

A Comparative Study of Farm Income and Economic Viability of Organic and Conventional Coffee and Pepper Cultivation: A Case Study of Meenangadi Grama Panchayat, Wayanad

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Publication Date: 2026/10/05

Abstract: Plantation agriculture plays an important role in the livelihood of farming households in Meenangadi Grama Panchayat, Wayanad, where coffee and pepper are the major commercial crops. However, farmers face several challenges, including irregular rainfall, pest and disease incidence, labour scarcity, rising wage rates, increasing cultivation costs and fluctuations in market prices. Organic farming has emerged as an environmentally sustainable alternative, but its economic viability compared with conventional farming requires closer examination at the micro level. This study examines the socio-economic characteristics, farming practices, constraints, and profitability of organic and conventional coffee-pepper farming in Meenangadi Grama Panchayat. A descriptive and analytical research design was adopted, and primary data were collected through personal interviews from 120 farm households, comprising 60 organic and 60 conventional farmers. Secondary data were obtained from government publications, institutional reports and relevant academic literature. The study compares the costs, gross returns, net returns and Benefit–Cost Ratio (BCR) of the two farming systems. The findings indicate that both organic and conventional farms generated positive returns over the measured cost of cultivation. Organic farms incurred substantially lower mean per hectare cultivation costs, whereas conventional farms recorded higher mean gross and net returns. However, the difference in the Benefit Cost Ratio between the two farming systems was not statistically significant, suggesting comparable economic efficiency relative to investment. The major constraints faced by organic farmers include market uncertainty, price fluctuations, high labour costs, certification difficulties and limited institutional support. The study concludes that organic plantation farming is economically viable in the study area, although its relative profitability cannot be established conclusively. Strengthening market linkages, certification support, extension services and productivity-enhancing measures is essential for improving its long-term economic sustainability.

Keywords: Organic Farming, Conventional Farming, Plantation Agriculture, Coffee; Pepper, Cost of Cultivation, Farm Profitability, Benefit Cost Ratio.

How to Cite: Dr. Prajisha P.; Dr. Rahul K., Dr. Rajimol M. S.; Adithya Mohanan (2026) A Comparative Study of Farm Income and Economic Viability of Organic and Conventional Coffee and Pepper Cultivation: A Case Study of Meenangadi Grama Panchayat, Wayanad. *International Journal of Innovative Science and Research Technology*, 11(9), 2719-2724. <https://doi.org/10.38124/ijisrt/26sep1391>

I. INTRODUCTION

Agriculture continues to occupy an important place in the Indian economy by providing employment, food security and income to a large section of the population. In Kerala, plantation agriculture is particularly important in the highland districts, where it contributes to farm income, employment and allied activities such as processing, transport and marketing. Wayanad is one of the major plantation districts

of the State, with coffee and pepper forming an important part of its agricultural economy. Robusta coffee is the dominant variety, while pepper is commonly grown as an intercrop in coffee gardens. The mixed cropping and shade grown plantation system followed in the district also provides favourable conditions for the adoption of organic farming practices.

The increasing use of chemical fertilisers and pesticides has contributed to higher agricultural production, but prolonged and indiscriminate use of such inputs has also raised concerns regarding soil degradation, declining soil fertility, biodiversity loss, water pollution and increasing cultivation costs. Organic farming has therefore emerged as an alternative approach based on organic manure, biological processes, crop rotation, and non chemical methods of pest and disease management. Organic farming can contribute to long-term sustainability by improving soil health, conserving biodiversity and reducing dependence on external chemical inputs [1,2]. However, its economic performance depends on factors such as output, labour cost, input cost, market access and the availability of premium prices [3].

Plantation farmers in Wayanad also face a number of production and marketing constraints, including labour scarcity, high wage rates, irregular rainfall, pest and disease incidence, wildlife-related crop loss, unstable prices and rising cultivation costs. Earlier studies on coffee cultivation in the district have identified climate variability, black rot, berry dropping, pest incidence and low profitability as important concerns [4]. In the case of organic farming, these problems may be further influenced by conversion related yield changes, certification expenses, limited market linkages and inadequate institutional support. Therefore, the environmental advantages of organic farming need to be examined together with its cost and profitability at the farm level.

Although a considerable body of literature is available on organic farming and plantation agriculture, relatively few micro-level studies have compared the economic performance of organic and conventional plantation farms at the Grama Panchayat level in Wayanad. In this context, the present study examines organic and conventional plantation farming in Meenangadi Grama Panchayat by analysing the socio-economic and farm characteristics of farmers, identifying the major constraints associated with organic farming, and comparing the cost, income and profitability of the two farming systems.

II. REVIEW OF LITERATURE

The economic viability of organic farming has received considerable attention, particularly in relation to production costs, yield differences and price premiums. Earlier evidence suggests that organic farming can remain economically competitive with conventional agriculture because of lower dependence on purchased inputs, diversified production and greater capacity to withstand economic and natural risks [5,6]. Crowder and Reganold [7], based on a global meta-analysis, found that organic farming was substantially more profitable than conventional farming when actual organic price premiums were considered, even though organic yields were generally lower and labour costs were relatively higher. More recent evidence from tropical farming systems also shows that organic and conventional systems can generate comparable gross margins and that associated and rotational crops can make an important contribution to overall farm profitability [8]. Evidence from India similarly shows that

lower yields, higher production costs in some situations and market-access constraints remain important trade-offs, while premium prices, lower dependence on external inputs and improved soil resilience can strengthen the long-term economic viability of organic farming [9]. Thus, the profitability of organic farming cannot be explained merely by whether a farm is organic or conventional; it depends on yield, labour requirement, input cost, crop combination, output prices and access to appropriate markets.

The economic performance of organic farming is closely linked with its environmental sustainability. Organic farming is generally associated with reduced dependence on synthetic agrochemicals and improvements in soil quality, biodiversity and ecological sustainability [1,2]. However, the transition from conventional to organic farming can involve lower yields, difficulties in nutrient and pest management, certification problems and marketing constraints [10,11]. These issues are particularly important for small and marginal farmers because even a temporary decline in output or failure to obtain a premium price can reduce farm income considerably. At the same time, some of the benefits of organic farming become more visible over a longer period. Recent evidence indicates that organic management can improve the physical, chemical and biological properties of soil, including soil carbon, nutrient availability and microbial activity, although short-run yields may remain lower than those under conventional farming [12]. Evidence from Robusta coffee systems also shows that organic management and shade-tree systems can reduce certain pest infestations and provide additional ecological benefits [13]. Therefore, assessment of organic farming should go beyond immediate crop yield and consider input use, soil productivity, pest management and sustainability of production over time.

The Kerala experience further indicates that economic viability is influenced by certification, marketing arrangements and institutional support. Parvathi and Waibel [14], in their study of certified smallholder black pepper farmers in Kerala, found that organic and fair-trade certification improved income compared with conventional farming, although fair-trade participation did not provide an additional income advantage to farmers who were already organically certified. Studies from Kerala also show that weak market access reduces the benefits of organic production, while better price realisation and fair-trade arrangements can improve farm income [3]. These issues are highly relevant to Wayanad, where organic cultivation takes place largely within a smallholder and plantation-based agricultural system. A study from Mananthavady identified high labour costs, inadequate extension services, limited mechanisation, certification difficulties, absence of branding and marketing problems as important constraints faced by organic farmers [15]. Coffee growers in Wayanad also face problems relating to production, harvesting, changing weather conditions, pest and disease incidence and access to quality inputs [4]. Although these studies provide useful evidence on organic farming, certification and production constraints in Kerala and Wayanad, relatively little empirical work has compared the economic performance of organic and conventional coffee-pepper farms at the Grama

Panchayat level. In particular, differences in per-hectare cost of cultivation, gross return, net return, benefit-cost ratio and investment efficiency have received inadequate attention. The present study attempts to address this gap by making a comparative economic assessment of organic and conventional coffee and pepper farms in Meenangadi Grama Panchayat of Wayanad district.

III. METHODOLOGY

The study is based on primary data collected from plantation farmers in Meenangadi Grama Panchayat of Wayanad district, Kerala. A total sample of 120 farmers was selected for the study, which is consisting of 60 organic farmers and 60 conventional farmers. The sample was designed to enable a direct comparison between the two farming systems. Information was collected on the socio-economic characteristics of farmers, farm size, cropping pattern, input use, labour use, cost of cultivation, output, price realised, gross income, marketing conditions and constraints faced in cultivation. The analysis was carried out mainly on a per-hectare basis so that differences arising from variation in farm size could be minimised.

The economic performance of organic and conventional farms was evaluated using standard farm profitability indicators. Total cost of cultivation was estimated by combining variable and fixed costs including expenditure on planting material, manure or fertiliser, plant protection inputs, labour, irrigation, machinery, transportation, value of land, depreciation and interest on fixed capital, wherever applicable. Gross return was estimated as the value of output obtained by multiplying quantity produced by the price realised. Net return was calculated by deducting total cost from gross return. Benefit Cost Ratio was estimated as the

ratio of gross return to total cost, while Return on Investment was calculated as net return as a percentage of total cost. These indicators were used to compare the relative economic viability of organic and conventional plantation farming.

The data were analysed using descriptive and inferential statistical techniques. Frequencies, percentages, mean, standard deviation, range and variance were used to describe the socio-economic and farm characteristics of the respondents. Cross-tabulation and percentage analysis were employed to examine differences in categorical characteristics between organic and conventional farmers. Independent-samples t-tests were used to compare the mean per-hectare total cost, gross return and net return of organic and conventional farms. Levene's test was applied to examine the equality of variances, and the Welch test result was considered where the equal-variance assumption was not satisfied. A p value below 0.05 was treated as statistically significant. All statistical computations were carried out using IBM SPSS Statistics.

IV. RESULTS AND DISCUSSIONS

The analysis is based on 120 plantation farmers in Meenangadi Panchayath, consisting of 60 organic farmers and 60 conventional farmers. The socio-economic characteristics of the respondents provide the background for understanding the differences in farm income and profitability between the two farming systems. The average age of the respondents was 58.03 years, indicating that plantation farming in the study area is largely undertaken by middle-aged and older farmers. The relatively limited participation of younger persons may have implications for the future continuity of plantation farming in the region.

Table 1 Selected Socio-Economic Characteristics of Respondents

Characteristic	Category / Measure	Value
Sample size	Total respondents	120
Farming system	Organic / Conventional	60 / 60
Age	Mean age (years)	58.03
Education	Secondary education	50 respondents
Gender	Male / Female	95 / 25
Annual family income	Mean (Rs.)	1,02,390

Source: Primary Data, 2026.

➤ Farm Characteristics and Cultivation Practices

The average landholding of the surveyed farmers was 2.37 acres, while the average area under the selected plantation crop was 1.94 acres. However, there was considerable variation in the size of holdings, with total landholding ranging from 0.50 acre to 10 acres. This indicates that plantation farming in the study area is undertaken under widely different farm-size conditions.

There are clear differences between organic and conventional farmers in the use of farm inputs. Among organic farmers, compost and farmyard manure were the major nutrient sources. Out of the 60 organic farmers, 37 reported composts as their principal organic input, while 20 mainly depended upon cattle yard manure. Manual methods

constituted the most important form of pest and disease control, followed by neem based and other methods. In contrast, conventional farmers depended on purchased chemical fertilizers and chemical plant-protection measures. Complex fertilizers and urea were commonly used, while fungicides, herbicides and insecticides formed part of the plant-protection system.

These differences in input use are important in explaining the economic performance of the two farming systems. Organic farming involves relatively limited dependence upon purchased chemical inputs, whereas conventional cultivation involves greater expenditure on fertilizers, pesticides and related inputs.

However, a lower cultivation cost by itself does not necessarily imply higher profitability because economic

returns also depend upon yield, crop combination, output price and market conditions.

Table 2 Landholding and Area under Selected Crop

Variable	N	Minimum (acres)	Maximum (acres)	Mean (acres)	Std. Dev.
Total Landholding	120	0.20	12.00	2.37	2.58
Area under Selected Crop	120	0.15	10.00	1.94	2.29

Source: Primary data, 2026.

Table 3 Major Input and Plant-Protection Practices by Farming System

Farming System	Practice / Input	Number of Farmers
Organic	Compost as main organic input	37
Organic	Farmyard manure as main organic input	20
Organic	Manual pest and disease control	44
Conventional	Complex fertilizer as main chemical fertilizer	22
Conventional	Urea as main chemical fertilizer	16

Source: Primary Data, 2026.

➤ Cost of Cultivation, Gross Return and Net Farm Income

The most important difference between the two groups is observed in the level of cultivation cost and farm returns. The average total cost of cultivation was ₹26,974.67 per hectare among organic farmers, compared with ₹1,25,925.00 per hectare among conventional farmers. Thus, conventional cultivation involved a substantially higher level of expenditure per hectare.

The difference was even more visible in gross farm returns. Organic farms reported an average gross return of ₹57,229.00 per hectare, whereas the corresponding return among conventional farms was ₹3,66,477.50 per hectare. Similarly, the average net return was ₹30,254.33 per hectare for organic farms and ₹2,40,552.50 per hectare for conventional farms.

Table 4 Comparative Cost and Returns of Organic and Conventional Farms

Indicator	Organic Farming (₹/ha)	Conventional Farming (₹/ha)
Total Cost of Cultivation	26,974.67	1,25,925.00
Gross Return	57,229.00	3,66,477.50
Net Return	30,254.33	2,40,552.50

Source: Primary Data, 2026.

The results therefore reveal an important feature of plantation farming in the study area. Organic cultivation is characterized by considerably lower expenditure but this cost advantage is accompanied by substantially lower gross and net monetary returns. Conventional farmers, on the other hand, incur much higher cultivation costs, but the additional expenditure is associated with much higher gross as well as net returns. The large standard deviations, particularly among conventional farmers, also indicate considerable variation in the economic performance of individual farms.

However, the observed difference in returns should not be attributed entirely to the farming system. The available data do not separately identify the influence of crop composition, productivity, output prices, quality differences, farm management and other factors. Hence, the higher return of conventional farms should be interpreted as an observed association within the surveyed sample rather than as the effect of conventional farming alone.

➤ Statistical Significance of the Difference in Profitability

The statistical analysis confirms that the observed differences in cost and returns are not merely descriptive differences. Since Levene's test indicated unequal variances between the two groups, the Welch independent-samples t-test was used.

The difference in total cost of cultivation was statistically significant at the one per cent level ($t = -4.455$; p is 0.001). The difference in gross return was also statistically significant ($t = -3.944$; p is 0.001). Similarly, the difference in net return between organic and conventional farmers was statistically significant ($t = -3.464$; $p = 0.001$). In all the three cases, conventional farms recorded higher mean values.

These results establish that there is a significant difference between organic and conventional farms in terms of the absolute monetary cost and return per hectare. While organic farmers operate with a much lower cost structure, conventional farmers obtain significantly higher gross and net farm income.

Table 5 Welch T-test for Cost and Return Indicators

Variable	t-value	df	p value	Result
Total Cost of Cultivation	-4.455	40.20	0.001	Significant
Gross Return	-3.944	39.42	0.001	Significant
Net Return	-3.464	39.37	0.001	Significant

Source: Primary Data, 2026.

➤ *Benefit-Cost Ratio and Return on Investment*

Absolute farm income provides only one dimension of economic performance. It is also important to examine how efficiently the amount invested in cultivation generates returns. For this purpose, the Benefit Cost Ratio (BCR) and Return on Investment (ROI) were considered.

The mean BCR was 2.42 for organic farms and 2.76 for conventional farms. This implies that every rupee of measured cultivation cost generated an average gross return of ₹2.42 under organic farming and ₹2.76 under conventional farming. The corresponding mean ROI was 142.18 per cent for organic farmers and 175.78 per cent for conventional farmers.

Table 6 Benefit-Cost Ratio and Return on Investment

Farming System	Mean BCR	Mean ROI (%)
Organic Farming	2.42	142.18
Conventional Farming	2.76	175.78

Source: Primary Data, 2026.

Although conventional farming recorded a higher BCR, the difference in BCR between the two groups was not statistically significant ($t = -0.927$ and $p = 0.357$). Therefore, the two farming systems cannot be considered statistically different when profitability is measured in terms of return generated per rupee of cultivation cost. No separate significance test was reported for the difference in ROI.

the two systems becomes much smaller when returns are considered relative to investment. Thus, conventional farming has an advantage in terms of absolute farm income, whereas the evidence regarding its relative profitability advantage is less conclusive.

This finding is particularly important. The conventional system generates much higher absolute income, but it also requires a substantially higher investment. Organic farming generates lower monetary returns, but it does so with a much lower cultivation cost. Consequently, the difference between

➤ *Labour Utilization*

Labour use also differed considerably between the two farming systems. The mean labour utilization was 72.8 man-days per hectare per year among organic farms, compared with 45.2 man-days among conventional farms. This indicates that organic farming was considerably more labour intensive within the surveyed sample.

Table 7 Labour Utilization by Farming System

Farming System	N	Mean Labour (man-days/ha/year)
Organic Farming	60	72.8
Conventional Farming	60	45.2

Source: Primary Data, 2026.

Higher labour use may partly contribute to the higher cost of organic cultivation. At the same time, greater labour input may also be associated with more intensive cultivation and higher output. Since the available analysis does not separately estimate labour productivity, it is not possible to determine whether the additional labour expenditure itself produces a proportionate increase in output or income.

This is particularly relevant in the case of organic farming. The economic justification for organic production partly depends upon the ability of farmers to obtain a remunerative price or an organic price premium. If organically produced output is sold through the same market channels as conventional produce without any significant price advantage, the incentive for farmers to continue organic production may remain weak. Certification difficulties and inadequate market linkages may further reduce the economic advantage expected from organic cultivation.

➤ *Market and Institutional Constraints*

The economic performance of organic farming cannot be examined only in terms of production conditions. Market conditions are equally important. The surveyed farmers reported price fluctuations, market uncertainty, transport difficulties, high labour costs and certification-related problems as major constraints. Marketing was largely dependent upon local traders and nearby-town markets. The study also indicates that a considerable number of respondents remained uncertain regarding the long-term economic viability of organic farming.

V. CONCLUSION

The comparative analysis brings out a mixed picture regarding the economic performance of organic and conventional plantation farming in Meenangadi Panchayath. On the one hand, organic farming involves a considerably lower cost of cultivation and generates positive returns. On the other hand, conventional farming records significantly

higher gross and net returns per hectare. The higher monetary return of conventional farms is accompanied by substantially higher investment and greater labour utilization.

More importantly, the difference in the Benefit-Cost Ratio is not statistically significant. This suggests that the very large difference observed in absolute farm income does not translate into an equally strong difference in return per rupee invested. Therefore, it may not be appropriate to conclude merely from gross and net income figures that conventional farming is economically superior in every respect. Both of these farming systems appear economically viable on the basis of a BCR greater than one and positive ROI.

The results further reveal that the economic viability of organic plantation farming cannot be improved merely through reduction in cultivation cost. What is required is an improvement in farm productivity, market access and price realization. Certification support, development of specialized organic marketing channels, reduction of marketing costs and better linkage with consumers may enable organic farmers to obtain a price premium for their produce. Unless such market advantages are realized, the lower cost of organic farming may continue to be accompanied by comparatively lower absolute farm income.

The study, therefore, indicates that the choice between organic and conventional farming involves a trade-off between cost and absolute return. Conventional farmers incur higher expenditure and obtain significantly higher monetary returns, while organic farmers operate at a lower cost and continue to generate positive returns with a BCR statistically comparable to that of conventional farmers. The relative advantage of organic farming will therefore depend to a considerable extent upon improvements in productivity, certification, market linkage and price realization

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