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Impact of floriculture development enhances livelihood of India's rural women

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Abstract

India's rural women are involved in various types of work and contribute considerably to the economy. However much of their work is not systematically accounted in the official statistics. India's governmental and non-governmental data collection agencies admit that there is an under-estimation of tribal women's contribution as rural workers. This study describes in detail a research project that focuses on the indicators for socioeconomic development in the least developed rural villages by examining the impact of floriculture on the lives of impoverished tribal women who inhabit the harsh drylands of western India.

Keywords: Floriculture, tribal women, development, economy, drylands, India

1 Introduction

India's agriculture and allied industrial sectors employ 89.5 % of total female labour force (FAO, 2008). Although the Government of India had declared 2001 as the 'Year of Women Empowerment' by passing a policy, much of the rural women's work has not been accounted in official statistics and data collection agencies admit serious under-estimation (Leach & Sitaram, 2002). Similarly, women in Kenya contribute 70 % of labour in the agricultural sector but they hold only 1 % of registered land titles (Dolan, 2007). Women's limited ability to own land and property negatively affects their ability to participate in producer groups, receive income for their labour, and benefit from agricultural services (Ellis *et al.*, 2007). On the contrary, India's urban women have impressive number in workforce. In software industry for example, they occupy 30 % – they are to a large extent equal with their male counterparts in wages (FAO, 2008).

The tribal people or *adivasi* (meaning 'original people', also known as 'tribal') predominantly inhabit the harsh drylands of India; they are the poorest because they have less access to public services in health, education, and commerce (Phansalkar & Verma, 2005). Within the rankings of the traditional Indian caste system, tribals are beneath even untouchables, thus the most downtrodden, economically and socially (Agoramoorthy & Hsu, 2006). The Indian constitution of 1950 singled them out for preferential treatment— in a kind of permanent affirmative action plan, but the government has managed to overlook the tribal issue for over half century. Most of India's 70 million tribals are illiterate with shorter life expectancy compared to other communities, and the marginal environmental conditions for agriculture often influenced by low/erratic rainfall and unreliable water supply for irrigation further create problems for their survival (Jagawat, 2005; Agoramoorthy, 2008). Despite these difficulties, tribal women continue to plow their fields to harvest crops and contribute to local economy (Agoramoorthy & Hsu, 2008a). An added crisis that may inexplicably affects these women is the looming climate change calamity

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since they live in areas affected by desertification and deforestation. They have to walk long distances to fetch water and firewood further limiting their time to educate children and generate subsistence income.

Recent statistics indicate that 836 million people (77 %) live on less than half a dollar a day in India (NCEUS, 2007). In addition, there has been on average one farmer suicide every 30 minutes since 2002 (NCRB, 2007). While India's unprecedented economic growth is certainly giving prosperity for the urbanites, the alarming farming crisis in remote villages remains unnoticed. Although vast majority (68 %) of the Indian workforce relies on farming (compared to 44 % in China and 21 % in Brazil), the agriculture contribution to the Gross Domestic Product (GDP) has diminished from 38 % in 1975 to 17.2 % in 2008 (Puri, 2007; Agoramoorthy & Hsu, 2008a,b). In developing countries such as India, rural women are more vulnerable to poverty because they own less land (2 %) and therefore access to farming and credit affects them greatly – widows and indigenous (tribal) women are the most at risk (Berger, 1989). Therefore addressing the linkage between poverty and agriculture should be fundamental for India. For that reason the role of small rural enterprises in poverty alleviation schemes has become absolutely critical (Berger, 1989).

Women's income in many South Asian nations including India directly benefits family and cover expenses of food and basic needs while men's income usually goes for assets, luxuries and liquor. This realization has led to the development of income generating activities for women on a large scale targeting developing nations (Boserup, 1989). However, the strategy did not fully succeed since poverty-stricken women increasingly faced with fewer opportunities to work due to lack of skills, education, and access to technologies, tools and productive assets. Moreover, rural women are often burdened with household routine and care for the family.

As there are not enough rural job opportunities, many non-governmental organizations (NGOs) have taken on the task of empowering women through microenterprises (Kraus-Harper, 1998; Meyer & Nagarajan, 2000). One such intervention is the implementation of marginal floriculture in rural areas. Although India's current contribution to the global floricultural export is negligible (0.4 %) compared to other countries such as the Netherlands (58 %), Colombia (14 %), Ecuador (7 %), Kenya (5 %), Israel (2 %), Italy (2 %) and Spain (2 %), the small-scale cottage industry appears to benefit many impoverished women in the most backward rural areas (Roy, 2008). Many authors who studied gender and livelihood have suggested the importance of women's role in agriculture extension work and bargaining (Sen, 1990; Kabeer, 1994; Ellis, 2000; Bryceson, 2002). In societies where women have weaker bargaining position, as in the case of male-dominated India, they are often discriminated against in the distribution of resources with serious detrimental consequences for their welfare (Sen, 1990). When women tend to earn an income, they appear to have not only greater access to resources but also better health, education, awareness and social status (Sen, 1990). Researches could also show that women's incomes are often either appropriated by their husbands in the South Asian society or often used to provide for children's care (Young *et al.*, 1990).

In this report, we provide a case study on floriculture development put into service by a local NGO in remote tribal villages and its impact on the lives of the impoverished rural women who inhabit the drylands of western India.

2 Materials and Methods

This case study investigated the impact of floriculture on the lives of rural women in Dahod District (area 3,642 km^2) of Gujarat State in the western part of India. The district harbours a population of 1,636,433 with a density of 449 persons / km^2. About 25 % of the land area comes under the jurisdiction of the State Forest Department (Government of India, 2001). This area receives 860 mm of annual average rainfall resulting in a drought every third year. This drought prone region is one of the poorest in Gujarat State. The predominant population (72 %) belongs to the *Bhils* tribe. In most tribal communities, land is inherited in the male line and marriage is predominantly patrilocal. Daughters' right to the ancestral property of their fathers is recognized only when there are no male descendants; women can also inherit as a widow or mother of a deceased. Political institutions such as the council of elders and the tribal chiefs are usually men. Only sons can succeed fathers as head of clan. However, in the tribal economy, women's role is more articulate and they perform agricultural tasks such as soil preparation, planting, weeding, harvesting and storing food; they participate in economic decisions within the family (Jagawat, 2005). Socially, women of the *Bhil* tribe enjoy more freedom of movement compared to their non-tribal counterparts. Divorce and remarriage of a divorcee or a widow are generally accepted and birth of girls is welcome. The tribe practices a bridal price where the bride's family receives cash/materials from the groom's family while most non-tribal communities practice this the other way around (Saini & Koppen, 2001).

Between January 2006 and December 2007, data on the impact of floriculture development in local communities were collected from 25 villages in Dahod District of Gujarat State. The floriculture project has been implemented by a local non-profit agency called NM Sadguru Water and Development Foundation based in Chowsala village of Gujarat State. It is popularly known as 'Sadguru' (Sanskrit meaning 'true teacher') and it was created in 1974. During village visits, data on the name of village, household information, poverty level (above or below), family size, and economic benefits derived from floriculture development were recorded following the methods of Mikkelsen (1995) and York (1998). A total of 125 women with an average of five women per village (in total 25 villages) were interviewed to collect data on floriculture activities that included size of flower plots, amount of flower production, types of flowers produced, and individual income levels before and after the implementation of floriculture. Collected data were analysed using the Statistical Analysis System software (SAS Institute, 2000). All mean values are presented as ± 1 standard deviation (SD). The total flower production, income and size of plot were positively correlated to each other (Pearson Correlation, $p < 0.001$, $n = 377$). Therefore, we standardized the production and income as the amount of products (kg) per 100 m^2 and income (USD dollars) produced per 100 m^2. The income increment was the current product selling minus the previous product earning. A general linear model was constructed separately to analyse the effect of flower types on dependent variables such as flower production, income, income increment as well as daily income per person (SAS Institute, 2000).

3 Results

3.1 Women-led floriculture and economic prosperity

Rose and marigold farming was the most frequent flower farming development activities, each accounting for 32.4 %, and followed by Gaillardia farming (28.6 %) and a mixture of rose and marigold farming (6.6 %). The average income before the transformation of floriculture was USD 11.5 (± 7.9, $n = 377$) and the average revenue of flower production was USD 252.3 (± 262.3, Table 1). Therefore, the income revenue after floriculture development was 29.5 to 18.3 times of the previous income, with an average of 21.9 fold increase (Table 1). The average increment of floriculture development profits was USD 240.8 ($n = 377$) — the highest increment revenue came from rose (USD 303.4 ± 323.9, Table 1). The flower production per 100 m^2 was effected significantly by the types of flowers produced ($F[3,373] = 9.51$, $p < 0.001$). The floriculture was highest on Gaillardia with 98.27 kg/100 m^2 (± 49.48, $n = 108$, Figure 1), which was significantly higher than those from marigold and mixed flowers (Duncan multiple range test, $p < 0.05$). The lowest production was the mixture of rose and marigold (12.38 kg/100 m^2 ± 20.84).

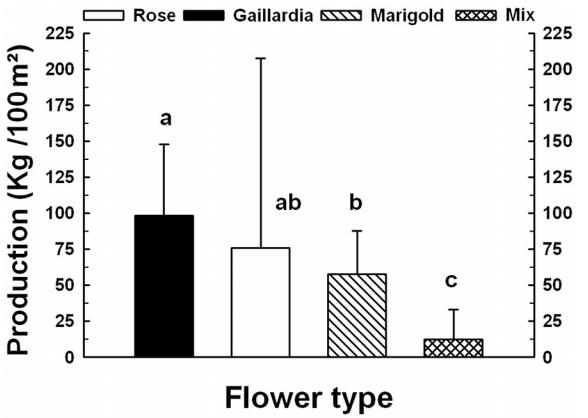

Fig. 1: *Flower production (*kg/100 m^2*) for rural tribal women farmers in India. Data presented as mean ± SD. Mix species: rose and Marigold mixed. a, b and c were from Duncan multiple range test and different letters indicated significant differences existed (*$p < 0.05$*).*

When the floriculture areas were standardized, the types of flowers played a significant effect on flower income revenue ($F[3,373] = 6.61$, $p < 0.001$) and income increment than before ($F[3,373] = 6.64$, $p < 0.001$). The highest income revenue came from rose (75.91 dollars/100 m^2 ± 132.59, $n = 122$, Figure 2), which was significantly higher than those from marigold and mixed flowers (Duncan multiple range test, $p < 0.05$). The lowest income revenue came from the mixture of rose and marigold production (20.88 dollars/100 m^2 ± 15.20, $n = 25$). Those patterns were similar in the income increment (Figure 2). The average daily income per person was also highest in rose (5.8 dollars ± 2.8) and lowest in the mixed flowers (4.5 dollars ± 2.7, $p < 0.05$, Figure 3).

3.2 Rozam – a case study of floriculture development

A small village located in Dahod District called Rozam became the 'Village of Flowers' after the initiation of floriculture development. The village is inhabited by 100 % tribal population. Prior to 2006, the women cultivated mainly maize, corn, wheat and other pulses. After the women practiced floriculture, their economic benefits significantly improved. For example, a woman named Ramila cultivated two flower crops such as rose and marigold in a small piece of land (0.3 acre) in 2006 and she sold roses and marigold worth USD 1,400 within three months. By seeing the huge profit, she started a nursery the following year with 2000 plants by grafting the mother plants and sold them at the

Table 1: *Flower types, plot size, total production and increment of income for rural tribal women farmers in India. Data presented as mean ± SD.*

Flower type	*number of farmers*	*Size of plot (100 m²)*	*Flower production (kg)*	*Income (USD)*		*Increment (USD)*
				Before	*After*	
Gaillardia	108	5.3 ± 2.6	476.7 ± 329.9	12.7 ± 9.5	260.7 ± 273.9	248.1 ± 269.7
Marigold	122	5.6 ± 3.0	278.9 ± 191.2	10.1 ± 6.4	184.6 ± 155.8	174.5 ± 155.9
Rose	122	5.1 ± 2.0	320.7 ± 179.4	12.5 ± 6.2	315.9 ± 323.9	303.4 ± 322.1
mix *	25	10.2 ± 3.1	154.0 ± 321.3	8.0 ± 11.3	236.2 ± 217.3	228.2 ± 214.9
Total	377	5.6 ± 2.9	340.8 ± 262.1	11.5 ± 7.9	252.3 ± 262.3	240.8 ± 260.0

* mix with rose and marigold.

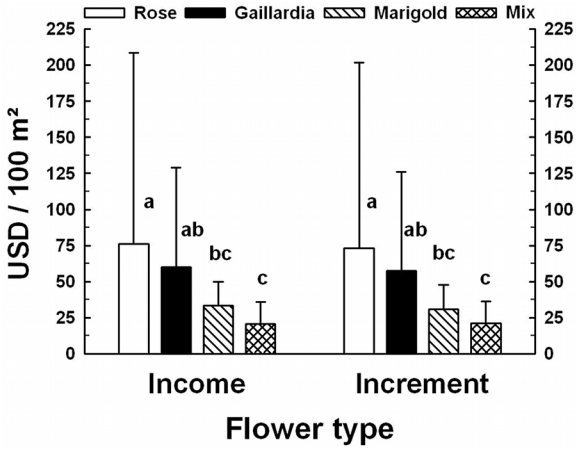

Fig. 2: *For every 100 square meters, current income and income increment (USD) compared to early farming from different flower species production for rural tribal women farmers in India. Data presented as mean ± SD. Mix species: rose and Marigold mixed. a, b and c were from Duncan multiple range test and different letters indicated significant differences existed ($p < 0.05$).*

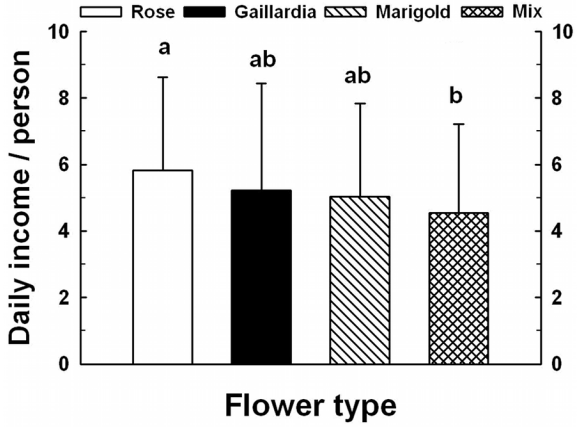

Fig. 3: *Daily income per person (USD dollars) for different flower species for rural tribal women farmers in India. Data presented as mean ± SD. Mix species: rose and Marigold mixed. a, b and c were from Duncan multiple range test and different letters indicated significant differences existed ($p < 0.05$).*

rate of USD 1 per 10 plants. She earned a profit of USD 200 just from the plants. After seeing the instant economic benefits obtained by Ramila, other women in the village started nurseries. About 80 % of farmers in the village started floriculture development since 2007 beside their usual cereal crops. Additionally, 60 nurseries became operational as of September 2008. The floriculture development not only increased income 29.5–18.3 times of the previous income revenue (Figure 2 and Figure 3) but also pulled the impoverished trial women out of poverty.

3.3 How rural women market flowers

Marketing of flowers for the rural women was not at all a problem due to the constant demand for flowers in the local market in Dahod town, which is just 5–15 miles away from the study villages. When the market in Dahod town faced flower shortages during religious festivities and marriage ceremonies, people went to villages to purchase flowers from the women. During normal days, women on average made a profit of USD 5–15/day and festival/marriage days brought USD 8–24/day, depending on landholding. In order to sustain future floriculture activities in rural areas, local government agencies involved in rural development have to systematically monitor such programmes to assess productivity. Then they must make sure to extend appropriate financial support and other incentives so that the women farmers can continue with their small scale floriculture activities leading to livelihood enhancement.

4 Discussion

4.1 India's floriculture scenario

Floriculture is an ancient occupation in India. For example, the national flower lotus has been frequently mentioned in the ancient Hindu Vedic scriptures written in Sanskrit (Randhawa & Mukhopadhyay, 2004). However, the trade did not find a place in horticultural literature for centuries. The flower trade was restricted locally within villages and towns till the 1960s where women primarily grew and sell flowers in the neighbourhood; fresh flowers could not survive a long journey elsewhere. This situation has changed during the last few decades and farmers are growing now various varieties of flowers for domestic and export markets (Singh & Upadhyaya, 2007). The fresh flowers are now moving long distances due to the availability of air transport and refrigerators.

India's floriculture development increased gradually from 9,900 acre in 1962 to 220,000 acres in 2000, which is in fact lower than China (Reddy *et al.*, 2002). The proportion of total floricultural area is 99 % in Colombia, 70 % in Netherlands and 57.51 % in Italy while it is only 0.56 % in India (Thippaiah, 2005). Besides, by government agencies and corporations floriculture is generally viewed as marginal farming predominantly done by women therefore only marginal efforts have been made to support the development of this economic sector. Although India's flower export generated 14 million USD during 2006-07, export revenues have plummeted during 2007-08 by reaching no more than USD 7 million (Bhattacharya, 2009). At present, India accounts for 0.65 % of the USD 11 billion global flower trade while Kenya still maintains the record as one of the top suppliers to the Netherlands – the world's flower centre, accounting for 37.8 % of supplies during 2008 (Bhattacharya, 2009). Even at the time of global economic slump during 2008, Kenya managed to earn more than USD 360 million from sales through the Dutch auctions. This raises the question, why India is doing poorly in the global flower market? In fact, the flower exports started with governmental backing in the 1990s, but infrastructure inadequacies in conjunction with the lack of a grower initiative led to a reduction in commercial activities for flowers in recent years. India has not been able to build up volumes and quality consistently and the overall lack of infrastructure to support the floriculture development has greatly minimized the global output. Kenya on the other hand, has maximized the advantage of being closer to the European market, which cuts their freight costs by half compared to India. Besides, Kenya has huge farms, 40 ha on average, compared to India's 4 ha average supported by hi-tech floriculture giving the country an economic advantage in comparison to India (Bhattacharya, 2009). Hence India can learn from the Kenya's experience to enhance floriculture development sustainably in future and the previously untapped rural women potential can be utilized.

4.2 Why the women-led floriculture deserves government support?

India has the second largest arable land in the world after USA. India's agriculture is dominated by small holdings where 60 % of small landholders own 17 % of farmlands with an average holding of 1 ha while 7 % of medium-to-large landholders (>4 ha) cling on to 40 % of farmlands (European Commission, 2007). The small landholders are often poor subsistence farmers with low investment and less productivity. As the service economy grows, the share of agriculture will diminish posing complications for India's future agriculture trade, policy and food security (European Commission, 2007). The prediction has reflected in a recent survey where rural areas have diversified from agriculture/horticulture to other sectors and 33.5 million people (54 %) who worked in service sector were from rural areas in 2007 (Times of India, 2009). Unlike India, farmers are minority (4 %) in developed countries, but their per capita income is huge since they receive strong capital support and subsidy from government. Therefore farming in developed nations cannot sustain without the financial backing of government and the collapse of Doha 2006 round of negotiations in agriculture has showed the chilling trend (Swaminathan, 2007). In contrast, farming in developing countries such as India has been practiced primarily by marginal farmers and women who have been struggling to meet local food demands with little and erratic government subsidy/support. Therefore upgrading of technology and boosting financial assistance towards small farmers, especially women farmers is the need of the hour to decelerate food insecurity and climate change.

This case study presented here shows that tribal women who grew flowers in rural areas have gained opportunities to interact with business communities and traders; they were no longer shy to approach government officials and NGOs on behalf of their villages to negotiate assistance for sustainable development projects. Prior to floriculture, the tribal women had no idea about cultivating flowers since they knew to grow only local crops. Staff from the Sadguru Foundation's floriculture division taught a few women farmers in each village on how to grow flowers. Then they became self-sufficient in growing and selling flowers. The floriculture business in villages has empowered women to take up unconventional jobs such as site supervisors, nursery raisers, or village agricultural extension workers. Women did not participate in these activi-

ties previously. After floriculture development, women started to participate in local politics as elected members of village councils (Panchayati Raj). The cottage-style flower industry has apparently transformed rural women to mobilize as a group to take various activities such as dairy cooperatives, savings and credits, floriculture groups and horticulture groups. In those villages, woman became more vocal in community development processes. For example, it is important to note that the average income for a single tribal family from agriculture and other subsistence activities in rural areas ranges only from USD 150 to 250 per year (Jagawat, 2005; Agoramoorthy, 2009). The floriculture on the other hand gave the impoverished tribal farmers, especially women, tremendous opportunities to improve their income significantly through floriculture development within a short period of time. The small-scale floriculture in rural areas undoubtedly energized and empowered tribal women to enhance their livelihoods, economy and local biodiversity therefore it has the potential to contribute significantly to India's sustainable development in future.

The practice of modern hi-tech floriculture is well known and it also affects soil quality, groundwater, and human health. In India, the fertilizer use in the hi-tech rose cultivation was 15,000 kg/ha, which was almost 100 times more than normal requirement of a food crop. Besides, the hi-tech floriculture crops are prone to diseases such as red mite, black spot, and powdery mildew; to control the diseases, each green house has to spray a gallon of strong pesticides/fungicides weekly. The use of pesticide in India's hi-tech floriculture is 16 times higher compared to traditional flowers (Reddy *et al.*, 2002; Shiva & Bedi, 2002). The workers engaged in the application of these chemicals suffer from headache, impaired vision/eye irritation, asthma, and skin diseases even after wearing masks and gloves (Veena, 1998; Shiva & Bedi, 2002). On the other hand, the case study of floriculture involving tribal women highlighted in this paper is highly sustainable due to the usage of farmyard manure that includes animal dung, urine, straw, green leaves and other organic waste from farms and homes.

Although the commonly grown crops such as sugarcane, rice and wheat across rural India consume more water, the floriculture practiced by the tribal women in this case study neither consumed more water nor damaged local biodiversity. The women had to pay for water (electricity on an hourly basis) to grow flowers why they naturally reduced water waste. Drip and sprinkler irrigation systems were used to grow flowers, which significantly reduced irrigation water wastage and enhanced local biodiversity in rural areas.

5 Conclusions

Deforestation driven by agricultural expansion and aggravated by the extraction of forest biomass at unsustainable levels has long been known as a leading trend in the history of India's land use pattern. Displacement of forest vegetation by agriculture has by no means limited to the British colonial period. Writings of the Chinese traveller Huien Tsan (624–642 AD) indicate that extensive agricultural development had already taken place centuries ago on the Gangetic plains of India what are now Uttar Pradesh, Bihar and West Bengal States (Grove, 1998). Similarly, forest vegetation had been denuded long ago in the tribal areas of Gujarat State where this case study took place leaving the landscape dry today. India's food security is heavily dependent on irrigation, yet large areas of irrigated land are threatened by increasing salination and decreasing ground water (Agoramoorthy & Hsu, 2008c). Therefore sustainable production/consumption has been given importance by the Johannesburg Plan of Implementation agreed at the World Summit on Sustainable Development (2002). The plan mandates socio-economic development at the grassroots in villages within the carrying capacity of local ecosystems to decelerate climate change induced by carbon emission. As rural women across India are involved in agricultural activities from sowing to harvesting, future agro-technology should be not only 'eco-friendly', but also 'women-friendly' with substantial support from the government and corporate sectors. Therefore the rural women-led floriculture practiced in India's drylands should be encouraged without any hesitation by state/federal governments and conglomerates because it has the potential to enhance sustainable production to relieve poverty mandated by the United Nation's Johannesburg Plan of Implementation. The women-led floriculture case study implemented by Sadguru foundation should be therefore strongly encouraged by the state/federal Government agencies responsible for rural, tribal and agriculture development to strengthen linkages with the rural community and user agency for long-term sustainable production and economic development.

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