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Research Paper

Floriculture for increasing Indian farmers income: Fitting in the present cropping system

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Abstract: Indian agriculture is witnessing a gradual change and the trend of last few decades shows diversification from field crops towards horticultural crops. Floriculture is being viewed as highly remunerative and profitable ventureof horticulture owing to a steady increase in demand of flowers on account of increase in per capita income, change in life-styles and social values of the people. In a span of eight years (2010-2018), the area under loose flower has grown rapidly by 69.63% as compared to vegetables (21.18%) and fruits (3.22%). Similarly, the production of loose flowers has increased by 90.30% and cut flowers by 58.88% both being much higher to vegetables (25.81%) and fruits (30.02%). The decadal Compound Annual Growth Rate (CAGR) of 7.84 and 9.62 has been registered for area and production, respectively of loose flowers.
In terms of increasing farmers' income, diversification towards flower cultivation results in higher profit per unit area than most of the field crops and therefore can enhance the livelihood of farmers. Flower based mono or sequence cropping system can be one of the alternative options for increasing income from same piece of land. Integrating Farming System, intercropping, bund plantation and protected cultivation comprising of flower crops have been found to be more profitable and sustainable. Comparison between flower cultivating and non-flower cultivating households reveals that the former earns significantly more per unit of area as compared to the latter both in terms of return and thus floriculture is better off even after incurring a higher cost of cultivation.

Keywords: Cropping system, crop diversification, increasing income, floriculture, integrated farming

Introduction:

Indian agriculture is witnessing a gradual change particularly in the cropping and land use system. The trend of last few decades shows diversification from field crops towards horticultural crops such as fruits, vegetables, spices, medicinal and aromatic plants, plantation crops and floriculture. Horticultural crops contribute significantly in the total agricultural production and play an important role in India's economy. Among the various

components of horticulture, floriculture is being viewed as a high growth Industry and has emerged as a sunrise industry. A paradigm shift is being witnessed in favour of floriculture owing to a steady increase in demand of flowers on account of increase in per capita income and change in life-styles. Commercial floriculture gained momentum in the 1990's and Government of India identified it as a priority sector and accorded it 100 per cent 'export oriented unit' (EOU) status. Flower cultivation results in higher profit per unit area than most of the field crops and is therefore a lucrative business which can enhance the livelihood of farmers.

Status of India in world flower trade

Presently the Indian share of floriculture produce in the global market is meager 0.6%. The share of floricultural products in the export of total horticultural produce is 3.2%. India has exported 15,695 MT floricultural produce worth about US $ 78 million (Table 1) even under the covid pandemic conditions. Floricultural export from India comprises of fresh cut flowers to Europe, Japan, Australia, Middle East & USA, loose flowers to the Gulf, cut foliage to Europe, dry flowers to USA, Europe, Japan, Australia, Far East & Russia and potted plants to few of the countries. Dry flower and ornamentals have great export and trade potential as nearly 70 per cent of total export of floricultural commodities from India consists of dried products. Whereas, India imports floriculture produce about 3960MT worth 21.68 million US$ (Table 2).

Table 1 Export status of floriculture trade from India

		2020-21	
Ranking	Country	Quantity (MT)	Value (US$ Mill)
1	U S A	3139.19	21.51
2	Netherland	1603.87	14.74
3	UAE	1659.88	4.67
4	UK	860.91	4.51
5	Germany	1054.69	4.32
6	Japan	114.16	3.48
7	Canada	485.65	3.10
8	Italy	235.30	2.40
9	Singapore	1418.93	1.52
10	Australia	57.71	1.42
Grand Total including other countries		15695.31	77.86

(APEDA, 2021-22)

Table 2. Import of floriculture produce from countries (2021-21)

Ranking	Country	Quantity (MT)	Value (US $ Mill)
1	Italy	899.26	5.4
2	Netherland	1,118.96	4.81
3	China P Rp	1,057.01	3.54
4	U S A	37.63	1.86
5	Thailand	213.4	1.62
Grand Total including other countries		3959.22	21.68

(APEDA, 2021-22)

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Growth of floriculture in India

In India, the major loose flower growing states are Tamil Nadu, Karnataka, West Bengal and Maharashtra, whereas, cut flowers are grown in West Bengal, Karnataka, Odisha and Assam. To meet the demand of flower seeds, several seed companies have developed production units in major flower growing states. Seasonal flower seed production is a well-established business in Punjab and Karnataka. Other segments like fillers, potted plants, seeds and planting material, turf grass industry and value added products also contribute in the overall growth of floriculture sector in India. As per the NHB database 2018, the area under loose flower crops is 3.24 Lakh ha (Table 3) which is a big jump in one decade as compared to 1.91 Lakh ha in 2010-11. In this decade, the area under loose flower has grown rapidly by 69.63% (Table 3) as compared to vegetables (21.18%) and fruits (3.22%). Similarly, the production of loose flowers has increased by 90.30% and cut flowers by 58.88% both being much higher as compared to vegetable crops (25.81%) and fruit crops (30.02%).

Table 3 Area, production and growth of horticultural crops

Year	Fruits		Vegetables		Loose Flowers		Cut Flowers
	Area	Production	Area	Production	Area	Production	Production
2010-11	6303	74878	8495	146554	191	1031	-
2011-12	6705	76424	8989	156325	254	1652	-
2012-13	6982	81285	9205	162187	233	1729	518
2013-14	7216	88977	9396	162897	255	1754	543
2014-15	6110	86602	9542	169478	249	1659	483
2015-16	6301	90183	10106	169064	278	1656	528
2016-17	6373	92918	10238	178172	306	1699	693
2017-18	6506	97358	10259	184394	324	1962	823
%age increase	3.22	30.02	21.18	25.81	69.63	90.30	58.88

Area in 000ha; Production in 000MT

Why floriculture as an option for increasing income

Flower crops have the advantage of providing higher productivity per unit of land resulting in higher income. It has the capability of providing sustainable livelihood to both medium and large farmers. It also creates opportunity in terms of entrepreneurship to the progressive farmers of peri-urban areas. Opportunities for floriculture are increasing due to urbanization, sense of aesthetic value and enhanced purchasing power of the people. Floricultural crops are highly labour intensive and have the capacity to engage the farmers round the year. Some of the key points in favour of floriculture for opting it as a means for enhancing income are:

- Higher income realized per unit area than many of the field crops
- Congenial climatic conditions for flower production in most parts of the country
- Commercial cultivation for essential oils, natural dyes and pigments to meet the demand of pharmaceuticals, nutraceuticals and food industry
- High demand for quality planting material including F_1 hybrids and tissue culture raised plants
- Nursery raising is coming up as a high return flourishing enterprise

- Possibility of exploring export of flowers and other value added products
- It supports and gives opportunity to subsidiary agri-business
- Availability of trained man power, skilled and unskilled workers

This is more so evident from the decadal Compound Annual Growth Rate (CAGR) of 7.84 and 9.62 registered for area and production, respectively of loose flowers (Table 4) which has improved in a rapid manner indicating the positive sign in the sector of floriculture in India.

Table 4. Compound Annual Growth Rate of Loose flowers grown in India

Year	Loose Flowers	
	Area (000 ha)	Production (000MT)
2010-11	191	1031
2017-18	324	1962
CAGR	7.84	9.62

PROFITABLE AVENUES IN COMMERCIAL FLORICULTURE

The commercially important avenues of commercial floriculture for increasing farmers' income are as follows:

Cut-flower production

The cut flowers constitute a major share of the total floricultural produce and there is huge demand for cut flowers round the year. Cut flowers are used in bouquet preparation/floral baskets, as corsages, in landscape gardening, flower arrangement and for decoration. Important cut-flowers are gerbera, rose, gladiolus, chrysanthemum, carnation and orchid. Majority of these crops are grown under protected conditions.

Loose-flower production

Loose flowers comprise of marigold, jasmine, tuberose, gaillardia, crossandra, barleria etc. Loose flowers have great demand for making garlands, veni, bracelets, garden display, religious offering and decorative purposes at various social functions. Most of these can be cultivated in the open field conditions.

Dry flowers

Dry flowers and the floral craft is being used for making various useful products like greeting cards, landscapes, photo frames, table mats, coasters, wall hangings and also potpourris and have good demand both in Indian and international markets. The demand for dry flowers has increased manifold during the last decade and is increasing at the rate of 8-10 per cent annually in the global floricultural trade (Singh 2009). The Indian export basket comprises of 71 per cent of dry flowers constituting more than two-thirds of the total floriculture exports. Exploitation of dry flower trade facilitates the demand of the market and also provides livelihood and employment opportunities not only to farmers but also to women, school drop-outs, unemployed rural youth and peoincreasingple belonging to backward and weaker society specially the tribal population through formation of CIGs (common interest groups). In fact, dry flower craft could be promoted as a cottage industry in forest dominated areas.

Cut greens

The cut greens (leaves or stems) or cut foliage which are attractive in form, colour, freshness and are long lasting have great demand in floriculture trade. They are used in fresh and dried floral designs and in bouquet, wreaths, interior decoration etc. Some of the cut foliage high in demand isasparagus, ferns, thuja, cupressus, eucalyptus *e*tc.

Pot plants

Pot plants are of considerable commercial importance and the pot plant industry is growing enormously. Pot plants may be either ornamental foliage plantsor flowering plants. Examples of pot plants

are begonia, kalanchoe, dracaena, diffenbachia, ficus, Kalanchoe, croton, cordyline, scindapsus, syngonium etc. Theyare used for indoor decoration at homes, offices, commercial complexes, corporate offices, conference rooms, hotels and for decoration of sites for various functions. Importance of these plants is increasing because with the growing population and lack of open spaces one has to largely depend on potted plants for decorating their surroundings and also for oxygen. These plants can be grown by farmers and supplied to nurseries for further selling or if the farmers are in urban or peri-urban areas they can directly sell to the consumers and earn lot of money.

Quality planting material-Flower seed and bulb production

There is lot of demand for good quality flower seeds and ornamental planting materials. Flower seed and bulb production has great commercial importance in floriculture. Availability of a great variety of soil and climatic conditions enables seed production of majority of flowers. There is always requirement for flower seeds of seasonal/annual plants. These seeds can be produced by farmers for sale under technical supervision. Similarly, large number of bulbous plants viz., gladiolus, tuberose, amaryllis, dahlia, lilies, freesia etc can be multiplied and marketed.

Perfumes and essential oils

Demand for floral extracts like perfumes from flowers is increasing day by day. Some flowers like rose, jasmine and tuberose are used for extraction of essential oils which is base for preparation of perfumes, scents or attar. Rose water, rose attar, gulkand, rose hair oil and rose otto all have high commercial value. Various farmers in Rajasthan and Western Uttar Pradesh are earning handsome money by taking up these crops.

2.8 Natural pigments and dyes

Flowers are used for extracting and preparing natural dyes. From marigold flowers, natural pigments (carotenoids) is extracted which is used in the food industry and poultry feed. In South India, a large number of farmers have diverted for production of marigold farmers to meet out the demand of carotenoids by pharmaceuticals, nutraceuticals and poultry feed industries. From chrysanthemum flower, yellow coloured dye is extracted for use in food products and cosmetics. Orange red dye is extracted from the arils of *Bixaorellana*, which is used in cosmetics and medicine. Like this, there are many flowers from which dye can be extracted which may find extensive use in the food, cosmetic, medicine and textile industries.

FLORICULTURE IN INCREASING FARMERS' INCOME

To meet out the food and nutrition demand, the cropping pattern is basically food grain based with cereal production occupying a significant place. The shift from traditional crops involves income-enhancing enterprises like floriculture in substitution or addition to the existing ones. There seems to be little doubt about the relatively higher profitability of flowers as compared with other crops (Sen and Raju 2006). More significant changes are taking place within the crop sector, as is evident from the changes in cropping pattern pointing out that floriculture is becoming an alternative source of income to uplift the livelihood of farmers discussed as under:

Crop diversification for increasing income

Crop diversification towards cash generating crop plays an important role in increasing the farmer's income and employment generation. In the cereal dominated regions, diversification towards high value flower crops is being considered as a way to increase the contribution of non-cereal crops to attain higher returns. With increasing demand in the domestic flower market, a number of small and marginal farmers with small land holdings have turned towards flower

production in these rainfed rice predominating areas in search of higher profits and less water requirement. The farmers earn more from flower cultivation compared with sugarcane or wheat or even a combination of fodder-wheat or sugarcane-wheat which are the other higher competing crop cycles in many areas. Cultivation of improved variety of gladiolus provides nearly eight times more return compared to the traditionally profitable combination of sugarcane (ratoon)-wheat (Sen and Raju, 2006). The continuous increase in Simpson's Index of Diversification (SID) (Table 5) also signifies shift towards non-foodgrain high value crops especially horticultural crops including floriculture (Lone 2013).

Table 5. Extant of Diversification in South Asian Countries

Country	Simpson Index of Diversity			
	1981-82	1991-92	1999-2000	2009-10
India	0.61	0.65	0.66	0.69
South Asia	0.59	0.63	0.64	0.66

Flower based cropping system

Flower based cropping system approach for higher economic returns from same piece of land are very remunerative. Ramachandra *et al.* (2007) found that inclusion of flowers in rice-based crop sequences gave higher net returns than other sequences viz. rice-soybean, rice-bell pepper, rice-fodder maize, rice-cowpea and rice-radish. Rice-marigold crop sequence recorded the highest gross and net returns and therefore, rice-marigold can be alternate suitable cropping sequences under low land rice-ecosystem of hill zone of Karnataka. According to Ghadge *et al.* (2002), the most economical floriculture based cropping systems under irrigation conditions of Ahmednagar in Maharashtra state is with crop sequences chrysanthemum (April planted)-wheat, chrysanthemum (April planted)-winter season onion, chrysanthemum (June planted)-groundnut and marigold-onion as compared with the established crop sequence of groundnut-wheat. However, among various cropping systems, the chrysanthemum (April planted)-onion and marigold-onion cropping sequence were found to be the most remunerative and profitable. The monetary returns recorded by these sequences were Rs.134667 and Rs.124391 per hectare and benefit-cost ratio was 5.18 and 5.21 respectively. Similarly, as reported by researchers elsewhere, cropping systems including floriculture with rice, maize and soybean is found to be remunerative in the different parts of the country.

Integrated Farming System

Integrating Farming System models comprising of flower crops have been found to be more profitable and sustainable. In a study on integrated farming system model for small farm holders of Western plain zone of UP by Singh *et al.* (2011), among the various farming systems viz., crops + dairy, vegetables, mango orchard, fisheries, bee keeping and poultry, flower crop marigold resulted in the highest BC ratio of 2.56 followed by vegetables (2.23). In Sirohi district of Rajasthan state, IFS model adopting Cash crop + vegetable + flower + fruit production earned Rs. 5.30 lakh per year with maximum B: C ratio (4.38) and generated 1800 man-days per year at farmers field from 2 hectare land with each component comprising 0.4 ha including flowers (Lal *et al*. 2018).

Intercropping

Usually cereals, pulses, vegetables and certain oilseeds are grown as intercrops in young orchards giving good returns (Rajput *et al.* 1986). But for still better and higher economic returns, flower crops are apromising option as intercrop in orchards.

Intercropping of gladiolus and marigold in mango orchard has proved to be a quite profitable venture providing. Sharma (2006) reported B:C ratio of 5.79 in gladiolus and 3.05 in marigold (both in second year) when grown as intercrop in mango orchard. Desai *et al* (2018) reported net annual income of Rs. 143810/ha and B:C ratio 3.13 in coconut + chrysanthemum intercropping system. In case of vegetables, Agrawal *et al.* (2010) observed higher cauliflower yield in cauliflower + marigold (14.80 t/ha) intercropping system compared to sole cauliflower with additional income from marigold. Intercropping in field/cash crops like sugarcane also yielded additional incomes. Prakash *et al.* (2009) revealed that cultivation of sugarcane with marigold intercropping increased the additional income to about 0.86 to 1.63 lakh/ha. Further, they noticed that the gross monetary return was higher in sugarcane + gladiolus intercropping system in comparison to cucumber, okra and French bean. Intercropping with marigold as a trap crop also induces a significant reduction in certain diseases and pests of various crops.

Field Bund planting

With approximately 43.2 million ha under rice cultivation in India, there is a big scope of utilizing wide bunds in rice fields. Similarly, fisheries ponds have large bund area available for planting. This provides opportunity of bund plantation in rice fields as well as fisheries pond bunds for additional income. Recently, impetus has been given on growing pulses on these bunds mostly to increase the area and production of pulses. However, with the vision of doubling farmers' income, apart from increasing production of various crops, higher profit is also desired. For this, concerted plan to improve additional incomes from unutilized land through floriculture has come out to be a viable option. Sharma *et al.* (2019) reported additional income apart from the main crop from same piece of land by planting marigold and tuberose on the wide bunds of rice fields.

Year round cultivation and offseason production

Year round availability of flowers ensures income in all the season and fetches high prices. Sharma (2020) in Surajpur district of Chhattisgarh, observed that year round production of marigold flowers could be met out through identification of appropriate high yielding varieties season wise and also through adopting cuttings planting or seed planting. On an average 70q flowers/acre were produced by farmers and net profit of more than Rs. 5 lakhs was earned by selling 35000 garlands. Additional income was obtained from selling of marigold cuttings/seedlings. This model offers an opportunity for uplifting the socio-economic conditions of the marigold growing farmers by producing and selling marigold flowers round the year. Similarly, as a result of intensive research and practical experience of many growers, chrysanthemum flowers can be produced throughout the year and/or in off-season at any time by environmental manipulation, fertilization, using growth regulating chemicals, by manipulating lighting, its blooming time can be controlled accurately and flower can be produced throughout the year. Moreover, the flowers produced during off-season fetch more income to the growers. Successful flowering of chrysanthemum throughout the year by using photoperiodic response have been reported by Dhiman *et al.* (2018).

Protected Floriculture

With the global boom in floriculture trade, hi-tech floriculture especially the cut flower segment has been identified as a thrust area for exports. A number of entrepreneurs have entered the area to cash in on the growing demand for cut flowers. The yield of flower crops under polyhouse cultivation is 5-8 times as compared to the open crop cultivation. Various trials conducted in northern India

indicates that cut flowers like gerbera, carnation, rose, orchids, lilium, anthurium, chrysanthemum grown under polyhouses gives high yield returns and quality produce throughout the year. So, the potential of floriculture under protected cultivation is huge for Indian and global markets. Further, Kalmegh and Singh (2016) conclude that though the cost of cultivation in polyhouse is 7 times greater than in open cultivation but in general the net profit is Rs. 50,000 per hectare in open cultivation while it is Rs.11 lakh per hectare in polyhouse.

FLORICULTURE AS AFFECTED BY COVID-19

With the world facing regular health challenges like flue and other respiratory infections and health emergencies like the COVID-19 pandemic, the importance of cleaner indoor air has been understood even more, as it not only just fights the pandemic, but also minimizes the risk of catching flu and respiratory infections that cost the country like U.S.A. more than $50 billion a year (Sharma, 2021). Phytoremediation is potentially economical and 'green' method of removing contaminants from the indoor environment. Due to its huge potential, many individuals and entrepreneurs will develop an interest in production of indoor plants at commercial level leading to employment generation as well. However, the floriculture trade has also been adversely affected by COVID-19 and the floriculture farmers now need to venture out on the optionsviz, vermicomposting, pigment extraction and dry craft from flowers.

Conclusion:

Study on comparison between flower cultivating and non-flower cultivating households indicates that the former earns significantly more per unit of area as compared to the latter both in terms of return and thus floriculture is better off even after incurring a higher cost of cultivation (Sen and Raju, 2006). However, the mission of increasing farmers' income through floriculture could make its niche but only with execution of sound strategic plans such as establishment of dedicated flower markets, model flower growing centers, cold storage chain as well as refrigerated transport facility in the major cities/town, production of quality planting material, transfer of proper techniques, cost effective polyhouse technology, replication of contract farming model having provision of buy back, upgrading of airport cargo and better subsidy to small farmers. Apart from these, measures for diversification to value addition, nutraceuticals, seed production also need to be addressedfor enhancing livelihood of farmers.

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