**Technology Adoption by Coffee Growers**

**Abstract**

Coffee is one of the major horticultural exported crop. The coffee growers are looking the coffee cultivation has an enterprise/industry for the reason that a huge amount of finance, manpower, land, input is involved in coffee production. As coffee production involves more of energy, huge financial and human involvement there is an adoption of good and improved production practices by coffee growers to get good yield and income. Hence, there is a need to study extent of adoption of improved production practices of coffee technologies by coffee growers. The study was conducted in Chikkamagaluru and Kodagu District of Karnataka to study the extent of adoption practices of coffee growers. Random sampling method was used to select 120 respondents. The primary data was collected from respondents using pre-tested interview schedule. For this purpose, an ex-post facto research design was employed. From the study of the overall adoption of improved cultivation practices of coffee by the respondents, it was found that the majority (40.83 %) of the respondents belonged to the medium adoption category, followed by 33.34 per cent and 25.83 per cent of the respondents belonged to the high and low adoptive categories respectively. Majority (86.66 %) of the respondents had got optimum yield and 99.16 per cent had adopted cherry as their processing practice and 59.16 per cent of the respondents had adopted the parchment processing method of Coffee. And, 33.33 per cent of the respondents had adopted recommended grade specifications. Adequate knowledge about the recommended package of practices is the pre-requisite for use in the cultivation of crops. It is a fact that, recommended practices are major contributing factors to yield. So, inadequate knowledge about recommended practices leads to their improper adoption. The farmers were not fully aware of the recommended varieties, application of FYM, chemical fertilizers, bio fertilizer and pest and disease control measures. These are complex practices and require more education about practices in a more practical way.

Keywords: Adoption, Extent, Coffee growers, Cultivation practices, varieties

**Introduction**

 Coffee is the world’s second most traded commodity. In the modern urban life, coffee is a beverage and great socializer. Coffee is cultivated as a silvi-horti cropping system under a tree cover for better yield. Coffee species are shrubs or small trees native to tropical and southern Africa and tropical Asia. Indian Coffee is regarded as the best coffee globally since it is cultivated in shade rather than direct sunlight. Coffee is grown in the tropical belt of the world where there is good sunshine with heavy rains and rich organic soil. India is the seventh largest producer of coffee in the world. More than 60 per cent of Indian coffee production is being exported (Anonymous., 2021). The Western Ghats in the southern peninsula of India forms the backbone of India’s coffee industry, covering the traditional coffee growing regions in the states of Karnataka, Kerala and Tamil Nadu, which account for more than 90 per cent of Indian coffee production. However, coffee is grown to a lesser extent in Andhra Pradesh, Orissa and North-Eastern states. The regions with high elevations are well suited for cultivating Arabica coffee of high quality. Those areas with warm humid conditions are more suited for growing Robusta coffee. Coffee crop is one of the major horticultural exports crop the coffee growers are looking the coffee cultivation has an enterprise/industry and also for the reason that huge amount of finance, manpower, land, input is involved in coffee production. As coffee production involves more of energy, huge financial and human involvement there is an adoption of good and improved production practices by coffee growers to get good yield and income. Hence, there is a need to study extent of adoption of improved production practices of coffee technologies by coffee growers.

**Methodology**

The study was conducted in Kodagu and Chikkamagaluru district of Karnataka. These districts were selected purposively because it had large area under coffee (Bharath Kumar, T. P., 2010) Considering maximum area under coffee cultivation as criteria, two taluks from each district namely Virajpet and Ponnampet from Kodagu district and Chikkamagaluru and Mudigere taluks in Chikkamagaluru district were selected for conducting the study. Three villages having maximum area under coffee cultivation were selected from each taluk and from each village 10 farmers growing coffee were selected by simple random sampling procedure. Thus, sample from each taluk was 30 making a total sample size of 120 respondents. Personal interview method was followed to collect the information in the light of objectives of the study. A schedule was developed and pretested in non-sample area was considered for the study. For this purpose, an ex-post facto research design was employed. The data collected were coded, analyzed and tabulated by using statistical tools such as frequency, percentage, mean, standard deviation and chi-square test.

**Results and discussion**

The data regarding the overall adoption of improved cultivation practices of coffee by the respondents (Table 1) revealed that the majority (40.83 %) of the respondents belonged to the medium adoption category, followed by 33.34 per cent and 25.83 per cent of the respondents belonged to the high and low adoptive categories respectively.

Adequate knowledge about the recommended package of practices is the pre-requisite for use in the cultivation of crops. It is a fact that, recommended practices are major contributing factors to yield. So, inadequate knowledge about recommended practices leads to their improper adoption. The farmers were not fully aware of the recommended varieties, application of FYM, chemical fertilizers, bio fertilizer and pest and disease control measures. These are complex practices and require more education about practices in a more practical way.

 It is seen from Table 1 that the majority of the respondents (40.83 %) had a medium overall adoption level. Whereas, 33.34 per cent of the respondents had a high level and 25.83 per cent had a low level of overall adoption. More than half of the respondents had adopted recommended varieties, planting material, spacing, and fertilizer application, harvesting and processing methods. The results are in accordance with the findings of Jakkawad et al. (2017).

 **Table 1: Distribution of respondents based on overall Extent of adoption**

 **(n=120)**

| **Category** | **Respondents** |
| --- | --- |
| **Frequency** | **Percentage** |
| Low (<37.55) | 31 | 25.83 |
| Medium (37.55-39.99) | 49 | 40.83 |
| High (>39.99) | 40 | 33.34 |
| **Total** | **120** | **100.0** |

The results depicted in Table 2 indicated that, with respect to varieties, in Robusta 80.00 per cent of the respondents adopted the C X R variety whereas, 79.16 per cent of the respondents adopted the S-274 Old variety. While, with respect to Arabica, 81.66 per cent of the respondents adopted the Hemavati variety, 80.83 per cent of the respondents adopted Selection 1,3,5,7,8,10,11,12, followed by 78.33 per cent of selection 9 variety, 77.50 per cent of the respondents adopted Chandragiri and Cauvery variety and 76.66 per cent of Selection-6 variety.

 In case of planting time, 83.33 per cent of respondents adopted the recommendation for June-July month for the planting of coffee

Further, 85.00 per cent of the respondents had chosen poly bag plants as their planting material. Majority of the respondents had adopted the practices like the use of recommended varieties, planting time, planting material, spacing, size of pits for planting coffee and plant population. This might be due to good extension contact and these are the important cultivation practices that had to be adopted otherwise it will have a direct effect on the yield of the crop.

 Further, the majority of the respondents (91.66 %) adopted Mixed cropping as their cropping pattern. Whereas, 8.33 per cent of the respondents had adopted mono-cropping as their cropping pattern and in the case of spacing, 83.33 per cent of the respondents adopted recommended spacing in Arabica, followed by 80.33 per cent in case of Robusta. This might be due to the reason that, as coffee is a plantation crop farmers can’t depend solely on one crop for their income. Also, mixed cropping permits greater utilization of a larger volume of soil and improves access to relatively immobile nutrients.

 It can be observed from Table 3 that 89.16 per cent of the respondents had planted silver oak and forest trees for shade followed by 82.50 per cent of the respondents had planted Alvanna trees for shade and regarding the size of the pits, 93.33 per cent of the respondents had adopted recommended size of the pits for planting coffee. This might be due to the reason that, as there is good demand for silver oak timber majority of the farmers have used it for shade.

Regarding plant population 84.16 per cent of the respondents had planted the ideal number of coffee plants in robusta. Whereas, 83.33 per cent of the respondents had planted a recommended number of plants in arabica. Majority (85.83 %) of the respondents had followed recommended time of pruning and 77.50 per cent of the respondents had adopted recommended type of pruning. The probable reason might be that by pruning old unproductive parts are removed, this encourages the growth of new branches and training helps to restrict the plant growth at desirable height for better management and also pooling the nutrients for yield maximization.

 Nearly three fourth (75.80 %) of the respondents had adopted recommended type of shade regulation and 70.00 per cent of the respondents had adopted the recommended time of shade regulation. And, in case of irrigation 95.00 per cent of the respondents had adopted sprinkler irrigation followed by 90.83 per cent and 88.33 per cent of the respondents had given Back showers and Blossom showers at the recommended time. Majority of the respondents had followed the proper time of shade regulation and type of shade regulation because shade regulation helps to protect the coffee plant from excessive heat and reduce its exposure to direct sunshine. Moreover, shade trees can act as windbreaks and also contribute to soil fertility.

Cent per cent of the respondents had followed recommended dose of fertilizer application and 87.50 per cent of the respondents had adopted recommended dose of lime application.

 To control the major pests, it can be observed from Table 3 that 85.00 per cent of the respondents used chemicals for control and 75.00 per cent of the respondents used cultural methods for controlling white stem borer. Regarding berry borer, 69.16 per cent of the respondents controlled chemically and 64.16 per cent of the respondents controlled culturally. 82.50 per cent of the respondents controlled shot hole borer followed by 83.33 per cent of the respondents who controlled green scales and mealy bugs chemically. (Singh, S. R. K and eta al, 2019)

To control disease, 80.00 per cent and 79.16 per cent of the respondents had adopted the recommended cultivation practices to control Koleroga and Rust disease respectively. Regarding harvest 90.83 per cent of the respondents had adopted recommended time for harvest and cent per cent of the respondents had adopted a manual method of harvesting and none of them had adopted a mechanized method of harvesting. The probable reason might be as pests and diseases play a major role in the yield of a crop, so farmers cautiously control the pest and diseases.

 Majority (86.66 %) of the respondents had got optimum yield and 99.16 per cent had adopted cherry as their processing practice and 59.16 per cent of the respondents had adopted the parchment processing method of coffee. And, 33.33 per cent of the respondents had adopted recommended grade specifications. The reason might be, as parchment processing includes extra work, time and labour for processing while cheery processing is a lot easier compared to parchment processing. In the case of grade specification, only one-third of the respondents went for it, the reason might be due to extra work, so majority of the respondents didn’t go for it. Maratha, P., 2017, Chethan, M. G., (2011) and Subhash, V., (2020)

**Table 2: Extent of adoption of improved cultivation practices of coffee by the respondents**

 **(n=120)**

Contd…**…**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No** | **Recommended practices** | **Adoption** | **Non-****Adoption** |
| **F** | **%** | **F** | **%** |
| **1** | **Varieties** |  |  |
| a. | Robusta |  |  |
| i | S-274 Old | 95 | 79.16 | 25 | 20.84 |
| ii | C X R | 96 | 80.00 | 24 | 20.00 |
| b. | Arabica |  |  |
| i | Hemavathi | 98 | 81.66 | 22 | 18.34 |
| ii | Chandragiri | 93 | 77.50 | 27 | 22.50 |
| iii | Cauvery | 93 | 77.50 | 27 | 22.50 |
| iv | Selection 1,3,5,6,7,8,9,10,11,12 | 97 | 80.83 | 23 | 19.17 |
| **2**. | **Planting time** |  |  |
|  | Rainy (June-July Month) | 100 | 83.33 | 20 | 16.67 |
| **3.** | **Planting Material** |  |  |
|  | Poly bag plants | 102 | 85.00 | 18 | 15.00 |
| **4.** | **Cropping pattern** |  |  |
| a. | Mono cropping | 10 | 8.33 | 110 | 91.67 |
| b. | Mixed cropping | 110 | 91.66 | 10 | 8.34 |
| **5**. | **Spacing** |  |  |
| a. | Robusta (8ft X 8ft) | 97 | 80.83 | 23 | 19.17 |
| b. | Arabica (5ft X 6ft) | 100 | 83.33 | 20 | 16.67 |
| **6.** | **Standards used for shed** |  |  |
| i. | Erythrinaindica (Alvanna/Palvanna) | 99 | 82.50 | 21 | 17.50 |
| ii. | Silver oak | 107 | 89.16 | 13 | 10.84 |
| iii. | Forest trees | 107 | 89.16 | 13 | 10.84 |
| **7.** | **Size of the pits for planting coffee** |  |  |
|  | 45cm X 45cm X 45cm | 112 | 93.33 | 08 | 6.67 |
| **8.** | **Number of plants/acres** |  |  |
| a. | Robusta - 681 | 101 | 84.16 | 19 | 15.84 |
| b. | Arabica-1452 | 100 | 83.33 | 20 | 16.67 |
| **9.** | **Training and pruning of coffee** |  |  |
| a. | Time of pruning (month) | 103 | 85.83 | 17 | 14.17 |
| b. | Type of pruning | 93 | 77.50 | 27 | 22.50 |
| **10**. | **Shade regulation during monsoon season** |  |  |
| a. | Time of Shade regulation (month) | 84 | 70.00 | 36 | 30.00 |
| b. | Type of Shade regulation | 91 | 75.80 | 29 | 24.20 |
| **11.** | **Irrigation** |  |  |
| a | Blossom showers | 106 | 88.33 | 14 | 11.67 |
| b | Back showers | 109 | 90.83 | 11 | 9.17 |
| c | Method of irrigation sprinkler | 114 | 95.00 | 06 | 5.00 |
| **12.** | **Fertilizers applied** |  |  |
| a. | NPK-24:15:24gmper plant after 5th year | 120 | 100 | 00 | 00 |
| b. | Lime – 200 kg/ acre | 105 | 87.50 | 15 | 12.50 |
| **13.** | **Measures to control the major pests** |  |  |
| a. | **White stem borer** | Maintain/create optimum shade Or Install pheromone traps @ 25 /ha, if the incidence is high. | 90 | 75.00 | 30 | 25.00 |
|  |  | Pad with monocrotophos 36 WSC @ 5 ml. | 102 | 85.00 | 18 | 15.00 |
| b. | **Berry borer** | Meticulously remove the leftover berries.Remove offseason berries to save main crop. | 77 | 64.16 | 43 | 35.84 |
|  |  | Spray Quinalphos 25 EC @ 340 ml/200 lit or lamdacyhalothrin 5 EC 120 – 160 ml / 200 lit. | 83 | 69.16 | 37 | 30.84 |
| c | **Shot hole borer** | Spraying with Quinalphos 25 EC 2 ml/lit. | 99 | 82.50 | 21 | 17.50 |
| d | **Green scales and mealy bugs** | Monocrotophos 36 % SL- 1.5 ml/lit.orQuinalphos 25 % EC- 2.5 ml/lit. | 100 | 83.33 | 20 | 16.67 |
| **14.** | **Measures to control the major diseases** |  |  |
| a. | **Rust** | Spray 0.5% Bordeaux mixture | 95 | 79.16 | 25 | 20.84 |
| b. | **Koleroga** | Spray 1% of Bordeaux | 96 | 80.00 | 24 | 20.00 |
| **15** | **Months the coffee plant takes to start yielding after 4 years** |
|  | 8-9 months | 95 | 79.16 | 25 | 20.84 |
| **16** | **Harvest** |  |  |
| a. | Harvest during November and February | 109 | 90.83 | 11 | 9.17 |
| b | Method of harvest - Manual | 120 | 100 | 00 | 00 |
| **17** | **Yield** |  |  |
|  | 750 - 1000 kg dry parchment /ha | 104 | 86.66 | 16 | 13.34 |
| **18** | **Processing** |  |  |
| a. | Parchment | 71 | 59.16 | 49 | 40.84 |
| b. | Cherry | 119 | 99.16 | 01 | 0.84 |
| **19** | **Grade specification** |  |  |
|  | Washed, Unwashed, Monsooned, Instant, Ground, Roasted | 40 | 33.33 | 80 | 66.67 |

**Table** **3: Association between personal, socio-economic, psychological, and communication characteristics with the extent of adoption of coffee growers**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No** | **Independent variables** | **p-value** | **Chi-square statistic** |
| 1 | Age | 0.514 | 3.266NS |
| 2 | Education | 0.202 | 5.965NS |
| 3 | Family size | 0.069 | 8.717NS |
| 4 | Occupation | 0.004 | 4.043\* |
| 5 | Land holding | 0.275 | 5.126NS |
| 6 | Annual income | 0.002 | 17.127\* |
| 7 | Farming experience | 0.023 | 11.289\* |
| 8 | Market orientation | 0.784 | 1.735\* |
| 9 | Mass media exposure | 0.029 | 10.781\* |
| 10 | Extension participation | 0.001 | 33.214\*\* |
| 11 | Extension contact | 0.017 | 12.042\* |
| 12 | Credit orientation | 0.025 | 11.182\* |

**\*Significant at 5% level of probability \*\* Significant at 1% level of probability**

**NS -Non significant**

The data in Table 3 revealed that occupation, farming experience, annual income, extension contact, market orientation, mass media exposure and credit orientation were significantly associated with the extent of adoption of coffee growers at a 5 per cent level of significance and extension participation was also significantly associated with the extent of adoption of coffee growers at 1 per cent level of significance. Other variables like age, education, family size and land holding showed non-significant association with the extent of adoption of coffee growers. The possible reason could be coffee as the traditional crop of the research area grower’s knowledge and experience with respect to cultivating the crop was very high and thus it would be simple for them to adopt most of the recommended cultivation practices. It is natural that mass media carry more information on improved methods of coffee cultivation. Farmers who had been exposed adequately to mass media might been had influenced by it. This might be because of the fact that the growers with large financial resources can take up the adoption of recommended practices quite easily. Since most of the respondents were in the medium annual income category, this could be the possible reason for the significant association between annual income and the adoption level of coffee growers Venkataramalu (2003) Since, there is a significant difference in extent of adoption among the coffee growers, the null hypothesis, H0 (2) is rejected.

**Conclusion**

Adequate knowledge about the recommended package of practices is the pre-requisite for use in the cultivation of crops. It is a fact that, recommended practices are major contributing factors to yield. So, inadequate knowledge about recommended practices leads to their improper adoption. A medium level of overall entrepreneurial behavior and medium level in different entrepreneurship components was found among the coffee growers. The growers are more potential in learning and adopting new technologies both in backward and forward linkages of coffee production. Periodic and intensive entrepreneurship development capacity building programmes need to be organized by the Government and other extension agencies for creating awareness about entrepreneurial opportunities, followed by vigorous follow-up, guidance and counseling for the sustainability of the entrepreneurial activity. There is also need of establishing a separate Entrepreneurial Development Centre (EDC) in the traditional belts of coffee growing areas to train growers on different components of entrepreneurship for the development of coffee production. in the country.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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