



## Economics of vanilla cultivation as an intercrop in arecanut plantation in Uttara Kannada district of Karnataka

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Vanilla (*Vanilla fragrans*) is an important commercial spice crop which constitutes the world's most popular flavoring agent for numerous sweetened foods. The demand for natural vanilla in the world is increasing due to its wider use in the manufacture of ice creams, soft drinks, chocolate, baked foods, liquors, perfumery and pharmaceuticals. India ranks 6<sup>th</sup> in the production of vanilla in the world. Karnataka occupies the highest area (1,465 ha) under vanilla cultivation in India, followed by Kerala (812 ha) and Tamil Nadu (268 ha) ([www.spices.com](http://www.spices.com)). Vanilla has economic significance and has a high demand in the international market besides offering employment opportunities. Indian vanilla is grown as intercrop in arecanut plantation and also grown as pure crop under artificial shade nets.

Vanilla, being a commercial spice crop having income earning potential through exports, there are no comprehensive studies on the assessment of economic viability of vanilla cultivation as an intercrop in arecanut plantation with the prevailing prices. Therefore, evaluating the investment feasibility and financial soundness of vanilla cultivation will be useful to farmers and policy makers. Hence, the present study was undertaken with the objectives 1) to assess the financial feasibility of vanilla cultivation as an intercrop in arecanut plantation in the study area and 2) to examine the costs and returns from production of vanilla.

Sirsi and Yellapur talukas of Karnataka state were selected for the study where vanilla was cultivated as intercrop with arecanut plantation. A

list of villages in these two talukas with the area under vanilla cultivation were obtained from the Spices Board. From Sirsi taluka, five villages viz., Vanalli, Kodangadde, Kolekallu, Salakani and Hegade Katti and five villages viz., Vajralli, Kampli, Yekan, Hittalahalli and Umachagi were selected. All these 10 villages had larger areas under vanilla cultivation. Four farmers were randomly selected from each village having a total sample size of 40. Further classification into small and large holdings was done based on the total number of vines and size of arecanut plantation. A farmer who is having less than 2000 vines was considered as smallholding and more than 2000 vines with more than one ha arecanut plantation was considered as large holding. Small and large farmers accounted 20 in each category.

Primary data for the study was obtained from the sample farmers through personal interview with the help of a pre-tested questionnaire. Primary data on aspects like capital requirement for the establishment of vanilla as intercrop, details on maintenance cost of the crop during non-bearing and bearing stage, yield levels and returns, were collected. Data pertained to the agricultural year 2004-05. Secondary data on area and production were collected from the Spices Board and the State Department of Horticulture.

Vanilla is a perennial crop that can be commercially cultivated for 15 years and bearing starts from 3<sup>rd</sup> year onwards and the economic yield starts from 4<sup>th</sup> year onwards. Costs incurred in the cultivation were broadly classified into variable cost and fixed cost.

Discounted cash flow techniques *viz.*, net present worth/value (NPW/NPV), benefit cost ratio (B:C Ratio) and internal rate of returns (IRR) were used to find the economic viability of investment in vanilla cultivation as an intercrop with arecanut plantation.

In the present study, a discount factor of 12 per cent used to discount net cash inflows representing the opportunity cost of capital. It is calculated as follows:

$$NPV = [\sum Y_n (1+r)^{-n}] - I_0$$

Where  $Y_n$  = Net cash inflows in the  $n^{\text{th}}$  year

$r$  = Discount factor (12%)

$I_0$  = Initial investment

$n$  = Economic life of the vanilla plantation.

Benefit cost ratio (B:C Ratio) was worked out by discounting net returns during the life period of the orchard at a discount rate of 12 per cent. It is worked out according to the following formula,

$$\begin{aligned} \text{B: C Ratio} &= \frac{\text{Present worth of benefits}}{\text{Present worth of costs}} \\ &= \frac{\sum_{i=1}^n B_n (1+i)^{-n}}{\sum_{i=1}^n C_n (1+i)^{-n}} \end{aligned}$$

Where,  $B_n$  = cash in flows

$C_n$  = cash out flows and

other notations represent the same as mentioned above in the NPV formula.

Internal Rate of Return (IRR) is the discount rate which makes the net present value/worth of cash flow equal to zero. It represents the average earning power. This can be calculated by trial and error method. If one discount rate found too low and leaves positive net worth and another discount rate is found too high and leaves a negative net worth of cash stream. Finally should arrive at a discount rate which equals the net present worth equal to zero.

Internal rate of return

$$\sum_{i=1}^n B_n - C_n / (1+i)^n = 0$$

Where,  $B_n$  = Benefit in each year

$C_n$  = Costs in each year

$n$  = number of years

$i$  = discount rate

The average size of vanilla plantation for small and large were 0.90 ha and 1.34 ha, respectively. Average number of vines per hectare was 1959 and 2340 in the small and large plantations. The spacing followed in vanilla plantation was 4.5 x 4.5 ft as intercrop in arecanut garden. The establishment cost of vanilla in arecanut plantation included the initial year of investment and the maintenance cost till the bearing period.

The level of establishment cost in vanilla in arecanut plantation varied with small and large farms (Table 1). Average establishment cost on large farm was Rs. 2,47,643 per hectare, while it was Rs. 2,48,992 in the small farm. Among the material costs, the cost incurred on planting material constituted the highest share both in small (39.20%) and large farms (42.20%). The cost incurred on planting materials in the large farms was comparatively higher than that of the small farms. This may be due to the more number of vines planted per hectare in large farms.

The labour cost for weeding, manuring, silt application and other cultural operations constituted the highest cost in the small farm than in the large farm.

Annual maintenance cost of vanilla cultivation during the bearing period was Rs. 84,573, Rs.93,642 and Rs. 98,474 during 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> year of bearing periods, respectively, for small farms which are provided in Table 2, while it was Rs. 80,632, Rs. 89,976 and Rs. 92,791 during 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> year of bearing periods, respectively, for large farms. The variable cost was more in both types of farms than the fixed cost. During the bearing period, the cost incurred in pollination and harvesting accounted the highest share in the total variable cost in both small and large farms because, the pollination in vanilla was done manually and is labour intensive. In fixed cost, the amortized establishment cost was found high due to heavy initial investment of vanilla as an intercrop in arecanut garden. Again, the fixed cost

Table 1. Establishment cost of vanilla (intercrop) (Rs.)

| Sl. No.                 | Particulars                    | Initial year |        | First year |        | Second year |       | Total establishment cost |                 |
|-------------------------|--------------------------------|--------------|--------|------------|--------|-------------|-------|--------------------------|-----------------|
|                         |                                | Large        | Small  | Large      | Small  | Large       | Small | Large                    | Small           |
| <b>A. Labour cost</b>   |                                |              |        |            |        |             |       |                          |                 |
| 1.                      | Digging pits for planting      | 976          | 780    | 976        | 780    | -           | -     | 976 (0.39)               | 780 (0.31)      |
| 2.                      | Manure and silt application    | 2880         | 2531   | 2880       | 2531   | 2940        | 2580  | 5820 (2.34)              | 5109 (2.06)     |
| 3.                      | Mulching                       | -            | -      | 2160       | 1680   | 2280        | 1800  | 4440 (1.78)              | 3480 (1.41)     |
| 4.                      | PPC* application               | -            | -      | -          | -      | 600         | 540   | 600 (0.24)               | 540 (0.22)      |
| 5.                      | Weeding                        | -            | -      | 5200       | 4640   | 5040        | 4520  | 10240 (4.11)             | 9160 (3.70)     |
| 6.                      | Watch and ward                 | -            | -      | 5600       | 5100   | 5600        | 5100  | 11200 (4.50)             | 10200 (4.12)    |
| 7.                      | Irrigation                     | -            | -      | 1525       | 1525   | 1525        | 1525  | 3050 (1.22)              | 3050 (1.23)     |
| 8.                      | Fencing                        | 1200         | 960    | 1200       | 960    | -           | -     | 1200 (0.48)              | 960 (0.39)      |
| 9.                      | Other expenses                 | -            | -      | 600        | 350    | 950         | 640   | 1550 (0.62)              | 990 (0.40)      |
|                         | Total labour cost              | 5056         | 4271   | 20141      | 17566  | 18935       | 16705 | 39076 (15.70)            | 34271 (12.80)   |
| <b>B. Material cost</b> |                                |              |        |            |        |             |       |                          |                 |
| 1.                      | Manures                        | 1950         | 21600  | 19520      | 21600  | 19750       | 22080 | 39270 (15.80)            | 43680 (17.60)   |
| 2.                      | Silt                           | 1250         | 1100   | 1250       | 1100   | 1376        | 1260  | 2625.5 (1.05)            | 2360 (0.95)     |
| 3.                      | Mulching materials             | -            | -      | 1020       | 756    | 1120        | 886   | 2140 (0.86)              | 1642 (0.66)     |
| 4.                      | Plant protection chemicals     | -            | -      | -          | -      | 580         | 610   | 580 (0.23)               | 610 (0.25)      |
| 5.                      | Sprinkler                      | 61500        | 56000  | 61500      | 56000  | -           | -     | 61500 (24.20)            | 56000 (22.60)   |
| 6.                      | Fencing                        | 6200         | 4680   | 6200       | 4680   | -           | -     | 6200 (2.49)              | 4680 (1.89)     |
| 7.                      | Planting materials (cutting)   | 97600        | 104400 | 97600      | 104400 | -           | -     | 97600 (39.20)            | 104400 (42.20)  |
|                         | Total material cost            | 186070       | 187780 | 187090     | 188536 | 22826       | 24836 | 209915.50 (74.30)        | 213372 (86.20)  |
|                         | Total establishment cost (A+B) | 191126.00    | 192051 | 207231     | 206102 | 41761       | 41541 | 248991.50 (100)          | 247642.90 (100) |

Note: Figures in parantheses indicate the percentage to the total cost

\*Plant protection chemicals

Table 2. Annual cost of vanilla (intercrop) (Rs.)

| Sl. No. | Particulars                            | Small farms       |                   |                   | Large farms      |                  |                  |
|---------|--|-------------------|-------------------|-------------------|------------------|------------------|------------------|
|         |  | III year          | IV year           | V year            | III year         | IV year          | V year           |
| I.      | Variable cost                          |                   |                   |                   |                  |                  |                  |
| A.      | Labour cost                            |                   |                   |                   |                  |                  |                  |
| 1.      | Manure and silt application            | 3000 (3.55)       | 3060 (3.27)       | 3120 (3.17)       | 2640 (3.27)      | 2700 (3.00)      | 2760 (2.91)      |
| 2.      | Mulching                               | 2340 (2.77)       | 2400 (2.56)       | 2460 (2.50)       | 1920 (2.38)      | 2040 (2.27)      | 2100 (2.22)      |
| 3.      | PPC* application                       | 600 (0.71)        | 600 (0.64)        | 600 (0.61)        | 540 (0.67)       | 540 (0.60)       | 540 (0.57)       |
| 4.      | Weeding                                | 4960 (5.86)       | 4880 (5.21)       | 4800 (4.87)       | 4440 (5.51)      | 4360 (4.85)      | 4320 (4.56)      |
| 5.      | Pollination                            | 8000 (9.46)       | 12000 (12.80)     | 14000 (14.20)     | 6000 (7.44)      | 10000 (11.10)    | 12000 (12.70)    |
| 6.      | Harvesting                             | 7200 (8.51)       | 10800 (11.50)     | 12600 (12.80)     | 5400 (6.70)      | 9000 (10.00)     | 10800 (11.40)    |
| 7.      | Watch and ward                         | 5600 (6.62)       | 5600 (5.98)       | 5600 (5.69)       | 5100 (6.33)      | 5100 (5.67)      | 5100 (5.38)      |
| 8.      | Irrigation                             | 1525 ( 1.80)      | 1525 (1.63)       | 1525 (1.55)       | 1525 (1.89)      | 1525 (1.69)      | 1525 (1.61)      |
| B.      | Material cost                          |                   |                   |                   |                  |                  |                  |
| 1.      | Manures                                | 2000 (23.60)      | 20250 (21.60)     | 20500 (20.80)     | 22800 (28.30)    | 23040 (25.60)    | 23280 (24.60)    |
| 2.      | Silt                                   | 1437.50 (1.70)    | 1500 (1.60)       | 1562.50 (1.59)    | 1380 (1.71)      | 1440 (1.60)      | 1500 (1.58)      |
| 3.      | Plant protection chemicals             | 640 (0.76)        | 732 (0.78)        | 850 (0.86)        | 735 (0.91)       | 845 (0.94)       | 916 (0.97)       |
| 4.      | Mulching                               | 1153 (1.36)       | 1189 (1.27)       | 1210 (1.23)       | 1025 (1.27)      | 1130 (1.26)      | 1085 (1.14)      |
| C.      | Interest rate on working capital @ 11% | 6210.10 (7.34)    | 7098.96 (7.58)    | 7571.03 (7.69)    | 5885.50 (7.30)   | 6789.20 (7.55)   | 7251.80 (7.65)   |
|         | Total variable cost (A+B+C)            | 62665.61 (74.10)  | 71634.96 (76.50)  | 76398.50 (77.60)  | 59390.50 (73.70) | 68509.20 (76.10) | 73177.80 (77.20) |
| II      | Fixed costs                            |                   |                   |                   |                  |                  |                  |
| 1.      | Rental value of land                   | 4650 (23.60)      | 4650 (4.97)       | 4650 (4.72)       | 4650 (5.77)      | 4650 (5.17)      | 4650 (4.91)      |
| 2.      | Land revenue                           | 50 (1.70)         | 50 (0.05)         | 50 (0.05)         | 50 (0.06)        | 50 (0.06)        | 50 (0.05)        |
| 3.      | Depreciation**                         | 319.18 (0.76)     | 289.60 (0.31)     | 262.90 (0.27)     | 263 (0.33)       | 243.20 (0.27)    | 224.40 (0.24)    |
| 4.      | Annual repairs                         | 760 (1.36)        | 890 (0.95)        | 985 (1.00)        | 550 (0.68)       | 795 (0.88)       | 960 (1.01)       |
| 5.      | Amortized establishment cost           | 16127.85 (7.34)   | 16127.85 (17.20)  | 16127.85 (16.40)  | 15728.60 (19.50) | 15728.60 (17.50) | 15728.60 (16.60) |
|         | Total fixed cost                       | 21907.03 (25.90)  | 22007.45 (23.50)  | 22075.80 (22.40)  | 21241.60 (26.30) | 21466.80 (23.90) | 21613 (22.80)    |
|         | Total cost (I+II)                      | 84572.64 (100.00) | 93642.41 (100.00) | 98474.30 (100.00) | 80632.20 (100)   | 89976 (100)      | 92790.90 (100)   |

\*Plant protection chemicals

\*\*Depreciation on equipment, sprinkler and fencing.

Figures in parentheses are per cent to total

per hectare in large farms was less than in small farms and these results are in conformity with a study on the economics of vanilla cultivation made earlier (Madan, 2004).

**Returns from vanilla:** Vanilla started yielding from third year onwards and yield levels stabilized from fifth year onwards. Returns obtained were green beans cuttings (Table 3). Gross returns earned per hectare by small farmers were Rs. 1,67,510, Rs. 4,10,880 and Rs. 6,39,760 during 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> year of bearing periods, while Rs. 1,89,700, Rs. 4,90,580 and Rs. 7,65,350 gross returns were obtained per hectare by large farmers during 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> year of bearing periods. Returns per rupee of total cost was Rs. 1.98 in 3<sup>rd</sup> year, Rs. 4.39 in 4<sup>th</sup> year and Rs. 6.50 in 5<sup>th</sup> year for small farms, while it was little high with respect to large farmers (Rs.2.35 in 3<sup>rd</sup> year, Rs. 5.51 in 4<sup>th</sup> year and Rs. 8.24 in 5<sup>th</sup> year) indicating economies of scale with respect to large farmers.

During the investigation, two marketing channels were identified; they are Channel - I: producer - local agents - export and Channel - II: producer - Vanilla Development Trust-export.

The farmers who were the members of the cooperative society, *i.e.*, Vanilla Development Trust Hiriyadka sold the produce to the trust, while others sold to local agents. Average marketing cost incurred per quintal of green beans was Rs. 29 and Rs. 33 in channel-I and channel-II, respectively. In both the channels, transportation cost accounted the major share followed by packing material and packing

costs. These results are in line with the results of Khirsagar *et al.* (2003)

To evaluate the feasibility of investment in vanilla as an intercrop in areca yard, the criteria of NPV, B:C ratio and IRR were used for both small and large farms which are presented in Table 4. The annual net cash inflows were discounted at the discount rate of 12 per cent which is opportunity cost of capital. NPV per hectare was Rs. 18,56,659 in small farms and Rs. 24,45,525 in large farms indicating higher profitability. Similarly, B:C ratio was also found high both in small farms (10.71) and large farms (13.75) implying financial soundness of the project.

Internal rate of returns (IRR) were 58 per cent in small farms and 65 percent on large farms. Investment was found feasible since IRR was higher than opportunity cost of capital (12%).

Cultivation of vanilla as intercrop in arecanut plantation was found profitable. Hence, appropriate combination of vanilla and perennial crop has to be encouraged. Non-availability of skilled labourers for pollination and processing of green beans were the major problems experienced by farmers. This led to

**Table 4. Financial feasibility of vanilla production (intercrop)**

| Sl No. | Financial viability measures      | Small farms  | Large farms  |
|--------|-----------------------------------|--------------|--------------|
| 1.     | Net present value (NPV)           | 18,56,659.40 | 24,48,524.80 |
| 2.     | Benefit:cost ratio (B:C ratio)    | 10.71        | 13.75        |
| 3.     | Internal rate of return (IRR) (%) | 58           | 65           |

Note: Discount rate was taken at 12%

**Table 3. Yield and returns (Rs/ha) from vanilla (intercrop)**

| Sl. No. | Particulars                                      | III year |        | IV year |        | V year |        |
|---------|--|----------|--------|---------|--------|--------|--------|
|         |  | Small    | Large  | Small   | Large  | Small  | Large  |
| 1.      | Number of vines                                  | 1952     | 2340   | 1952    | 2340   | 1952   | 2340   |
| 2.      | Number of yielding vines                         | 1658     | 1860   | 1804    | 2150   | 1952   | 2340   |
| 3.      | Yield of vanilla bean per vine (kg)              | 0.38     | 0.38   | 0.88    | 0.88   | 1.40   | 1.40   |
| 4.      | Total yield of vanilla bean (kg)                 | 630.0    | 706.8  | 1587.5  | 1892.0 | 2732.8 | 3248.0 |
| 5.      | Sale price per kg (Rs.)                          | 250      | 250    | 250     | 250    | 250    | 250    |
| 6.      | Returns by sale of bean (Rs.)                    | 157510   | 176700 | 396880  | 473000 | 619760 | 742950 |
| 7.      | Returns by sale of cuttings (Rs.)                | 10000    | 13000  | 14000   | 17580  | 20000  | 22400  |
| 8.      | Gross returns by sale of bean and cuttings (Rs.) | 167510   | 189700 | 410880  | 490580 | 639760 | 765350 |
| 9.      | Total variable cost of cultivation (Rs.)         | 62666    | 59391  | 71635   | 68509  | 76399  | 73178  |
| 10.     | Total cost of cultivation (Rs.)                  | 84573    | 80632  | 93642   | 88976  | 98474  | 92790  |
| 11.     | Net returns over variable cost (Rs.)             | 104844   | 130310 | 339245  | 422071 | 563362 | 692172 |
| 12.     | Net returns over total cost (Rs.)                | 82937    | 109068 | 317238  | 401604 | 541286 | 672560 |

low quality, poorly processed beans and some farmers adulterated the beans which in turn reduced the value in the international market off late vanilla cultivation found to be a loss venture. Hence, there is need to provide skill for the labourers in the activities like pollination. A good package for processing of vanilla beans needs the attention of the policy makers. It was also observed that no proper scale of finance was available for the crop from commercial or co-operative banks. Prevailing cost worked out may be considered as the scale of finance for sanctioning loans to vanilla growing farmers.

### References

- Khirsagar, B.M., Naidu, H.J. and Swamy K.G. 2003. Marketing of mango in Konkan costal region *Indian Journal of Agricultural Economics*. **46**:86-89.
- Lalith Achoth. 1978. Economics of tea production in the Niagara district. *M.Sc. (Hort.) Thesis*, University of Agricultural Sciences, Bangalore.
- Madan, M.S., 2004. Estimation of cost of cultivation in spices - vanilla. *Indian Journal of Arecanut, Spices and Medicinal plants* **6**(1): 28-37.
- Shivaram, Y. 1980, Evaluation of investment in coffee estate in Coorg district, Karnataka. *M.Sc. (Agri.) Thesis*, University of Agricultural Sciences, Bangalore.

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