ORCHID AND ANTHURIUM INDUSTRY IN KERALA - A STUDY OF HOMESCALE UNITS

By

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THESIS

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DECLARATION

I hereby declare that this thesis entitled **"Orchid and anthurium industry in Kerala - a study of homescale units"** is a bonafide record of research work done by me during the course of research and that this thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowships or other similar title of any other University or Society.

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We, the undersigned members of the Advisory Committee of **Mr. Prakash Kumar Karn**, a candidate for the Degree of **Master of Science in Agriculture** with major in **Agricultural Economics**, agree that this thesis entitled **"Orchid and anthurium industry in Kerala - a study of homescale units"** may be submitted by **Mr. Prakash Kumar Karn** in partial fulfilment of the requirement for the Degree.

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Dedicated to
My beloved parents

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

1. INTRODUCTION

Floriculture is fast emerging as a lucrative profession in the world scenario and is a potential money spinner for many third world countries. The return per unit area in floriculture is much higher than in other fields. Global floriculture trade is estimated to be in the range of about 52 billion US$ (Peter, 1998) and has been growing continuously at the rate of 10 per cent. In the order of their turnover, the most preferred flowers in world market are rose, chrysanthemum, carnation, tulip and lily. Cut flowers account for 60 per cent of the total value of world floriculture trade. Netherlands, Israel, Colombia and Italy are the major exporters of cut flowers to world market while Germany, France, US, and UK are the important importers (Lawson, 1996).

World flower consumption is projected to grow by 15 per cent from $36.1 million in 1995 to $42 million in 2000. Consumption of flower in Western Europe alone is nearly 50 per cent of the total flowers produced all over world. Modak *et al.* (1997) have observed that consumption of floricultural products has been positively related with the GDP of the countries - Norway, Japan, Netherlands, Italy and Switzerland being the leading consumers.

Orchids and anthuriums are the important crops in international cut flower trade. Out of over 30,000 species of orchids, under 600-800 genera, throughout the world, India alone accounts for about 1300 species, belonging to 140 genera. Orchids, which constitute nine per cent of the total Indian flora, are mainly distributed in north-eastern region (about 700 species; Hore and Sharma, 1990) and Western Ghats (about 200 species).

Orchids account for two per cent of the world flower trade. Thailand is the largest producer of orchids accounting for about 70 per cent of the world production. The demand for orchids is growing around

the world at nearly 25 per cent per annum. The sale of Indian native orchids does not exceed a few lakh rupees which is negligible compared to those of Thailand and Singapore who export orchids worth 10.3 million and 6.7 million dollars, respectively, per annum.

India enjoys certain comparative advantages in floriculture sector regarding:

- favourable tropical climate
- cheap labour
- geographic proximity to major world markets
- promising domestic market

With suitable policy support India can make use of these factors to make a dent in the international market.

However, growth of Indian floriculture sector has shown some rays of hope only recently. The growth rate of cut flower trade in India during 1991-95 was at the rate of 563 per cent.

The annual growth of floriculture export from India is increasing at an increasing rate with present estimated growth rate of 25 per cent (Raghava and Dadlani, 1997). The year-wise export data of floricultural products, from India, is furnished in Table 1.1.

Table 1.1: Export of floricultural products from India

Year	Total export of floricultural products (Million Rs.)	Share of cut flowers (%)	Sources
1988/89	46.71	4.84	Modak *et al.* (1997)
1989/90	55.64	0.88	Modak *et al.* (1997)
1991/92	145.54	2.74	Sindhu and Misra (1997)
1992/93	149.97	7.31	Sindhu and Misra (1997)
1993/94	179.86	5.63	Sindhu and Misra (1997)
1994/95	306.04	9.80	Sindhu and Misra (1997)
1995/96	601.00	17.00	Raghava and Dadlani (1997); Thamburaj (1999)
2000* AD	1000.00		Prasad and Srivastava (1997)

* expected by APEDA

Out of total 70,000 ha (approx.) of flower area in India (Ghosh, 1998) about two-third is estimated to be under traditional flowers (used in loose form) like jasmine, scented rose, chrysanthemum, tuberose, crossandra, aster etc., while rest is occupied by modern cut flowers (with stems - like orchid, anthurium, rose, carnation, gladiolus etc., which are used in bouquets and other floral arrangements) with a bulk of it being from South India. Major flower growing pockets of India are Andhra Pradesh, Karnataka, Maharastra, Tamil Nadu and West Bengal, which collectively accounted for 85 per cent of flower area of the country, according to APEDA's estimate in 1989. Total production of flower in India is estimated to be nearly three lakh tonnes of loose flowers and over 500 million numbers of cut flowers (Raghava and Dadlani, 1997; Thamburaj, 1999). Growth rate of flower production in India is 15 per cent whereas the world average is 10 per cent per annum.

Domestic market for flower is also growing at an excellent pace. It is estimated that annual growth rate of domestic trade of floriculture products is about 25-30 per cent, the total turn over being Rs. 2500 million in 1995-96. Consumption of flowers in southern states is reported to be much higher than in the northern region of India. For the promotion of floriculture sector, government of India has identified 10 Intensive Floriculture Areas (IFAs) with specific groups of flowers recommended for each area. The crops suggested for Kerala, under this zoning approach, were orchids and anthuriums. Elite planting material of these two flower crops were introduced and cultivation started in Kerala during early 1980's (Nair, 1999a), but even now it has to go a long way to get it established as an industry. Land being the most scarce natural resource for agricultural development in Kerala (Nair, 1984), orchids and anthuriums (being less labour- and area-intensive) offered an alternative for traditional flower production and, fitted well in the socio-economic environment of the state. Since the agro-climatic conditions of Kerala are

more favourable to some genera of orchids, Kerala can rightly be called an open green house for orchid cultivation where orchids are found from sea level to the high altitudes upto 2400 m.

The Federation of Indian Floriculturists (FIF), the apex body in floriculture sector of Kerala, estimates a plant population of orchids and anthuriums together to be around 1.4 million in the beginning of Ninth five year plan, and the present annual flower production of about six million spikes in Kerala.

In recent years there has been a mushroom growth of orchid and anthurium growing units in Kerala. Besides many success cases, a number of units are struggling, while a few have quietly closed down. In the absence of any scientific studies on the economics of these units in Kerala, this study has been undertaken with the objective to bring out a realistic picture of the commercial aspects of the industry. It assumes more importance in the light of the fact that floriculture adds to the standard of living without disturbing the food front in a sustainable manner.

The specific objectives of the study are:

a) To study the economics of commercial production and marketing of orchid and anthurium in Kerala and
b) To identify the constraints and analyze future prospects of these two crops in Kerala.

Scope of the study

Since popularization of orchid and anthurium as commercial enterprises is one of the extreme focus segments of Kerala government, a good number of people started this venture and took advantage of the situation. Majority of the growers is homescale growers. However, there

has not been any field level empirical study on economic viability of this industry in Kerala hitherto. This study will be of use to orchid and anthurium growers and entrepreneurs who wish to have a realistic picture on the feasibility, economic viability and marketing situation of these two flower crops. It will also be of use to policy makers in developing plans, and to the bankers who extend credit support to this sector.

Limitation of the study

In Kerala, generally the practice of record keeping is found common only in the plantation sector. In the absence of specific records, the information collected has been elicited from the memory of the respondents, which may cause recall bias. However, possible efforts were made to minimize the errors by cross-questioning, cross-checking and visual observations. There were several reports in the mass media about the failure stories of floribusiness in Kerala. The sample collected in the study includes only performing units. The sources of sampling frame consist only of performing units and hence the other units could not be identified. Some of the growers who exported their products to north Indian metropolis markets, with their own effort, were found a little reluctant in revealing any details about their market, because of the stiff competition existing in marketing of their products.

2. REVIEW OF LITERATURE

Studies on commercial floriculture have gained attention owing to the increased demand for flowers and the resultant profit. A large volume of literature is available on various aspects of floriculture sector across the continents. The discussion is presented under two headings: a) Studies in the world (outside India) b) Studies conducted in India.

2.1 *Studies conducted outside India*

Literature on the floribusiness in most of the producing and consuming countries are available. These papers analyse the present state of affairs and future prospects and constraints.

Bourke and Cartwright 1980 (US flower market), Javier *et al.* 1983 (Flower industries, Philippines), Schneider 1991 (Production and marketing of flowers in Netherlands and Italy), Lee *et al.* 1993 (Korean floriculture), Hoey 1993 (Malaysian cut-flower industry), Istituto Per Studi 1993 (Italian flower export market), Hamrick 1994 (Columbine floriculture), McNeil 1994 and Klotzbach 1995 (US flower market), Jablonska 1995 (Polish floriculture), Malhotra 1995 (Mauritius floriculture), Starnman *et al.* 1995 (Specialty cut flowers, Southeastern USA), Anon. 1997a (Italian floriculture situation), Anon. 1997b (World flower market), Anon. 1997c (Floriculture situation of France), Koyo 1997 (Production and consumption of flowers in Japan), Laws 1997 (Malaysian flower industry), Pausini 1997 (Italian floriculture, export and import), Ben Tal *et al.* 1998 (cut flowers in Europe), Deman 1998 (Belgian flower market), Koshioka 1998 (Ornamental plants and cut flower in Japan) etc. are some important literature dealing with this topic.

Several studies are also available on the production economics of commercially important flower species and green house production.

Ferratto *et al.* 1994 (roses in Argentina), Anttila and Malkki 1997 (roses in Finland), Lin and Wang 1991 (cut flowers in Taiwan), Mee *et al.* 1991 (gladiolus in Jamaica) are few which belong to former category and Lin and Chiu 1990 (gypsophila, carnation, gerbera and lilies in Taiwan), Matsunaga *et al.* 1995 (cut roses in Brazil), Lee *et al.* 1996a (rose and lily production in Korea), Noort 1987 (Green house cut flower production in Netherlands) etc. to the latter category.

Some of the studies concentrated on the consumer behaviour in flower markets. Vierheilig and Alvensleben 1986 (Hanover), Vierheilig and Alvensleben 1988 (Hanover), Prince *et al.* 1990 (US) etc. some important ones dealing with this aspect.

Considering the importance specific to this study, studies specific to orchid and anthurium only are detailed below.

Parado *et al.* (1983) in their study conducted in Pagadian City of Philippines, found that the total operating cost were £50.43 per orchid or anthurium; orchids anchored in driftwood received £1200 each, while seedlings were priced at £10 and cut flowers at £10 per spray. Flowering orchids were sold at £116. Average sale per year was £4704, and the net profit per respondent was estimated at £1922. The profit to cost ratio was 0.69. The major problems of producers included lack of technical knowledge of cultivation and of price information, inadequate market awareness, and a deficiency in operating capital.

Valdellon and Lizarondo (1983a) provided benchmark information on the role of florists in the distribution and marketing of orchids and anthuriums in Manila. The study identified the major problems the lack of flower supply and its poor quality.

Valdellon and Lizarondo (1983b) in a survey with nine hobbyists in Laguna and Albay, Philippines, of whom six were only growing orchids with average garden size of 16.75 m^2, identified some of the major problems which included lack of technical skill in propagation, high input costs, insufficient supply of anthuriums, and pest infestation.

Gatti (1989), using statistics for the wholesale flower market in Sao Paulo, has graphed the seasonal variation in availability for some species (including roses, gladioli, orchids, etc.). There has been a clear increase in sales of many species on the wholesale market over the last five years whilst sales of orchids have declined and sales of gladioli have collapsed. This is partly explained by high production costs of some species (orchids, anthuriums) and the diversification of demand towards longer lasting flowers.

Shehata *et al.* (1990) have estimated average annual loss due to blight [*Xanthomonas campestris* pv. dieffenbachiae] in the Anthurium crop in Hawaii. During 1989 the loss was estimated $6387 per acre, of which $2107 was on account of labour employed in different controlling measures. Farm size and plant protection cost were found to be negatively correlated - there was a general tendency to give up cultivation by smaller farm thus the larger farms monopolising the flower production sector.

Yoneda (1990) has described the orchid production in Japan, under plastic tunnels and glasshouses with heating and cooling systems, supplementary lighting and newly introduced substrata. The average production area was 1600 m^2 per farmer, with production of 10,600 pots. Production costs were 4000-6000 yen m^{-2} and returns were 6000-9000 yen m^{-2}. The range, prices and amounts of imports showed recent increases, with the main sources being Thailand and Singapore for *Dendrobium*, Australia, New Zealand and the Netherlands for Cymbidium and Taiwan and New Zealand for *Phalaenopsis*.

Lin and Lai (1991) have described the various aspects of the Taida Orchid Farm in Taiwan with special attention given to the financial

management. The most important problems were shown to be the problems in maintenance of good plant health, the lack of markets outside Taiwan, shipping costs, the procedural complexities in exports and the cost of capital equipment, especially automated greenhouses.

Antoine (1994) has studied the production cost involved in the commercial production of anthurium in Mauritius, which is approximately Rs. 15,00,000 ha^{-1}.

Ngo and Powell (1994) have observed that the *Dendrobium* orchid has greatest potential among the orchids with commercial potential as cut flowers for the Northern Territory Top End. The reasons for this include the high yields obtained from these orchids and the short time between deflasking and flower production.

Laws (1996) has discussed the economic aspects of the production of orchids for cut flowers, principally in Thailand, for the North American and European markets. Anthuriums and orchids together constitute only 1.6 per cent of total cut flower imports to these continents, due to factors including high transport costs, pricing policies and distribution problems. There are also cultural differences between Japan, which imports many of Thailand's cut orchids, and North America/Europe which mean that orchids are less in demand at particular times or for particular purposes in the western hemisphere.

Laws and Galinsky (1996) pointed out that the world trade in anthurium was second only to orchids among tropical flowers. In Asia in particular, their popularity is increasing. Though bacterial disease has caused production in traditional producing countries to decline by 25 per cent since 1986, new production in other geographical locations is contributing to a market increase that looks promising in terms of anthurium cut flower availability. For companies that can provide a

quality product, adapt to changing preferences and innovate to keep consumers interested, the prospects are bright.

Lee *et al.* (1996b) carried out a study to derive a farm management improvement plan for Cymbidium (orchid) production in the Korea Republic. Thirty farms were selected and surveyed by interview based on a questionnaire (October 1995). Some 83 per cent of total Cymbidium production was sold in the market from October to March. For farms with 0.3 ha and labour input by a husband and wife, income and net profit were won 40.7 million and won 16.4 million per year, respectively. Highland growing migration method was good for Cymbidium marketing and quality, and it was possible to produce earlier than any other method and increase the profitability of Cymbidium by six million per 0.1 ha.

Fitch (1998) reported that orchid flower production is considered as a high-income business in and around the Kingdom of Thailand. A royal project has been initiated in Thailand to encourage hill tribes to cultivate orchids in place of poppies, previously grown illegally to supply the opium trade. Orchid has been considered as the important alternative because it offers high returns and there is a strong domestic and export market for them. It has high retail acceptance, good resale value and it takes relatively little space and cultivation time in relation to income produced.

2.2 *Studies conducted in India*

Floriculture in India has been concentrated in traditional flower production primarily to meet the domestic demand. The scope and prospects of cut flower production both in domestic and international market has been realised only lately and studies on these line are only forthcoming.

Cultivation of anthurium is reported to be highly remunerative in India by several veterans in the field. Singh (1987) has examined that on an average 61,750 plants can be grown per hectare. Each plant produces five spikes annually. This gives 3,08,750 spikes annually from one hectare of land which yields a gross income of Rs. 3,08,750/- annually.

Das *et al.* (1988) have reported that West Bengal has become one of the largest tuberose market in the world. They identified the following reasons contributing to the successful growth of tuberose production in Nadia District of West Bengal: a) higher profit per acre b) year round regular cash flow c) avoidance of risk of pilferage d) minimisation of risk due to crop failure and price falls through crop diversification e) year round employment to disadvantaged persons such as widows, children and handicapped. Though initial investment for raising the crop is high, return per acre is much higher than other crops.

Swarup (1988) analysed the price variation in flowers according to the variety, quality, season and location. The long-stemmed rose blooms fetch the highest price of Rs. 12 to 18 a dozen during December in Delhi while at other times it is Rs. 2 to 6. The price of the large-flowered gladiolus is Rs. 36-48 a dozen during June-August but in winter it comes down by almost 50 per cent. Jasmine flower is sold at Rs. 10-40 kg^{-1}, small flowered chrysanthemum at Rs. 4-12 kg^{-1} and marigold at Rs. 30-75 a kg. The total cut flower trade of India was estimated around Rs. 1000 millions annually. Sindhu and Misra (1997) reported the price of traditional flowers in Delhi market. The price of marigold ranged between Re.1 to Rs. 20 kg^{-1}, whereas in rose (*desi*) it was Rs. 5-100 kg^{-1}, depending upon the season and demand in the market.

Kumari (1992) estimated net returns from chrysanthemum cultivation in Andhra Pradesh at Rs. 14,807 ha^{-1} with the total cost of cultivation Rs. 55,633 ha^{-1}. Lack of alternative marketing channels and wide fluctuations in flowers market price were reported to be the major problems in chrysanthemum cultivation.

Rao *et al.* (1992) have examined the economics of jasmine cultivation in Andhra Pradesh with a sample size of 120 jasmine gardens at three different stages. Average variable cost of cultivation was worked out as Rs. 35,484 ha^{-1}, which accounted for 73.4 per cent of the total cost of cultivation. Among different cultural operations, harvesting alone accounted for about 39 per cent of the total operational costs, followed by plant protection (16.23%). Variable costs were seen to decline with the age of the plant. The average net return realised was Rs. 10,735 over Cost C.

Reddy *et al.* (1992) have emphasised the scope for developing orchid cut-flower and plant production in India into a cottage industry, at an individual or a co-operative basis. Estimates of profitability, projected over 6 years, were based on an assumption of a growing area of 100 m^2 with 1750 plants in pots under shade-house conditions. It showed a net profit of Rs. 6000 per month, after deducting the initial costs of investment (excluding land).

Shegade and Borude (1992) studied the economics of flower production in Thane district of Maharashtra. They found that 60 per cent of cultivators were from marginal, small and medium sized groups. The capital costs for the establishment of flower gardens per hectare were calculated as Rs. 45,547 for kagda, Rs. 36,890 for jasmine and Rs. 35,632 for lily. Net returns per hectare and benefit cost ratios realised , at cost C, for these flower crops were Rs. 83,563 and 1.51 respectively for kagda; Rs. 76,513 and 1.55 for jasmine and Rs. 32,554 and 1.38 for lily.

Subrahmanyam and Sudha (1992) estimated the costs and returns associated with the cultivation of aster crops in Tumukur district of Karnataka. Aster being a highly labour intensive crop, human labour costs alone accounted for 48.5 per cent of the total costs. Harvesting accounted for 30-40 per cent of the total cost of cultivation. The total cost of cultivation was worked out to Rs. 14,000 ha^{-1} of which around Rs. 4000 was the fixed component. The net returns realised over total cost of cultivation varied from Rs. 15,000 ha^{-1} in summer season to Rs. 60,000 ha^{-1} in kharif season. Both the yield as well as price received were very low in summer season compared to other seasons.

Sudha and Subrahmanyam (1992) have compared the costs and returns of aster cultivation with other compatible inter crops in coconut orchards, in the Tumukur district of Karnataka during 1990-91. The cost of cultivation of aster alone, in coconut garden, was calculated as Rs. 23,323 ha^{-1}, net profit of Rs. 11,773 and benefit cost ratio as 1.51. However, mixed cropping of aster and coriander yielded a benefit cost ratio of 1.84, and that of aster and amaranthus was 2.14.

Bhattacharjee *et al.* (1993) estimated the cost of cultivation, farm business, income and net profit/ acre/ annum from rose cultivation and examined the variations in cost of cultivation and farm business income on the basis of different size groups, scale of farming and volume of business.

Chakrabarti (1995) has critically analysed the orchid plant export data for the duration 1983 to April 1992 and of domestic orchid trade in India. He has identified the important varieties and destinations for Indian exports. About 79,000 plants of 60 genera were exported during 1984. However, due to imposition of stringent control on orchid export,

by Indian Import and Export Policy April 1988 to March 1991, only four genera of 478 orchid plants were exported in 1988. This was followed by blank export (no export at all) during 1990. Again export is reviving under the favourable Export Policy 1992.

A survey report has described the economic aspects of cultivation of three commercially important flowers, viz., chrysanthemum, marigold and jasmine in Bangalore. The average cost of cultivation was estimated as Rs. 21,500 ha^{-1} for chrysanthemum and Rs. 8900 ha^{-1} for marigold. In the case of jasmine it was Rs. 18400 ha^{-1} during the first year and varied from Rs. 42600 to Rs. 52570 ha^{-1} from second year onwards. The most important item of cost was human labour. The net returns realised varied according to marketing channel. However, jasmine cultivation was found to be more profitable than others with benefit cost ratio of more than four (Anon., 1996).

Shukla and Jain (1996) estimated the cost breakdown and net profit in the export oriented flower producing companies, mainly rose flowers. On an average the net profit margin of companies was about 30 per cent. The rest 70 per cent can be divided into three different cost components: marketing and transport costs (30-35%); freight and transport cost (Rs. 70-80 kg^{-1} of flower); and production cost (15%). The rest included financial charges, depreciation and other costs. The success of the enterprises is largely emphasised by financial and technical aspects.

Cut flower business though reported to be highly lucrative activity at present, Kumar (1996) reports the other side of the business. The major demand for cut flowers comes from rich and upper middle elite classes in urban areas. Cut flower has all the characteristics of a good, which would have a highly elastic demand curve. It seems probable that

since increased production would be based on demand from lower income strata, there would be a kink in demand. Therefore, a small increase in production is likely to cause a sharp fall in prices which would wipe out the high profitability enjoyed at the existing level of production. Isvarmurthi (1997) has also highlighted some of the failure stories of floriculture units in India. Isvarmurti (1999) reported that the AVT Vanitha Orchid Club movement in Kerala was not very successful as most of the members were very affluent people.

Samuel (1996) indicated that once orchid starts flowering after one year, it gives annual rate of return of over 100 per cent with an initial investment of Rs. 35,000 in an area of 14 m^2.

Misra (1997) has estimated the investment requirements of capital intensive floriculture units. Capital costs for rose cultivation ranged from 64.76 lakhs to 157.5 lakhs ha^{-1}. For carnation, it was varying between 56.78 lakhs to 157.5 lakhs ha^{-1} and, for orchids it was Rs. 69.42 lakhs.

Raghava and Dadlani (1997) have estimated the variations in the returns per unit area for some flower crops in different regions. While the extent of local demand does influence overall returns, this does not justify the magnitude of variation. For instance, studies reported by different workers have indicated returns on jasmine cultivation to vary from State to State, viz., Rs. 10,000 ha^{-1} in Andhra Pradesh to Rs. 30,000 in major growing area of Tamil Nadu, to Rs. 68,000 in Karnataka and more than Rs. 80,000 in Maharashtra.

Rajeevan and Babu (1997) found bush jasmine cultivation more feasible and profitable even on small holdings, utilising under-employed/ unemployed family labour, especially women labour. The economic indicators worked out for it were: pay back period- 1.22 years; benefit

cost ratio- 1:1.8; net present worth- Rs. 14,632 and internal rate of return over 50 per cent.

Rajeevan *et al.* (1997) have estimated the cost of commercial orchid production as Rs. 10 million (as initial establishment cost) per hectare in the first year and, thereafter Rs. 0.4 million annually. A net profit of Rs. 2.4 million in the first year, Rs. 7.2 million in the second year, Rs. 9.6 million in the third year and Rs. 14.4 millions annually thereafter can be obtained from one hectare of land. Similarly, with regard to anthurium production, they reported that 1000 anthurium plants can be maintained in about 150 m^2 land. The cost of establishing such a unit comes to about Rs. 0.1 million. An annual income of Rs. 48,000 can be expected and the net profit is projected as Rs. 30,000 per annum.

Salvi (1997) conducted an experiment on anthurium cultivation and calculated the economics involved in it. The experiment was laid out in 400 m^2 area (1975 plants). The total cost of cultivation was Rs. 3,37,972 of which Rs. 1,93,950 was fixed component (non-recurring). The net profit was Rs. 438200. Further, it was mentioned that as the age of the plant advances, the expenditure on plant will comparatively be reduced and the margin of profit will increase to a greater extent because of the higher number of suckers and flowers. Maximum net profit per pot recorded for the 18 months period was Rs. 204.6. About six suckers per plant were produced during this period.

Because of paucity of reliable data, proper marketing channels and lack of record keeping system, the estimates of growth rate on domestic trade of floriculture, as done by various authors, shows some variation. Sindhu and Misra (1997) reported the growth pattern of floriculture in the domestic market of India. During 1991-92 to 1992-93 the growth rate was around 10 per cent which increased to 15 per cent during 1993-94.

It further increased to around 20 per cent during 1994-95 and 1995-96. Oberai (1997) reported the growth rate of domestic market, in recent years, to be almost 35 per cent per annum as compared to the world flower market growth of 12 per cent. With a population of over 900 million, of which only about 10 per cent, i.e., 90 million (larger than the population of some major European countries put together) have the buying power, India stands as one of the largest untapped flower markets of the world. Ghosh (1998) estimated this annual growth rate as 25-30 per cent in recent years. In domestic market, consumption of flowers in the southern states is much higher than in the northern region.

Tilekar (1997), in a study on a sample of 30 rose farms in Nasik district of Maharashtra during 1993-94, observed that three types of rose flowers i.e., those with 18", 12" and 6" stalks were being harvested. The proportions of these flowers produced were 15, 40 and 45 per cent respectively, of total harvest. The flowers with long stalks (18") were highly preferred in Mumbai market where about 96 per cent of the total flower were being sold. The average price received per dozen of flowers of 18", 12" and 6" stalks lengths were Rs. 13, Rs. 10 and Rs. 6 respectively.

Ganguly (1998) emphasised the importance of flori-business by citing a case of Deulia Bazar, where various flowers are transacted, in Midnapore district, West Bengal. This market supports the livelihood of 12,000 families in the district. The daily average turnover of the market often crosses the Rs. 10 lakh mark, but in lean months it comes down to 1 - 1.5 lakh. Price varies from about rupees seven per flower during marriage season (June-November) to even rupees three per flower during dull periods.

In a marketing study conducted in south Indian (Chennai) flower markets by Ghosh (1998) it was observed that growers realised only 31-

36 per cent of the consumers price. However, in rose it was about 50 per cent. Analysis of composition of cost price of rose showed that labour, propagation material, fuel and materials cover 33 per cent, 26 per cent, 26 per cent and 4 per cent of total cost respectively.

Sharma and Vaidya (1998) analysed the project cost of floriculture sector in Himanchal Pradesh (H.P.). They estimated a project cost of Rs. 310 lakhs for 5 years, with Rs. 46.5 lakh investment in the first year. This project would bring total of 16 ha area under flower in various districts of H.P., starting with four hectare area in first year. It would generate an economy of about Rs. 14 crores per annum in the selected districts and would ensure a net income of about Rs. 2.5 crores per annum to the participating growers. They also estimated the cost of cultivation and net returns from important flower crops in H.P.

Analysing the price movement of the various flowers in Delhi market during 20th January to 20th February 1999, it was observed that there was wide price variation between cultivars of roses from minimum of Rs. 20 to maximum of Rs. 50 per bundle of 20 flowers. For orchids and anthuriums, price varied according to size. The variation was from Rs. 5 to Rs. 8 in anthuriums and Rs. 8 to Rs. 20 in orchids (Anon., 1999).

With a plant population of 32,000-40,000 ha^{-1}, the capital cost for 1000 plants of *Dendrobium* orchid is estimated as Rs. 72,000 and recurring cost as Rs. 11,000 in first year and second year. Maintenance cost of Rs. 4,500 is required from second year onwards. The net income of Rs. 27,900 in second year and there after Rs. 49,500 each year upto fifth year can be obtained (Department of Horticulture, Andhra Pradesh, 1999).

Kaur (1999) has reported that the Indian floriculture industry suffered a setback estimated at 30 per cent due to fall in production. The delay in production due to cloudy weather resulted in Indian exporters missing the four auction days in Holland which led to a loss of rupees one crore to the industry. Though the industry is facing hard time in export market, chances are bright on the domestic front.

Nair (1999b) observed the prices of flowers in Thovalai market, one of the oldest flower market for traditional flowers in Kanyakumari district of Tamil Nadu. During the usual period the total margin ranges between 40 to 50 per cent and during the festival season the margin goes up to 80 per cent. The highest price was recorded during December/January when jasmine flowers yield a price of Rs. 300 kg^{-1}. During peak periods Thovalai market assembles around 7000 kg of different varieties of jasmine flowers.

Rengasamy and Soorianathasundaram (1999) emphasised that cultivation of traditional flowers has equal potential, as modern cut flowers, to become 'money spinners' with comparatively low risk and capital investment, in Kerala. Kerala climate is ideally suited to grow many tropical traditional flowers such as jasmine, chrysanthemum, marigold and crossandra. However, high humidity, heavy rainfall during monsoon months and high cost of labour may impede cultivation of these traditional flowers. The expenditure to maintain one hectare of jasmine comes around 1.5 lakh an year and expected minimum net profit of Rs. 75,000 an year. For tuberose, the cost of planting materials and other inputs will be around Rs. 70,000 ha^{-1} per year. The return from the sale of flowers and bulbs will be Rs. 1.5 lakhs ha^{-1}. Similarly, a net profit of Rs. 60,000 ha^{-1} per year can be obtained, from cultivation of chrysanthemum, Rs. 20,000 ha^{-1} from marigold and Rs. 75,000 ha^{-1} per year from the cultivation of crossandra.

Orchid and anthurium flowers are highly perishable and their demand and price are subjected to unexpected fluctuations. Sukesan (1999) suggested that a dual price policy is the only solution to deal with the marketing of such commodities effectively. Under dual pricing, a preliminary price to match with the cost of production and grades of different varieties of flowers will be fixed and payment to suppliers will be made on the spot at this rate. Thereafter, on marketing and realisation of prices will be offered on pro rata basis based on sale proceeds.

Tilekar and Nimbalkar (1999) have estimated the cost of production and marketing of roses using the data collected from 10 large polyhouse owners around Pune City in Maharashtra district. The per flower average cost of production was estimated to be Rs. 6.85 and the average price received from its sale was Rs. 10.44 which gave a substantial margin of Rs. 3.59 per flower. However, the price goes high during some festivals. Similarly price varied according grade also. The average price received for the flowers according to stalk length varied from Rs. 7 to Rs. 20.

3. AREA OF STUDY

City Corporations of Thiruvananthapuram (Trivandrum), Ernakulam (Cochin/ Kochi) and Calicut (Kozhikode) and Municipal Corporation (recently declared as City Corporation) of Thrissur (Trichur) are reported to be the major centres of commercial production of orchid and anthurium. Therefore, these four major production centres have been taken as sample in the present study.

3.1 Location

3.1.1 Kerala state

The state of Kerala (area: 38,863 km^2) lies in the south-west corner of the Indian peninsula, between 8° 18' and 12° 48' north latitude and 74° 52' and 77° 22' east longitude, as a long narrow strip of land (32 to 130 km wide) hedged between the lofty heights of Western Ghats and the Arabian sea, with a 590 km long coastal belt. The state is so rich in flora and fauna that the biological scientists consider Kerala as a genetic paradise. The state is divided into 14 districts, which occupies 1.18 per cent of the total area of India supporting a population of about 3.5 per cent (1991 Census). Population density is, thus, higher (747 km^{-2}) than the average for the country (257 km^{-2}). The State has highest sex ratio (1040 females per 1000 males) as well as highest literacy rate (90%) in the country.

3.1.2 Thiruvananthapuram

Thiruvananthapuram, the southern most district of Kerala, is situated between north latitudes 8° 17' and 8° 51' and east longitudes 76° 41' and 77° 17'. It is bounded by Quilon district in the north, Tivunelvbeli district in the east, Kanyakumari district in the south and the Arabian

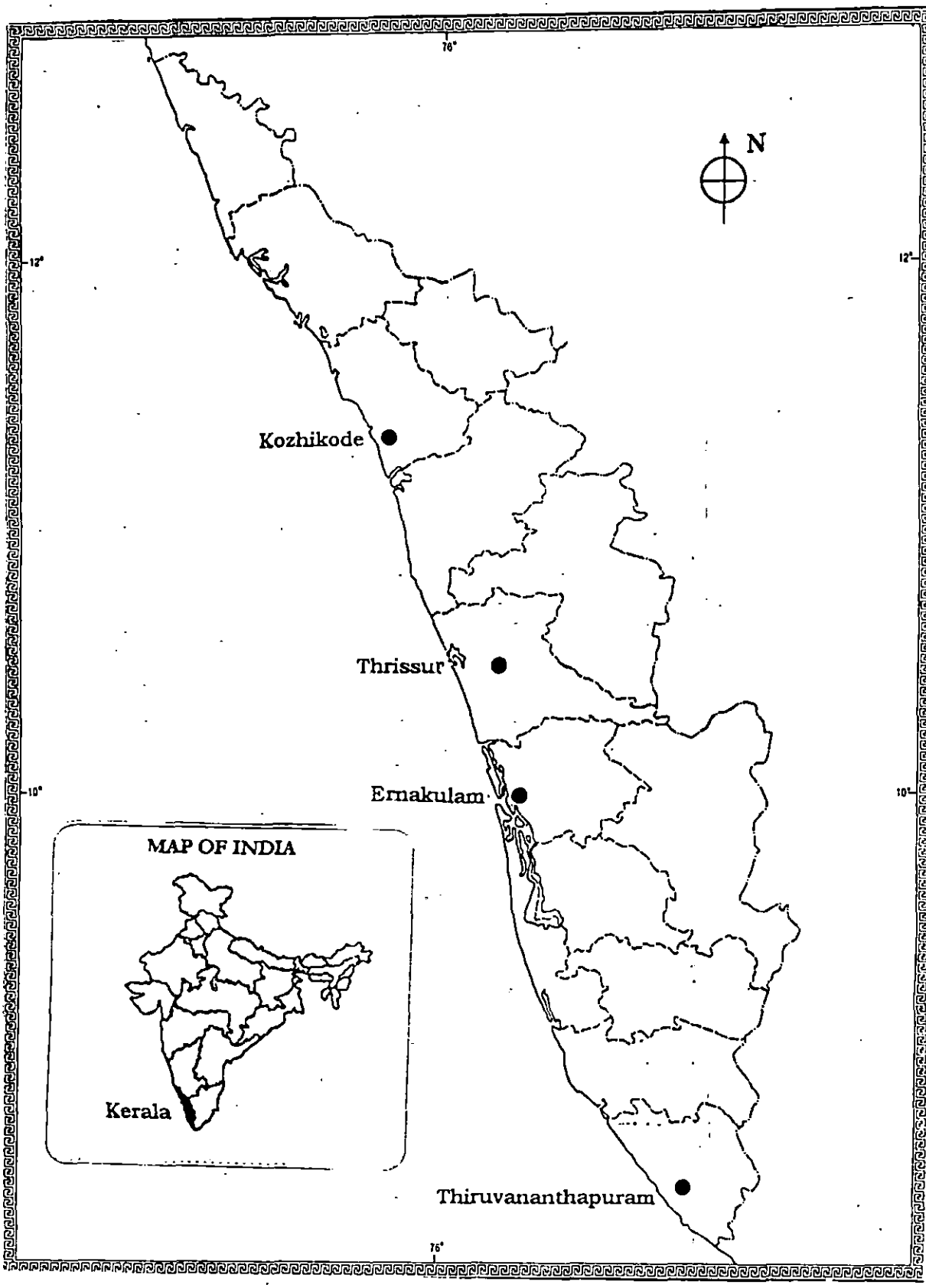


Figure 1: Map of Kerala showing the study area

sea in the west. The district extends over an area of 2192 km^2 which accounts for about 5.6 per cent of the total area of the state. Population of this district is 10.1 per cent of the state's population and the population density 319 people km^{-2}. It has a sea coast of about 72 km length. Sex ratio and literacy rate of this district is similar to that of the state. This district can be considered as a traditional orchid growing area.

3.1.3 Ernakulam

Ernakulam district is located between the latitude 9° 42' 38" to 10° 18' north and longitude 76° 12' to 76° 46' east. The district is bounded by a 30 km coastal belt of Arabian sea on the west, Kottayam and Alappuzha district in the south, Idukki district on the east and Thrissur on the north. The area of the district is 2408 km^2 which accounts for 6.2 per cent of the total area of the state. This district accommodates 9.7 per cent of the state's population and has a population density of 1168 people km^{-2}. It has almost equal number of males and females (sex ratio: 1002). With regard to orchid farming, A.V. Thomas & Company, the major private sector company which promotes orchid cultivation, concentrate into this district.

3.1.4 Thrissur

Thrissur district is located at the centre of the state of Kerala between north latitude 10° and 10° 4' and east longitude 75° 57' and 76° 54'. The district is bounded on the north by Palakkad and Malappuram districts. Palakkad district forms the eastern boundary of Thrissur district. Ernakulam and Idukki districts form the southern boundary and Arabian sea the western. The total geographical area of Thrissur district is 3032 km^2 which forms 7.8 per cent of the total area of the state. The district accommodates about 9.4 per cent of state's population and has a population density of 902 people km^{-2}.

Table 3.1 : Summary table showing geographic location and demographic details of sample areas

	State	TVM	EKM	TSR	KZD
Location: North Latitude	8° 18' to 12° 48'	8° 17' to 8° 51'	9° 42' 38" to 10° 18'	10° to 10° 4'	11° 08' to 11° 58'
East Longitude	74° 52' to 77° 22'	76° 41' to 77° 17'	76° 12' to 76° 46'	75° 57' to 76° 54'	75° 30' to 76° 28'
Geographical area of the district/State (km^2)	38,863	2192	2408	3032	2345
Area as percentage of the State	100	5.6	6.2	7.8	6.0
Population (Millions)	29.03	2.94	2.81	2.74	2.61
Sex ratio (No. of female/1000 male)	1040	1041	1002	1088	1031
Population as percentage of the state	100	10.1	9.7	9.4	9.0
Population density (person/sq. km)	747	1341	1168	902	1115

Source: Census of Kerala 1991
TVM - Thiruvananthapuram; EKM - Ernakulam; TSR - Thrissur; KZD - Kozhikode

3.1.5 Kozhikode

Kozhikode district is located towards the northern end of the state of Kerala. The district is bounded on the north by Kannur district, on the east by Wyanad district, on the south by Malappuram district and on the west by Arabian sea. It is situated between north latitudes 11° 08' and 11° 58' and east longitudes 75° 30' and 76° 28'. The total geographic area of the district is 2345 km^2 which accounts for six per cent of total area of the state. The district has a coastal length of about 80 km. This districts supports about nine per cent of the total population of the State and has a density of 1115 people km^{-2}. Sex ratio of this district is 1031.

3.2 Climate

A brief introduction of climatic conditions of four locales of study is presented here. Monthly mean data on three weather parameters, viz., rainfall, temperature and relative humidity , which are most relevant to the crops under study are presented for all the four locales of the study in Tables 3.2 to 3.4.

3.2.1 State

Kerala state is situated in the humid tropics with bimodal rainfall distribution pattern. The state gets heavy rains during both the monsoons (southwest and northeast). The mean date of onset of the southwest monsoon varies from 25th May to 1st June. The northeast monsoon starts by the middle of October. The normal rainfall of the state is 3063 mm. Relative humidity varies season-wise. It reaches maximum values during the southwest monsoon period and lowest value occur during January and February.

The average temperature is lowest during southwest monsoon. The mean maximum temperature ranges between 28^{o}C and 30^{o}C from June to September while the mean minimum remains between 22^{o}C and 24^{o}C. the highest maximum temperature ranges around 34^{o}C - 35^{o}C over the coastal areas and goes even higher in the interior in the June (Menon and Rajan, 1989).

3.2.2 Thiruvananthapuram

Heavy annual rainfall, high humidity and more or less uniform temperature throughout the year are the climatic features of this district. Mean maximum temperature varies around 29.5 ^{o}C to 34.9 ^{o}C and mean

minimum temperature around 22.8 °C and 26.3 °C. It receives both southwest monsoon and northeast monsoon. There are four seasons, the dry weather from December to February, hot weather from March to May, southwest monsoon from June to September and northeast monsoon from October to November. Relative humidity is usually higher, especially during June to December.

3.2.3 Ernakulam

A tropical humid climate with almost uniform temperature throughout the year is experienced in the district. The maximum day temperature varies form 29.5 °C to 33 °C and minimum temperature from 22.8 °C to 26 °C. The total annual rainfall per year is about 3500 mm, the major part of which is received in the month of June, July and August. Heavy rains occurring continuously for 10-15 days result in flooding, which is usual during June, July and August. Humidity is often very high, recording more than 90 per cent.

3.2.4 Thrissur

The climate of Thrissur district is tropical and humid with an oppressive hot season. Average daily maximum temperature is 31 °C - 32 °C in the coastal regions and 29 °C to 36.2 °C in interior. The rainfall is seasonal and fairly assured. The annual rainfall received in this district during 1997 was 3106.3 mm, concentrated in the months from June to September, the southwest monsoon season. Relative humidity fluctuates highly in this district, ranging from 72 per cent to 95 per cent of maximum mean and 38 per cent to 80 per cent of minimum mean. Higher RH is during June to September. Fluctuation in RH is much higher in this district.

3.2.5 Kozhikode

It has a fairly salubrious climate. The high land region has bracing cold climate for the most part of the year whereas the other regions enjoy a temperate climate. The most important rainy season in the district is the southwest monsoon commencing from June and ending in September. The other rainy season is the north east monsoon which generally lasts from October to November. Compared to the other districts, Kozhikode district receives more rainfall; it was about 4055 mm during 1997. Humidity is very high in the coastal region. It is maximum during July to September and is minimum during January and February.

Table 3.2: Average monthly rainfall during 1997 (in mm.)

Months	TVM	EKM	TSR	KZD
January	2.9	5.8	0.0	1.6
February	10.1	1.0	0.0	0.0
March	17.8	48.0	0.7	9.5
April	63.1	86.3	6.9	1.0
May	124.6	130.1	85.1	67.1
June	265.4	550.6	700.7	1084.0
July	221.4	942.6	946.1	1495.7
August	122.6	471.8	545.4	728.7
September	401.2	415.4	315.3	158.4
October	227.6	329.0	213.9	207.4
November	308.2	377.2	217.9	238.4
December	115.2	141.7	74.3	62.7
Annual	**1880.1**	**3499.5**	**3106.3**	**4054.5**

Source: Farm Guide 1999, Farm Information Bureau, Government of Kerala

Table 3.3 : Average monthly mean temperature (°C)

Months	TVM*		EKM		TSR		KZD*	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Jan.	33.8	23.4	31.9	22.8	32.8	22.1	33.9	23.8
Feb.	33.5	24.0	32.3	24.3	34.8	22.5	34.1	24.3
March	34.7	24.8	32.7	25.4	36.2	23.8	34.0	25.5
April	34.9	26.3	33.0	26.0	35.6	25.0	35.4	27.9
May	33.0	25.7	32.5	25.9	34.0	24.8	34.9	27.6
June	30.8	24.4	30.4	24.2	30.1	23.4	30.9	24.7
July	30.0	23.6	29.5	23.7	29.0	23.0	29.5	24.1
Aug.	30.0	23.9	29.5	23.9	29.4	23.2	30.0	24.6
Sept.	29.5	23.5	30.2	24.2	30.5	23.3	30.0	24.2
Oct.	29.9	23.3	30.8	24.2	31.4	23.1	30.3	23.9
Nov.	30.5	23.2	31.4	24.0	31.7	22.9	31.9	24.2
Dec.	30.6	22.8	32.0	23.2	31.9	22.6	32.1	23.5

* Data for 1998; Remaining data - average of 1983-1997
Sources: IMD, Thiruvananthapuram; Ajith, 1999

Table 3.4 : Average relative humidity in the study area (%)

Months	TVM*		EKM		TSR		KZD*	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Jan.	82	62	74	61	72	41	80	63
Feb.	81	61	79	66	77	38	75	63
March	77	63	77	68	82	42	79	70
April	76	72	77	70	84	53	75	71
May	83	79	81	73	86	60	77	75
June	88	81	90	83	93	78	91	86
July	89	79	91	83	95	80	94	87
Aug.	88	80	90	82	94	77	93	85
Sept.	89	82	87	79	92	70	93	87
Oct.	90	82	84	77	87	69	91	85
Nov.	88	79	82	72	83	62	85	75
Dec.	88	77	75	64	75	49	83	70

* Data for 1998; Remaining data - average of 1983-1997
Sources: IMD, Thiruvananthapuram; Ajith, 1999

4. METHODOLOGY

Orchids and anthuriums are generally grown together owing to their similar climatic and other requirements as well as cultural practices. In this study, therefore, both the crops were included. Methodology adopted for conduct of the study and analysis of data are presented below.

4.1 Sampling procedure and methodology

City corporations of Thiruvananthapuram, Kochi and Kozhikode and municipal corporation of Thrissur, are the major centres of commercial production of orchid and anthurium. These were selected as the study area.

The available details on orchid and anthurium growers were collected from various sources such as Cut Flower Societies, Agri-Horti Societies, Krishi Bhavans, Federation of Indian Floriculturists (FIF), AV Thomas & Company (AVT) etc. Separate lists of growers were prepared for both crops for all these four district headquarters.

Growers from each list were then classified into three categories, viz., low, medium and large scale growers based on available estimate of number of plants. Classification was as below:

Group I	(symbolised as G-I)	-	less than 500 plants
Group II	(symbolised as G-II)	-	500 to 1000 plants
Group III	(symbolised as G-III)	-	above 1000 plants

The total sample size was fixed as 80 growers each for orchid and anthurium. Number of growers to be sampled from each group was taken in proportion to the number of growers enlisted in the respective group in

each district headquarter. Sample growers were selected using simple random sampling method.

The distribution of selected sample growers is presented below in Table 4.1.

Table 4.1: Distribution of sample growers across different strata

Scale of operation	Crop	District headquarters				Total
		TVM	EKM	TSR	KZD	
G-I	Orchid	11	4	7	6	28
	Anthurium	6	6	9	9	30
G-II	Orchid	2	9	8	11	30
	Anthurium	12	13	3	6	34
G-III	Orchid	9	6	5	2	22
	Anthurium	5	2	6	3	16
Total	Orchid	22	19	20	19	80
	Anthurium	23	21	18	18	80

4.2 Period of study

The reference year of the study was 1998-99 and the collection of data was carried out during the period of February 1999 to May 1999.

4.3 Collection of data

The required primary data were collected from households by personal interview method using well-structured and pre-tested schedule (Appendix - I). The information on socio-economic characteristics and on various aspects of orchid and anthurium were obtained as on the date of interview. Information relating to production and marketing aspects, inputs, cost structure and returns were also collected and analysed.

4.4 Method of analysis

Percentage analysis and capital productivity analysis were used for analysing and interpreting the data.

* Capital productivity analysis

Capital productivity analysis is the most important tool for evaluating the economic performance of perennial crops. It brings out the efficiency of capital use in production. There are various methods to measure the capital productivity. The four measures used in this study are:

a) Pay-back period (PBP)
b) Benefit cost ratio (BCR)
c) Net present value (NPV) and
d) Internal rate of return (IRR).

The cost of cultivation and returns obtained over the economic life of crops were used for these computations. The first one - 'pay back period' is the undiscounted measure while other three measures are discounted measures of assessing investment worth. For estimating these parameters costs and returns are discounted at 12.5 per cent rate of interest, being the rate at which medium term and long term credit could be obtained from commercial banks.

* Pay-back period

It is an undiscounted measure of the worth of an endeavour, which measures the efficiency of cultivation by indicating the period within which the returns offset the investment. Pay back period has two major drawbacks as a measure of investment worth: a) it doesn't consider earnings after this period and b) it fails to take into consideration difference in the timing of earnings during the pay back period. Given the

expected life of the project, the shorter the pay-back period, the greater is the profitability. The pay-back period can be estimated by estimating the progressive total of returns and progressive total of costs. The year at which progressive total of returns exceeds progressive total of costs is known as pay back period.

*** Benefit cost ratio**

The benefit cost ratio indicates the return on a rupee of investment. It is the ratio between the present worth of benefits and that of costs (Gittinger, 1976). A project with benefit cost ratio greater than unity is considered viable.

$$BCR = \frac{\text{Present worth of benefits}}{\text{Present worth of costs}} = \frac{\Sigma \{B_t/(1+i)^t\}}{\Sigma \{C_t/(1+i)^t\}}$$

Where, $t = 1 \ldots\ldots n$ years

(n = Total number of years of the project)

B_t = Benefits in t^{th} year

C_t = Costs in t^{th} year

i = Discount rate

*** Net present value**

This is a most straightforward discounted cash flow measure of the project worth. This is simply the present worth of the net cash flow stream. In other words it is the difference between present worth of benefits and present worth of costs. The formal selection criterion for the net present value measure of project worth is to accept all projects with a positive net present value when discounted at the opportunity cost of capital.

Symbolically, net present value (NPV) is

$$NPV = \sum \frac{(B_t - C_t)}{(1 + i)^t}$$

Where, $t = 1 \ldots\ldots n$ years

(n = Total number of years of the project)

Other symbols are same as mentioned earlier

*** Internal rate of return**

Another way of using discounted cash flow for measuring the worth of a project is to find that discount rate which just makes the net present value of the cash flow equal to zero. This discount rate is termed the internal rate of return and it represents the average earning power of the money used in the project over the project life (Gittinger, 1976). Based on this criteria a project is considered worth to be accepted if the internal rate of return is above the opportunity cost of capital.

Symbolically, internal rate of return (IRR) is that discount rate 'i' such that

$$NPV = \frac{\Sigma (B_t - C_t)}{\Sigma (1 + i)^t} = 0$$

Where, $t = 1 \ldots\ldots n$ years

(n = Total number of years of the project)

Other symbols are as mentioned earlier.

Internal rate of return has been calculated using in-built module of Microsoft Excel computer package (Windows 95), Version 7.0.

4.5 Sensitivity Analysis

Sensitivity analysis is done to see what happens to earning capacity of the project if something goes wrong which is beyond our control. Such uncertainty situation may arise out because of sudden fall in product prices or abrupt increase in input prices. In this study, sensitivity of the project has been analysed for four assumed conditions. These are:

- Decline in benefit stream by 10 per cent
- Decline in benefit stream by 20 per cent
- Increase in cost stream by 10 per cent
- Increase in cost stream by 20 per cent

For all these four conditions, project worth measures such as PBP, NPV, BCR and IRR have been estimated.

4.6 Concepts used in study

* Shade house

The term 'shade house' refers to the artificial structure erected to restrict the amount of sunlight, allowing only required partial sunlight to the plants. It is made by giving the cover of Ultra Violet Stabilised Agro-Shade Nets which is available with different meshing percentage. The construction and type of shade houses varies to a great extent with respect to basement (concrete/ cement/ soil floor), extent of covering (fully covered in all sides to only few sides covered) and standing support (durable metal/ GI pipes/ temporary support like bamboo poles/ fastening with trees, buildings etc.). However, there has not been any standard classification regarding type of shade houses hitherto. Because of these variations in the construction and type of shade house, their cost of construction was found varying to a large extent. Therefore, to narrow down the variation in the cost incurred for the shade house construction,

all the orchid and anthurium units were roughly categorised into three groups, viz.,

Permanent type shade houses	-	Symbolised as S-I
Semi-permanent type shade houses	-	Symbolised as S-II
Temporary type shade houses	-	Symbolised as S-III

All the shade houses with durable supports and fully or almost fully covered by shade net were categorised as permanent shade house, while partially covered shade house with semi-durable or temporary support or hanging shade nets, tied with trees, buildings etc., were categorised as semi-permanent type. The cultivation under the natural shade such as the shade of trees or walls or buildings, or under semi-shade of already utilised shade nets was considered as temporary type of shade house. Separate analyses have been done for the units with permanent and semi-permanent type of shade houses (i.e., S-I and S-II), under each three size categories (i.e. G-I, G-II, & G-III) for orchid and anthurium units. Analysis for S-III was not tried because of insufficiency of number of units in this sub-category under any group.

*** Cost of shade house**

This cost covers various expenses incurred in construction of shade house including supports, nets, concrete structures or flooring and the labour required for its set up.

*** Cost of plants/ planting materials**

Growers were found purchasing plants and planting materials from different sources like private nurseries, individual growers, cut flower societies and private firms like AVT. Cost varies widely from one source to another and also based on the stage of plant and size of consignment. Few growers, having approach to foreign countries,

imported these plants from other countries at extremely higher prices while some growers obtained free of charges from relatives, friends etc. In such a circumstance a uniform cost of Rs. 75/- for anthurium and Rs. 66/- for orchid plants (including transportation cost) have been taken in the study, regardless of areas and their actual source of purchase. At these prices growers can avail a good quality plant of flowering stage (which starts flowering in the same year) at present, from the reliable sources of plant suppliers all over the state. These are, hence the average sale price of orchid/anthurium plants in near flowering stage (NFS), of registered private nurseries in the study area.

*** Suckers and Keikis**

Suckers are the side shoots, developed from the base of mother plant of anthurium, which can be detached and planted afresh as a new plant. In the case of orchids, older shoots develop baby plants (called keikis) on the upper nodes of shoot. These keikis can also be detached and planted afresh. Utilisation of anthurium suckers as planting material was seen common practice among growers, however, keikis was rarely utilised in the case of orchid propagation. Thus, only anthurium suckers have been evaluated at the existing market price of Rs. 25 per sucker, and no value has been ascribed for the keikis produced.

*** Economic life of plant**

Orchid and anthurium plants are perennial in nature with longer life span. However, because of decline in quality and quantity of flowers after certain stage of plants, the economic life of plants has been delineated as five years (from near flowering stage) for both the crops in present study. Though plants continue to bear flowers even after the economic life considered here, retaining these plants beyond this point is commercially not beneficial as these plants give very less production of poor quality flowers.

*** Value of human labour**

The existing wage rate for labourer engaged in crop production was considered as the value of hired labour/ casual labour. The labourer employed in initial set up of the shade house has been included in the cost of shade house construction. In the case of attached labourer who worked part-time in orchid/anthurium unit, the total time spent has been accounted and valued at the existing wage rate in the area. The value of family labour has also been evaluated at the same existing wage rate. Operationally, total labours have been categorised into two activities, viz., potting/planting and care and maintenance (including harvesting). Gender aspects of labour has also been studied across different categories and activities.

*** Value of fertilisers and plant protection chemicals**

Expenditure on fertilisers and plant protection chemicals have been evaluated at the actual purchase cost.

*** Capital investment and cost of tools and equipments**

Fixed capital included cost required for setting up the shade house, purchase of plants, pots and potting mixture, setting up irrigation system, purchase of machineries & implements such as sprayers, cutter, sprinkler etc.

The actual market price of tools and equipments has been taken here. Some growers received sprayer as complement from AVT. Such sprayers are evaluated at existing market price. In the case of tools which are used for both household purpose as well as for flower units, only 50 per cent of the price of tool has been considered for analysis. The growers who are engaged in cultivation of both orchids and anthuriums were using same tools and equipments for both crops in general. In such

cases, price of tools has been apportioned to orchid and anthurium enterprises based on the number of plants served in each case, giving equal weightage to both crops.

4.7 Salvage value

Depreciation is the decline in the value of a given asset as a result of the use, wear and tear, accidental damages and time obsolescence. Diminishing balance method of depreciation was applied to estimate the salvage value (junk value) of capital items at the end of economic life of crops. In diminishing balance method, a fixed rate of depreciation is used for every year and applied to the value of the asset at the beginning of the year. The original cost of an asset is divided by its estimated life to knock off a fixed percentage. This percentage is deducted every year from the diminished balance, till the asset reached the salvage value and no further depreciation is possible.

The salvage value of the shade house and other tools and equipments has been included in the benefit stream in the last year (5^{th} year) of economic life of the crops.

* Shade house

Owing to the difference in durability of materials used in shade house construction across different types of shade houses (i.e., S-I, S-II, S-III), a differential rate of depreciation has been adopted for two different types of shade houses. Investment in shade house type I (S-I) has been depreciated at the rate of 15 per cent annually and investment in the shade house type II (S-II) at the rate of 20 per cent. The aggregate salvage value, for any particular category (G-I, G-II, G-III or any district headquarters), which includes both types of shade houses (S-I and S-II), has been calculated as the weighted mean of salvage values (of S-I and S-

II), weight being the number of plants under the respective shade house type.

$$\text{Salvage value} = (n_1x_1 + n_2x_2)/(n_1 + n_2)$$

Where, n_1 = no. of plants under S-I

n_2 = no. of plants under S-II

x_1 = calculated salvage value for S-I

x_2 = calculated salvage value for S-II

*** Plants**

After the economic life, anthurium plants were retained for sucker production at the farm or sold out to hobbyist while orchid plants were neither sold nor remained productive. Though orchid plants could be rejuvenated by back-bulb separation, this practice was not found among growers in general. Thus, an imputed salvage value of Rs. 40/- has been ascribed to the mother plant of anthurium and no value for the orchid mother plants.

*** Pots**

All the remaining pots (unbroken and undamaged) after the economic life of first crop can be re-utilised for next crop. Thus, with the assumption of 50 per cent pots may be damaged, the original purchase price of remaining 50 per cent pots has been taken as the salvage value of pots.

*** Tools, equipments and irrigation system:**

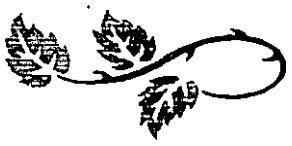
These items have been depreciated at the rate of 10 per cent for five years, using diminishing balance method.

4.8 Interest rate

An interest rate of 12.5 per cent per annum was charged on working capital as well as on fixed capital for the project worth estimation. This is the interest rate at which short term and medium term credits are available from the commercial banks.

4.9 Land revenue and land rents

Since these crops are grown in residential premises - on terraces/backyards, land revenue and land rents do not seem to be relevant cost component and have been excluded from the analyses. No case of leasing-in of land was observed in the samples selected.



5. RESULTS

This chapter presents different costs and returns associated with orchid and anthurium cultivation, for three scales of operation (i.e., G-I, G-II and G-III) as well as for the aggregate. Each of these groups (scale of operation) was further divided into three sub-groups (S-I, S-II and S-III) based on type of shade house. Various analyses have been done for each of these sub-groups under each group and results are presented. Analysis for different district headquarters was also attempted. All the costs and returns are calculated and presented for a standard of 100 plants, unless otherwise mentioned, in both orchids and anthuriums for all the categories.

5.1 ORCHID

5.1.1 *General socio-economic features of the sample growers*

*** Age, sex and family size**

Classification of the members of respondent's family on the basis of age and sex is presented in Table 5.1.1.

Table 5.1.1: Distribution of orchid growers' family based on age and sex

Age group (Years)	Sex	G-I		G-II		G-III		Average	
		No.	(%)	No.	(%)	No.	(%)	No.	(%)
<15	Male	8	6.1	9	6.7	5	4.2	22	5.7
	Female	10	7.6	17	12.6	12	10.0	39	10.1
15-25	Male	25	19.1	14	10.4	22	18.3	61	15.8
	Female	22	16.8	26	19.3	23	19.2	71	18.4
25-60	Male	25	19.1	32	23.7	28	23.3	85	22.0
	Female	28	21.4	30	22.2	23	19.2	81	21.0
>60	Male	8	6.1	4	3.0	6	5.0	18	4.7
	Female	5	3.8	3	2.2	1	0.8	9	2.3
Aggregate	Male	66	50.4	59	43.7	61	50.8	186	48.2
	Female	65	49.6	76	56.3	59	49.2	200	51.8
Total		*131*	*100*	*135*	*100*	*120*	*100*	*386*	*100*
Average family size		4.68		4.50		5.45		4.83	

As much as 43 per cent of total members in aggregate belonged to the age group of 25-60 years followed by 34.2 per cent in age group of 15-25 years. About 15.8 per cent of the members were under the age of 15 years and only about seven per cent above 60 years. Females accounted for 51.8 per cent and the sex ratio calculated was 1075. Except in G-I, all other groups exhibited higher number of female members than male members. Average family size in aggregate was 4.83, with the largest average size of 5.45 in G-III.

*** Occupation**

Distribution of respondents according to the main occupation of household head is presented in Table 5.1.2. It can be observed that, major portion of respondents were engaged in business (41.2%) followed by government services accounting for 27.5 per cent. About 23.8 per cent growers were enjoying their retired life while only 7.5 per cent were in private services. Government service was the most prominent occupation among growers of G-I, accounting for 39.3 per cent, while business was prominent among G-II and G-III. In G-III, as high as 72.7 per cent people were engaged in business while only 9.1 per cent in government services. Commercial orchid production is more prevalent among business people.

Table 5.1.2: Distribution of orchid growers family based on occupation of head of household

Occupation	G-I		G-II		G-III		Average	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
1. Govt. Service	11	39.3	9	30.0	2	9.1	22	27.5
2. Private service	2	7.2	4	13.3	0	0.0	6	7.5
3. Business	6	21.4	11	36.7	16	72.7	33	41.2
4. Retired life	9	32.1	6	20.0	4	18.2	19	23.8
Total	**28**	**100**	**30**	**100**	**22**	**100**	**80**	**100**

*** Family income**

Family income is the income of the household from all sources per annum. Total respondents are classified into three income groups, viz., less than one lakh rupees, between one and two lakh rupees, and above two lakh rupees and the information on family income is summarised in Table 5.1.3. About 45 per cent of growers enjoyed an annual income of less than one lakh. Only 12.5 per cent of growers were earning more than two lakh rupees per annum, and half of such growers belonged to G-III. Major proportion of respondents in G-I and G-II earned less than one lakh rupees per annum while major proportion of G-III earned between one and two lakh rupees per annum.

Table 5.1.3: Classification of orchid growers based on annual family income

Income group (Rs.)	G-I		G-II		G-III		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<1 lakh	15	53.6	14	46.7	7	31.8	36	45.0
1-2 lakhs	12	42.8	12	40.0	10	45.5	34	42.5
>2 lakhs	1	3.6	4	13.3	5	22.7	10	12.5
Total	**28**	**100**	**30**	**100**	**22**	**100**	**80**	**100**

5.1.2 *General information on orchid cultivation*

*** Varieties grown**

Dendrobium was observed as the most popular orchid because of its suitability to existing climatic condition and higher market demand. *Dendrobium* was estimated about 85 per cent of the total volume of orchids among sample growers. *Cattleya, Aranda, Mokara, Phalinopsis* etc. constituted the rest. Wide varietal diversity was observed in orchid farming with highest variability in small and medium scale growers (i.e., G-I and G-II). Most commonly grown *Dendrobium* varieties were Sonia-16, Sonia-17 (Plate 1), Sonia-18, Sonia-28, Pravit White (Plate 2), Bom Joe etc. In Thiruvananthapuram, some local

Plate 1: 'Sonia-17', the most popular variety of orchid grown

Plate 2: 'Pravit White', a popular white orchid variety

varieties were also grown, one of that is 'Phillipica'. Though productivity is high its market preference was low.

* Sources of planting materials and technical information

Growers usually started this enterprise with a few plants and expanded gradually by adding from time to time from different sources (Table 5.1.4). AVT (AV Thomas & Company) had initiated pioneer efforts in the commercial production of orchids in Kerala among the urban elite, in association with one of the leading Malayalam magazine for women, namely, Vanitha, establishing AVT - Vanita (women) Orchid Clubs. Thus, nearly 50 per cent of the respondents got their planting materials from AVT. AVT, though it is also a private organisation, has been dealt seperately because of its dominance over other private organisations/nurseries with regard to supply of planting materials and other information on orchids and anthuriums. Others private nurseries also acted as important sources. Various floricultural societies, neighbours and friends as well as imported market (from other states/country) had an equal share of percentage each.

Table 5.1.4: Sources of planting materials of orchid (percentage of growers)

Sources	G-I	G-II	G-III	Average
1. Private nurseries	46.7	24	--	26
2. AV Thomas & Company	53.3	52	40	50
3. Societies	--	16	--	8
4. Neighbours/friends	--	--	40	8
5. Other State/Country	--	8	20	8

AVT's efforts to popularise the flori-business were not confined to supply of planting materials alone. Their services in the field of technical guidance, disease and pest management, marketing of products etc. were

also remarkable, as revealed by the fact that it continued to be the major source for these services. Pomology and Floriculture Department of Horticulture College, KAU, Vellanikkara as well as various societies were also seen to be important sources of technical assistance (Table 5.1.5). The growers who were getting assistances from more than one source on a particular aspect, have been included into all these source categories and thus, the column total in the Table 5.1.5 may not add up to 100 per cent.

Table 5.1.5: Distribution of orchid growers according to the source of technical assistance (% of growers)

Sources	Motivation to grow	Cultivation & other techniques	Disease & pest management	Marketing
1. AV Thomas & Co. (AVT)	47.1	41.4	35.7	25.3
2. Kerala Agrl. University	24.3	30.0	32.9	16.0
3. Societies	22.9	31.4	31.4	18.7
4. Private nurseries	14.3	11.4	14.3	8.0
5. Neighbours/friends	17.1	14.3	8.6	20.0
6. Florists	--	--	5.7	16.0
7. Govt. offices	--	--	--	2.7
8. Exporters	--	--	--	12.0

Distribution of sample growers according to their scale of operation (Table 5.1.6) shows that about 37.5 per cent of the respondents were growing 500-1000 plants. Average number of plants maintained by a unit, in aggregate, was 997 and the average area covered 91.8 m^2. The area occupied by 100 plants was calculated as 9.2 m^2 and number of plants per hectare as 1,08,700. Area occupied by 100 plants in G-I, G-II and G-III were 12 m^2, 9.8 m^2 and 8.6 m^2 respectively. It indicates that with the increasing number of plants with a grower, the unit area occupied is decreasing - economy of scale.

Table 5.1.6: General information on orchids cultivation

Particulars		G-I	G-II	G-III	Average
Av. No. of plant		220	738	2305	997
Av. Area covered (m^2)		26.4	72.5	198.3	91.8
Av. Area for 100 plants (m^2)		12	9.8	8.6	9.2
No. of plants ha^{-1}('000)		83.33	102.04	116.28	108.70
Types of shade house	S-I	15(33.3)	16(35.6)	14(31.1)	45 (100)
	S-II	11(36.7)	12(40.0)	7 (23.3)	30 (100)
	S-III	2(40.0)	2(40.0)	1 (20.0)	5 (100)

Figures in parentheses show percentage value of total

Orchid plants require partial shade (40% - 50% under Kerala's climate). Nearly half of the respondents (45%) were growing orchid under good quality fully covered shade house (S-I type) and only a few (five per cent) were found growing in open field (without any artificial shade house) (i.e., S-III type). They were growing cultivars of intergeneric monopodials like Aranda, Mokara, Aranthera etc. which prefer open condition. This practice was noticed mainly in Thiruvananthapuram. Usually when the growers had both orchid and anthurium, orchid is generally grown in the available space on the terrace of their residential bungalow and anthurium on the ground. This is in view of the higher shade requirement for anthurium than that of orchids. On the ground, besides artificial shade houses, natural shade of various objects are also available.

Orchid is generally grown in earthen pots. Brick/tile pieces, charcoal, coconut husk etc. are used as potting mixture. Use of coconut husk, as the media is cheaper but reported to be harmful for plant health, as these husks absorb and retain water for a longer period causing many type of fungal infections. Orchid requires frequent irrigation preferably as mist. Growers had adopted various types of irrigation system, viz., mist irrigation, micro-sprinkler irrigation system, manual irrigation using sprayer.

*** Disease and pests**

Usually the occurrence of diseases and pests was very less. Fully covered shade houses (G-I type) also provided mechanical protection. Routine application of agro-chemicals was found to be common practice. Fertilisers were given at very low rate at frequent intervals (usually twice a week) and plant protection chemicals once a week. Besides chemical formulations, many local materials like neem cake, groundnut cake, coconut water, cow's urine etc. were also applied to improve the plant health. Snails and slugs were the most common pests and these were controlled by picking up manually during the night-time, the time of causing damage to pants. Besides commercial pesticides (containing metaldehyde), beer was also reported to be effective against these pests.

5.1.3 *Economics of cultivation*

5.1.3.1 Costs of cultivation

Orchid, being a perennial crop, the costs for its cultivation are spread over years. Here an attempt is made to present the cost of cultivation as it would incur at present prices. For this, costs of inputs and output are evaluated at the present market prices. Total cost for cultivating hundred plants of orchid for five years is presented in Table 5.1.7.

*** Year-wise cost of cultivation**

Year-wise breakup of the total cost of cultivation of orchid plants has revealed that establishment cost varied from Rs. 9,979 to Rs. 10,425 (constituting 52.33 per cent to 60.45 per cent of total cost) in different categories (Table 5.1.7). On an average the proportion was 57.28 per cent (Rs. 10,007) in first year and 8.5 per cent (≅ Rs. 1,500) each in the rest of the years.

Table 5.1. 7: Year-wise cost of cultivation of orchid (Rs. per 100 plants)

	G-I			G-II			G-III			Districts				Average
	S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Establishment cost														
Cost of shade house	3210	1503	2400	2172	1154	1784	2023	1227	1797	1901	1709	1895	1929	1858
Cost of pots (inclu. transportation)	755	765	760	838	880	860	850	923	881	893	868	777	789	833
Cost of potting media	215	250	228	270	316	312	304	302	305	293	264	269	298	281
Cost of Irrign-system	275	217	253	311	322	309	318	286	303	351	319	271	366	323
Cost of tools & equipments	115	122	110	69	54	63	25	19	23	26	36	48	59	42
Labour for planting	76	71	74	77	63	71	75	62	70	73	69	74	66	70
Cost of plants (inclu. transportation)	6600	6600	6600	6600	6600	6600	6600	6600	6600	6600	6600	6600	6600	6600
Total	***11246***	***9528***	***10425***	***10337***	***9389***	***10003***	***10195***	***9419***	***9979***	***10137***	***9865***	***9934***	***10107***	***10007***
Recurring costs (annual)														
1st yr. Labour cost	1593	1691	1659	1563	1630	1616	1102	1147	1123	1408	1261	1301	1241	1298
Plant protection chemicals	78	95	85	79	54	71	57	57	57	78	59	59	61	63
Nutrients and fertilisers	136	107	122	118	92	106	100	122	107	171	89	94	88	108
Miscellaneous cost*	21	15	19	17	20	18	17	12	15	20	16	16	20	18
Total	***1828***	***1908***	***1885***	***1777***	***1796***	***1811***	***1276***	***1338***	***1302***	***1677***	***1425***	***1470***	***1410***	***1487***
2nd yr Labour cost	1593	1691	1659	1563	1630	1616	1102	1147	1123	1408	1261	1301	1241	1298
Plant protection chemicals	78	95	85	79	54	71	57	57	57	78	59	59	61	63
Nutrients and fertilisers	136	107	122	118	92	106	100	122	107	171	89	94	88	108
Miscellaneous cost	*21*	*44*	*33*	*17*	*42*	*27*	*17*	*20*	*18*	*24*	*21*	*19*	*30*	23
Total	***1828***	***1937***	***1899***	***1777***	***1818***	***1820***	***1276***	***1346***	***1305***	***1681***	***1430***	***1473***	***1420***	***1492***
3rd yr Labour cost	1593	1691	1659	1563	1630	1616	1102	1147	1123	1408	1261	1301	1241	1298
Plant protection chemicals	78	95	85	79	54	71	57	57	57	78	59	59	61	63
Nutrients and fertilisers	136	107	122	118	92	106	100	122	107	171	89	94	88	108
Miscellaneous cost	43	37	40	24	57	37	23	27	24	36	33	16	37	30
Total	***1850***	***1930***	***1906***	***1784***	***1833***	***1830***	***1282***	***1353***	***1311***	***1693***	***1442***	***1470***	***1427***	***1499***
4th yr Labour cost	1593	1691	1659	1563	1630	1616	1102	1147	1123	1408	1261	1301	1241	1298
Plant protection chemicals	78	95	85	79	54	71	57	57	57	78	59	59	61	63
Nutrients and fertilisers	136	107	122	118	92	106	100	122	107	171	89	94	88	108
Miscellaneous cost	27	44	36	24	62	39	19	29	22	35	27	23	36	30
Total	***1834***	***1937***	***1902***	***1784***	***1838***	***1832***	***1278***	***1355***	***1309***	***1692***	***1436***	***1477***	***1426***	***1499***
5th yr Labour cost	1593	1691	1659	1563	1630	1616	1102	1147	1123	1408	1261	1301	1241	1298
Plant protection chemicals	78	95	85	79	54	71	57	57	57	78	59	59	61	63
Nutrients and fertilisers	136	107	122	118	92	106	100	122	107	171	89	94	88	108
Miscellaneous cost	21	15	19	17	36	25	17	12	15	20	16	19	31	18
Total	***1828***	***1908***	***1885***	***1777***	***1812***	***1818***	***1276***	***1338***	***1302***	***1677***	***1425***	***1473***	***1421***	***1487***
Grand Total	**20414**	**19148**	**19902**	**19236**	**18486**	**19114**	**16583**	**16149**	**16508**	**18557**	**17023**	**17297**	**17211**	**17471**

* Miscellaneous cost includes maintenance cost of shade house, tools and equipments, irrigation system, electricity charges etc.

*** Input-wise costs**

Input-wise breakdown of total cost of cultivation is presented in Table 5.1.8. Plants, pots and media together constituted the major share of about 44.15 per cent of the total cost, which is followed by labour (37.55%) and shade house (10.63%). Other costs constituted very small share in total cost.

Table 5.1.8: Input-wise breakdown of total cost of cultivation of orchid (Rs. per 100 plants)

Input items	G-I		G-II		G-III		Average	
	Rs.	(%)	Rs.	(%)	Rs.	(%)	Rs.	(%)
1. Plants, pots & media	7588	38.13	7776	40.68	7786	47.17	7714	44.15
2. Labour	8369	42.05	8151	42.64	5685	34.44	6560	37.55
3. Shade-house	2400	12.06	1784	9.33	1797	10.89	1858	10.63
4. Irrigation system, tools & equipment	363	1.82	372	1.95	326	1.97	365	2.09
5. Fertilizers	610	3.07	530	2.77	535	3.24	540	3.09
6. PP chemicals	425	2.14	355	1.86	285	1.73	315	1.80
7. Miscellaneous cost	147	0.74	146	0.76	94	0.57	119	0.68
Total	**19902**	**100**	**19114**	**100**	**16508**	**100**	**17471**	**100**

Miscellaneous cost included all the costs incurred for operation and maintenance of irrigation system, shade house, tools and equipments. Input-wise breakdown of total costs among different subgroups and four district headquarters is given in Appendix II.

*** Establishment cost and recurring costs**

*** Establishment cost**

On an average about 57.28 per cent of total cost was incurred in the first year, which in monetary terms amounted to around rupees ten

thousand. Cost of plants alone constituted 65.95 per cent of the establishment cost, which is followed by shade house (18.57%) and pots and potting media (11.13%) (Table 5.1.9). Except the cost of pots and media all the costs are seen declining towards the smaller groups.

Table 5.1.9: Input-wise breakdown of establishment cost of orchid (Rs. per 100 plants)

Inputs	G-I		G-II		G-III		Average	
	Rs.	(%)	Rs.	(%)	Rs.	(%)	Rs.	(%)
1. Plants	6600	63.31	6600	65.98	6600	66.14	6600	65.95
2. Shade house	2400	23.02	1784	17.83	1797	18.01	1858	18.57
3. Pots & media	988	9.48	1176	11.76	1186	11.88	1114	11.13
4. Tools & Irrigation system	363	3.48	372	3.72	326	3.27	365	3.65
5. Labour	74	0.71	71	0.71	70	0.70	70	0.70
Total	**10425**	**100**	**10003**	**100**	**9979**	**100**	**10007**	**100**

*** Recurring costs**

Input-wise breakup of total recurring cost is provided in Table 5.1.10. Average annual recurring cost was around Rs. 1500 (Table 5.1.7). Of the total recurring cost, labour cost constituted about 86.95 per cent, followed by cost of agro-chemicals (11.45%). Miscellaneous cost constituted about 1.59 per cent of the total recurring cost. All the costs are seen declining towards larger groups.

Table 5.1.10: Input-wise breakdown of pooled recurring costs for orchid (Rs. per 100 plants)

Input items	G-I		G-II		G-III		Average	
	Rs.	(%)	Rs.	(%)	Rs.	(%)	Rs.	(%)
1. Labour costs	8295	87.53	8080	88.68	5615	86.00	6490	86.95
2. Agro-chemicals	1035	10.92	885	9.71	820	12.56	855	11.45
3. Miscellaneous cost	147	1.55	146	1.60	94	1.44	119	1.59
Total	**9477**	**100**	**9111**	**100**	**6529**	**100**	**7464**	**100**

Agro-chemicals occupied second position with the share of 11.45 per cent in total recurring costs. Breakdown of total cost of agro-chemicals into plant protection chemicals and nutrient and fertilisers are presented in the Table 5.1.11. Proportion of cost of agro-chemicals was lower in G-II (9.71%) while higher in G-III (12.56%).

Table 5.1.11: Cost of agro-chemicals used in orchid (Rs. per 100 plants)

Inputs	G-I		G-II		G-III		Average	
	Rs.	(%)	Rs.	(%)	Rs.	(%)	Rs.	(%)
1. Plant protection chemicals	425	41	355	40	285	35	315	37
2. Nutrient and Fertilisers	610	59	530	60	535	65	540	63
Total	**1035**	**100**	**885**	**100**	**820**	**100**	**855**	**100**

5.1.3.2 Labour and its gender aspects

Labour is one of the major items of the input costs having a share of 37.55 per cent of the total cost of cultivation for five years (Table 5.1.8). Total labour employed has been studied under two categories namely: a) labour for potting and planting and b) labour for care and maintenance. The former category constituted 1.07 per cent of total labour use wherein a major part of work was done by female labour force. Detailed structure of labour employed for these activities is presented in Tables 5.1.12 and 5.1.13. Detailed breakdown of labour employed for these operations among various subgroups and in the four district headquarters is presented in Appendix III and cost of these labours in Appendix IV.

For potting and planting of 100 orchid plants, about 6.3 hours of labour was employed, of which around 70 per cent was contributed by female labour force. The involvement of family labour was found to be considerably high in comparison to the hired labour force in case of

smaller growers than in bigger ones. The labour cost incurred for potting and planting operations was nearly same amounting to Rs. 70 per 100 plants for all sizes of growers.

Table 5.1.12: Labour used for potting and planting of orchid (Hours per 100 plants)

		G-I		G-II		G-III		Average	
	Gender	Hrs.	(%)	Hrs.	(%)	Hrs.	(%)	Hrs.	(%)
Family	Male	1.6	24.24	0.9	13.85	1.2	19.05	1.1	17.46
	Female	4.0	60.61	2.5	38.46	2.2	34.92	2.4	38.10
	Total	**5.6**	**84.85**	**3.4**	**52.31**	**3.4**	**53.97**	**3.5**	**55.56**
Hired	Male	0.4	6.06	0.8	12.31	0.7	11.11	0.7	11.11
	Female	0.6	9.09	2.3	35.38	2.2	34.92	2.1	33.33
	Total	**1.0**	**15.15**	**3.1**	**47.69**	**2.9**	**46.03**	**2.8**	**44.44**
Aggregate	Male	2.0	30.30	1.7	26.15	1.9	30.16	1.8	28.57
	Female	4.6	69.70	4.8	73.85	4.4	69.84	4.5	71.43
	Total	*6.6*	*100*	*6.5*	*100*	*6.3*	*100*	*6.3*	*100*

Table 5.1.13: Weekly labour used for care & maintenance of orchid (Hours per 100 plants)

		G-I		G-II		G-III		Average	
	Gender	Hrs.	(%)	Hrs.	(%)	Hrs.	(%)	Hrs.	(%)
Family	Male	0.6	19.93	0.7	25.44	0.5	25.93	0.6	25.11
	Female	2.1	69.26	1.3	47.00	0.7	39.15	1.0	44.84
	Total	**2.6**	**89.19**	**2.1**	**72.44**	**1.2**	**65.08**	**1.6**	**69.96**
Hired	Male	0.0	0.00	0.0	0.00	0.2	11.11	0.1	6.28
	Female	0.3	10.81	0.8	27.56	0.5	23.81	0.5	23.77
	Total	**0.3**	**10.81**	**0.8**	**27.56**	**0.7**	**34.92**	**0.7**	**30.04**
Aggregate	Male	0.6	19.93	0.7	25.44	0.7	37.04	0.7	31.39
	Female	2.4	80.07	2.1	74.56	1.2	62.96	1.5	68.61
	Total	*3.0*	*100*	*2.8*	*100*	*1.9*	*100*	*2.2*	*100*

Labour used for care and maintenance was about 2.2 hours per week for 100 orchid plants, but smaller growers needed more time than the average while the bigger growers needed less. Contribution of family labour force was very high (about 90%) in smaller groups. Average annual labour cost for care and maintenance of 100 orchid plants amounted to Rs. 1,298, but it was as high as Rs. 1,659 in G-I (Appendix IV). In terms of monetary value, about 90 per cent of labour was contributed by family labour in G-I whereas it was about two-third (65.63%) in G-III.

5.1.3.3 Returns

In the case of orchids, returns constitute income exclusively from the sale of flower spikes produced and no additional income is obtained by selling the keikis and mother plants (after economic life of plants).

Production pattern of flower spikes over the economic life of plant is presented in Table 5.1.14. Production is higher during middle years of economic life, viz., 2nd, 3rd and 4th years. On an average 371 flower spikes were produced per 100 orchid plants per annum in the first year of crop, which increased to the highest of about 686 spikes in the third year and again declined to 587 spikes during fifth year of crop life. Prices per spike and number of spikes produced among the growers of different subgroups and in four district headquarters are provided in Appendix V.

Table 5.1.14: Annual production of flowers per 100 orchid plants (Nos.)

Year	G-I	G-II	G-III	Average
1	377	343	398	371
2	617	646	695	650
3	663	673	729	686
4	636	665	705	667
5	561	620	587	590
Total	**2854**	**2947**	**3114**	**2964**
Average	**571**	**589**	**623**	**593**

*** Prices and salvage values**

Average prices per flower spike, realised by growers, are presented in Table 5.1.15. Average price of first year's products was lower than that realised for subsequent years. The salvage value is also given in the table, which is the income in the end of the economic life of the crop. Salvage values were estimated for shade house, pots, tools and equipments and for irrigation system. The prices of various grades of spikes, offered by FIF are presented in Appendix VIII.

Table 5.1.15: Prices of flower spikes and estimated salvage value of orchid

Prices realised	G-I	G-II	G-III	Average
In first year (Rs./spike)	7.2	7.57	8.1	7.59
In subsequent years (Rs./ spike)	11.73	12.3	13.09	12.32
Salvage value (Rs.)	1471	1337	1283	1326

The annual returns expressed as Rs. per hundred plants are presented in Table 5.1.16.

Table 5.1.16: Annual returns from orchid (Rs. per 100 plants)

Year	G-I		G-II		G-III		Average	
	Rs.	(%)	Rs.	(%)	Rs.	(%)	Rs.	(%)
0	0	0.0	0	0.0	0	0.0	0	0.0
1	2714	8.2	2597	7.2	3224	8.0	2816	7.8
2	7237	21.8	7946	22.1	9098	22.7	8008	22.2
3	7777	23.4	8278	23.0	9543	23.8	8452	23.4
4	7460	22.4	8180	22.7	9228	23.0	8217	22.8
5*	8052	24.2	8963	24.9	8967	22.4	8595	23.8
Total	**33240**	**100**	**35964**	**100**	**40060**	**100**	**36088**	**100**

*Values in fifth year also includes salvage values.

The first year return is about seven to eight per cent of the total income of the whole crop duration. And in subsequent years it is around 22 to 25 per cent. This pattern was seen almost similar across the

groups. Share of income in the last year is higher than previous year even though production is lower, obviously due to the salvage value. Gross returns among the growers in various subgroups as well as in four district headquarters are presented in Appendix VI.

5.1.3.4 Capital productivity analysis

Investment and income that are spread over a period of time are compared, after bringing them in the same plane of comparison through discounting. Capital productivity analysis brings out the efficiency of capital used in production. An attempt is made here to measure the productivity of capital by estimating: a) pay back period b) net present value c) benefit cost ratio and d) internal rate of return. The estimated cost of cultivation and returns obtained were used for these computations. Cash flow statement of the investment in orchid cultivation (for 100 plants) is provided in Table 5.1.17.

Table 5.1.17: Cash flow statement of investment in orchid enterprises (Rs. per 100 plants)

	G-I			G-II			G-III			Average		
Years	Cash outflow	Cash inflow	Cash flow	Cash outflow	Cash inflow	Cash flow	Cash outflow	Cash inflow	Cash flow	Cash outflow	Cash inflow	Cash flow
0	10425	0	-10425	10003	0	-10003	9979	0	-9979	10007	0	-10007
1	1885	2714	829	1811	2597	786	1302	3224	1922	1487	2816	1329
2	1899	7237	5338	1820	7946	6126	1305	9098	7793	1492	8008	6516
3	1906	7777	5871	1830	8278	6448	1311	9543	8232	1499	8452	6953
4	1902	7460	5558	1832	8180	6348	1309	9228	7919	1499	8217	6718
5	1885	8052	6167	1818	8963	7145	1302	8967	7665	1487	8595	7108
Total	19902	33240	13338	19114	35964	16850	16508	40060	23552	17471	36088	18617

Estimated project worth measures are presented in Table 5.1.18. These estimates for various subgroups as well as for enterprises in different district headquarters are presented in Appendix VII.

*** Payback period**

The pay back periods of orchid enterprise among different groups were estimated and are presented in Table 5.1.18. It is seen that this period is longer in G-I (2.8 years), followed by G-II (2.5 years) and shortest in G-III (2.1 years). In aggregate, it was 2.3 years.

Table 5.1.18: Economic viability of orchid culture (units per 100 plants)

Project worth measures	G-I	G-II	G-III	Average
Pay Back Period (Years)	2.8	2.5	2.1	2.3
Net Present Value (Rs.) **(@ 12.5%)**	5545	7993	12866	9345
Benefit Cost Ratio **(@ 12.5%)**	1.32	1.48	1.88	1.61
Internal Rate of Return (%)	29	35	49	39

*** Net present value**

Net present values for all three groups and for aggregate are seen positive (Table 5.1.18). Net present value for G-I is estimated as Rs. 5,545; for G-II, Rs. 7,993 and for G-III, Rs. 12,866.

*** Benefit cost ratio**

The estimated benefit cost ratios for all categories are given in Table 5.1.18. In all the groups as well as in aggregate this ratio is higher than unity. Moreover, with the increasing scale of operation this ratio is increasing showing increasing profitability towards larger scale of operation. Group III was found to be most efficient in capital efficiency with a BCR of 1.88.

*** Internal rate of return**

The internal rate of returns were estimated as 29 per cent, 35 per cent, 49 per cent and 39 per cent respectively for G-I, G-II, G-III and for

aggregate (Table 5.1.18), which is higher than the opportunity cost of capital, which is taken as the cost of borrowed capital. Earning power of investment in G-III is seen about one and half times greater than the investment in G-I.

Analysis of orchid enterprises in district headquarters indicated the Ernakulam area to be most profitable where internal rate of return was found to be above 50 per cent, followed by Thiruvananthapuram. Subgroup-wise analysis indicated higher investment towards better quality shade house (S-I) to be of no additional advantage. In smaller group shade house type II performed efficiently than better ones (S-I) in terms of profitability.

5.1.3.5 Sensitivity Analysis

Sensitivity analysis shows that smaller groups are more vulnerable to changes in benefits and costs, while larger groups have more shock absorbing capacity.

The results of sensitivity analysis are presented in Tables 5.1.19 to 5.1.22. Results for subgroups and various district headquarters are presented in Appendix VII.

Table 5.1.19: Pay back period in orchid culture in four different situations (Years)

	Pay Back Period (Years)				Increase in PBP (%)			
	G-I	G-II	G-III	Average	G-I	G-II	G-III	Average
Decline in benefit stream								
By 10%	3.1	2.8	2.3	2.6	12	10	8	11
By 20%	3.5	3.2	2.5	2.8	27	27	20	21
Increase in cost stream								
By 10%	3.0	2.8	2.3	2.6	9	10	8	11
By 20%	3.3	3.0	2.4	2.8	21	20	16	18

Table 5.1.20: Net present value of orchid culture under four situations (Rs.)

	Net Present Value (Rs.)				Decline in NPV by (%)			
	G-I	G-II	G-III	Average	G-I	G-II	G-III	Average
Decline in benefit stream								
By 10%	3273	5544	10116	6878	41.0	30.6	21.4	26.4
By 20%	1001	3096	7367	4411	81.9	61.3	42.7	52.8
Increase in cost stream								
By 10%	3828	6344	11403	7812	31.0	20.6	11.4	16.4
By 20%	2110	4695	9940	6280	61.9	41.3	22.7	32.8

Table 5.1.21: Benefit Cost Ratio of orchid culture under four situations

	Benefit Cost Ratio (BCR)				Fall in BCR by (%)			
	G-I	G-II	G-III	Average	G-I	G-II	G-III	Average
Decline in benefit stream								
By 10%	1.19	1.34	1.69	1.45	9.8	9.5	10.1	9.9
By 20%	1.06	1.19	1.50	1.29	19.7	19.6	20.2	19.9
Increase in cost stream								
By 10%	1.20	1.35	1.71	1.46	9.1	8.8	9.0	9.3
By 20%	1.10	1.24	1.57	1.34	16.7	16.2	16.5	16.8

Table 5.1.22: Internal rate of return of orchid culture under four situations (%)

	Internal Rate of Return (%)				Fall in IRR (%)			
	G-I	G-II	G-III	Average	G-I	G-II	G-III	Average
Decline in benefit stream								
By 10%	22	29	42	33	7	6	7	6
By 20%	16	22	35	26	13	13	14	13
Increase in cost stream								
By 10%	23	29	43	34	6	6	6	5
By 20%	18	24	37	28	11	11	12	11

5.1.4 *Marketing*

There are four routes identified through which flowers moved:

Channel I (56.6%): Producers ⟶ Local florists ⟶ Consumers

Channel II (32.8%): Producers ⟶ Exporters ⟶ Florists (outside) ⟶ Consumers

Channel III (6.1%): Producers ⟶ Florists (outside) ⟶ Consumers

Channel IV (4.5%): Producers ⟶ Consumers

The Channel I ("Producers ⟶ Local florists ⟶ Consumers") is identified to be the most important channel through which major proportion of the production (56.6%) was marketed (Table 5.1.24). About 81.3 per cent of the growers utilised this channel. Many growers sold their flowers partly to more than one buyer. Such growers are considered in more than one channel and thus column totals in Table 5.1.23 may not add up to 100 per cent.

Table 5.1.23: Percentage sale of orchid flower through different marketing channels (% of growers)

Sold to	G-I	G-II	G-III	Average
Florist	61.5	92.9	90.5	81.3
Exporters	38.5	42.9	47.6	42.7
Outside state	--	--	28.6	8.0
Consumers	7.7	7.1	14.3	9.3

Table 5.1.24: Volume of flowers sold to different buyers (% of total product)

Sold to	G-I	G-II	G-III	Average
Florist	63.1	68.4	32.9	56.6
Exporters	34.6	25.1	41	32.8
Outside state	--	--	21.7	6.1
Consumers	2.3	6.6	4.5	4.5

About 42.7 per cent of the growers utilised Channel II [Producers ⟶ Exporters ⟶ Florists (outside) ⟶ Consumers] selling about one-third (32.8%) of the total flowers produced. The term 'exporter' included different societies, federations, AVT and other organisations or individuals who exported flower to other domestic markets.

Few larger growers were able to establish contact with the florists in north Indian metropolis markets also. They gathered flowers from few growers together and exported to these florists in metropolis markets directly. This route is recognised as Channel III. About 6.1 per cent of the aggregate flower produced was routed through this channel (Table 5.1.24). Few growers (9.3%) also sold some flowers, about 4.5 per cent of the aggregate flowers directly to consumers. This route is recognised as Channel IV in the study.

*** Prices at different buyers**

Average prices realised from different buyers are presented in Table 5.1.25. Though not remarkable but some difference in prices received per spike among different groups has been observed. Price also varied from buyer to buyer. Usually larger growers obtained a little higher price.

Table 5.1.25: Average price per spike realised at different buyers (Rs.)

Buyers	G-I	G-II	G-III	Average
Florist	12.2	12.8	13	12.7
Exporters	11.1	11.5	11.8	11.5
Outside state	--	--	16.3	16.9
Consumers	7.7	9.5	7.8	8.5

5.2 ANTHURIUM

Details of various cost components and returns from anthurium plants are presented here. Costs and returns are also estimated for four district headquarters as well as for subgroups within each groups, and the results are provided in appendices.

5.2.1 *General socio-economic features of the sample growers*

*** Age, sex and family size**

Distribution of family members according to age and sex and average family size for different categories of growers is presented in Table 5.2.1. Highest proportion of members (45%) were in the age group '25-60 years' followed by 33.8 per cent in age group 15-25 years. Proportion of females was higher than that of males in all categories; on an average it was 52.1 per cent and the sex ratio was calculated as 1090.

Table 5.2.1: Distribution of anthurium growers family based on age and sex

Age group (Years)	Sex	G-I		G-II		G-III		Average	
		No.	(%)	No.	(%)	No.	(%)	No.	(%)
<15	Male	9	7.3	5	3.4	6	7.8	20	5.7
	Female	12	9.8	18	12.1	8	10.4	38	10.9
15-25	Male	16	13.0	29	19.5	11	14.3	56	16.0
	Female	21	17.1	28	18.8	13	16.9	62	17.8
25-60	Male	32	26.0	30	20.1	18	23.4	80	22.9
	Female	29	23.6	32	21.5	16	20.8	77	22.1
>60	Male	2	1.6	5	3.4	4	5.2	11	3.2
	Female	2	1.6	2	1.3	1	1.3	5	1.4
Aggregate	Male	59	48.0	69	46.3	39	50.6	167	47.9
	Female	64	52.0	80	53.7	38	49.4	182	52.1
Total		*123*	*100*	*149*	*100*	*77*	*100*	*349*	*100*
Average family size		4.10		4.38		4.81		4.36	

Average size of family ranged from minimum of 4.1 members in G-I to maximum of 4.81 members in G-III. The average size of family was 4.36, which is a little smaller than the aggregate average size of orchid growers' family.

*** Occupation**

Distribution of respondents according to the main occupation of head of household is presented in Table 5.2.2. More than one third (36.25%) growers were seen engaged in business followed by those who were retired from government services (23.75%). As in the case of orchid, here also major portion of the respondents in G-III was engaged in business activities.

Table 5.2.2: Distribution of anthurium growers family based on occupation of head of household

	G-I		G-II		G-III		Average	
Occupation	No.	(%)	No.	(%)	No.	(%)	No.	(%)
1. Govt. Service	9	30.0	9	26.5	2	12.5	20	25
2. Private service	7	23.3	5	14.7	0	0.0	12	15
3. Business	8	26.7	10	29.4	11	68.7	29	36.3
4. Retired life	6	20.0	10	29.4	3	18.8	19	23.8
Total	**30**	**100**	**34**	**100**	**16**	**100**	**80**	**100**

*** Family income**

The classification of growers according to their annual family income is given in Table 5.2.3. It can be seen in the table that major proportion of growers (43.7%) belonged to the group having annual family income between rupees one and two lakh, followed by the group with income of less than one lakh. Only about 15 per cent of growers were from the highest income group of above two lakh rupees per annum.

Majority of growers in G-I was from lower income group (less than one lakh rupees per annum), while majority of G-II were from medium income group (between one and two lakh rupees per annum).

Table 5.2.3: Classification of anthurium growers based on annual family income

Income group (Rs.)	G-I		G-II		G-III		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<1 lakh	16	53.3	13	38.2	4	25.0	33	41.3
1-2 lakhs	11	36.7	18	53.0	6	37.5	35	43.7
>2 lakhs	3	10.0	3	8.8	6	37.5	12	15.0
Total	**30**	**100**	**34**	**100**	**16**	**100**	**80**	**100**

5.2.2 *General information on anthurium cultivation*

* Varieties grown

Generally sample growers cultivated named exotic varieties mostly red and pink. Varieties like Tropical, Cancane, Lady Jane, Sakura Pink, Agnihotri and Lima White (Plate 3 & 4) are the most commonly grown varieties. As in the case of orchids, high intra-varietal diversity was observed in anthurium.

* Sources of planting materials and technical information

AV Thomas & Company and other private nurseries were found equally sharing a substantial part of demand (39.1% each) (Table 5.2.4). Besides, different flower societies, neighbours and friends also served as the source of planting materials to about 21.7 per cent of growers. Contrary to other groups, growers in G-II were mainly depending on private nurseries, and not on AVT. Besides planting materials, AVT is also a good source of technical information on various aspects of crop.

Plate 3: Agnihotri, a popular anthurium variety.

Plate 4: ' Lima White' , a popular white anthurium variety.

Table 5.2.4: Sources of planting materials of anthurium (percentage of growers)

Sources	G-I	G-II	G-III	Average
1. Private nurseries	33.3	50	25	39.1
2. AV Thomas & Company	44.5	30	50	39.1
3. Societies	22.2	10	--	13.0
4. Neighbours/friends	--	10	25	8.8

Kerala Agricultural University, different societies, private nurseries and neighbours and friends also had a good role in supplying technical information to growers, on various aspects like cultivation practices, disease and pest management etc. (Table 5.2.5). The growers who were getting assistance from more than one source on a particular aspect, have been included into all these source categories and thus, the column total in the Table 5.2.5 may not add up to 100 per cent.

Table 5.2.5: Distribution of anthurium growers according to the source of technical assistance (% of growers)

Sources	Motivation to grow	Cultivation & other techniques	Disease & pest management	Marketing
1. AV Thomas & Co. (AVT)	37.5	39.1	29.0	10.1
2. Kerala Agrl. University	18.8	29.7	16.1	8.7
3. Societies	21.9	29.7	32.3	20.3
4. Private nurseries	34.4	17.2	32.3	14.5
5. Neighbours/friends	21.9	15.6	9.7	30.4
6. Florists	--	--	3.2	23.2
7. Exporter	--	--	--	11.6

Major proportion (42.5%) of the total anthurium growers, belonged to G-II, followed by G-I (37.5%) and G-III(20%). Average number of plants per unit, in aggregate, was 860 and average area covered 91.6 m^2 (Table 5.2.6).

Table 5.2.6: General information on anthurium cultivation

Particulars		G-I	G-II	G-III	Average
Av. No. of plant (Nos.)		226	768	2232	860
Av. Area covered (m^2)		27.8	82.2	230	91.6
Av. Area for 100 plants (m^2)		12.3	10.7	10.3	10.7
No. of plants ha^{-1} ('000)		81.30	93.46	97.09	93.46
Types of shade house	S-I	12 (41.4)	8 (27.6)	9 (31)	29 (100)
	S-II	9 (22.5)	24 (60)	7 (17)	40 (100)
	S-III	9 (81.8)	2 (18)	0 (0)	11 (100)

Figures in parentheses indicate percentage value of total

Average area occupied by 100 plants was calculated as 10.7 m^2, i.e., a little higher (16% more) than the area occupied by the same number of orchid plants. At this accommodation rate, about 93,460 plants can be grown per hectare area. Average area for 100 plants was highest in G-I (12.3 m^2), followed by G-II (10.7 m^2) and G-III (10.3 m^2) (Table 5.2.6). Here also, as in the case of orchid, area covered is seen declining with increasing scale of operation. Anthurium was grown in earthen pots usually laid down on ground under shade.

Anthurium prefers higher level of shade, about 75 per cent in Kerala's climatic condition. About 40 per cent of respondents were growing anthurium under partially covered or semi-permanent type of shade house (S-II) as against the case of orchid which was grown mainly under permanent type shade house (S-I). It was observed that people paid much attention to orchid than to anthurium. Few growers (11%) were also growing under natural shade (without using any artificial shading materials) of walls, buildings, window sills, tree canopy etc. Notably, 82 per cent of such growers (open cultivation) were from G-I. Commonly used media for anthurium planting were sand, mosses, cow dung etc. Anthurium requires a little larger sized pots than that for orchids.

*** Disease and pests**

Disease and pest occurrence was seen very occasionally and was managed well with available pesticides in the local market. Generally routine prophylactic spraying of pesticides is practised by growers. Frequency of nutrients application was twice a week and of pesticides once a week in most cases.

5.2.3 *Economics of cultivation*

5.2.3.1 Costs of cultivation

Cost of cultivation presented here is the cost incurred for cultivating 100 anthurium plants during the period of five years. Various costs are evaluated at the present prices. The year-wise cost of cultivation among different groups, subgroups and district headquarters are presented in Table 5.2.7.

*** Year-wise cost of cultivation**

The total cost of cultivation ranged from Rs. 21,921 in G-I, Rs. 19,535 in G-II to Rs. 18,064 in G-III. On an average this cost was Rs. 19,153 (Table 5.2.7). Of the total cost of cultivation, share of establishment cost was around 58.1 per cent, which amounted to Rs. 11,123. The annual maintenance costs constituted 8-9 per cent of total costs across the groups.

*** Input-wise costs**

Input-wise breakdown of the total cost of cultivation for five years is presented in Table 5.2.8. Plants, pots and potting media together accounted for lion's share (47.3%) in the total cost. Labour costs constituted 36.69 per cent and shade house 8.94 per cent while other inputs like irrigation system, agro-chemicals and miscellaneous costs all

Table 5.2. 7: Year-wise cost of cultivation of anthurium (Rs. per 100 plants)

	G-I			G-II			G-III			Districts				Average
	S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Establishment cost														
Cost of shade house	2532	1647	2509	2088	1285	1552	1689	1112	1421	1750	1960	1679	1518	1712
Cost of pots (inclu. transportation)	1243	1348	1264	1242	1441	1382	1307	1225	1272	1342	1220	1219	1489	1316
Cost of potting media	253	225	237	243	222	232	272	297	283	237	230	260	254	244
Cost of Irrign-system	365	277	321	293	265	270	257	223	241	312	237	242	198	255
Cost of tools & equipments	86	123	99	52	60	55	23	19	22	31	56	37	51	43
Labour for planting	57	45	50	66	51	55	42	65	53	44	59	47	64	53
Cost of plants (inclu. transportation)	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500
Total	*12036*	*11165*	*11980*	*11484*	*10824*	*11046*	*11090*	*10441*	*10792*	*11216*	*11262*	*10984*	*11074*	*11123*
Recurring costs (annual)														
1st yr. Labour cost	1810	1631	1758	1410	1503	1489	1252	1230	1244	1355	1308	1409	1500	1395
Plant protection chemicals	87	78	82	75	56	66	58	56	57	75	65	50	57	63
Nutrients and fertilisers	141	89	114	115	121	118	113	155	132	153	101	105	130	125
Miscellaneous cost*	24	33	27	18	12	14	13	13	13	21	15	15	6	14
Total	*2062*	*1831*	*1981*	*1618*	*1692*	*1687*	*1436*	*1454*	*1446*	*1604*	*1489*	*1579*	*1693*	*1597*
2nd yr Labour cost	1810	1631	1758	1410	1503	1489	1252	1230	1244	1355	1308	1409	1500	1395
Plant protection chemicals	87	78	82	75	56	66	58	56	57	75	65	50	57	63
Nutrients and fertilisers	141	89	114	115	121	118	113	155	132	153	101	105	130	125
Miscellaneous cost	*24*	*60*	*34*	*18*	*29*	*25*	*13*	*37*	*24*	*31*	*24*	*32*	*13*	*25*
Total	*2062*	*1858*	*1988*	*1618*	*1709*	*1698*	*1436*	*1478*	*1457*	*1614*	*1498*	*1596*	*1700*	*1608*
3rd yr Labour cost	1810	1631	1758	1410	1503	1489	1252	1230	1244	1355	1308	1409	1500	1395
Plant protection chemicals	87	78	82	75	56	66	58	56	57	75	65	50	57	63
Nutrients and fertilisers	141	89	114	115	121	118	113	155	132	153	101	105	130	125
Miscellaneous cost	24	100	44	18	46	37	13	45	28	49	27	31	18	32
Total	*2062*	*1898*	*1998*	*1618*	*1726*	*1710*	*1436*	*1486*	*1461*	*1632*	*1501*	*1595*	*1705*	*1615*
4th yr Labour cost	1810	1631	1758	1410	1503	1489	1252	1230	1244	1355	1308	1409	1500	1395
Plant protection chemicals	87	78	82	75	56	66	58	56	57	75	65	50	57	63
Nutrients and fertilisers	141	89	114	115	121	118	113	155	132	153	101	105	130	125
Miscellaneous cost	24	80	39	18	43	34	13	43	27	44	29	31	15	30
Total	*2062*	*1878*	*1993*	*1618*	*1723*	*1707*	*1436*	*1484*	*1460*	*1627*	*1503*	*1595*	*1702*	*1613*
5th yr Labour cost	1810	1631	1758	1410	1503	1489	1252	1230	1244	1355	1308	1409	1500	1395
Plant protection chemicals	87	78	82	75	56	66	58	56	57	75	65	50	57	63
Nutrients and fertilisers	141	89	114	115	121	118	113	155	132	153	101	105	130	125
Miscellaneous cost	24	33	27	18	12	14	13	17	15	21	15	15	10	14
Total	*2062*	*1831*	*1981*	*1618*	*1692*	*1687*	*1436*	*1458*	*1448*	*1604*	*1489*	*1579*	*1697*	*1597*
Grand Total	**22346**	**20461**	**21921**	**19574**	**19366**	**19535**	**18270**	**17801**	**18064**	**19297**	**18742**	**18928**	**19571**	**19153**

* Miscellaneous cost includes maintenance cost of shade house, tools and equipments, irrigation system, electricity charges etc.

together constituted around seven per cent of the total cost. Input-wise breakdown of total costs across different subgroups and district headquarters are presented in Appendix IX.

Table 5.2.8: Input-wise breakdown of total cost of cultivation of anthurium (Rs. per 100 plants)

Input items	G-I		G-II		G-III		Average	
	Rs.	(%)	Rs.	(%)	Rs.	(%)	Rs.	(%)
1. Plants, pots & media	9001	41.06	9114	46.65	9055	50.13	9060	47.30
2. Labour	8840	40.33	7500	38.39	6273	34.73	7028	36.69
3. Shade-house	2509	11.45	1552	7.94	1421	7.87	1712	8.94
4. Irrigation system, tools & equipments	420	1.92	325	1.66	263	1.46	298	1.56
5. PP chemicals	410	1.87	330	1.69	285	1.58	315	1.64
6. Fertilisers	570	2.60	590	3.02	660	3.65	625	3.26
7. Miscellaneous cost	171	0.78	124	0.63	107	0.59	115	0.60
Total	**21921**	**100**	**19535**	**100**	**18064**	**100**	**19153**	**100**

*** Establishment costs and Recurring costs**

*** Establishment costs**

Breakdown of establishment costs into various components is presented in Table 5.2.9.

Table 5.2.9: Input-wise breakdown of establishment cost of anthurium (Rs. per 100 plants)

	G-I		G-II		G-III		Average	
	Rs.	(%)	Rs.	(%)	Rs.	(%)	Rs.	(%)
1. Plants	7500	62.60	7500	67.90	7500	69.50	7500	67.43
2. Shade house	2509	20.94	1552	14.05	1421	13.17	1712	15.39
3. Pots & media	1501	12.53	1614	14.61	1555	14.41	1560	14.02
4. Tools & irrigation system	420	3.51	325	2.94	263	2.44	298	2.68
5. Labour	50	0.42	55	0.50	53	0.49	53	0.48
Total	**11980**	**100**	**11046**	**100**	**10792**	**100**	**11123**	**100**

Of the total establishment costs, plants alone accounted for about 67.43%, followed by shade house (15.39%) and, pots and media (14.02%).

*** Recurring costs**

Input-wise breakdown of pooled recurring cost for five years is given in Table 5.2.10. Average pooled recurring cost was Rs. 8,030 of which labour alone accounted for about 86.86 per cent (Rs. 6,975). Agro-chemicals accounted for about 11.71 per cent and miscellaneous costs 1.43 per cent of the total recurring costs.

Table 5.2.10: Input-wise breakdown of pooled recurring costs for anthurium (Rs. per 100 plants)

Input items	G-I		G-II		G-III		Average	
	Rs.	(%)	Rs.	(%)	Rs.	(%)	Rs.	(%)
1. Labour costs	8790	88.42	7445	87.70	6220	85.53	6975	86.86
2. Agro-chemicals	980	9.86	920	10.84	945	13.00	940	11.71
3. Miscellaneous cost	171	1.72	124	1.46	107	1.47	115	1.43
Total	**9941**	**100**	**8489**	**100**	**7272**	**100**	**8030**	**100**

Agro-chemicals was the second major input after labour among recurring costs. Breakdown of cost of agro-chemicals is given in the Table 5.2.11. Plant protection chemicals constituted about one-third of the total cost of agro-chemicals and rest was the cost of nutrients and fertilisers.

Table 5.2.11: Cost of agro-chemicals used in anthurium (Rs. per 100 plants)

Inputs	G-I		G-II		G-III		Average	
	Rs.	(%)	Rs.	(%)	Rs.	(%)	Rs.	(%)
1. Plant protection chemicals	410	42	330	36	285	30	315	34
2. Nutrient and Fertilisers	570	58	590	64	660	70	625	66
Total	**980**	**100**	**920**	**100**	**945**	**100**	**940**	**100**

5.2.3.2 Labour and its gender aspects

Total labour constituted about 36.69 per cent of the total cost of cultivation (Table 5.2.8). Total labour employed has been studied under two categories namely: a) labour for potting and planting and b) labour for annual care and maintenance. The former constituted less than one per cent (0.76%) of the total labour while rest was accounted by latter category. Detailed structure of labour used is presented in Appendix X and labour costs in Appendix XI.

Table 5.2.12 presents the details of labours employed for potting and planting of anthurium. For potting and planting of 100 anthurium plants an average of 4.4 hours of labour was employed, about 45.45 per cent of which was contributed by female labours. Family members contributed up to 40.91 per cent of the total labour use. Cost of labour for potting and planting was about Rs. 50 per 100 anthurium plants (Appendix XI).

Table 5.2.12: Labour used for potting and planting of anthuriums (Hours per 100 plants)

		G-I		G-II		G-III		Average	
	Gender	Hrs.	(%)	Hrs.	(%)	Hrs.	(%)	Hrs.	(%)
Family	Male	1.2	26.67	1.2	26.09	0.3	6.98	0.7	15.91
	Female	1.3	28.89	1.8	39.13	0.5	11.63	1.1	25.00
	Total	**2.5**	**55.56**	**3.0**	**65.22**	**0.8**	**18.60**	**1.8**	**40.91**
Hired	Male	0.2	4.44	1.2	26.09	2.4	55.81	1.7	38.64
	Female	1.8	40.00	0.4	8.70	1.1	25.58	0.9	20.45
	Total	**2.0**	**44.44**	**1.6**	**34.78**	**3.5**	**81.40**	**2.6**	**59.09**
Aggregate	Male	1.4	31.11	2.4	52.17	2.7	62.79	2.4	54.55
	Female	3.1	68.89	2.2	47.83	1.6	37.21	2.0	45.45
	Total	*4.5*	*100*	*4.6*	*100*	*4.3*	*100*	*4.4*	*100*

On an average 2.4 hours of labour was employed per week for care and maintenance 100 anthurium plants (Table 5.2.13). Labour hours required was higher towards smaller groups. Family labour force contributed about 73.31 per cent of the total labours while contribution of female labour was about 64.41 per cent.

Table 5.2.13: Weekly labour used for care & maintenance of anthurium (Hours per 100 plants)

		G-I		G-II		G-III		Average	
	Gender	Hrs.	(%)	Hrs.	(%)	Hrs.	(%)	Hrs.	(%)
Family	Male	0.5	16.04	0.8	29.57	0.8	39.41	0.8	32.20
	Female	1.9	60.06	1.1	43.97	0.7	33.00	1.0	41.10
	Total	**2.4**	**76.10**	**1.9**	**73.54**	**1.5**	**72.41**	**1.7**	**73.31**
Hired	Male	0.0	0.00	0.0	0.00	0.2	7.39	0.1	3.39
	Female	0.8	23.90	0.7	26.46	0.4	20.20	0.6	23.31
	Total	**0.8**	**23.90**	**0.7**	**26.46**	**0.6**	**27.59**	**0.6**	**26.69**
Aggregate	Male	0.5	16.04	0.8	29.57	1.0	46.80	0.8	35.59
	Female	2.7	83.96	1.8	70.43	1.1	53.20	1.5	64.41
	Total	*3.2*	*100*	*2.6*	*100.*	*2.0*	*100*	*2.4*	*100*

The average annual cost of labour for care and maintenance was about Rs. 1,395 (Appendix XI) of which share of family labour force was three-fourth (75.34%) and the share of female labour was about 56.85 per cent.

5.2.3.3 Returns

Total returns in the case of anthurium is constituted of income from the sale of flowers, suckers and mother plants after the economic life period. Salvage values adds to the benefits in the fifth year.

Annual production pattern of flowers indicates the productivity to be higher during middle years of crop life, the average production being

548 flowers per annum per hundred plants (Table 5.2.14). Sucker production started only from second year and plants gave increasing number of suckers in the subsequent years. An average of 124 suckers were obtained per annum from 100 plants. Production pattern across subgroups and district headquarters is presented in Appendix XII.

Table 5.2.14: Annual production of flowers and suckers per 100 anthurium plants (Nos.)

Year	Flowers produced				Suckers produced			
	G-I	G-II	G-III	Average	G-I	G-II	G-III	Average
1	392	410	436	409	0	7	0	3
2	712	710	807	730	150	137	150	144
3	738	754	846	766	185	196	217	195
4	705	704	775	718	183	200	225	198
5	638	654	717	663	183	204	233	202
Total	**3185**	**3232**	**3581**	**3286**	**701**	**744**	**825**	**742**
Average	**531**	**539**	**597**	**548**	**117**	**124**	**138**	**124**

*** Prices and salvage values**

Price obtained for first year flowers was lower than that of the subsequent years. Average price obtained per flower was Rs. 4.87 in the first year and Rs. 7.03 in the remaining years (Table 5.2.15). Prices realised and imputed salvage values across subgroups and district headquarters are given in Appendix XII.

Table 5.2.15: Prices of flower spikes and estimated salvage value of anthurium

Prices realised	G-I	G-II	G-III	Average
In first year (Rs./flower)	4.5	4.88	5.55	4.87
In subsequent years (Rs./flower)	6.59	7.04	7.84	7.03
Salvage value (Rs.)	5780	5589	5335	5468

Salvage values in the case of anthurium, is constituted of remnants of shade house, tools and equipments, irrigation system, pots and mother plants. Average salvage value was Rs. 5,468.

Total annual returns over years are presented in Table 5.2.16. Annual returns from anthurium cultivation ranged from Rs. 43,473 in G-I to Rs. 46,056 in G-II and Rs. 53,037 in G-III. Income in the first year is about 4.5 per cent while in second to fourth year about 20 per cent of the total and finally 32.8 per cent in the fifth year. Percentage distribution of income over years is almost similar in all the groups. Returns over years among different subgroups and district headquarters are presented in Appendix XIII.

Table 5.2.16: Annual returns from anthurium (Rs. per 100 plants)

Year	G-I		G-II		G-III		Average	
	Rs.	(%)	Rs.	(%)	Rs.	(%)	Rs.	(%)
0	0	0.0	0	0.0	0	0.0	0	0.0
1	1764	4.1	2176	4.7	2420	4.6	2067	4.5
2	8442	19.4	8423	18.3	10077	19.0	8732	18.9
3	9488	21.8	10208	22.2	12058	22.7	10260	22.2
4	9221	21.2	9956	21.6	11701	22.1	9998	21.6
5*	14559	33.5	15293	33.2	16781	31.6	15179	32.8
Total	**43474**	**100**	**46056**	**100**	**53037**	**100**	**46236**	**100**

*Values in fifth year also includes salvage values.

5.2.3.4 Capital productivity analysis

Economic performance of anthurium crop is analysed using the same four measures of capital productivity analysis, as in the case of orchids. These are a) pay back period b) net present value c) benefit cost

ratio and d) internal rate of return. Cash flow statement of the investment in anthurium cultivation (for 100 plants) is provided in Table 5.2.17.

Table 5.2.17: Cash flow statement of investment in anthurium enterprises (Rs. per 100 plants)

	G-I			G-II			G-III			Average		
Years	Cash outflow	Cash inflow	Cash flow	Cash outflow	Cash inflow	Cash flow	Cash outflow	Cash inflow	Cash flow	Cash outflow	Cash inflow	Cash flow
0	11980	0	-11980	11046	0	-11046	10792	0	-10792	11123	0	-11123
1	1981	1764	-217	1687	2176	489	1446	2420	974	1597	2067	470
2	1988	8442	6454	1698	8423	6725	1457	10077	8620	1608	8732	7124
3	1998	9488	7490	1710	10208	8498	1461	12058	10597	1615	10260	8645
4	1993	9221	7228	1707	9956	8249	1460	11701	10241	1613	9998	8385
5	1981	14559	12578	1687	15293	13606	1448	16781	15333	1597	15179	13582
Total	21921	43474	21553	19535	46056	26521	18064	53037	34973	19153	46236	27083

The estimated values of pay back period, net present value, benefit cost ratio and internal rate of return are presented in Table 5.2.18. The estimate of these values across subgroups and districts are given in Appendix XIV.

*** Pay back period**

The average pay back period for anthurium enterprise in the State is estimated as 2.4 years. It showed inter-group variation ranging from 2.8 years in G-I to 2.2 years in G-III.

Table 5.2.18: Economic viability of anthurium culture (units per 100 plants)

Project worth measures	G-I	G-II	G-III	Average
Pay Back Period (Years)	2.8	2.5	2.2	2.4
Net Present Value (Rs.) (@ 12.5%)	9679	13371	19229	13767
Benefit Cost Ratio (@ 12.5%)	1.51	1.78	2.2	1.82
Internal Rate of Return (%)	33	42	54	43

*** Net present value**

The net present value is estimated as Rs. 13,767 which varied from Rs. 9,679 in G-I and Rs. 13,371 in G-II to Rs. 19,229 in G-III (Table 5.2.18).

*** Benefit cost ratio**

Benefit cost ratios were estimated as 1.51, 1.78, 2.2 and 1.82 respectively for G-I, G-II, G-III and for aggregate (Table 5.2.18). All groups exhibited benefit cost ratio higher than unity.

*** Internal rate of return**

On an average the internal rate of return for anthurium enterprise is found to be 43 per cent. For G-III it is seen to be above 50 per cent while it is estimated as 33 per cent and 42 per cent for G-I and G-II respectively (Table 5.2.18). Internal rate of return is higher than opportunity cost of capital in all the categories.

Analysis for district headquarters indicates that the anthurium cultivation is more profitable towards the southern part of Kerala. Returns in Thiruvananthapuram and Ernakulam were almost similar but higher than those in Thrissur and Kozhikode. Subgroup-wise analysis shows positive correlation between type of shade house and profitability, i.e., better quality shade house (S-I) performed more efficiently in all the groups (Appendix XIV).

5.2.3.5 Sensitivity Analyses

Sensitivity analysis was tried for four situations, viz., for 10 and 20 per cent decline in benefit stream, cost remaining the same as well as for 10 and 20 per cent increase in costs, benefits remaining the same.

Results of sensitivity analysis are presented in Tables 5.2.19 to 5.2.22. Effect of these four conditions on project worth parameters among different subgroups and district headquarters are presented in Appendix XIV.

For 20 per cent decline in benefit stream as well as for 20 per cent increase in cost stream, pay back period extends to about three years, net present values in all the groups remain positive and benefit cost ratios well above unity. Internal rate of return also remains higher than opportunity cost of capital.

Table 5.2.19: Pay back period in anthurium culture in four different situations (Years)

	Pay Back Period (Years)				Increase in PBP (%)			
	G-I	G-II	G-III	Average	G-I	G-II	G-III	Average
Decline in benefit stream								
By 10%	3.1	2.7	2.3	2.7	9	7	8	10
By 20%	3.4	3.0	2.5	2.9	21	20	15	21
Increase in cost stream								
By 10%	3.1	2.7	2.3	2.7	9	7	4	10
By 20%	3.3	2.8	2.4	2.8	18	13	12	17

Table 5.2.20: Net present value of anthurium culture under four situations (Rs.)

	Net Present Value (Rs.)				Fall in NPV (%)			
	G-I	G-II	G-III	Average	G-I	G-II	G-III	Average
Decline in benefit stream								
By 10%	6806	10325	15709	10706	29.7	22.8	18.3	22.2
By 20%	3932	7279	12190	7646	59.4	45.6	36.6	44.5
Increase in cost stream								
By 10%	7773	11662	17632	12083	19.7	12.8	8.3	12.2
By 20%	5868	9953	16035	10399	39.4	25.6	16.6	24.5

Table 5.2.21: Benefit cost ratio of anthurium culture under four situations

	Benefit Cost Ratio (BCR)				Fall in BCR by (%)			
	G-I	G-II	G-III	Average	G-I	G-II	G-III	Average
Decline in benefit stream								
By 10%	1.36	1.60	1.98	1.64	9.9	10.1	10.0	9.9
By 20%	1.21	1.43	1.76	1.45	19.9	19.7	20.0	20.3
Increase in cost stream								
By 10%	1.37	1.62	2.00	1.65	9.3	9.0	9.1	9.3
By 20%	1.26	1.49	1.84	1.51	16.6	16.3	16.4	17.0

Table 5.2.22: Internal rate of return of anthurium culture under four situations (%)

	Internal Rate of Return (%)				Fall in IRR (%)			
	G-I	G-II	G-III	Average	G-I	G-II	G-III	Average
Decline in benefit stream								
By 10%	28	36	48	37	6	6	6	6
By 20%	22	30	41	31	12	12	13	12
Increase in cost stream								
By 10%	28	37	48	37	5	5	6	5
By 20%	24	32	43	33	9	10	11	10

5.2.4 *Marketing*

Generally, marketing of anthurium and orchid flowers are done in the same manner. Total of four types of marketing channels were followed by growers for the sale of anthuriums as below:

Channel I (56.2%): Producers ⟶ Local florists ⟶ Consumers

Channel II (34.5%): Producers ⟶ Exporters ⟶ Florists (Upcountry ⟶ market) ⟶ Consumers

Channel III (6.4%): Producers ⟶ Florists (Upcountry market) ⟶ Consumer

Channel IV (3.5%): Producers ⟶ Consumers

Of the all channels identified, the Channel I (Producers ⟶ Local florists ⟶ Consumers) was the most important one through which major portion (56.2%) of production was marketed (Table 5.2.24) and about 80 per cent (since most growers sold their flowers partly to many buyers, the vertical sum in the Table 5.2.23 may not be equal to 100 per cent) of the growers utilised this channel for selling their products partly or wholly (Table 5.2.23). This channel was important in all three groups also.

Second channel routed (Producers ⟶ Exporters ⟶ Florists (upcountry market) ⟶ Consumers) about 34.4 per cent of the total flowers. About 34.3 per cent of the growers utilised this channel.

Table 5.2.23: Percentage sale of anthurium flowers through different marketing channels (% of growers)

Sold to	G-I	G-II	G-III	Average
Florist	76.9	86.7	71.4	80.0
Exporters	23.1	40.0	42.9	34.3
Outside state	--	6.7	14.3	5.7
Consumers	7.7	--	--	2.9

Many growers sold their flowers partly to more than one buyer. Such growers are considered in more than one channel and thus column totals in Table 5.2.23 may not add up to 100 per cent.

Table 5.2.24: Volume of anthurium flowers sold to different buyers (% of total product)

Sold to	G-I	G-II	G-III	Average
Florist	61.9	62.1	32.9	56.2
Exporters	29.8	32.9	46.1	34.4
Outside state	--	5.0	21.0	6.0
Consumers	8.3	--	--	3.4

A few growers (5.7%) sold their products through Channel III (Producers ⟶ Florists (upcountry market) ⟶ Consumer) which accounted for about 6.0 per cent of total anthuriums produced.

Very few growers (2.9%) sold flowers directly to consumers (Channel IV) in the local area. About 3.4 per cent of the flowers were marketed through this channel.

*** Prices at different buyers**

Producers enjoyed highest price in Channel III (Table 5.2.25). However, in local market exporters paid better price than the florists which is contrary to the case of orchid marketing where florists paid better price than exporters.

Table 5.2.25: Average price per anthurium flower realised at different buyers (Rs.)

Buyers	G-I	G-II	G-III	Average
Florist	6.2	6.6	5.9	6.3
Exporters	7.8	7.6	8.1	7.8
Outside state	0	8.9	10.3	9.8
Consumers	6.4	0	0	6.4

6. DISCUSSION

6.1 ORCHID

6.1.1 General

Orchid cultivation was found generally undertaken by housewives where the husbands were engaged in business or government services. Size of production unit was found to be positively correlated with family income, i.e., larger sized production units were seen in the family with higher annual income. Average size of unit was 220 plants in G-I, where majority enjoyed an annual income of less than one lakh rupees while the average size of unit in G-III was 2,305 plants where the annual family income was between one and two lakh rupees. This supports the general impression that orchid culture is a fad of the urban elite and not that of the rural traditional farmer. Due to this higher size of the production unit economy of scale operates and unit cost of production is in favour of higher sized units.

6.1.2 Cost of cultivation

The unit cost of cultivation for orchid was found declining with the increase in number of plants per farm unit, ranging from Rs. 19,902 in G-I and Rs. 19,114 in G-II to Rs. 16,508 in G-III (Table 5.1.7). Of the total cost, about 52.33 per cent (in G-II) to 60.45 per cent (in G-III) was invested in the first year, as establishment cost, and about 7.9 per cent (in G-III) to 9.6 per cent (in G-I and G-II) was incurred in the remaining years, as operational (recurring) cost.

Distribution of total cost over years was almost similar across the groups. In G-III, cost structure was slightly different than G-I and G-II; proportion of establishment cost being a little higher (60.45%). On an average, the establishment cost constituted 57 per cent and care and

maintenance cost (in subsequent years) about 8.5 per cent of total cost of cultivation. It is conspicuous from the cost stream that once the business is set up, operational cost in subsequent years is comparatively less. Details of total cost of cultivation are shown in Figure 2.

6.1.2.1 Input-wise costs

Planting materials (along with pots and media) and labour together accounted for about 80 per cent of the total costs incurred over the crop life span. The proportion of former components ranged from 38.13 per cent in G-I to 47.17 per cent in G-III (Table 5.1.8, Figure 4). In aggregate this cost was 44.15 per cent. In absolute terms, cost of plants, pots and media together (around the average of Rs. 7,714) as well as the cost of irrigation structure (average Rs. 365) were almost similar across the different groups while other costs exhibited declining trend towards larger groups (Figure 3).

Labour cost, the second important single input, accounted for 37.55 per cent of total cost in aggregate. This proportion was almost similar in G-I and G-II (around 42%) but was lower in G-III (37.55%). Labour cost was lower towards larger groups in absolute term also. Wage cost varied from Rs. 8,369 in G-I and Rs. 8,157 in G-II to Rs. 5,685 in G-III. Miscellaneous costs included all the costs incurred for operation and maintenance of irrigation system, shade house, tools and equipments.

The cost of shade house accounted for 10.63 per cent of total cost. This cost was higher in G-I (Table 5.1.8). There was wide variation in the establishment cost (for the whole unit) among growers in different groups as well as within the group, mainly because of variation in the type of shade house. Average cost of shade house varied from Rs. 5,260 (in G-I) to Rs. 41,275 in G-III (Table 6.1). Average cost of shade house per meter square was found to be Rs. 202 in this study.

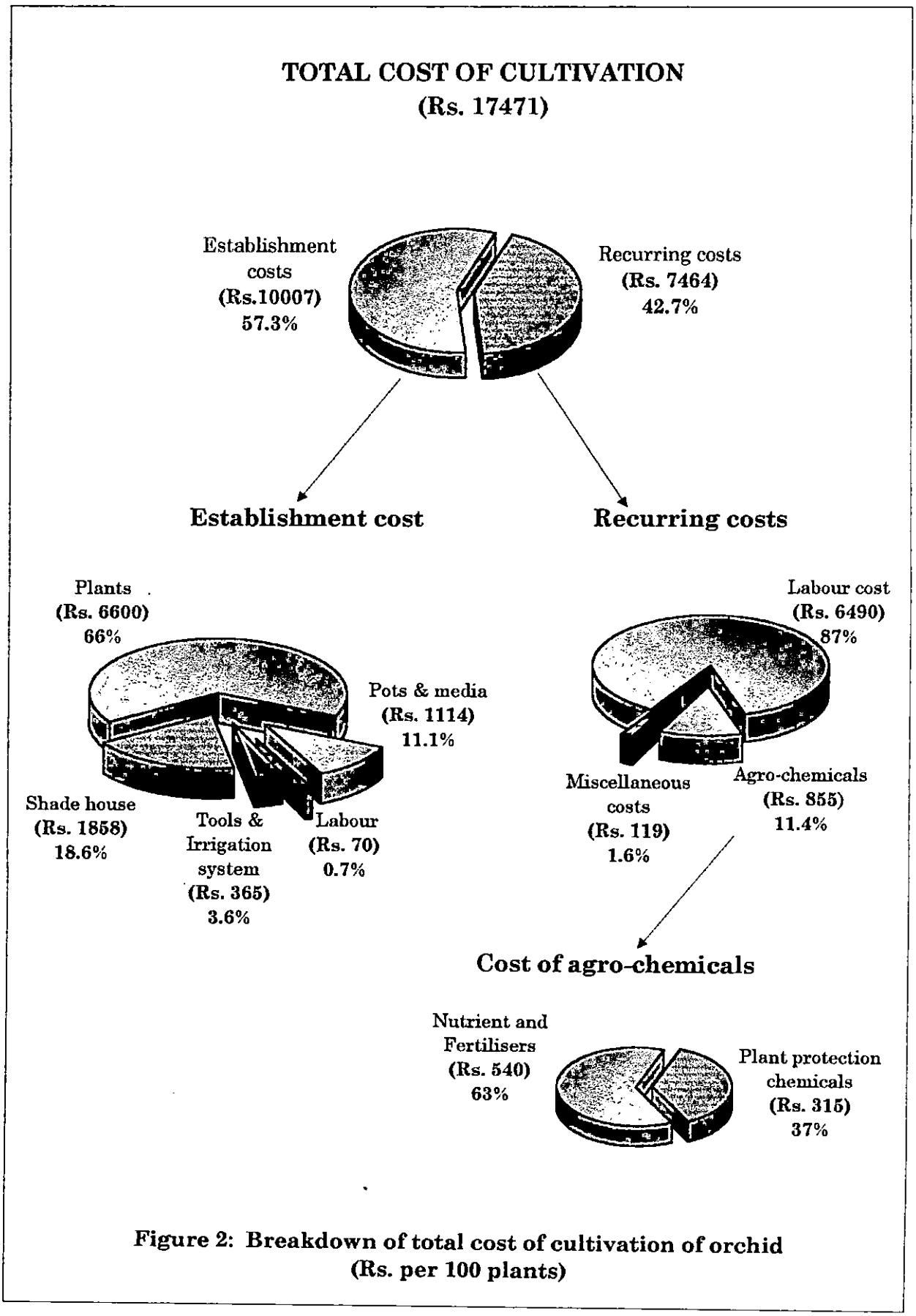


Figure 2: Breakdown of total cost of cultivation of orchid (Rs. per 100 plants)

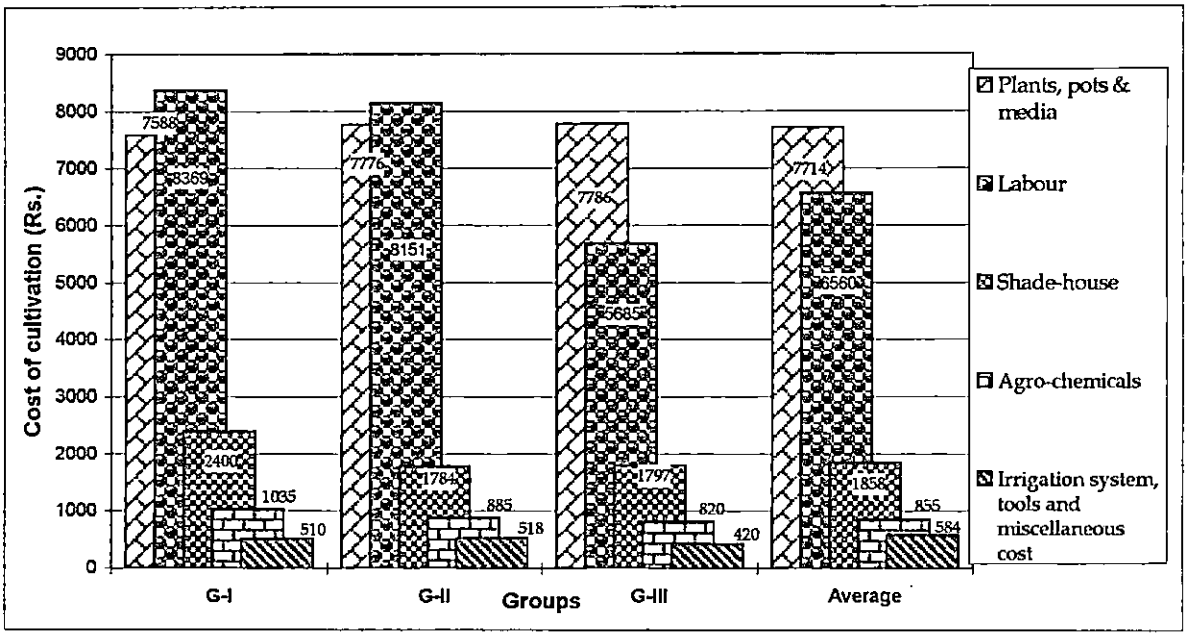


Figure 3: Input-wise breakdown of total cost of cultivation of orchid (Rs. per 100 plants)

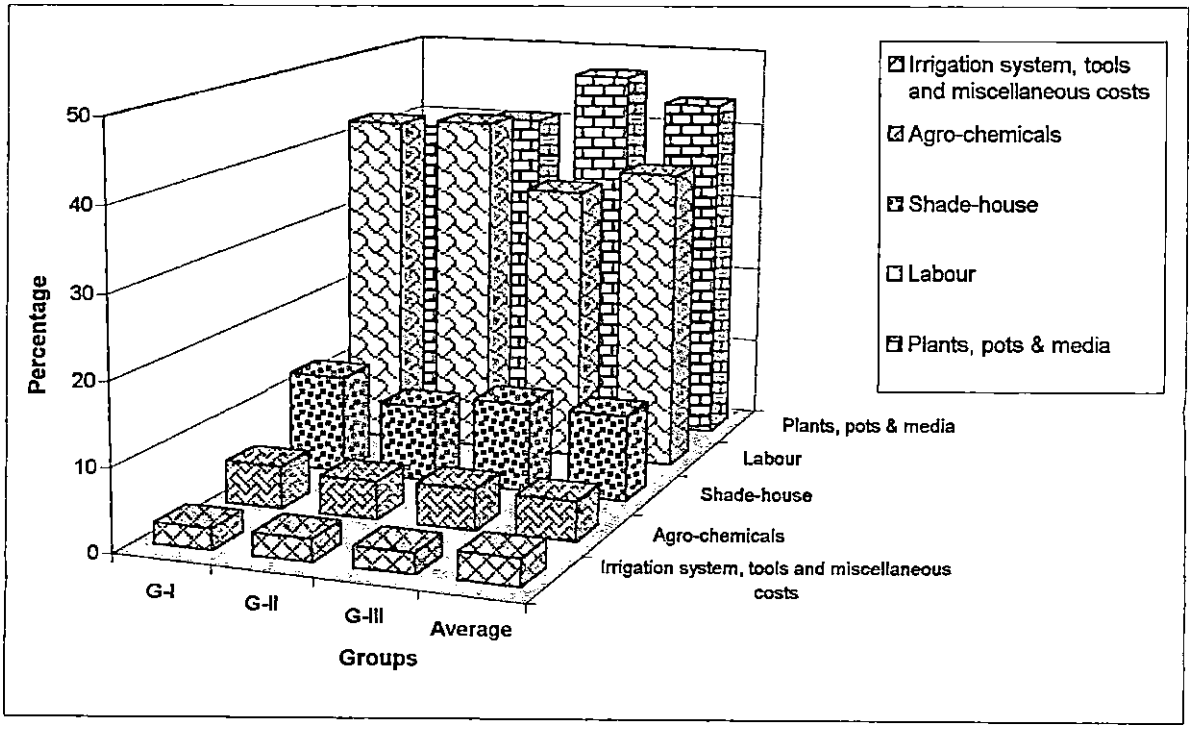


Figure 4: Percentage of various input costs in the total cost of cultivation of orchid

Table 6. 1: Average cost of shade house for orchid (Rs.)

Cost of shade house	G-I	G-II	G-III	Total
For total plants	5260	13159	41275	18484
Per plant	23.9	17.8	17.9	18.5
Per sq. m	200	182	209	202
For 100 plants	2400	1784	1797	1858

Under orchid and anthurium promotional activities, Federation of Indian Floriculturists constructs a low cost shade house at the rate of Rs. 125 m^{-2} (which covers only materials and labour costs while excludes transportation and service charges) for the targeted group (low income families) while it charges Rs. 205 m^{-2} (which covers materials, labour, transportation and service charges) with others for the same type of shade house.

Rajeevan (1998) estimated the cost of shade house per meter square as Rs. 250, which is comparable with the observed average cost of Rs. 209 per meter square of shade house in G-III (for the scale of 1000 plants) in the present study. Among sample respondents construction of second level roofing was seen a rare practice, and thus no additional cost was seen for it.

6.1.2.2 Establishment cost

On an average, establishment cost was about Rs. 10,007, which constituted 57.28 per cent of the total cost. It varied from Rs. 10,425 in G-I and Rs. 10,003 in G-II to Rs. 9,979 in G-III. Cost of plants and shade house are the two major items of establishment cost constituting about 85 per cent (Table 5.1.9) of the total in which planting material alone accounted for 65.95 per cent. Pots and potting media, with their share of about 11.13 per cent in total investment cost, was the third component. Contrary to the case of other costs which shows declining trend towards

larger groups, cost of pots and potting media is seen increasing towards larger groups. Larger sized units generally used bigger sized pots and good quality potting mixture. Though there was no consistency among growers with regard to components of potting mixture and their proportion, larger growers as a group were usually seen using brick pieces, tiles and charcoal as potting mixture. This is as per the recommendation of Kerala Agricultural University.

6.1.2.3 Recurring costs

When all the recurring cost for five years were pooled together and categorised into three broad groups, viz., labour, agro-chemicals and miscellaneous costs, it is seen that labour cost is the most prominent single component which accounted for about 87 per cent, in aggregate (Table 5.1.9). Interestingly, this cost component constituted similar proportion of total costs in all the categories though it varied greatly in absolute terms. Costs of agro-chemicals as well as miscellaneous costs are also declining towards larger groups. Total recurring cost in G-I was almost one and half times greater than that in G-III. On an average the total recurring cost comes to Rs. 7,464.

Proportion of cost of agro-chemicals was lower in G-II (9.71%) while higher in G-III (12.56%). Of the total cost of agro-chemicals, nutrient and fertilisers constituted about two-third (63%) while plant protection chemicals constituted the remaining (Table 5.1.11). It is observed that proportion of cost of plant protection chemicals is highest in smaller groups. Miscellaneous costs, which covered maintenance costs of all the tools, irrigation system and shade house constituted only a negligible share of about 1.4 to 1.6 per cent.

Rajeevan (1998) has estimated cost of cultivation for a unit of 1000 orchid plants. About Rs. 1,00,000 was estimated as establishment cost

while Rs. 5000 as the recurring costs from the second year onwards. The economic life of crop was taken as five years. The establishment cost is found nearly equal to that of present study, which comes to Rs. 99,790 for 1000 plants. While recurring cost is a little higher (around Rs. 6500) in present study.

Federation of Indian Floriculturists [FIF, 1997] has estimated the establishment cost for 500 orchid plants as Rs. 57,000. The recurring cost was about Rs. 3,000 in all the years, except in second year where it was Rs. 3,500. The economic life was considered as five years. The establishment cost in G-II (equivalent scale of operation) of the present study is about 17.5 per cent lesser than that estimated by FIF. However, the major difference is seen with regard to recurring costs, which is about three times more in the present study than the recurring cost projected by FIF.

A.V. Thomas & Company has projected the establishment cost as Rs. 87,081 and recurring cost as Rs. 23,208 in first year, Rs. 25,708 in second year, Rs. 24,658 in the third year, Rs. 19,408 in the fourth year and Rs. 17,000 in the fifth year for 1000 orchid plants. This projection may be better compared with the G-III in present study, which is equivalent in scale of operation. The establishment cost is seen higher (Rs. 99,790 for 1000 plants) while recurring costs are lower (around Rs. 13,000) in present study.

National Bank for Agriculture and Rural Development (NABARD) has prepared a model project for orchid in large scale in about three acres of land (which can accommodate about 158,400 plants at the assumed accommodation rate of 1320 plants 100 m^{-2}) and has projected costs and returns from it. Establishment charge is projected as Rs. 84.0 lakh and recurring costs as Rs. 6.16 lakh in first year, Rs. 21.64 in

second year, Rs. 38.61 in third year and Rs. 62.49 each in fourth to seventh year. The economic life of orchid is considered as seven years.

6.1.3 Labour and its gender aspects

Labour constituted about 37.55 per cent of the total cost of cultivation (Table 5.1.8) which is spread over the entire period of the crop. Potting and planting constituted only 1.07 per cent of total labour use. It is seen that for potting and planting of 100 plants, about 6.3 hours of total labour was employed, of which 71.43 per cent was contributed by female labour. In small scale cultivation, these operations were usually done by family members contributing up to 84.85 per cent of the total labour while in G-III, family labour contributed just above half (54%) (Table 5.1.12).

Labour for care and maintenance includes all the labour related activities after planting till harvesting. Activities such as daily supervision, application of chemicals, harvesting etc. are the important ones. On an average, total of 2.2 hours was spent per week for the care and maintenance of the unit (Table 5.1.13). The time required for such activities is seen declining with the increasing number of plants per farm. In G-I it was 3.0 hours per week as compared to 1.9 hours per week in G-III (Figure 5).

Family labour contributed about 70 per cent of the total labour used. Share of family labour was as high as 89.19 per cent in G-I, while lowest in G-III (65.08%). It shows that smaller units are usually managed by family members only, while larger units (G-III) hired one-third of total labour required. In the same fashion, contribution of female labour is highest in G-I (80.07%) and declines to 74.56 per cent in G-II and to 62.96 per cent in G-III. In aggregate family labour contributed about two-

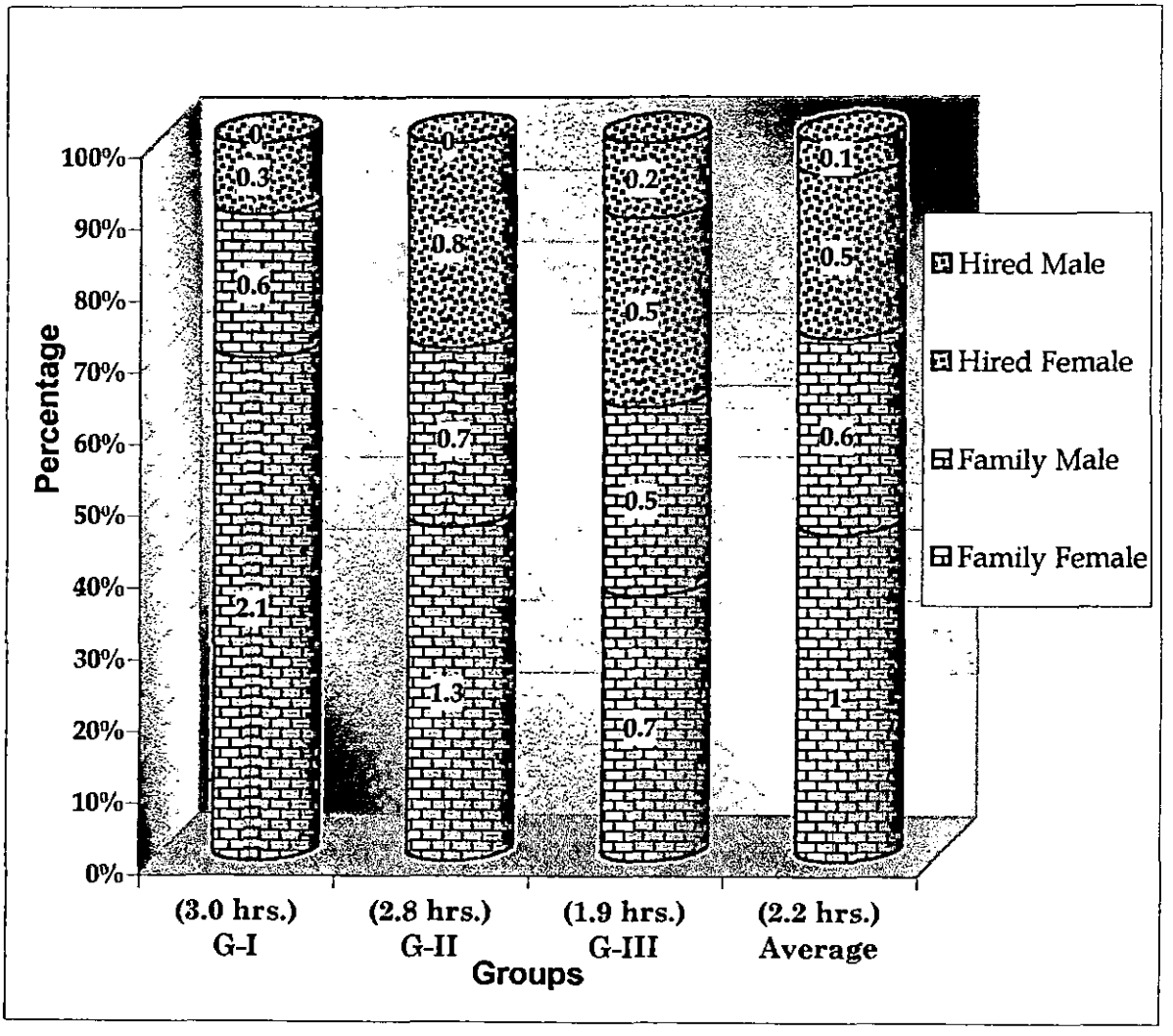


Figure 5: Break-up of weekly labour hours for care and maintenance of orchids (Hours/week/100 plants)

third (68.61%) of the total labour employed. Thus, smaller units can rightly be called exclusively as women's enterprises. In monetary terms, family labour contributed 71.03 per cent and female labour accounted for 61.4 per cent of the total labour costs (Appendix IV). The annual care and maintenance cost was about Rs. 1,659 in G-I, Rs. 1,616 in G-II, Rs. 1,123 in G-III and in aggregate this cost was Rs. 1,298.

6.1.4 Returns

Returns are the income exclusively from the sale of flower spikes produced. Eventhough additional income can be obtained by selling the keikis and mother plants (after economic life of plants), none of the sample growers resorted to the sale of keikis and mother plants and there was no instance of using them for income generation. Hence it was not considered in this study for the purpose of estimation of total returns.

Production of flower spikes starts by first year (from 'NFS - i.e., near flowering stage' plants) and is spread over to fifth year. Though plants continue to bear flower after the age of five years also, its quality and quantity are not satisfactory in terms of marketability. In practice, all of the sample growers replaced the old plants after five years in commercial production units with new plants though they retained the discarded plants for aesthetic value.

Production is observed higher during middle years of economic life, viz., 2nd, 3rd and 4th years (Table 5.1.14). Because of the smaller size of the flower spikes during first year, average price realised during first year was lower than that realised for subsequent years (Table 5.1.15).

The average annual returns from 100 orchid plants are distributed as Rs. 2,816 in first year, Rs. 8,008 in second year, Rs. 8,452 in third year, Rs. 8,217 in the fourth year and Rs. 8,595 in the fifth year (Table

5.1.16). The total income during the period of five years is Rs. 33,240 for G-I and it rises to Rs. 35,964 for G-II and further to Rs. 40,060 for G-III. The rise in income towards larger group is owing to the higher productivity and price advantages enjoyed by the larger growers.

Federation of Indian Floriculturists [FIF, 1997] has projected an income of Rs. 23,500 in the second year, Rs. 41,000 in the third year, Rs. 42,500 in the fourth year and Rs. 78,500 in the fifth year from a unit of 500 orchid plants. Though total returns over years is almost equal to that of the present study (G-II), some deviation is seen in beginning and ending years of the unit. Projected returns of FIF is higher than the estimated ones towards the later part of plant life; it is obviously because of inclusion of imputed values of keikis and mother plants which has been ignored in the present study.

AV Thomas & Company has projected costs and returns, for a unit of 500 orchid plants. The gross returns estimated in different years are as Rs. 15,000 in the first year, Rs. 45,000 in the second year, Rs. 75,000 in the third year, Rs. 90,000 in the fourth year and again Rs. 90,000 in the fifth year. These projected values deviates much from the estimated values in the equivalent scale of operation (G-III) in the present study. The projected values of AVT are based mainly on technical information.

Rajeevan (1998) estimated the annual gross return from a unit of 1000 plants as Rs. 20,000 in first year, Rs. 50,000 in second year, Rs. 70,000 in third year and Rs. 1,20,000 each in fourth and fifth years. In the equivalent scale of operation the income flow shows slight deviation from this estimates, the study by Rajeevan (1998) is more based on imputed value of input and output rather than a study based on sample selection.

National Bank for Agriculture and Rural Development (NABARD), in its model scheme for orchid in three acres of land (about 158,400 plants), has projected a gross income of Rs. 24.4 lakh in second year, Rs. 66.0 lakh in third year and Rs. 132.0 lakh in remaining years till seventh year of crop life.

6.1.5 Capital productivity analysis

The results of capital productivity analysis help to draw the following conclusions. Smaller sized units take more time to recoup their total investment made in orchid enterprise. The pay back period was 2.8 years in G-I, 2.5 years in G-II and 2.3 years in G-III (5.1.18). In aggregate, it was about 2.3 years.

Net present values in all the categories are seen positive with the estimated values of Rs. 5,545 for G-I; Rs. 7,993 for G-II and Rs. 12,866 for G-III (Table 5.1.18). The growers with more number of plants were able to earn much higher income than smaller growers. In this study, net present value in G-III is more than double and in G-II about one and half times than in G-I. Net present value in aggregate is Rs. 9,345.

The benefit cost ratios in all the groups as well as in aggregate was higher than unity. It was about 1.32, 1.48, 1.88 and 1.61 respectively for G-I, G-II, G-III and aggregate. It indicates good earning power of investment after paying for all the inputs. With the increasing scale of operation this ratio is increasing showing increasing efficiency in input use towards larger scale of operation. Group-III was found to be most efficient one.

The estimated internal rate of return was higher than the opportunity cost of capital, i.e., the borrowed cost of capital, in all the categories. These were about 29 per cent in G-I, 35 per cent in G-II and

49 per cent in G-III (Table 5.1.18). It was around 39 per cent in aggregate. The result confirms earlier findings that Group-III is more profitable and efficient than the rest (Figure 6). Earning power of investment in G-III is seen about one and half times greater than the investment in G-I. NABARD has estimated a financial rate of return of about 34 per cent from a model scheme of orchid in three acres of land.

All the project worth assessment parameters obviously corroborate that even the smallest group (i.e., G-I) is worth for making investment. However, these parameters are strongly in favour of larger scale of operation for making the investment more productive. All these parameters substantiate the same trend "higher profitability from larger number of plants".

Analysis of orchid enterprises in district headquarters pointed out the Ernakulam area to be most profitable where internal rate of return was found to be above 50 per cent and net present value about double of those of Thrissur and Kozhikode. Thiruvananthapuram was seen to be second profitable area. This variation may be because of climatic factor to some extent and price advantage (AVT as buyer in Ernakulam) in these areas as well (Appendix V). Average price realised per spike in Thiruvananthapuram and Ernakulam was higher than those in other district headquarters owing to their better market access in local area as well outside the state.

Subgroup-wise analysis indicates the higher investment in the small group (G-I) towards better quality shade house (S-I) as worthless. In the smaller group, semi-permanent type shade house (S-II) performed efficiently than the high quality (higher investment) shade house (i.e., S-I) in terms of profitability. Thus, in such a small scale of operation one

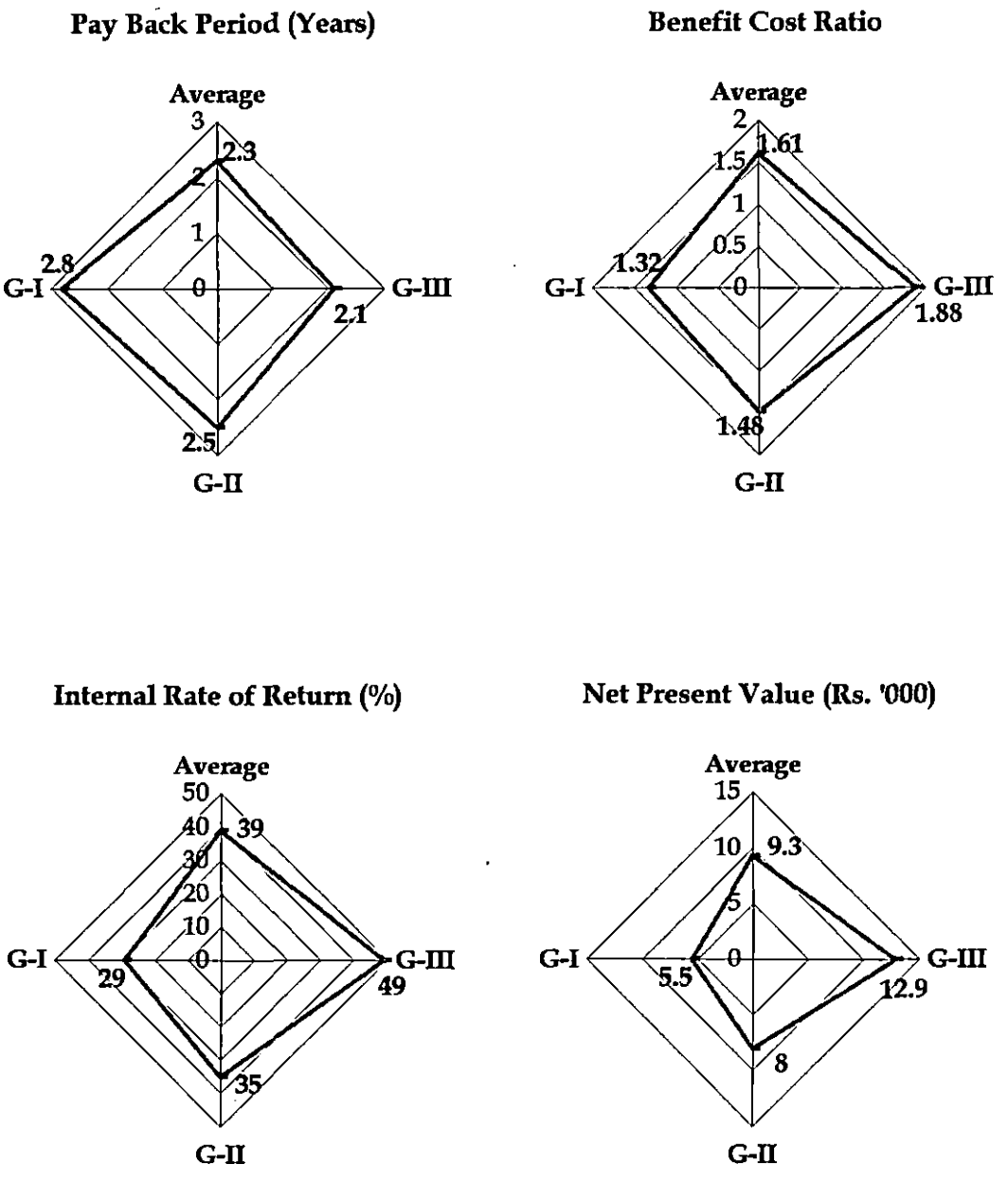


Figure 6: Economic viability of orchid enterprises across the different groups

should not go for high investment in shade house since it turns to be uneconomical.

6.1.6 Sensitivity analysis

Often risk and profit are positively correlated and risk absorption capacity of enterprise is equally important as its profitability. The sensitivity analysis reveals that in orchid farming when benefits decline by 20 per cent, cost remaining the same, or when costs increase by 20 per cent, benefits remaining the same, pay back period extends to about 2.8 years (increase by 21%). Obviously, smaller units take more time to adjust to these fluctuations by extending the pay back period (Table 5.1.19).

When benefit stream declines by 10 per cent, net present value in G-I declines by about 41 per cent while only by its half (21.4%) in G-III (Table 5.1.20). A decline in benefits by 20 per cent reduces the net present value to less than its half in aggregate. Similarly, any increase in cost causes net present value in G-I to decline by about three times more than that in G-III. However, any increase in costs causes less adverse effect than that of similar (by same percentage) decline in benefits, i.e., price and/or yield decline more adversely affect orchid farming rather than increase in input cost.

Net present value in all the groups as well as in aggregate remains positive even when benefit stream fall by 20 per cent. However, the difference among groups, with regard to net present value, becomes very wide, i.e., net present value in G-III becomes Rs. 7,367 as compared to Rs. 3,096 in G-II and Rs. 1001 in G-I. Though net present value in G-I is positive but it is negligible in comparison to investment; its benefit cost ratio is almost equal to unity (i.e., 1.06).

At 20 per cent decline in benefits, benefit cost ratio of G-I falls to marginally above unity (i.e., 1.06) indicating only a negligible gain. However, in other groups as well as for increases in costs up to 20 per cent, all benefit cost ratios are above unity. Average benefit cost ratio remains 1.29 and 1.34 respectively for 20 per cent decline in benefits and 20 per cent increase in costs (Table 5.1.21).

For the changes in benefits or costs, a change in internal rate of return is almost similar in all three groups and in aggregate. With 20 per cent decline in benefits, internal rate of return falls to as low as 16 per cent (nearer to opportunity cost) in G-I (Table 5.1.22), while G-III maintains IRR at 35 per cent, and aggregate IRR remains 26 per cent.

It can be concluded that orchid farming at all levels of operation are capable of remaining profitable even if the costs increase by 10 per cent or benefits decline by 10 per cent. But a 20 per cent decline in benefits make the smallest sized group uneconomic, though all other groups performed well. However, a decline in benefit is found to have more adverse influence on project worthiness than increase in costs by same percentage. Hence measures to improve productivity and upholding a stable price is more important in orchid culture.

6.1.7 Marketing

Though massive programmes for crop promotion were organised for orchid farming, the emphasis was mainly on production management with little emphasis on marketing. Organisations like A.V. Thomas & Company (AVT) and Federation of Indian Floriculturists take care of marketing aspect also as a part of their flower promotional activities. But their business work is restricted to only certain centres, among a few growers. Majority of the sample growers in this study resorted to local sale according to the situation prevailing at the time of harvest.

Due to the perishable nature of orchid flowers, harvesting is done only based on a predetermined schedule, based on time and quantity of sale. Usually they are sold as such after some light processing, for longer "vase life".

The important routes through which flowers moved are identified as:

Channel I (56.6%): Producers ⟶ Local florists ⟶ Consumers

Channel II (32.8%): Producers ⟶ Exporters ⟶ Florists (outside) ⟶ Consumers

Channel III (6.1%): Producers ⟶ Florists (outside) ⟶ Consumers

Channel IV (4.5%): Producers ⟶ Consumers

Among the channels identified, the Channel I ("Producers ⟶ Local florists ⟶ Consumers") was the most important channel through which bulk of the products (56.6%) was marketed (Table 5.1.24). Majority of growers (81.3%) sold their flowers, partly or wholly, to local florists (Table 5.1.23). Around 93 per cent of growers from G-II, 90.5 per cent from G-III and about 61.5 per cent of growers from G-I were selling their flowers to florists.

Florists sold these flowers to consumers after value addition as floral arrangements, bouquet, garland, wreath etc. in which they used a combination of different flowers/leaves. Thus estimating the price of orchid flowers alone from the consumer price was difficult and thus, marketing margin could not be estimated in the channel.

Through Channel II [Producers ⟶ Exporters ⟶ Florists (outside) ⟶ Consumers] 42.7 per cent of growers sold their product.

About 32.8 per cent of the total product was marketed through this channel. Exporters sold these flowers to the florists in the north Indian metropolis markets. None of these exporters exported the collected flowers outside the India.

As regards to Channel III, about eight per cent of respondents, all from G-III (28.6% growers of G-III), exported their flowers directly to north Indian metropolis markets. Usually few larger growers pooled their flowers together or some larger growers purchased flowers from some other growers to make the volume sufficient and exported to metropolis markets. Through this channel about 6.1 per cent of the aggregate flower production or about 21.7 per cent of the total flower of G-III, were routed (Table 5.1.24).

As per their agreement, such grower-exporters were required to send their flowers regularly and consistently at weakly or fortnightly basis, to keep up the market assured. Flowers were sent mainly to Delhi, Bombay, Ahmedabad and Bangalore. Average prices received in these markets were higher than the average price realised in local markets. Moreover, the additional advantage they derived by exporting their flowers outside was 'assurance of market' where they could dispose all their products regularly. However, by making such an agreement with outside markets they were denied of the opportunities to take advantage of higher prices in local market during festivals and marriage seasons.

During February-May, demands for orchid and anthurium in these metropolis markets fall down because of abundant supply of traditional variety of flowers like gladiolus at extremely cheaper prices. However, regular suppliers of orchid and anthurium were not affected by such redundancy of flowers. Because of higher transportation charges to Delhi, Bombay and other distant markets, which require airlifting of flowers,

growers are now concentrating more on Bangalore market, where they could send flowers by bus, overnight, at cheaper cost. For those exporters, Bangalore market is more profitable owing to the lower transportation cost (i.e., about Rs. 30 per box containing 100-125 spikes whereas transportation for same box to Bombay comes around Rs. 400).

Price of flowers in other domestic markets was not revealed by these exporters, rather they provided only net prices of flowers that they paid to growers. They were found reluctant in revealing any information with regard to their markets due to existing stiff competition.

Only about 9.3 per cent of growers sold their flowers directly to consumers, which constituted 4.5 per cent of total production. This route is recognised as Channel IV in the study. These consumers mainly consisted of hotels, beauty parlours, offices etc.

6.2 ANTHURIUM

6.2.1 General

Anthurium cultivation was seen taken up by housewives where the husbands were engaged in business or retired from government/ private service. Size of production unit was found to be positively correlated with family income, higher income group with larger sized unit. Average size of unit was 226 plants in G-I, where majority enjoyed an annual income of less than one lakh rupees and it was nearly ten times this figure in G-III where majority enjoyed an income of two lakh rupees per annum.

Anthurium culture is seen as a elite group affair and not that of the rural traditional farmer. Due to this higher size of the production unit economy of scale operates and unit cost of production is in favour of higher sized units.

6.2.2 Cost of cultivation

Though average cost of cultivation was Rs. 19,153 it showed wide variation ranging from Rs. 21,921 in G-I and Rs. 19,535 in G-II to Rs. 18,064 in G-III (Table 5.2.7). Similar declining trend towards larger groups is observed in establishment cost as well as in operational costs incurred in the subsequent years. Establishment cost constituted about 58.1 per cent of the total cost and the operational costs in the following years varied between eight and nine per cent. Split up of total cost of cultivation of anthurium is shown in Figure 7.

6.2.2.1 Input-wise costs

An analysis of the extent of various input uses revealed that, labour was the highest single item of cost accounting for 36.7 per cent of total cost of cultivation. This also showed a declining trend across the groups. Plants, pots and media together constituted 47.3 per cent of the total cost (Table 5.2.8). Rest was shared by shade-house (8.94%), tools and irrigation system (1.56%), agro-chemicals (4.9%) and miscellaneous costs (0.6%) (Figure 9).

Costs of shade house, labourers, irrigation system, plant protection chemicals and miscellaneous costs are seen declining towards larger groups while the cost of fertilisers is seen increasing with the increasing scale of operation. Cost of plants, pots and media remained almost similar in all the groups (Figure 8). Increase in fertiliser cost is because larger growers usually applied quality fertilisers like green care, orchid care, cakes etc. and followed some recommended schedule while smaller growers usually preferred '17 complex (17:17:17 NPK mixture)' which is comparatively cheaper.

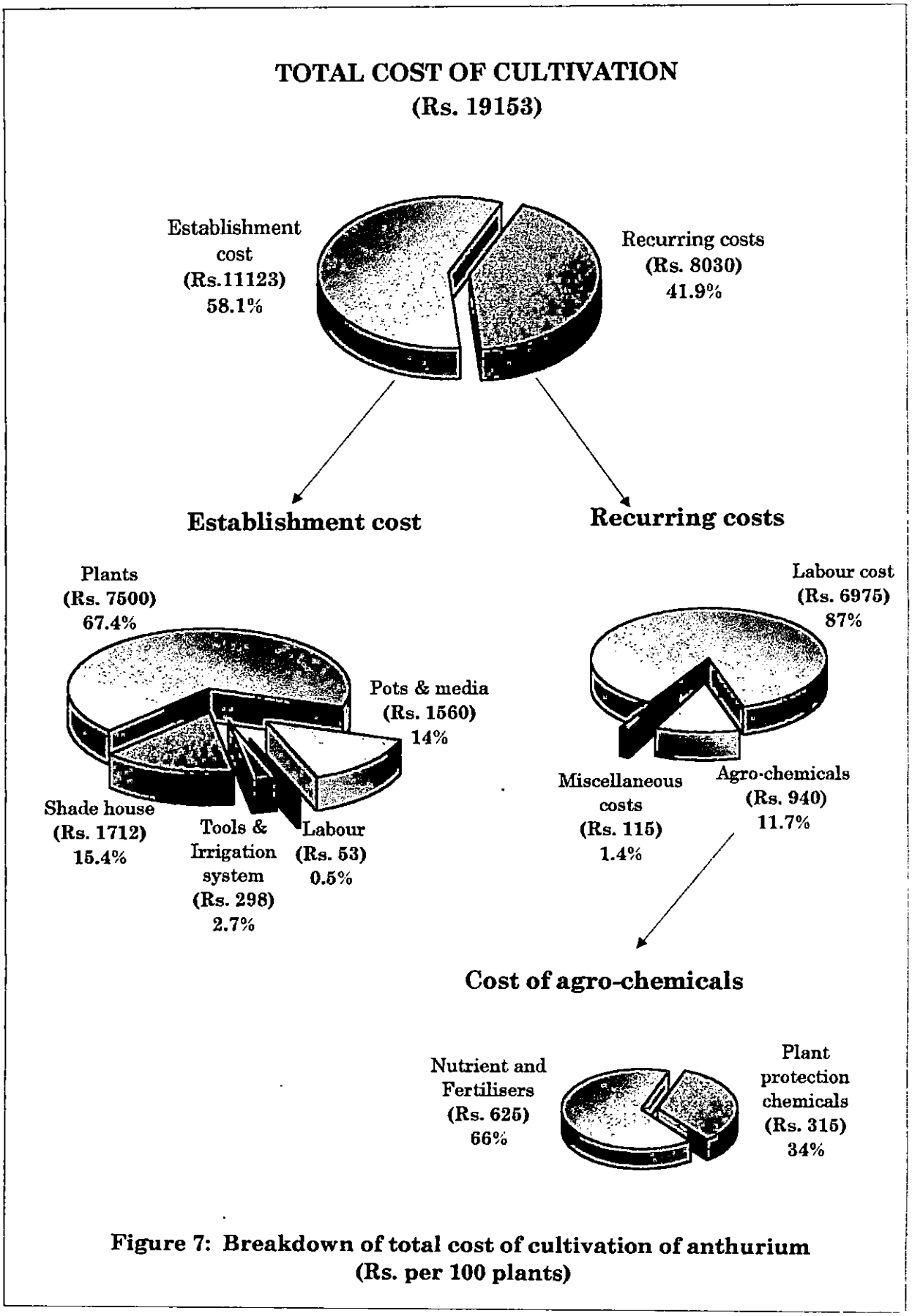


Figure 7: Breakdown of total cost of cultivation of anthurium (Rs. per 100 plants)

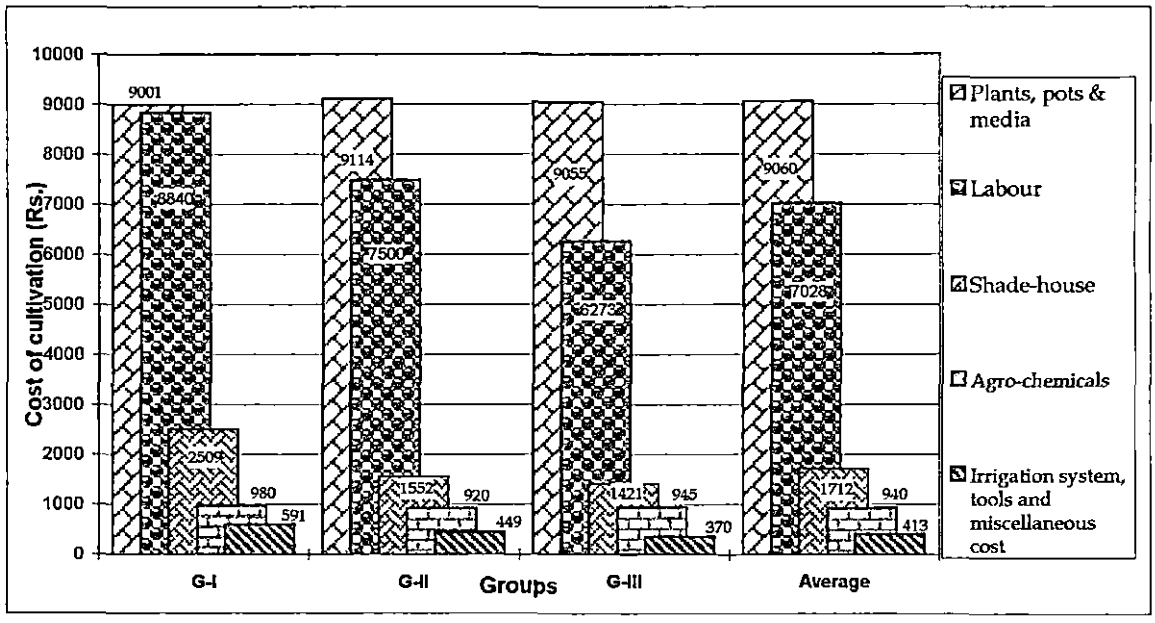


Figure 8: Input-wise breakdown of total cost of cultivation of anthurium (Rs. per 100 plants)

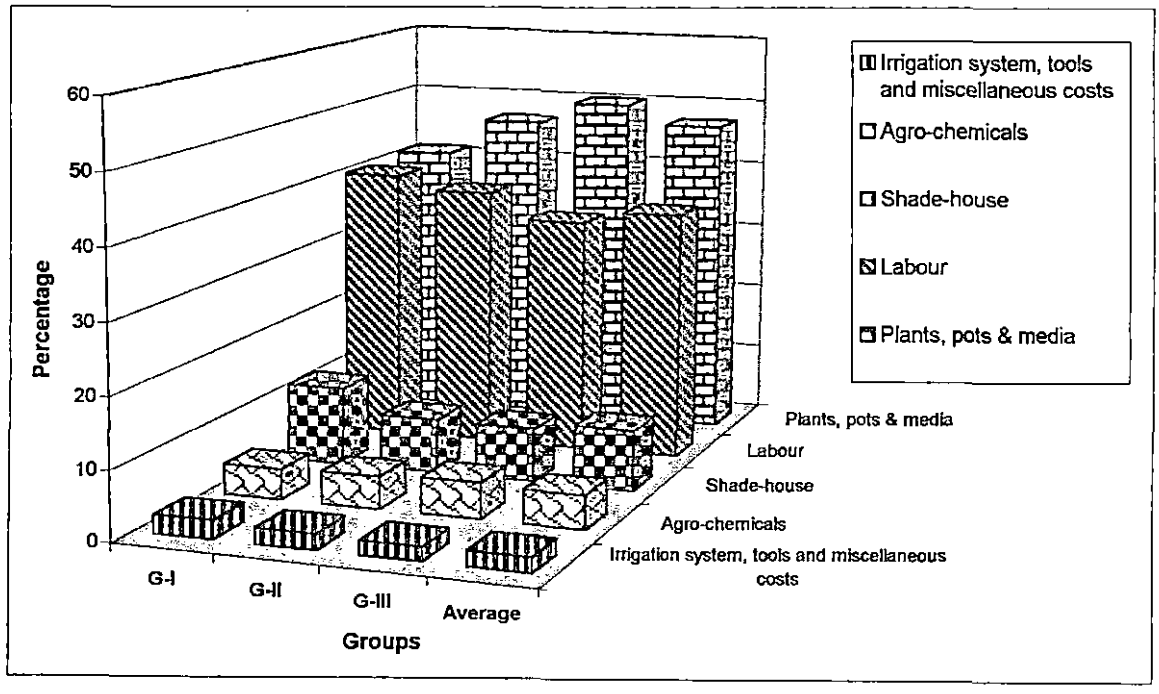


Figure 9: Percentage of various input costs in the total cost of cultivation of anthurium

Table 6. 2: Average cost of shade house for anthurium (Rs.)

Cost of shade house	G-I	G-II	G-III	Average
For total plants	5646	11891	31643	14626
Per plant	25	15.5	14.2	17
Per sq. m	204	145	138	160
For 100 plants	2509	1552	1421	1712

Average cost of shade house construction was Rs. 14,626 for the unit as a whole (Table 6.2). The cost of shade house for 100 plants varied from Rs. 2,509 in G-I and Rs. 1,552 in G-II to Rs. 1,421 in G-III. Average cost of shade house per meter square was Rs. 160 while cost per plant was Rs. 17. Both these costs are seen declining towards larger groups.

6.2.2.2 Establishment cost

Establishment cost covers costs of all components which are required at the beginning to start the enterprise. It included cost of shade house, plants, pots, potting mixture, labour, various tools and irrigation system. On an average the establishment cost was around Rs. 11,123 constituting about 58.1 per cent of total cost of cultivation for five years (Table 5.2.7). This proportion is declining slightly towards smaller groups, though it is not so in absolute terms (Table 5.2.7).

Cost of plants was the major cost component which accounted for about two-third (67.43%) of the establishment cost. Other important components were cost of shade house (15.39%) and that of pots and media (14.02%). Tools and Irrigation system and labour constituted only a minor share of about 2.68 per cent and 0.48 per cent respectively.

6.2.2.3 Recurring cost

Input-wise breakdown of total recurring cost (pooled for five years) recognised labour as the single most important component which

accounted for about 86.86 per cent of the total recurring cost (Table 5.2.10). This cost component constituted almost similar proportion of total recurring cost in all the categories. The cost of labour was higher in smaller groups and lower in larger groups for the maintenance of same number of plants. Other cost components were agro-chemicals, which accounted for about 11.71 per cent of recurring costs. Share of cost of agro-chemicals showed increasing trend towards larger groups (9.86% in G-I, 10.84% in G-II and 13% in G-III), however, in absolute terms the cost remained almost similar in all the groups. Miscellaneous costs constituted only a minor share of about 1.43 per cent of total recurring costs.

The term 'agro-chemicals' included plant protection chemicals and nutrient and fertilisers. The annual cost of all agro-chemicals used was almost similar, around the average cost of Rs. 188, in different groups. Cost of nutrient and fertilisers was higher than the cost of plant protection chemicals in all the groups. On an average the cost of fertilisers was about two-third (66%) of total agro-chemicals' cost. Share of plant protection chemicals is seen declining towards larger groups with corresponding increasing in the use of nutrient and fertilisers.

Federation of Indian Floriculturists [FIF, 1997] has estimated the establishment cost and recurring costs for a unit of 500 anthurium plants. The projected establishment cost was Rs. 76,500 and the recurring costs for different years as Rs. 3,500 in the first year, Rs. 4,500 in the second year and Rs. 4,000 each in all the remaining years. The economic life was considered as five years. Comparing these values with the corresponding production unit size (G-II) it was seen that the actual establishment costs at field level was lesser than this while the recurring costs were higher.

Gajanana and Subrahmanyam (1999) have estimated the establishment charges as Rs. 1.27 lakh for smaller growers and Rs. 1.03 lakh for the larger ones for 1000 anthurium plants in the Coorg district of Karnataka, based on a study of sample growers. This is in agreement with the present study. In the present study, the establishment charge in smaller group (G-I) is estimated as Rs. 1.1 lakh and for larger group (G-III) Rs. 1.07 lakh for 1000 plants. As in present study, the cost of plants was seen the major cost component (accounting for 80% of establishment charge) in their study also. Proportionate cost for shade house is also very much similar.

6.2.3 Labour and its gender aspects

Labour is one of the major items of the input costs having a share of 36.69 per cent in the total cost of cultivation (Table 5.2.8). Total labour employed has been studied under two categories namely: a) labour for potting and planting and b) labour for care and maintenance.

Labour cost for potting and planting accounted less than one per cent (0.75%) of the total labour cost. In the establishment cost, share of labour cost was only about 0.48 per cent (Table 5.2.9). On an average about 4.4 hours of labour was required for potting and planting of 100 anthurium plants (Table 5.2.12).

About 45.45 per cent of total labour was contributed by female labour force. Contribution of female labour force was higher in smaller groups - about 68.89 per cent in G-I, 47.83 per cent in G-II and 37.21 per cent in G-III. In small scale cultivation, these operations were usually done by family members who contributed up to 65.22 per cent in G-II and 55.56 per cent of the total labour hours in G-I. While in G-III, family

labour contributed only 18.6% of the total labour hours and rest was hired.

Labour for care and maintenance included all the labour related activities after planting till harvesting. Labour hours employed per week for care and maintenance of unit, including harvesting was, on an average, 2.4 hours per week (Table 5.2.13). The time required for such activities was seen declining with the increasing number of plants per unit. Time spent per week in G-I was much higher (3.2 hrs.) than in G-II (2.6 hrs.) and G-III (2.0 hrs.) (Figure 10). Smaller enterprises were usually managed by family members contributing above two-thirds (73.31%) of total labour hours required. This contribution was 76.1 per cent in G-I, 73.54 per cent in G-II and 72.41 per cent in G-III. On an average, family labour contributed about two-third (64.41%) of the total labour hours employed.

Gender analysis indicated that female labour contributed much more than male labours towards smaller groups. Of the total labour hours, female labour contributed as high as 83.96 per cent in G-I, about 70.43 per cent in G-II and 53.2 per cent in G-III.

In monetary terms, imputed value of family labour contributed about three-fourth (75.34%) of the total labour cost and, contribution of female labour cost remained 56.85 per cent of the total wage cost. The annual care and maintenance cost was about Rs. 1,758 in G-I, Rs. 1,489 in G-II, Rs. 1244 in G-III, and in aggregate this cost was Rs. 1,395 (Appendix XI).

6.2.4 Returns

Annual production pattern of flowers over the economic life of crop shows peak production during middle years of economic life. Productivity

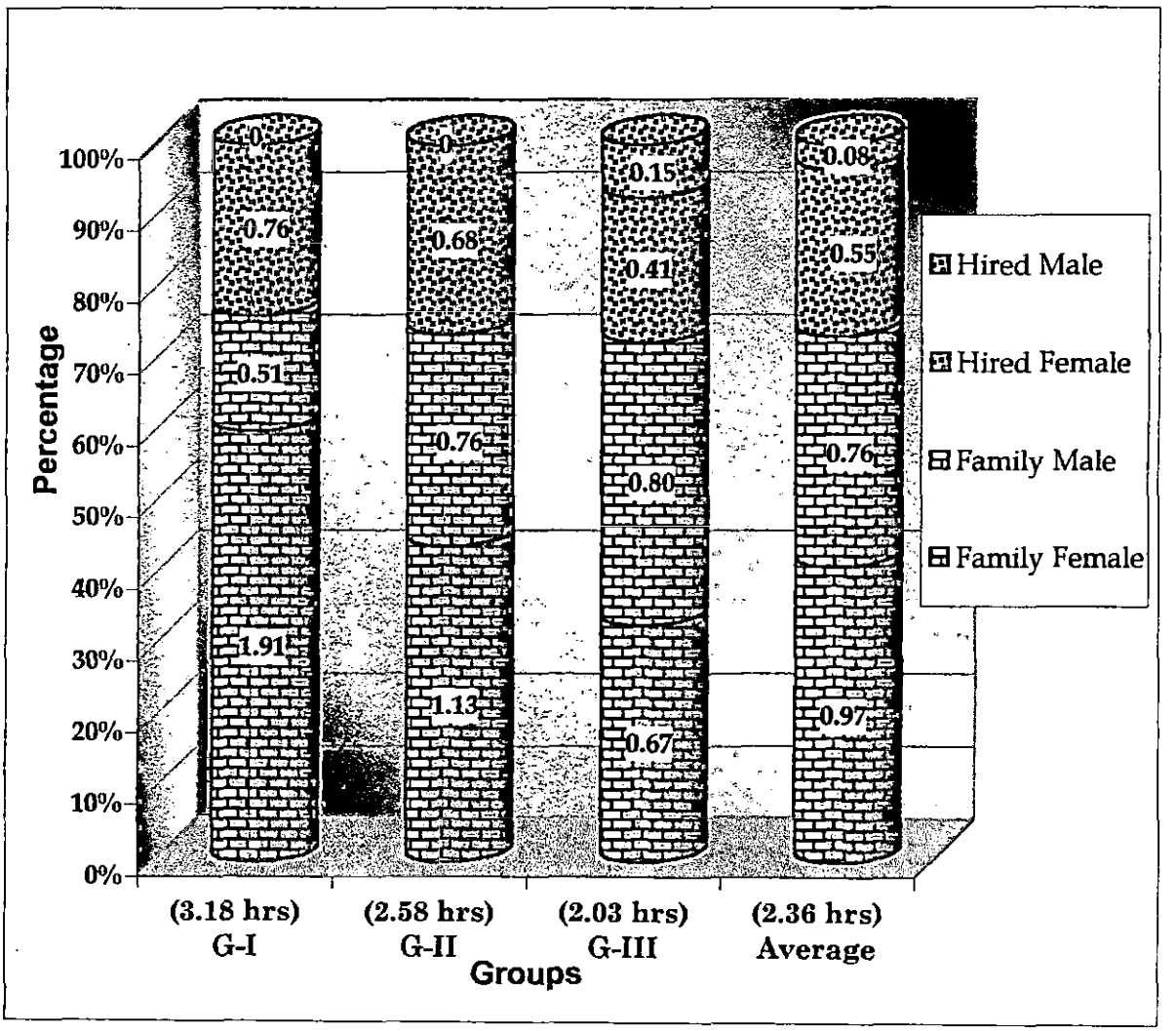


Figure 10: Break-up of weekly labour hours for care and maintenance of anthuriums (Hours/week/100 plants)

was estimated to 548 flowers per 100 plants per annum. It was little higher in G-III (597) followed by G-II (539) and G-I (531) (Table 5.2.14). Production pattern of suckers shows increasing trend in production with the advancing age of plant. An average of about 124 suckers were obtained per annum from 100 plants. In first year there was almost no sucker production, however, from second year onward plants gave increasing number of suckers. Productivity of flowers as well as suckers increased across the groups. It may be because of difference in management aspects, quality of fertilisers, shade management etc.

Average prices per flower spike, realised by growers, were different for first year and for subsequent years because of the quality and appearance of flowers . On an average Rs. 4.87 per spike was realised for first year and Rs. 7.03 for subsequent years (Table 5.2.15). G-III producers realised higher prices, it may be due to quality factor to some extent and better market accessibility to larger growers.

Distribution of total returns over years showed a common pattern among all three groups as well as in aggregate. About 4.5 per cent of total income was obtained in the first year, 18.9 per cent in second year, 22.2 per cent in third year, 21.6 per cent in fourth year and finally 32.8 per cent in the last year. The distribution pattern of income over years was almost similar among all the groups. Ignoring salvage values, a distinct peak of income was observed in the third year of crop, which was around 22 per cent. Income was seen higher towards larger groups obviously due to cost and price advantages as well as higher production. Pooled income in G-I was Rs. 43,474; in G-II Rs. 46,056 and in G-III Rs. 53,037. The average pooled income was about Rs. 46,236.

Federation of Indian Floriculturists [FIF, 1997] has estimated the annual returns from a unit of 500 plants as Rs. 30,000 in the second

year, Rs. 47,000 in third year and fourth year and Rs. 97,000 in the fifth year. These values, when compared with the annual returns of G-II in the present study, are almost similar during the middle years, with variation in the first year and fifth year. FIF has not considered the returns from flower production in the first year.

6.2.5 Capital productivity analysis

Cost of cultivation and returns are spread over many years in cultivating anthurium plants, being perennial in nature. Performance of anthurium cultivation has been analysed using four measures of capital productivity analysis, namely a) pay back period b) benefit cost ratio c) net present value and d) internal rate of return.

The average pay back period of anthurium enterprise was estimated as 2.4 years (Table 5.2.18). Smaller groups took longer time in recovering their investment as compared to larger groups. Pay back period in G-I was about 2.8 years, which declined to 2.5 years in G-II and about 2.2 years in G-III.

Net Present Values are positive in all the groups with values varying from Rs. 9,679 for G-I and Rs. 13,371 for G-II to Rs. 19,229 for G-III. It is perceptible here that larger groups earned much more than smaller ones. Net present value in G-III is almost double than in G-I and about one and half times more than in G-II. Similarly, net present value in G-II is also about one and half times higher than in G-I. These values elucidate the larger groups as more lucrative.

Benefit cost ratio is seen well above unity in all the groups as well as in aggregate. It indicates the investment to be of worth in all the groups. Further, with the increasing scale of operation this ratio is increasing which rationalises the larger groups to be more profitable.

Largest benefit cost ratio of 2.2 is seen in G-III followed by G-II (1.78) and lastly G-I (1.51). The aggregate benefit cost ratio was 1.82.

Gajanana and Subrahmanyam (1999) estimated the benefit cost ratio of more than two for a unit of 1000 anthurium plants in the Coorg district of Karnataka.

On an average the internal rate of return is found to be about 43 per cent for anthurium enterprise. It was above 50 per cent in G-III, about 33 per cent in G-I and 42 per cent in G-II. The internal rate of return shows all the groups to be highly remunerative; at the same time it also confirms the larger group to be more remunerative than the smaller ones (Figure 11).

Capital productivity measures establishe the anthurium enterprises to be highly profitable venture. Since all the groups are seen remunerative the decision regarding the scale of operation is to be based on availability of capital investment. However, all the measured parameters favoured more to larger groups which are proved to be more worthy than smaller ones.

6.2.6 Sensitivity analysis:

Sensitivity analysis has been tried for four risk situations, viz., for 10 and 20 per cent decline in benefit stream as well as for 10 and 20 per cent increase in costs. Any decline in benefits exerts more adverse effect to the project worth parameters than what a similar increase (by the same percentage) in the costs does.

For any adverse condition, recovery period of investment extends more in the smaller groups than in larger groups. Pay back period is observed almost similar in orchids and anthurium enterprises in normal

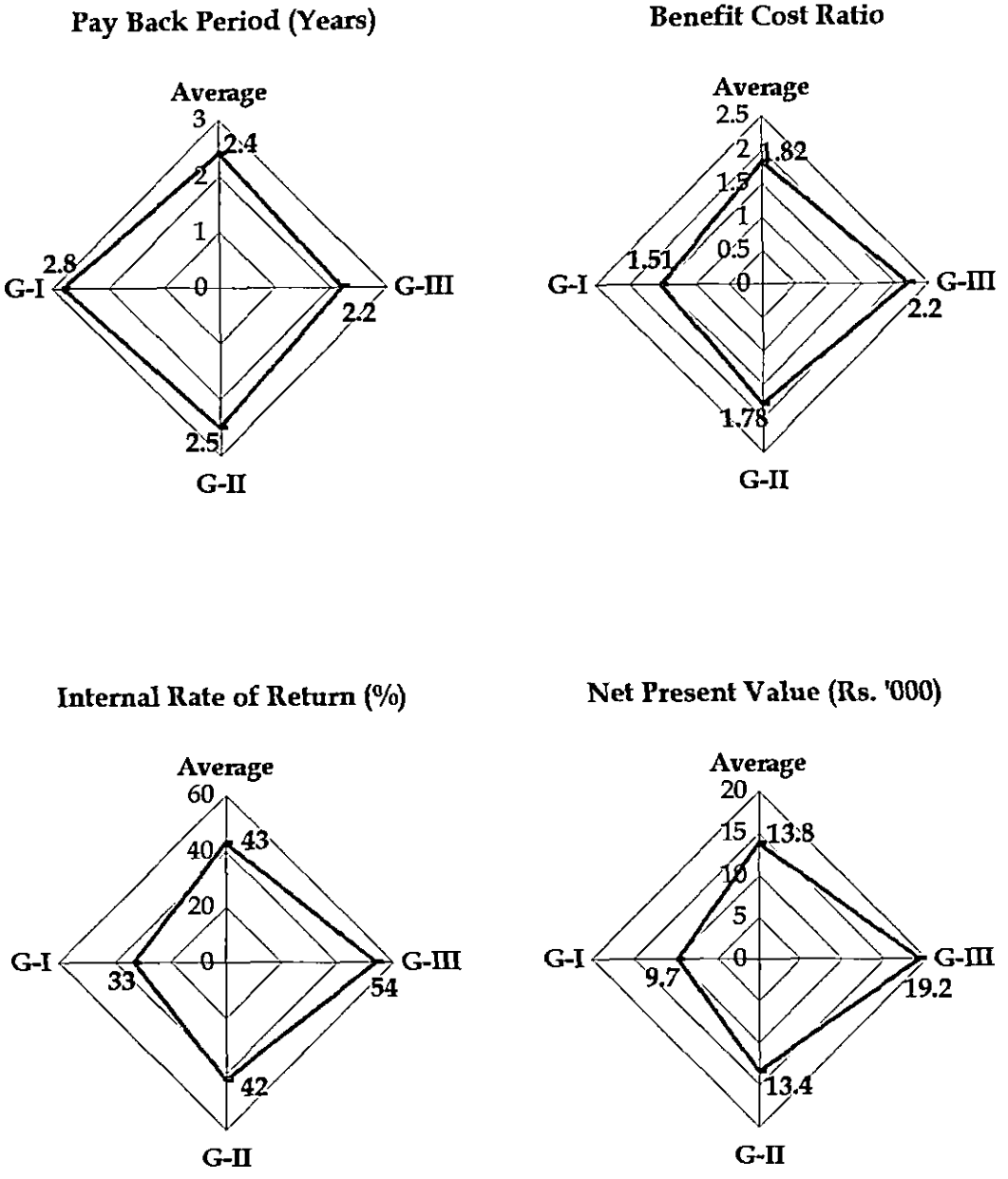


Figure 11: Economic viability of anthurium enterprises across the different groups

conditions as well as in the conditions of uncertainty. For 20 per cent decline in benefits pay back period extends to highest of 3.4 years in G-I (Table 5.2.19).

Net present value is also more susceptible to the decline in benefits than the increase in costs. For 20 per cent decline in benefits, net present value declines by about 59.4 per cent in G-I with the average decline of 44.5 per cent. While for the 20 per cent increase in costs net present value declines by 24.5 per cent in aggregate and by 39.4 per cent G-I (Table 5.2.20). Smaller growers seem to be more vulnerable to such adversaries.

Benefit cost ratio shows similar decline in all the categories for the changes in benefits or costs. For 20 per cent decline in benefits, benefit cost ratio also declines by about 20 per cent, while for 20 per cent increase in costs, benefit cost ratio declines by about 16-17 per cent (Table 5.2.21).

Similarly, internal rate of return also declines by almost equally in all the groups. For 20 per cent decline in benefits, internal rate of return declines uniformly by about 12-13 per cent in all the categories regardless of original values. In aggregate it declined from 43 to 31 per cent. For 20 per cent increase in costs, internal rate of return declines by about 10 per cent in aggregate (Table 5.2.22).

Through sensitivity analyses for up to 20 per cent decline in benefits as well as for 20 per cent increase in costs, all the categories are seen more stable and possessing more endurance capacity under unforeseen adverse conditions. All the four estimated parameters are observed well above the acceptance level under all the assumed unforeseen conditions.

Subgroup-wise analysis strongly ascertains that anthurium cultivation under permanent type of shade house (S-I) is more profitable than those under the semi-permanent type of shade house (S-II) (Plates 5, 6, 7 & 8). This holds true in all the categories in normal condition as well as under uncertainties. This is in contrary to the case of orchid in G-I, where S-I (higher cost shade house) is seen less profitable than S-II, however, in G-II and G-III of orchid enterprises, normally expected condition is observed, i.e., S-I is more remunerative than S-II. Thus, in the case of anthurium cultivation a good quality shade house would be of worth even for smaller growers.

Analysis for district headquarters shows increasing returns from anthurium enterprise towards the southern part of Kerala. It has shown clear gradient from north to south in terms of returns. It may be because of more favourable climate and more awareness about technical aspects of the crop management as well as price advantages towards south.

6.2.7 Marketing

Anthurium flowers are usually harvested at fortnightly intervals. The mode of marketing of anthurium is similar to orchids because anthuriums are also usually collected together with orchid flowers. Generally, florists as well as exporters purchased both flowers together. However, AVT, the promoter cum exporter of floriculture business in the state concentrates more on orchid marketing. Anthurium flowers were handled only when there was special occasion.

Flowers were usually sold to local florists and also few growers had developed some sort of agreement with some exporters and the florists in north Indian metropolis markets. The term 'exporters' included the organisations like AVT, FIF and other associations who collected flowers and exported to other domestic markets. Anthurium flower marketing was very similar to orchid flowers.

Plate 5: Anthurium in the permanent shade house (S-I)

Plate 6: Anthurium - open cultivation (under natural shade) (temporary shade house - S-III)

Plate 7 & 8: Anthurium in semi-permanent shade house (S-II)

For the sale of anthurium flowers growers depended on four types of marketing channels.

Channel I (56.2%): Producers ⟶ Local florists ⟶ Consumers

Channel II (34.4%): Producers ⟶ Exporters ⟶ Florists (outside) ⟶ Consumers

Channel III (6.0%): Producers ⟶ Florists (outside) ⟶ Consumers

Channel IV (3.4%): Producers ⟶ Consumers

Channel I (Producers ⟶ Local florists ⟶ Consumers) is identified as the most important one which was followed by about 80 per cent of growers to sell their flowers, partly or wholly (Table 5.2.23). From all the categories more than two-thirds of growers followed this channel. Growers sold to local florists who resold again to consumer after value addition.

Florists sold these flowers to consumers in combination with another flowers in certain form of arrangements, bouquets etc. It was, thus, difficult to find out the exclusive price for anthurium flowers from the total price consumer paid to florists, and marketing margin could not be estimated for this channel.

The second channel (Producers ⟶ Exporters ⟶ Florists (outside) ⟶ Consumers) routed about 34.4 per cent of the total anthurium flowers of sample respondents. About 34.3 per cent of growers sold their flowers to exporters who sold in north Indian markets through the florists in these markets. Like in orchid, in this case also same problem of unwillingness to reveal their marketing information, prices, transportation costs etc. from the part of exporter was encountered.

About 5.7 per cent of respondents, exported their flowers directly to the florists in north Indian markets. For establishing such relations many of them had visited these markets personally. Usually florists in these markets are reluctant in establishing direct relation with individual growers at distant. It is because the chance of damages and injuries during the freight, consignment of substandard quality flowers etc. These growers faced problem in timely payment from the florists in these markets. In this channel also paucity of market data hindered the estimation of marketing margin. This channel is recognised as 'channel III' in the study.

Very few growers (2.9%), all from G-I, sold flowers directly to consumers (Channel IV). The total flowers marketed through this channel was about 3.4 per cent. Beauty parlours, private organisations individuals etc. are the main direct consumers. During some festivals and marriage season price of flowers goes exorbitantly high and during that time flowers are sold through this channel.

It is to be inferred that the larger sized units are in an advantageous position. Due to better resource base they are able to establish contact with the upcountry florists who paid the highest price. On account of the scale/price and productivity advantages higher sized units are performing economically better with better risk absorbing capacity.

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Constraints and prospects of orchid and anthurium industries in Kerala

Potential of Indian floriculture sector in the domestic and international markets are highlighted by various researchers (Ramphal 1993, Awasthi 1993, Salunkhe *et al.* 1990). In the following section, identification of constraints and prospects of orchid and anthurium industry in the State is discussed.

Pandey and Chaturvedi (1994) reported that rapid changes have occurred in floriculture industry of India, since the late 1980's. The value of export increased eight fold between 1987-88 and 1992-93. The Ministry of Commerce has identified horticultural products as an important source of potential exports. The major problem of floriculture sector in the country is identified as postharvest technology development, limited germplasm availability and unfavourable air freight costs and EU import taxes relative to some competitor countries. Expert group on the topic has made series of recommendations for enhancing production.

Pathania *et al.* (1998) described the international as well as domestic floricultural scenario of India. Indian floriculture was reported to be least capital intensive compared to the international scene. The live plants from India are sent mainly to Gulf countries and cut flowers are exported to Germany, The Netherlands, Italy and USA. According to this observation rose, carnation, chrysanthemum, orchid, anthurium, gerbera, asiatic and oriental lilies and molucella are the major flowers which has got better export scope.

The major constraints observed and prospects for the industry derived from the study are described below.

- In this study it was observed that, the institutional support for floriculture industry was mainly focusing on large units. The analysis also reveals that the larger sized units are performing better than their smaller counterparts, with better shock absorbing capacity. Moreover, the units in Ernakulam have exhibited a higher profitability than other three centres. These observations reveal that orchid/anthurium industry in the State is more suited to the larger income group of growers who have better access to market. The scope of popularising orchid and anthurium industry to the capital poor rural farmers is to be done with care.

- Very high level of intra-farm varietal diversity was observed in the production units of both the flowers, irrespective of the size group. This has resulted in supply management problems in a commercial scale. Often adequate volume of preferred variety could not be supplied. Varietal management in accordance with market demand is very critical. In Bangkok, which is the number one orchid producer of the world, cultivation of only one variety or only one colour of orchid is undertaken on the farms of nearly 40 acres area (as a single unit), which is almost equal to total land area under orchids in India. For commercial purposes, one should maintain larger number of plants from each variety possessing high demand.

- Strategies for production management/planning responsive to the national and international market pulse is needed in the state. Salunkhe *et al.* (1990) have suggested the production time management strategies in flower production to be followed in India for aiming at European market to ensure maximum profit. The

flowers in majority of European countries are produced under glass or green house. Because of higher cost of heating, the production during winter months fall far below their requirements. During this period they resort to import flowers from other countries. Similarly, the demand for cut flowers, particularly, roses and orchids during popular wedding months (June to August) is much high and are always in short supply in European countries. Therefore, the production of flower can be timed to catch up this market to ensure maximum profit to growers.

★ Unit size should be possibly larger as the profitability is seen increasing with the increasing scale of operation. Higher investment for good quality shade house (S-I) in the case of smaller growers (G-I) is seen uneconomical for orchid. However, for anthurium it is rational. Type of shade house also affects the quality and quantity of production and consequently the profitability of the unit (as can be seen from the analysis of subgroups given in appendices). Thus a low cost protected cultivation model, viable for small holdings, should be standardised and popularised, on similar lines as the Eco-compatible model developed by KAU has been successfully popularised among larger growers. Setting up of model green houses in University, Research Centres and government farms for demonstration would be helpful in imparting practical education to growers.

★ The production technologies adopted by growers were found varying from grower to grower. Thus, a standard package of practices has to be popularised among growers which may lead to uniformity in quality and productivity.

- In the case of orchid, the utilisation of keikis and back-bulb as the means of propagation is rare practice among growers at present. Emphasising practical oriented propagation techniques in the forthcoming training programmes of KAU, FIF, AVT and other societies would help develop skill among growers. Performance demonstrations of these propagated plants is also felt equally important as there are general consensus among growers that such propagules in orchid do not perform well. Adoption of such techniques by growers will reduce the cost of unit expansion drastically by saving the cost of purchasing new plants, which constitutes the major share of cost of cultivation.

- Planting material alone accounts for nearly 38-40 per cent of the total cost of cultivation. Establishment of a State owned tissue culture laboratory would be able to make the prices of plants competitive and to ensure the supply of elite planting materials. Mercy (1999) reported the high cost of good planting material of anthurium and lack of its adequate availability as a most serious constraint affecting the prospective of anthurium growers of Kerala today. Soorianathasundaram and Rengasamy (1999) also reported the higher initial investment (Rs. 1.0 - 1.5 lakh per 1000 plants) on the cost of planting material as foremost among the constraints faced by the anthurium growers.

- Government of Kerala has been offering subsidy for the establishment of shade house, especially to smaller growers. However, in the absence of any marketing assurance, smaller growers become the main sufferers. Thus, in present condition, subsidy seems to become more relevant, if it could be associated with marketing of products or in some form of marketing assurance,

development of packages, establishment of precooling and postharvest handling and storage facilities etc.

- Establishment of cold storage/ transportation facilities and reduction in freight charges would help promote flower export. Finding adequate space in air cargo for transporting flowers has been the another problem. Kaur (1999) reported that Indian floriculture industry suffered a loss worth rupees two crore in three separate instances, on account of transportation bottleneck connected with air cargo. The airlines have always been reluctant to pick up the cargo such as flowers, which has stood as a hurdle in the way of floral export. Though the industry is facing hard time in export market, chances are bright on the domestic front.

- Thamburaj (1999) has pointed out some critical constraints for the development of Indian floriculture sector. One important issue was the duty levied by EU on the import of Indian flowers, which is 12 per cent during the season and 17 per cent during the off season. However, some other countries like Sri Lanka and African countries are being exempted of this duty. Another issue is with regard to high rate of freights, i.e., Rs. 90 kg^{-1} of flower compared to the international charges of Rs. 45. Besides, airports had no policy of according priority to perishables as in other countries. These constraints should be addressed effectively for the development of Indian floriculture.

- Awasthi (1993) has pointed out cases of non-acceptability of Indian flowers in the foreign market, due to sub-standard quality and cost factor. This necessitates the need for production management and quality control mechanism to promote floricultural export.

- ★ Marketing of products has been the major problem among orchid and anthurium growers especially among the smaller ones at present, which discourages the expansion of existing units and also prevents the new entrants in this field. Effective marketing system is bound to boost the production and productivity of these crops as well as adoption of these business at larger scale. Study on the scope and possibility of expansion of the domestic market is the urgent requirement. Gopinath (1999) identified some factors which discourages the anthurium growers in taking up the project in Kerala: lack of trained labourers on actual cultural practices; lack of knowledge on postharvest treatment, packaging and storage, transportation etc. He has suggested some marketing improvement strategies for commercial anthurium.

- ★ Marketing procedure of flowers should be channelled under the control of State government or some strong grower's association or any other existing organisation such as Federation of Indian Floriculturists, various societies, AVT etc. And such responsible organisation should be availed with refrigerated vans and other amenities to facilitate the regular collection of flowers from different parts of the state. In this regard, Kerala Cut Flower Producer's Society has expressed their willingness to take up marketing of flowers as a challenge. The lessons from milk marketing can be suitably emulated here, as both are highly perishable.

All the orchid and anthurium growers, wishing to have regular marketing of their flowers, should be affiliated to their local area growers' association where they must gather the minimum agreed number of flowers, on a regular basis. The organisation envisaged to take care of marketing would be able to collect flowers from all these growers' association through its own network.

- Various associations, societies, federations associated with these flower crops should keep update market information through regular collection of market data on prices, demand, preferences, seasons of peak demand at various consumer centres and growers should be kept update with the market information.

- Few growers, all from larger scale of operation, have established contact with florists outside the state where they realise the highest prices. However, none of the small scale growers have such outside contacts, mainly because of their insufficient volume of flowers for export and lack of initiative. Some development organisation may take lead to organise few small growers together in a 'self-help group' to enable them develop such contact with outside market and realise better prices, in the absence of the marketing mechanism suggested earlier.

- Besides developing infrastructure for promoting export of flowers, further emphasis be given to develop local markets. A custom of *'Say it with flowers'* may be popularised in the state especially with the efforts of organised societies. Witmer (1997) reported that in India, with nearly a billion inhabitants, some 100-200 million have enough purchasing power to buy flowers from time to time. He also suggests two ways to make the customer buy more flowers - the first is to improve the existing infrastructure, especially at retail level, which will help to preserve the keeping quality of flowers for a longer period. Secondly, show the people by way of propaganda that flowers are not only nice to use in festivals or ceremonies but also for presents as well as for decorating the houses. It takes time and money, money which should come mainly from growers and government. Kaur (1999) also predicts bright future for domestic

market. The flower, which does not meet export standards, can be sold in local market.

Lee (1996) has presented statistical and econometric results of an analysis of household expenditure on flowers. The data used in the study were obtained from a survey on consumer behaviour in Taipei and Taichung, Taiwan. The results show that family income and lifestyle of household head are important factors affecting household expenditures for flowers. Furthermore, a Tobit model reveals the estimated income elasticity for flowers as 2.84, indicating that household demand has a positive income effect.

- Training on flower arrangements to housewives and other unemployed ones from the growers' family would be helpful in marketing their products easily since consumption of flowers is mainly in *'value added forms'*, i.e., after arranging them in different forms.

- Insurance companies like New India Assurance Company, Oriental Insurance Company have already entered in the field of flower crops and have started giving insurance to orchid and anthurium culture. However, the scheme requires to be popularised among growers as only two of the total sample growers were found to have used such insurance to their flower crops.

- Rajeevan (1999) suggested that Research institutions, Government agencies and Non-Governmental Organisations should work symbiotically in boosting flower production and trade in the state. Following roles can be played by each in this endeavour:

Institutions		Nature of mandate
Agricultural University, TBGRI etc.	:	To conduct research on improvement of existing varieties, use of chemicals for regulation of crop growth and control of diseases
Federation of existing organisations	:	To organise supply of material and disposal of products
State Department of Agriculture	:	To impart technical know-how at farmer level
State/Central Government	:	To take up auction of flowers, preferably at the premises of the Nedumbassery international airport, Ernakulam

Isvarmurti (1999) reported the Madras based Natural Synergies Limited (NSL) as the largest orchids cultivator and exporter in India today. It sold approximately 7,00,000 orchid stems in 1997-98, 60 per cent of which was exported to international markets and rest was sold in the local markets. This company reports orchid business as more feasible and profitable than roses in India because of following reasons:

- Orchid flowers have long shelf life (nearly a month) and travelling ability than rose flowers.
- It has good demand in domestic market too and fetches the same price as in international markets. Orchids are sold for Rs. 7 - 25 (depending on the variety, colour and size) per stem whereas rose sells only for Rs. 2 - 4 per stem in domestic markets.
- The demand for orchids is increasing around the world at nearly 25 per cent. For roses the demand is growing only at 0.5

per cent. But roses represent about 30 per cent of the world trade while orchid represents only two per cent.

- Quality of flower is not of that concern as it is in roses, in international market.

✳ Standardisation of quality and grade norms to ensure uniformity of produce supplied and prices is an important prerequisite in export marketing. Growers should be given proper training on quality and grading norms followed in local market as well as in upcountry markets so that they can maintain the plants accordingly to get better grade and can grade their flowers themselves.

According to the present grading system in orchid, developed by FIF which is more or less similar to the grading system followed by AVT and other societies, a spike with 9-10 flowers plus one tight bud is considered Ist grade and fetches maximum price of about Rs. 20. Presence of tight bud is a must as it reflects the age of spike at the time of harvest.

In the case of Anthurium, the stalk length, spathe size as well as other factors like angle between spathe and candle, corrugation and colour of the spathe etc. makes difference in price especially in other upcountry markets. At present red and orange coloured anthurium flowers are the most preferred ones. Corrugation of the surface is preferred over plane surface of flowers. Similarly, exporters prefer smaller angle between flower surface and candle as it facilitates easy packaging and prevents damages during transportation. The grading system developed by Federation of Indian Floriculturists (FIF) and prices offered accordingly is presented in Appendix XV.

Hegde (1992) has highlighted floriculture as the fastest expanding and most lucrative form of agriculture for Kerala, with the ideal agro-climatic conditions for floriculture. The State can become a serious contender in the global market, particularly for exotic orchids and anthuriums. Visualising this potential, National Bank for Agriculture and Rural Development (NABARD) has diversified its investment into the floriculture sector. With the help of definite promotional strategies, state can enjoy a due share of growing flower market.

7. SUMMARY AND CONCLUSIONS

Orchid and anthurium occupy a prime position in the domestic as well as in the international cut flower market. Kerala government has recognised these two flowers as the thrust area of development in floriculture sector and has extended various assistance to orchid and anthurium growers in the state. This study was conducted with the objective to study the economics of commercial production and marketing of orchid and anthurium in Kerala and to identify the constraints and analyse future prospects of these two crops in the State.

The study is based on primary data collected from 80 growers each selected across four important growing centres of Kerala. Percentage analysis and capital productivity analysis are done for analysing the data. Orchid and anthurium growing units have been studied across three scales of operation, viz., small (upto 500 plants: G-I), medium (500 to 1000 plants: G-II) and large (above 100 plants: G-III). All the costs, returns and other parameters are estimated and discussed here are for 100 plants unless otherwise mentioned thereof. Orchid and anthurium business in the state has been observed as the elite family affair, who can invest more and bear more risk.

7.1 Orchid

Total cost of cultivation for five years was estimated to be Rs. 17,471, of which, about 57.28 per cent was the establishment cost. Per unit cost of cultivation is found increasing towards smaller scale of operation. It is found to be Rs. 19,902 in G-I, Rs. 19,114 in G-II and Rs. 16,508 in G-III.

Plants, pots and potting media together constituted the major share (44.15%) of the total cost, followed by labour (37.55%) and shade

house (10.63%). About 6.3 hours of labour was required for potting and planting at the time of establishment, and thereafter about 2.2 hours of labour for care and maintenance of unit per week. About two-third of the total labour was contributed by female labour force. Proportions of female labour use as well as family labour use were found higher towards smaller scale of operation.

In orchid, the return was taken to be the exclusive income from the sale of flowers. The total return realised over crop life is found to be about Rs. 36,088. It varied for different scale of operation - higher returns from larger scale of operation. It was Rs. 33,240 in G-I, Rs. 35,964 in G-II and Rs. 40,060 in G-III.

The estimated project worth parameters are well above acceptance level in all the groups (scales of operation). Pay back period was estimated to be between two and three years in all the categories. Net present value is found to be about Rs. 9345. It was about Rs. 5545 in G-I and Rs. 7993 in G-II while in G-III it was almost double of that of G-I, i.e., Rs. 12,866. Benefit cost ratio was about 1.61 on an average. It varied from 1.32 in G-I and 1.48 in G-II to 1.88 in G-III. Internal rate of return was found to be higher than cost of capital in all the categories. On an average it was 39 per cent, which varied from 29 per cent in G-I and 35 per cent in G-II to 49 per cent in G-III. All the estimated parameters rationalise the larger scale of operation to be more efficient and profitable.

Sensitivity analysis reveals that orchid farming, at all levels of operation, is capable of remaining profitable even if the costs increase by 10 per cent or benefits decline by 10 per cent. But a 20 per cent decline in benefits turned the smallest sized group uneconomic, though all other groups performed well. A decline in benefit is found to have more adverse

influence on project worthiness than increase in costs by same percentage.

Four marketing channels were found to be existing in orchid marketing. The most important one was "Producer → Local florist → Consumers", which routed about 56.6 per cent of the total production. Next important channel was "Producer → Exporters → Florists (outside market) → Consumers" which accounted for about 33 per cent of production. Other channels included direct sale from producer to florists in the outside market (6.1%) and to consumers in the local area (4.5%).

7.2 Anthurium

Per unit cost of cultivation of anthurium was little higher than that of orchid and showed similar pattern of increase towards smaller sized units. Total cost of cultivation for five years was estimated to be Rs. 19,153, about 57.28 per cent of which was the establishment cost. It was Rs. 21,921 in G-I, Rs. 19,535 in G-II and Rs. 18,064 in G-III.

Two most important input items identified were plants (including pots and potting media) and labour. Plants constituted about 47.30 per cent and labour cost about 36.69 per cent of the total cost. It was followed by shade house (8.94%) while the share of other inputs was very small.

About 4.4 hours of labour was required for potting and planting at the time of establishment, and thereafter about 2.4 hours of labour for care and maintenance of unit per week. The labour required for potting and planting at the time of establishment was lower than that of orchid while for care and maintenance it was higher. On an average, female labour force contributed about two-third of the total labour. As in the

case of orchid, proportions of female labour as well as family labour were found higher towards smaller scale of operation, in anthurium also.

In anthurium, the return is comprised of income from the sale of flowers, suckers and mother plants (after economic life). The total return realised over crop life was found to be about Rs. 46,236. It varied for different scales of operation - higher returns from larger scale of operation. It was Rs. 43,474 in G-I, Rs. 46,056 in G-II and Rs. 53,037 in G-III.

The estimated pay back period of anthurium enterprise was also between two and three years in all the categories. Net present worth was estimated as Rs. 13,767 on an average. It was about Rs. 9679 in G-I and Rs. 13,371 in G-II and Rs. 19,229 in G-III. Benefit cost ratio was 1.82. It varied from 1.51 in G-I and 1.78 in G-II to 2.2 in G-III. Internal rate of return is found to be higher than cost of capital in all the categories. On an average it was 43 per cent, which ranged from 33 per cent in G-I and 42 per cent in G-II to above 50 per cent in G-III. All the estimated parameters indicated that the profitability and efficiency of enterprise increased with the increasing scale of operation.

Sensitivity analysis revealed that anthurium farming remains profitable even if the costs increase by 20 per cent or benefits decline by 20 per cent. In anthurium also, a decline in benefit is observed to have more adverse influence on project worthiness than increase in costs by same percentage.

Marketing of anthuriums was almost similar to that of orchids as the both crops were usually sold together. Out of four marketing channels identified, the most important was "Producer → local florist → consumers", which routed about 56.2 per cent of the total flowers. Next

important channel was "Producer → Exporters → Florists (outside market) → Consumers", which accounted for about 34.4 per cent of flowers. Other channels included direct sale from producer to florists in the outside market (6.0%) and to consumers in the local area (3.4%).

The most significant problem faced by orchid and anthurium growers was the marketing of their products. Most growers, especially smaller ones, depended on local florists, who purchased as and when they needed. Few larger growers could establish contact with florists in the other domestic markets (outside the state) where they realised comparatively higher prices than any other channels. Smaller growers were handicapped mainly due to insufficient volume of their production in making such contacts outside. Effective production planning and marketing management are the key sectors of development.

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APPENDIX I:

INTERVIEW SCHEDULE FOR DATA COLLECTION FOR THE PROJECT " ORCHID AND ANTHURIUM INDUSTRY IN KERALA - A HOMESCALE STUDY".

1. Name of the respondent: Ph / Fx:
2. Address

Date:
Place: TVM/ EKM/ TSR/ KZD

- Family detail:

S.N.	Age group (Years)	Number		Occupation	Av. Annual income	Hrs./day, spent in garden
		M	F			
1.	< 15					
2	15 - 25					
3	25 - 60					
4	> 60					

- Crop detail:

	At start				At present		
	Yr	No. of plants	Cultivation type*	Land area	No. of plants	Cultivation type	land area
O							
A							

- Cultivation type: Open-field (OF)/ Open-pot (OP)/ Shade-field (SF)/ Shade-pot (SP).
- Shade type: One-side/ two sides/ four sides/ fully covered shade structure.
- Area: Rooftop (O).....(A).....; Field (O).....(A).....; Pots (O).....(A).....

- Plants grown:

Crop	Major varieties	At present		Peak Prodⁿ month	Harvesting stage
		Flowering	Total		
O	1. 2. 3. 4. 5.				
A	1. 2. 3. 4. 5.				

- Attached labour? .....; Payment: ..... .
- Approximate time spent for O&A related works: ..... .

Establishment Costs:

- Land development:
  - human labour .....
  - others: .....
- Shade structure:
  Year of construction ..... No. .....

Item	Cost	Remarks
Building (basic structure)		
Shade net (@ Rs...../m; ..... m; .....% shade, colour		
Irrigation structure		
Electricity		
Sprayer/ tools/ equipments etc.		
Others.		

- Annual maintenance cost:
- Building/ structure: .....
  - Shade net : .....
  - Replacement frequency: ...
- Irrigation structure: .....
- Tools & equipments: .....
- Others: .....

- Planting materials used:

	Type* of PM	No.	Stage	Variety	Cost (incl: transport)	Sources** {Source, No., Cost }
Orchid						
I year						
Recent years						
Anthurium						
I year						
Recent years						

* Tissue cultured/ suckers/ keikis/ cuttings etc.

** Sources: Private nursery, Improved growers, Govt institutions, Imported materials, Volunteer organisations, Cut flower societies, others ..... .

- Pots and potting media:

	Component		Quantity		Rate		Cost		Source	
3	Pots (inch)									
Potting mixture for: Orchid		Anthurium	O	A	O	A	O	A	O	A
	a) b) c) d)	a) b) c) d)								
	No. of pots that can be filled: O ..... A									
	Proportion of above ingredients used in: O: .....; A:.....									
	Others:									

- Labour Use Pattern

Time spent (hrs/day) for various operations	Male (man-days/hrs)		Female (man-days/hrs)		Attached labour
	HL*	FL*	HL	FL	
Potting mix preparation and planting					
Supervision (irrigⁿ/fertigⁿ, weeding, pesticide application etc.)					
Others:					

*HL: hired labour; *FL: family labour

- Irrigation system: manual/ automatic;
  Automatic: Capacity: ....., Cost....., Application frequency:.....
  Source of water: ....., Cost of water .....

- Tools and equipments purchased:

Items	Yr. of purchase	No.	Rate	Cost
1.				
2				
3.				

- Staking accessories (rod/thread etc.)
- Other materials:

Recurring costs:

Chemicals:

Chemicals for	Name	Cost & amount	Applⁿ. Rate & freq.	Remk
Disease mngt				
Insect mngt				
Fertilizers: - Organic: - Inorganic: • Orchid care • Green care Others				
Deeping solution			Enough for .....(duration)	

Harvesting:

Crop	Frequency	No.of spike/ harvest	Grades proportion	Remk
Orchid				
Anthurium				

- Labour Use Pattern

Time spent (hrs/day) for various operations	Male (man-days/hrs)		Female (man-days/hrs)		Attached labour
	HL*	FL*	HL	FL	
Potting mix preparation and planting					
Supervision (irrigⁿ/fertigⁿ, weeding, pesticide application etc.)					
Others:					

*HL: hired labour; *FL: family labour

- Irrigation system: manual/ automatic;
  Automatic: Capacity: ....., Cost....., Application frequency:.....
  Source of water: ....., Cost of water .....

- Tools and equipments purchased:

Items	Yr. of purchase	No.	Rate	Cost
1.				
2				
3.				

- Staking accessories (rod/thread etc.)
- Other materials:

Recurring costs:

Chemicals:

Chemicals for	Name	Cost & amount	Applⁿ. Rate & freq.	Remk
Disease mngt				
Insect mngt				
Fertilizers: - Organic: - Inorganic: • Orchid care • Green care Others				
Deeping solution			Enough for .....(duration)	

Harvesting:

Crop	Frequency	No.of spike/ harvest	Grades proportion	Remk
Orchid				
Anthurium				

- Grading and prices of flowers:

Grade	Characteristics	Prices (at different customers)				
		Exporters	Societies	Retailers	Brokers	Others
Orchid 1. 2. 3. 4.						
Anthurium 1. 2. 3. 4.						

- Production starts at the age:

	Flowering		Suckering		Life of the plant	
From:	Orchid	Anthurium	Orchid	Anthurium	Orchid	Anthurium
TC plants						
Suckers (stage .....)						
Keikis						
Others (.....)						

- Flower production pattern over lifespan of the crop:

	I Yr	II Yr	III Yr	IV Yr	V Yr	VI Yr	VII Yr	VIII Yr
Orchid								
No. of flowers								
No. of keikis								
Anthurium								
No. of flowers								
No. of suckers								

- Destination of mother plants at the end of their economic life ?
  - Orchid:..... Anthurium:.....

Market:

- Seasonal variation in demand for any specific type of flowers ?

Season	Maximum demand for type/size/colour etc.		
	International mkt	Local mkt	Other domestic mkt
Orchid:			
Anthurium:			

- Any additional price offered during particular season ? .....

- Marketing channel/ margin

Per harvest :	Sold to: at the rate of									
	Broker		Exporter		Societies		Retailers		Others	
	O*	A*	O	A	O	A	O	A	O	A
Cost incurred in: • transportation • chilling/preservation • packaging • other expenses										

O*- Orchid, A*- Anthurium

- Sources of technology and information:

Information on	Sources* of information
Motivation to grow this crop	
Cultivation and other techniques	
Disease pest management	
Market & marketing	

*Possible sources: Krishi Bhavan, Societies, Exporters, Brokers, Local vendors. Funding agency, University, Others

- Constraints:

Constraints	Priority
1. With regard to time/ cost/ quality/..... a) Availability of planting materials:	
b) Availability of fertilizers:	
c) Availability of technical knowhow:	
2. Severity of disease/ pests and their control:	
3. Product quality	
4. Marketing:	
a) satisfactory price ?	
5. Transportation/ storage/ keeping quality	
6. Financial:	
7. Others:	

Appendix II: **Input-wise cost of cultivation for orchids (Rs. per 100 plants)**

	G-I			G-II			G-III			Districts				Average
	S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Shade-house	3210	1503	2400	2172	1154	1784	2023	1227	1797	1901	1709	1895	1929	1858
Plants, pots & media	7570	7615	7588	7708	7796	7776	7754	7825	7786	7786	7732	7646	7687	7714
Irrigation system & tools	390	339	363	380	376	372	343	305	326	377	355	319	425	365
Labour	8041	8526	8369	7892	8213	8151	5585	5797	5685	7113	6374	6579	6271	6560
PP chemicals	390	475	425	395	270	355	285	285	285	390	295	295	305	315
Fertilisers	680	535	610	590	460	530	500	610	535	855	445	470	440	540
Total maintenance costs	133	155	147	99	217	146	93	100	94	135	113	93	154	119
Total	**20414**	**19148**	**19902**	**19236**	**18486**	**19114**	**16583**	**16149**	**16508**	**18557**	**17023**	**17297**	**17211**	**17471**

Appendix III: Labour utilisation in orchid (for 100 plants)

		G-I			G-II			G-III			Districts				Average
		S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Labour required for potting and planting (Hours)															
Family	Male	1.8	1.6	1.6	1.1	0.2	0.9	0.9	1.6	1.2	2.3	0.9	0.9	0.3	1.1
	Female	5.1	3.0	4.0	3.1	1.2	2.5	2.1	2.4	2.2	2.8	2.3	2.5	1.7	2.4
	Total	*6.9*	*4.6*	*5.6*	*4.2*	*1.4*	*3.4*	*3.0*	*4.0*	3.4	*5.1*	3.2	*3.4*	*2.0*	3.5
Hired	Male	0.0	0.8	0.4	0.6	1.4	0.8	1.0	0.4	0.7	0.6	0.1	1.5	1.2	0.7
	Female	0.0	0.8	0.6	2.3	2.9	2.3	2.8	1.0	2.2	0.5	3.2	1.6	2.8	2.1
	Total	*0.0*	*1.6*	*1.0*	*2.9*	*4.3*	*3.1*	*3.8*	*1.4*	2.9	*1.1*	*3.3*	*3.1*	*4.0*	*2.8*
Aggregate	Male	1.8	2.4	2.0	1.7	1.6	1.7	1.9	2.0	1.9	2.9	1.0	2.4	1.5	1.8
	Female	5.1	3.8	4.6	5.4	4.1	4.8	4.9	3.4	4.4	3.3	5.5	4.1	4.5	4.5
	Total	**6.9**	**6.2**	**6.6**	**7.1**	**5.7**	**6.5**	**6.8**	**5.4**	**6.3**	**6.2**	**6.5**	**6.5**	**6.0**	**6.3**
Labour required for care & maintenance; including harvesting (Hours per week)															
Family	Male	0.33	0.78	0.59	0.63	0.87	0.72	0.51	0.42	0.49	0.62	0.53	0.52	0.63	0.56
	Female	2.05	2.04	2.05	1.26	1.40	1.33	0.65	0.95	0.74	0.87	0.81	1.23	1.20	1.00
	Total	*2.38*	*2.82*	*2.64*	*1.89*	*2.27*	*2.05*	*1.16*	*1.37*	*1.23*	*1.49*	*1.34*	*1.75*	*1.83*	*1.56*
Hired	Male	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.06	0.21	0.29	0.19	0.00	0.03	0.14
	Female	0.55	0.13	0.32	0.87	0.53	0.78	0.35	0.59	0.45	0.58	0.62	0.55	0.27	0.53
	Total	*0.55*	*0.13*	*0.32*	*0.87*	*0.53*	*0.78*	*0.65*	*0.65*	*0.66*	*0.87*	*0.81*	*0.55*	*0.30*	*0.67*
Aggregate	Male	0.33	0.78	0.59	0.63	0.87	0.72	0.81	0.48	0.70	0.91	0.72	0.52	0.66	0.70
	Female	2.60	2.17	2.37	2.13	1.93	2.11	1.00	1.54	1.19	1.45	1.43	1.78	1.47	1.53
	Total	**2.93**	**2.95**	**2.96**	**2.76**	**2.80**	**2.83**	**1.81**	**2.02**	**1.89**	**2.36**	**2.15**	**2.30**	**2.13**	**2.23**

Appendix IV: Labour cost for orchid culture (Rs. for 100 plants)

		G-I			G-II			G-III			Districts				Average
		S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
For potting and planting															
Family	Male	24.8	22.0	22.0	15.1	2.8	12.4	12.4	22.0	16.5	31.6	12.4	12.4	4.1	15.1
	Female	51.0	30.0	40.0	31.0	12.0	25.0	21.0	24.0	22.0	28.0	23.0	25.0	17.0	24.0
	Total	*75.8*	*52.0*	*62.0*	*46.1*	*14.8*	*37.4*	*33.4*	*46.0*	*38.5*	*59.6*	*35.4*	*37.4*	*21.1*	*39.1*
Hired	Male	0.0	11.0	5.5	8.3	19.3	11.0	13.8	5.5	9.6	8.3	1.4	20.6	16.5	9.6
	Female	0.0	8.0	6.0	23.0	29.0	23.0	28.0	10.0	22.0	5.0	32.0	16.0	28.0	21.0
	Total	*0.0*	*19.0*	*11.5*	*31.3*	*48.3*	*34.0*	*41.8*	*15.5*	*31.6*	*13.3*	*33.4*	*36.6*	*44.5*	*30.6*
Aggregate	Male	24.8	33.0	27.5	23.4	22.0	23.4	26.1	27.5	26.1	39.9	13.8	33.0	20.6	24.8
	Female	51.0	38.0	46.0	54.0	41.0	48.0	49.0	34.0	44.0	33.0	55.0	41.0	45.0	45.0
	Total	**75.8**	**71.0**	**73.5**	**77.4**	**63.0**	**71.4**	**75.1**	**61.5**	**70.1**	**72.9**	**68.8**	**74.0**	**65.6**	**69.8**
For care & maintenance; including harvesting (annual)															
Family	Male	237	559	423	452	624	516	366	301	351	444	380	373	452	401
	Female	1069	1064	1069	657	730	693	339	495	386	454	422	641	626	521
	Total	*1306*	*1623*	*1492*	*1109*	*1354*	*1209*	*705*	*796*	*737*	*898*	*802*	*1014*	*1078*	*922*
Hired	Male	0	0	0	0	0	0	215	43	151	208	136	0	22	100
	Female	287	68	167	454	276	407	182	308	235	302	323	287	141	276
	Total	*287*	*68*	*167*	*454*	*276*	*407*	*397*	*351*	*386*	*510*	*459*	*287*	*163*	*376*
Aggregate	Male	237	559	423	452	624	516	581	344	502	652	516	373	474	501
	Female	1356	1132	1236	1111	1006	1100	521	803	621	756	745	928	767	797
	Total	**1593**	**1691**	**1659**	**1563**	**1630**	**1616**	**1102**	**1147**	**1123**	**1408**	**1261**	**1301**	**1241**	**1298**

Appendix V: Flower production in orchid over years (No. of spikes/plant/year), prices (Rs./spike) and salvage value (Rs.)

	G-I			G-II			G-III			Districts				Average
	S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Flower production pattern														
Year 1	3.60	4.00	3.77	3.82	3.09	3.43	3.88	4.29	3.98	3.96	4.09	3.73	3.11	3.71
Year 2	6.14	6.30	6.17	6.93	5.91	6.46	6.85	7.14	6.95	6.63	7.06	6.16	6.17	6.50
Year 3	6.93	6.40	6.63	7.20	6.11	6.73	7.38	7.14	7.29	6.73	7.00	7.00	6.69	6.86
Year 4	6.64	6.13	6.36	7.07	6.11	6.65	7.18	6.86	7.05	6.53	6.94	6.76	6.43	6.67
Year 5	5.78	5.38	5.61	6.55	5.71	6.20	6.00	5.50	5.87	5.42	6.35	5.78	6.10	5.90
Average	**5.82**	**5.64**	**5.71**	**6.31**	**5.39**	**5.89**	**6.26**	**6.19**	**6.23**	**5.85**	**6.29**	**5.89**	**5.70**	**5.93**
Price (Rs/spike)														
First year	7.14	7.41	7.2	7.97	7.19	7.57	8.41	7.67	8.1	7.62	8.71	6.75	7.32	7.59
Subsequent years	11.34	12.15	11.73	12.65	11.8	12.3	13.36	12.58	13.09	12.76	13.97	10.81	11.79	12.32
Salvage value (Rs.)	2032	1076	1471	1607	1040	1337	1526	1044	1283	1360	1290	1305	1394	1326

Appendix VI: Cash flow statement of investment in orchid for a 100 plants unit

(In Rs.)

	G-I			G-II			G-III			Districts				Average
	S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Cash inflow														
Year 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Year 1	2570	2964	2714	3045	2222	2597	3263	3290	3224	3018	3562	2518	2277	2816
Year 2	6963	7655	7237	8766	6974	7946	9152	8982	9098	8460	9863	6659	7274	8008
Year 3	7859	7776	7777	9108	7210	8278	9860	8982	9543	8587	9779	7567	7888	8452
Year 4	7530	7448	7460	8944	7210	8180	9592	8630	9228	8332	9695	7308	7581	8217
Year 5	8587	7613	8052	9893	7778	8963	9542	7963	8967	8276	10161	7553	8586	8595
Total	**33509**	**33456**	**33240**	**39756**	**31394**	**35964**	**41409**	**37847**	**40060**	**36673**	**43060**	**31605**	**33606**	**36088**
Cash outflow														
Year 0	11246	9528	10425	10337	9389	10003	10195	9419	9979	10137	9865	9934	10107	10007
Year 1	1828	1908	1885	1777	1796	1811	1276	1338	1302	1677	1425	1470	1410	1487
Year 2	1828	1937	1899	1777	1818	1820	1276	1346	1305	1681	1430	1473	1420	1492
Year 3	1850	1930	1906	1784	1833	1830	1282	1353	1311	1693	1442	1470	1427	1499
Year 4	1834	1937	1902	1784	1838	1832	1278	1355	1309	1692	1436	1477	1426	1499
Year 5	1828	1908	1885	1777	1812	1818	1276	1338	1302	1677	1425	1473	1421	1487
Total	**20414**	**19148**	**19902**	**19236**	**18486**	**19114**	**16583**	**16149**	**16508**	**18557**	**17023**	**17297**	**17211**	**17471**

Appendix VII : Economic viability of orchid culture under normal condition as well as in four assumed situations

	G-I			G-II			G-III			Districts				Average
	S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Pay Back Period (Months)														
Normal	**35**	**30**	**33**	**28**	**33**	**30**	**25**	**24**	**25**	**28**	**33**	**32**	**31**	**28**
10% decline in returns	39	34	37	31	37	33	27	26	27	31	26	35	34	31
20% decline in returns	45	38	42	34	42	38	30	29	30	34	28	39	38	34
10% increase in costs	39	33	36	30	36	33	27	26	27	31	25	35	33	31
20% increse in costs	43	36	40	33	40	36	29	28	29	33	27	38	36	33
Net Present Values (Rs.)														
Normal	**4998**	**6641**	**5545**	**10430**	**5504**	**7993**	**13596**	**11926**	**12866**	**9060**	**14557**	**6391**	**7645**	**9345**
10% decline in returns	2721	4339	3273	7720	3368	5544	10762	9312	10116	6541	11605	4235	5365	6878
20% decline in returns	444	2037	1001	5009	1231	3096	7928	6698	7367	4022	8653	2078	3084	4411
10% increase in costs	3221	5003	3828	8763	3918	6344	12122	10505	11403	7447	13061	4874	6129	7812
20% increse in costs	1443	3365	2110	7095	2332	4695	10648	9084	9940	5834	11565	3356	4613	6280
Benefit Costs Ratio														
Normal	**1.28**	**1.41**	**1.32**	**1.63**	**1.35**	**1.48**	**1.92**	**1.84**	**1.88**	**1.56**	**1.97**	**1.42**	**1.50**	**1.61**
10% decline in returns	1.15	1.26	1.19	1.46	1.21	1.34	1.73	1.66	1.69	1.41	1.78	1.28	1.35	1.45
20% decline in returns	1.03	1.12	1.06	1.30	1.08	1.19	1.54	1.47	1.50	1.25	1.58	1.14	1.20	1.29
10% increase in costs	1.16	1.28	1.20	1.48	1.22	1.35	1.75	1.67	1.71	1.42	1.79	1.29	1.37	1.46
20% increse in costs	1.07	1.17	1.10	1.35	1.12	1.24	1.60	1.53	1.57	1.30	1.64	1.18	1.25	1.34
Internal Rate of Return (%)														
Normal	**26**	**34**	**29**	**41**	**30**	**35**	**49**	**49**	**49**	**39**	**53**	**32**	**34**	**39**
10% decline in returns	20	27	22	34	23	29	43	42	42	32	46	26	28	33
20% decline in returns	14	19	16	27	17	22	36	35	35	25	38	19	22	26
10% increase in costs	21	27	23	35	24	29	43	43	43	33	47	26	29	34
20% increse in costs	16	22	18	30	19	24	38	37	37	27	41	21	24	28

Appendix VIII:

Grading And Pricing System of Federation of Indian Floriculturists (FIF) for Orchid Flowers

S.N.	Varieties	Grade	Sizes	Rates (Rs.)
1.	Arachnis	I	75 cms +	5.00
		II	60 cms +	4.00
		III	40 cms +	3.00
2.	Aranthera &	I	75 cms +	12.00
	Annie Black	II	60 cms +	8.00
		III	50 cms +	6.00
3.	Aranda	I	40 cms + and 25 flowers	15.00
		II	35 cms + and 20 flowers	10.00
		III	30 cms + and 15 flowers	7.00
4.	Vanda	I	35 cms + and 15 flowers	15.00
		II	30 cms + and 10 flowers	12.00
		III	25 cms + and 7 flowers	10.00
5.	Dendrobium	I	40 cms, 10+1 bud and large flowers	20.00
		II	35 cms, 7-9+1 bud and large flowers	15.00
		III	5 - 6 + 1 bud and large flowers	8.00
6.	Oncidium	I	Good spray of 50 cms +	12.00
		II	Good spray of 40 cms +	8.00
		III	Good spray of 35 cms +	6.00
7.	Phalaenopsis	I	Good spray of 40 cms + & 10 flowers	20.00
		II	Good spray of 35 cms + and 8 flowers	15.00
		III	Good spray of 30 cms + and 6 flowers	10.00
8.	Philippica	I	Good spray of 60 cms +	12.00
		II	Good spray of 50 cms +	8.00
		III	Good spray of 40 cms +	6.00

Appendix IX: Input-wise cost of cultivation for anthurium (Rs. per 100 plants)

	G-I			G-II			G-III			Districts				Average
	S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Shade-house	2532	1647	2509	2088	1285	1552	1689	1112	1421	1750	1960	1679	1518	1712
Plants, pots & media	8996	9073	9001	8985	9163	9114	9079	9022	9055	9079	8950	8979	9243	9060
Irrigation system & tools	451	400	420	345	325	325	280	242	263	343	293	279	249	298
Labour	9107	8200	8840	7116	7566	7500	6302	6215	6273	6819	6599	7092	7564	7028
PP chemicals	435	390	410	375	280	330	290	280	285	375	325	250	285	315
Fertilisers	705	445	570	575	605	590	565	775	660	765	505	525	650	625
Total maintenance costs	120	306	171	90	142	124	65	155	107	166	110	124	62	115
Total	**22346**	**20461**	**21921**	**19574**	**19366**	**19535**	**18270**	**17801**	**18064**	**19297**	**18742**	**18928**	**19571**	**19153**

Appendix X: Labour utilisation in anthurium (for 100 plants)

		G-I			G-II			G-III			Districts				Average
		S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Labour required for potting and planting (Hours)															
Family	Male	1.7	1.2	1.2	0.9	0.5	1.2	0.6	0.0	0.3	0.9	0.4	0.1	1.4	0.7
	Female	1.8	1.6	1.3	1.8	2.5	1.8	0.7	0.0	0.5	1.2	1.7	0.1	1.2	1.1
	Total	*3.5*	*2.8*	*2.5*	*2.7*	*3.0*	*3.0*	*1.3*	*0.0*	*0.8*	*2.1*	*2.1*	*0.2*	*2.6*	*1.8*
Hired	Male	0.0	0.2	0.2	2.3	0.0	1.2	2.5	0.0	2.4	0.8	2.2	2.1	2.1	1.7
	Female	1.6	1.0	1.8	0.4	0.0	0.4	1.5	0.0	1.1	0.9	0.6	1.6	0.4	0.9
	Total	*1.6*	*1.2*	*2.0*	*2.7*	*0.0*	*1.6*	*4.0*	*0.0*	*3.5*	*1.7*	*2.8*	*3.7*	*2.5*	*2.6*
Aggregate	Male	1.7	1.4	1.4	3.2	0.5	2.4	3.1	0.0	2.7	1.7	2.6	2.2	3.5	2.4
	Female	3.4	2.6	3.1	2.2	2.5	2.2	2.2	0.0	1.6	2.1	2.3	1.7	1.6	2.0
	Total	**5.1**	**4.0**	**4.5**	**5.4**	**3.0**	**4.6**	**5.3**	**0.0**	**4.3**	**3.8**	**4.9**	**3.9**	**5.1**	**4.4**
Labour required for care & maintenance; including harvesting (Hours per week)															
Family	Male	0.35	0.98	0.51	0.86	0.78	0.76	0.88	0.72	0.80	0.61	0.53	0.99	0.95	0.76
	Female	1.71	1.78	1.91	0.93	1.25	1.13	0.50	0.87	0.67	1.02	1.06	0.82	0.97	0.97
	Total	*2.06*	*2.76*	*2.42*	*1.79*	*2.03*	*1.89*	*1.38*	*1.59*	*1.47*	*1.63*	*1.59*	*1.81*	*1.92*	*1.73*
Hired	Male	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.15	0.24	0.00	0.00	0.00	0.08
	Female	1.28	0.00	0.76	0.59	0.56	0.68	0.32	0.50	0.41	0.41	0.72	0.52	0.60	0.55
	Total	*1.28*	*0.00*	*0.76*	*0.59*	*0.56*	*0.68*	*0.59*	*0.50*	*0.56*	*0.65*	*0.72*	*0.52*	*0.60*	*0.63*
Aggregate	Male	0.35	0.98	0.51	0.86	0.78	0.76	1.15	0.72	0.95	0.85	0.53	0.99	0.95	0.84
	Female	2.99	1.78	2.67	1.52	1.81	1.81	0.82	1.37	1.08	1.43	1.78	1.34	1.57	1.52
	Total	**3.34**	**2.76**	**3.18**	**2.38**	**2.59**	**2.57**	**1.97**	**2.09**	**2.03**	**2.28**	**2.31**	**2.33**	**2.52**	**2.36**

Appendix XI: Labour cost for anthurium culture (Rs. for 100 plants)

		G-I			G-II			G-III			Districts				Average
		S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
For potting and planting															
Family	Male	23.4	16.5	16.5	12.4	6.9	16.5	8.3	0.0	4.1	12.4	5.5	1.4	19.3	9.6
	Female	18.0	16.0	13.0	18.0	25.0	18.0	7.0	0.0	5.0	12.0	17.0	1.0	12.0	11.0
	Total	*41.4*	*32.5*	*29.5*	*30.4*	*31.9*	*34.5*	*15.3*	*0.0*	*9.1*	*24.4*	*22.5*	*2.4*	*31.3*	*20.6*
Hired	Male	0.0	2.8	2.8	31.6	0.0	16.5	34.4	0.0	33.0	11.0	30.3	28.9	28.9	23.4
	Female	16.0	10.0	18.0	4.0	0.0	4.0	15.0	0.0	11.0	9.0	6.0	16.0	4.0	9.0
	Total	*16.0*	*12.8*	*20.8*	*35.6*	*0.0*	*20.5*	*49.4*	*0.0*	*44.0*	*20.0*	*36.3*	*44.9*	*32.9*	*32.4*
Aggregate	Male	23.4	19.3	19.3	44.0	6.9	33.0	42.7	0.0	37.1	23.4	35.8	30.3	48.2	33.0
	Female	34.0	26.0	31.0	22.0	25.0	22.0	22.0	0.0	16.0	21.0	23.0	17.0	16.0	20.0
	Total	**57.4**	**45.3**	**50.3**	**66.0**	**31.9**	**55.0**	**64.7**	**0.0**	**53.1**	**44.4**	**58.8**	**47.3**	**64.2**	**53.0**
For care & maintenance; including harvesting (annual)															
Family	Male	251	703	366	617	0	545	516	0	574	437	380	710	681	545
	Female	892	928	996	485	334	589	454	0	349	532	553	428	506	506
	Total	*1143*	*1631*	*1362*	*1102*	*334*	*1134*	*970*	*0*	*923*	*969*	*933*	*1138*	*1187*	*1051*
Hired	Male	0	0	0	0	0	0	0	0	108	172	0	0	0	57
	Female	667	0	396	308	1528	355	261	0	214	214	375	271	313	287
	Total	*667*	*0*	*396*	*308*	*1528*	*355*	*261*	*0*	322	*386*	*375*	*271*	*313*	*344*
Aggregate	Male	251	703	366	617	0	545	516	0	681	609	380	710	681	602
	Female	1559	928	1392	793	1861	944	714	0	563	746	928	699	819	793
	Total	**1810**	**1631**	1758	**1410**	**1861**	**1489**	**1230**	0	**1244**	**1355**	**1308**	**1409**	1500	**1395**

Appendix XII: Flower and sucker production in anthurium over years (No./plant/year), prices (Rs./flower) and salvage value (Rs.)

	G-I			G-II			G-III			Districts				Average
	S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Flower production pattern														
Year 1	4.20	4.14	3.92	4.14	4.25	4.10	4.75	3.83	4.36	4.30	4.25	3.88	3.88	4.09
Year 2	7.70	7.50	7.12	7.43	7.05	7.10	8.38	7.67	8.07	7.45	7.11	7.25	7.38	7.30
Year 3	7.70	7.50	7.38	7.57	7.63	7.54	8.50	8.40	8.46	7.95	7.56	7.57	7.50	7.66
Year 4	7.10	7.43	7.05	7.29	7.06	7.04	7.75	7.75	7.75	7.31	7.35	6.85	7.14	7.18
Year 5	6.57	6.33	6.38	7.00	6.59	6.54	7.13	7.25	7.17	6.63	6.88	6.30	6.58	6.63
Average	**6.65**	**6.58**	**6.37**	**6.69**	**6.52**	**6.46**	**7.30**	**6.98**	**7.16**	**6.73**	**6.63**	**6.37**	**6.50**	**6.57**
Price of flower (Rs./flower)														
First year	7.14	7.41	7.2	7.97	7.19	7.57	8.41	7.67	8.1	7.62	8.71	6.75	7.32	7.59
Subsequent years	11.34	12.15	11.73	12.65	11.8	12.3	13.36	12.58	13.09	12.76	13.97	10.81	11.79	12.32
Sucker production (No./plant/year)														
Year 1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Year 2	1.7	1.1	1.5	0.9	1.6	1.4	1.8	1.2	1.5	1.6	1.3	1.6	1.4	1.4
Year 3	2.0	1.8	1.9	2.1	2.0	2.0	2.2	2.2	2.2	2.1	2.1	1.8	1.7	2.0
Year 4	2.1	1.7	1.8	2.1	2.0	2.0	2.3	2.2	2.3	2.1	2.2	1.9	1.7	2.0
Year 5	2.1	1.7	1.8	2.3	2.0	2.0	2.3	2.3	2.3	2.1	2.3	1.9	1.6	2.0
Salvage value (Rs.)	2032	1076	1471	1607	1040	1337	1526	1044	1283	1360	1290	1305	1394	1326

Appendix XIII: Cash flow statement of investment in anthurium for a 100 plants unit

(In Rs.)

	G-I			G-II			G-III			Districts				Average
	S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Cash inflow														
Year 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Year 1	2163	1925	1764	2352	2231	2176	2831	1915	2420	2473	2202	1746	1758	2067
Year 2	9756	7880	8442	8020	8684	8423	11514	8486	10077	9515	8461	8638	8225	8732
Year 3	10506	9430	9488	11330	10025	10208	12463	11515	12058	11268	10869	9396	9128	10260
Year 4	10327	9283	9221	11109	9766	9956	12242	11044	11701	10834	10889	9103	8895	9998
Year 5	16034	13891	14559	17006	14782	15293	17297	16201	16781	16008	16230	14177	13764	15179
Total	**48786**	**42409**	**43474**	**49817**	**45488**	**46056**	**56347**	**49161**	**53037**	**50098**	**48651**	**43060**	**41770**	**46236**
Cash outflow														
Year 0	12036	11165	11980	11484	10824	11046	11090	10441	10792	11216	11262	10984	11074	11123
Year 1	2062	1831	1981	1618	1692	1687	1436	1454	1446	1604	1489	1579	1693	1597
Year 2	2062	1858	1988	1618	1709	1698	1436	1478	1457	1614	1498	1596	1700	1608
Year 3	2062	1898	1998	1618	1726	1710	1436	1486	1461	1632	1501	1595	1705	1615
Year 4	2062	1878	1993	1618	1723	1707	1436	1484	1460	1627	1503	1595	1702	1613
Year 5	2062	1831	1981	1618	1692	1687	1436	1458	1448	1604	1489	1579	1697	1597
Total	**22346**	**20461**	**21921**	**19574**	**19366**	**19535**	**18270**	**17801**	**18064**	**19297**	**18742**	**18928**	**19571**	**19153**

Appendix XIV : Economic viability of anthurium culture under normal condition as well as in four assumed situations

	G-I			G-II			G-III			Districts				Average
	S-I	S-II	Average	S-I	S-II	Average	S-I	S-II	Average	TVM	EKM	TSR	KZD	
Pay Back Period (Months)														
Normal	**31**	**33**	**34**	**30**	**29**	**30**	**24**	**28**	**26**	**28**	**29**	**30**	**32**	**29**
10% decline in returns	33	35	37	32	32	32	26	30	28	30	31	33	35	32
20% decline in returns	37	39	41	35	35	36	28	32	30	32	34	36	38	35
10% increase in costs	33	35	37	32	31	32	26	30	27	29	31	33	34	32
20% increse in costs	36	38	40	34	34	34	27	31	29	31	33	35	37	34
Net Present Values (Rs.)														
Normal	**12977**	**10282**	**9679**	**15512**	**13280**	**13371**	**21405**	**16699**	**19229**	**16308**	**15493**	**11886**	**10540**	**13767**
10% decline in returns	9741	7476	6806	12237	10262	10325	17645	13461	15709	12980	12285	9033	7773	10706
20% decline in returns	6506	4669	3932	8961	7243	7279	13884	10223	12190	9653	9077	6180	5007	7646
10% increase in costs	11039	8504	7773	13788	11590	11662	19785	15131	17632	14611	13834	10222	8827	12083
20% increse in costs	9101	6726	5868	12063	9899	9953	18165	13563	16035	12914	12175	8557	7115	10399
Benefit Costs Ratio														
Normal	**1.67**	**1.58**	**1.51**	**1.9**	**1.79**	**1.78**	**2.32**	**2.06**	**2.2**	**1.96**	**1.93**	**1.71**	**1.62**	**1.82**
10% decline in returns	1.50	1.42	1.36	1.71	1.61	1.60	2.09	1.86	1.98	1.76	1.74	1.54	1.45	1.64
20% decline in returns	1.34	1.26	1.21	1.52	1.43	1.43	1.86	1.65	1.76	1.57	1.55	1.37	1.29	1.45
10% increase in costs	1.52	1.43	1.37	1.73	1.62	1.62	2.11	1.88	2.00	1.78	1.76	1.56	1.47	1.65
20% increse in costs	1.39	1.32	1.26	1.58	1.49	1.49	1.93	1.72	1.84	1.63	1.61	1.43	1.35	1.51
Internal Rate of Return (%)														
Normal	**39**	**36**	**33**	**44**	**43**	**42**	**58**	**49**	**54**	**48**	**45**	**39**	**37**	**43**
10% decline in returns	33	30	28	38	37	36	51	43	48	41	39	34	31	37
20% decline in returns	27	24	22	32	30	30	44	37	41	35	33	28	25	31
10% increase in costs	34	31	28	39	37	37	52	44	48	42	40	34	31	37
20% increse in costs	29	26	24	34	32	32	47	39	43	37	35	30	27	33

Appendix XV:

Measurement of Anthurium Flowers and Rates, Developed by Federation of Indian Floriculturists (FIF), Thiruvananthapuram

A - Maximum width (in cms.)
B - Maximum length (in cms.)
Size - (A + B) cms.

Classes of Flowers	Measurements		Stem length	Prices of different grades		
	(A + B)	(A+B)"/2		Grade I	Grade II	Grade III
(a)	(b)	(c)	(d)	(e)	(f)	(g)
Su – Super	30 cms +	6" +	60 cms +	12.00	8.00	4.00
La – Large	25 cms +	5" +	50 cms +	10.00	6.50	3.25
Me – Medium	20 cms +	4" +	40 cms +	8.00	5.75	2.50
Sl – Small	15 cms +	3" +	30 cms +	5.00	3.50	1.50
Mi – Mini	12 cms +	2.5" +	20 cms +	3.00	2.00	----

Note: The class of flower (column 'a') is determined based on the criteria mentioned in column 'c' in the above table, i.e., the mean of maximum length and maximum width of the spathe. However, the grades (as given in the columns e, f & g) are determined based on criteria given in column 'd'. Thus, within the same class there may be different grades. If a flower meets the stem length criteria (column 'd') within any class, the flower is considered to be of Grade-I otherwise Grade-II. Only local and traditional varieties are considered to be of Grade-III.

ORCHID AND ANTHURIUM INDUSTRY IN KERALA - A STUDY OF HOMESCALE UNITS

By

PRAKASH KUMAR KARN

ABSTRACT OF THE THESIS

Submitted in partial fulfilment of the requirement for the degree of

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ABSTRACT

Orchid and anthurium are identified as the most important flowers with commercial potential suitable for the state. Present study was aimed to investigate the economics of commercial production and marketing of orchid and anthurium in Kerala and to identify the constraints and analyze future prospects of these two crops in the State. The study was conducted with a sample of 80 growers for each crop. Percentage analysis and capital productivity analysis were used to analyze the data.

Orchid and anthurium growing units have been studied across three scales of operation, viz., small (upto 500 plants: G-I), medium (500 to 1000 plants: G-II) and large (above 1000 plants: G-III) for a standard of 100 plants in each categories.

1. Orchid

Total cost of cultivation for five years was estimated to be Rs. 17,471 of which about 57.28 per cent was the establishment cost. Per unit cost of cultivation is found increasing towards smaller scale of operation. The total return realized over crop life is found to be about Rs. 36,088. Higher returns were realized from larger scale of operation – varying from Rs. 33,240 to Rs. 40,060.

The estimated project worth parameters were well above acceptance level in all the groups. On an average, pay back period was estimated as three years, net present value as Rs. 9,345, benefit cost ratio as 1.61 and the internal rate of return as 39 per cent.

2. Anthurium

Per unit cost of cultivation of anthurium was little higher than that of orchid and showed similar cost structure and increasing pattern towards smaller groups. Total cost of cultivation for five years was estimated to be Rs. 19,153, about 57.28 per cent of which was the establishment cost. The total return realized over crop life was found to be Rs. 46,236. It varied from Rs. 43,474 to Rs. 53,037 in different scales of operation.

The pay back period of anthurium enterprise was also estimated to be between two and three years, net present worth as Rs. 13,767, benefit cost ratio as 1.82 and internal rate of return as 43 per cent.

Capital productivity analysis of orchid and anthurium showed both the enterprises to be profitable at all the levels (scale of operation), however, larger units were seen comparatively more efficient and profitable than smaller ones.

In both orchid and anthurium, on an average, female labour force contributed about two-third of the total labour use. Proportions of female labour as well as family labour were found higher towards smaller scale of operation.

Sensitivity analysis revealed that orchid and anthurium farming are capable of remaining profitable even if the costs increase by 20 per cent. A decline of 20 per cent in benefits turned the smallest sized group (G-I) of orchid uneconomic, though all other groups in both flower crops performed well. A decline in benefit is observed to have more adverse influence on project worthiness of both the crops than increase in costs by same percentage.

Marketing of both the flowers was almost similar as they were usually sold together. Out of four marketing channels identified, the most important one was "Producer ⟶ Local florist ⟶ Consumers", through which bulk of the produce moved.

The most significant problem faced by orchid and anthurium growers, especially smaller sized units, was irregular market for their products. High level of intra-farm varietal diversity resulted in non-uniform flowers which are in inadequate quantity.

Effective production planning and marketing management are the key sectors of development.

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