other resources, as the productive inputs get diverted to the non-agriculture sector. Hence, agriculture based livelihoods in rural areas are suffering due to the lack of both skilled and unskilled labour. Thus, for the poor, the struggle for economic survival has been a challenging endeavour with dependence on natural resources as their main source of income.

Farm women have to cope with day-to-day basic needs such as fetching water, collecting fodder and fuel, preparing food and caring for their children and the elderly, as well as attending to livestock and agriculture tasks. Rural women also need to take care of their ailments due to malnutrition, unsafe water, lack of sanitation, and neglect. Traditionally they are deprived of basic education and confined to their homes. In poor families, women are treated as being idle, despite their productive work schedule stretching throughout the day and are not involved in decision making or allowed to express their opinion on matters concerning them and the family.

The important role of women in the welfare of the family is gradually being realized. As the socioeconomic progress of the rural community has a direct link with the empowerment of women, the development programmes for women need to receive the appropriate attention. In this context, the concept of SHGs is a vital tool as well as a strategy to empower women, socially, economically and politically in rural areas. The problems of access to economic resources including credit, poor educational facilities and health services can be effectively addressed through the SHG approach. Ensuring effective participation of women in sustainable development of the community by creating employment and income generation activities is the key for rural development. By focusing on the propagation of biofuel tree plantations as a sustainable development strategy in rural areas, this study has demonstrated that empowering rural women through biofuel plantations will increase tree planting in rural areas. The knowledge gained from this study could be used to help women in other parts of the world.

Women empowerment in rural areas besides providing education has to consciously and constructively build through employment generation programmes. With a concerted effort from development workers (Govt. NGOS, volunteers) to adopt action research and the SGH approach, it is possible to provide income generating skills even in sophisticated laboratory based biotechnologies, and women with low education can participate in the process of development. While the output of the study was the increased area and number of trees at low or zero transaction cost, the outcome was the empowerment of women in rural areas. This enhanced their confidence and improved their socio-economic status and enabled them to adopt community development skills and development of neglected common land.

Women beneficiaries engaged in caring multipurpose tree species

Women beneficiaries occupied in accounting, extraction of bio-fuel oil and bottling for marketing

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