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Economic Significance of Coffee (*Coffee Arabica*) Production in Parbat District of Nepal

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Abstract

This study considered the production economics of coffee in Pakuwa village development committee of Parbat district, Nepal. Household Survey was done in June 2014. Data collection was done using semi-structured pre-tested questionnaire administered on 40 coffee producers selected randomly. Gross margin analysis, profitability index and the benefit-cost ratio was used to analyze the production economics of coffee in the study area. The results revealed coffee cultivation as a profitable enterprise in the study area. This is reflected by the gross margin of NRs. 90205.43 per hectare, benefit-cost ratio of 3.84 and profitability index of 1.23. Coffee sector alone contributed 16.26 percent of total household income showing positive sign for commercialization. The number of productive plants and cost on sapling were the most significant factor affecting coffee production. While keeping other explanatory variables constant, production function analysis resulted one percent change in number of productive plants and cost of sapling would increase the yield of coffee by 0.894 and 0.151 percent respectively. Further, increasing return to scale was observed in coffee production with value 1.26. Farmers explained more income from coffee and easy to sell as the major reasons of its cultivation. Lack of irrigation and lack of detailed knowledge about improved coffee production technology were ranked as production constraints whereas; low price and lack of processing facility stood as marketing constraints of coffee in the study area. Study resulted positive economic significance of coffee and this shows immense need of Government, NGOs, traders, and other line agencies to lay efforts on production and marketing management such that its quality production and household income can be raised.

Keywords:
Production economics, Coffee, Profitability index, Benefit-cost ratio, Return to scale, Nepal

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INTRODUCITON

Within Nepal there is remarkable ethnic and biological diversity and a wealth of indigenous knowledge of plants with economic value. High value cash crops such as coffee show great potentiality from the perspective of trade. As the climate and soil in the mid and high hills of Nepal are found to be very suitable for Arabica coffee, the coffee planted in Nepal is all Arabica (Giri, 2006). Coffee is one of the important cash generative crops in the mid hill regions of Nepal. Initially, coffee spread to several districts through the initiation of individual farmers as well as by an ADB/N supported programs. Presently, coffee is cultivated in around 40 districts, but it has been producing commercially in about 20-22 hill districts. Some districts like Gulmi, Palpa, Argakhanchi, Lalitpur, Tanahu, Kavre, Sindhupalchowk, Lamjung, Kaski, Gorkha, Syangja, Parbat, Baglung are successfully growing and producing Coffee beans and is increasing gradually (NTCDB, 2014). The total production of coffee in Nepal is 429.4 metric ton from total area of 1911 hectares (MoAD, 2014). Coffee is grown in Nepal with almost no use of inorganic fertilizer and pesticide. It could be an important occupation in the rural economies with massive participation of marginal, poor and down trodden class of rural communities. In addition, it could be an important means for soil conservation, bio-diversity maintenance and watershed balance in the mid-hills of Nepal. Coffee cultivation has an enormous potential to income generation opportunities as Nepalese coffee has high demand in International market. Coffee is high value low volume cash crop which is nearly three times more profitable as compared to cash crops and five times than other cereal crops (Bajracharya, 2003). Among the various cash crops for commercialization, coffee is emerging as a likely agro-enterprise with great potential to provide farm employment and income generation opportunities in the mid hills of Nepal (CoPP, 2007). However, in comparison with demand in the international market, Nepalese coffee has low production and below the standard quality specified by the developed countries. Despite the higher economical importance of coffee, it is being devalued and graded as low grade agriculture product in Nepal due to the wrong and narrow conception of the people. Farmers are not properly and adequately aware of coffee farming technologies. Lack of research and development in coffee is the bottleneck to develop the coffee sub sector into viable industry for producers, processors and traders (Shrestha, 2004). Hence, it is justified that there is an immediate need of conducting research on existing production economics, income activities, constraints in production and marketing, marketing structure and value addition of coffee sector.

The overall objective of the study was to analyze the production economics and marketing performance of coffee in Parbat District of Nepal. The specific objectives were;

- To analyze gross margin, benefit cost ratio and factors affecting in coffee production.
- To analyze the contribution of coffee in household income.
- To identify and rank the problems associated with production and marketing of Coffee.

MATERIALS AND METHODS

Sampling and data collection procedure

Forty Coffee producing farmers in Pakuwa VDC of Parbat District of Nepal were purposively selected for the study using simple random sampling technique. Primary data were collected through face to face interview using semi-structured interview schedule and the field survey was conducted in June, 2014. The final analysis was done by using computer software SPSS, Microsoft Excel and STATA 12.

Cost of coffee production

In this study only variable cost items were included for analyzing the cost of coffee production. The variable cost included were cost of sapling, cost of labor, cost of manure, cost of plant protection, cost on irrigation, cost on harvesting and marketing. Total variable cost was calculated by summing all the variable cost items.

Cost of coffee production (Rs.) = C_{plant} + C_{labor}+ C_{manure} +$C_{pesticide}$+ C_{other}

Where;

C_{plant} (Rs.) = Cost of plant/sapling

C_{labor} (Rs.) = Cost of labor used

C_{manure} (Rs.) = Cost of FYM/organic manure used

$C_{pesticide}$ (Rs.) = Expenditure on plant protection materials

C_{other} (Rs.) = other cost on coffee production including cost on irrigation, cost on marketing, cost on postharvest etc.

Gross margin, profitability and cost-benefit analysis

This is the difference between the Gross Farm Income (GFI) and the Total Variable Cost (TVC). Only variable cost items were included for analyzing the cost of coffee production.

Gross margin was calculated as;

GM= GFI-TVC

Gross Margin (Rs.) = Gross return (Rs.) - Total variable cost (Rs.)

Where, Gross return (Rs.) = Price of fresh cherry (Rs./Kg)× total quantity sold (Kg.)

Total variable cost (Rs.) = Summation of cost on all variable input.

Profitability index (PI) = Net farm Income (NFI) / TVC

Similarly, benefit cost analysis was done using the total cost and gross return from the French bean farming. Cost of production was calculated by summing all the variable cost items in the production process. For calculating gross return, income from the sale was accounted. Thus the benefit cost analysis was carried out by using formula;

B/C ratio= Gross return (NRs.)/ Total variable cost(NRs.)

Production function analysis

The Cobb-Douglas type of production was used in this study as it is the most widely used in the agricultural research and is convenient for the comparison of the partial elasticity coefficient (Prajneshu, 2008). The following form of Cobb- Douglas production function was used to determine the contribution of different factors on production and to estimate the efficiency of the variable factors of production of coffee.

$Y= aX1_{b1}X2_{b2}X3_{b3}\ X4_{b4}\ X5_{b5}eu$

where;

Y= Gross Income (Rs./ha.)

X1= Labor cost (Rs./ ha.)

X2= Cost of manure (Rs./ ha.)

X3= Cost of sapling/plant (Rs./ ha.)

X4= Number of productive plants (Number)

X5= Area under coffee (ha.)

u = Random disturbance term and

b1 ...b4 are the coefficient to be estimated.

The Cobb- Douglas production function in the form expressed above was linearized in to a logarithmic function with a view to getting a form amenable to practical purposes as expresses below.

$\ln Y= \ln a+b1\ln X1+b2\ln X2+b3\ln X3 + b4\ln X4+ b5\ln X5+ u$

where;

ln= Natural logarithm,

a= constant,

u= Error term

Return to scale analysis

This is the measure of farm success in producing maximum output from a given set of inputs. For the calculation of return to scale from coffee, Cobb-Douglas production function was used and calculated using formula;

$RTS= \sum bi,$

where,

bi =regression coefficient of ith variables.

The sum of bi from the Cobb-Douglas production function indicates the nature of return to scale.

Return to Scale decision rule;

RTS<1: Decreasing return to scale

RTS=1: Constant return to scale

RTS>1: Increasing return to scale

Contribution of coffee production in household income

The percentage share of coffee in the total household income was analyzed. Average income from coffee, income from cereals, income from vegetables, income from livestock and off-farm income were taken and percentage share of these sectors to the average household income was calculated. Thus, total household income was;

$Yi = X1 + X2 + X3 + X4 + X5$

where,
Yi = total household income (100%)
X1 = income from coffee (%),
X2 = income from cereals (%),
X3 = income from vegetables (%),
X4 = income from livestock (%),
X5= off-farm income (%)

Analysis of problems associated with production and marketing of Coffee

Indexing of responses given by the respondent was done to rank the problems severity and was computed by using the following formula;

$I_{severity} = \sum Sifi/N$

where,
I = index 0 Ð I Ð 1
S_i = scale value at i^{th} severity
f_i = frequency of the i^{th} severity
N = total number of respondents = ∑fi

RESULTS AND DISCUSSION

Socio-demographic features of sampled household

Out of 40 respondents, an overwhelming majority were male (72.5%) over female (27.5%). Among the sample households, most of the families were nuclear type. In overall, 70% were with nuclear family and remaining 30% were living jointly. Average male per household was greater than average female where the average family size was 6.42 (Table 1).

The education level was categorized as illiterate, primary, secondary and higher level. The majority of family member are literate. Figure below revealed that 17.5 % were illiterate, 17.5% were primary, 40% were secondary and 25 % were of higher education level (Figure 1). Respondents were categorized into three group namely, Brahmins/Chettri, Aadibasi/Janajati and Dalits. Brahmins and Chhetri were the dominant castes (75%) followed by Janajati (15%) and Dalit (10%). Study showed that the average coffee cultivated area was 0.13, total area was 0.75 and among it irrigated area was only 0.55.

Gross margin, Profitability index and Benefit cost analysis of coffee production

Table 2 below revealed that the average total cost per hectare of coffee production was NRs. 73253.50 whereas; per hectare return from coffee production was NRs. 163458.93. From the analysis, it could be seen that per hectare

Table 1: Distribution of the population by sex in the study area (2014)

Characteristics	Frequency	Percentage
Male	29	72.5
Female	11	27.5
Total	40	100
Average male (Number/household)	3.37	-
Average female (Number/household)	3.00	-
Average family size (Number/household)	6.42	-

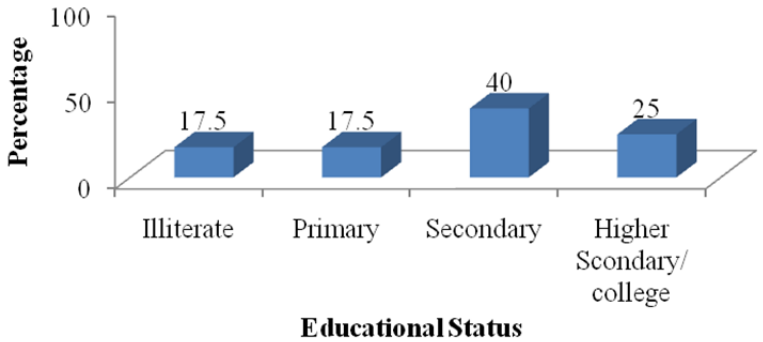

Figure 1: Educational status of sampled household in the study area (2014)

Table 2: Gross margin, Profitability index and Benefit-cost analysis of Coffee in the study area

Statistics	Mean	Std. Error
Return	163458.93	6138.43
Cost	73253.50	6624.71
Gross margin	90205.43	10935.29
B:C Ratio	3.84	0.63
Profitability Index= 90205/73253.50= 1.23		

average gross margin was NRs. 90205.43 with benefit-cost ratio 3.84. Similar to this result, the gross margin on coffee production was found 119129.70/ha in Palpa district (Pandit, 2008). The analysis of gross margin showed that coffee cultivation was more profitable in the study area. The highest benefit cost ratio indicated that coffee cultivation was prominently profitable enterprise in Parbat. However, benefit cost ratio greater than one also indicated that coffee cultivation was running in profit. The result further showed that the profitability index was 1.23. This indicates that coffee farmers in the study area earned Rs. 1.23 on each Rupees invested in production process. Similar results were concluded by (Bastola, 2007).

Return to scale

Return to scale was calculated as the sum of individual production inputs elasticities. Return to scale described response of an output toward its proportional change from input in overall. The elasticity of production which is the sum of coefficients of the Cobb-Douglas production function is the return to scale. The summation of all the values of parameter was 1.26, which indicated the increasing returns to scale means that all input addition by one percent would increase output by 1.26 percent. Similar case was found by Pandit (2008), as the return to scale in coffee production was 1.054 in Palpa district.

Constraints on production and Marketing of coffee

Farmers in the study area were asked to rank the major problems of coffee production and marketing. The major problems ranked by the farmers were tabulated and ranked according to their responses. Table 3 depicted that the major problems hindering the coffee production was lack of irrigation followed by other. Lack of adequate knowledge on coffee production and lack of skilled manpower were ranked as constraints followed by irrigation. Similarly, unavailability of labor, incidence of stem borer, and lack of quality sapling, poor soil fertility status and lack of crop insurance were ranked thereafter (Table 3). About 70% of the respondents' area under coffee was under lack of irrigation facility. Result shows that low price of coffee with index value 0.94 ranked as the most severe problems on coffee marketing followed by other. Similarly, lack of transportation facility, no certification, lack of organized market and market information, lack of processing techniques, low quality production and low production were perceived severe followed by price. Study also concluded that only 30 percent of the coffee pro-

Table 3: Problems on coffee production and marketing in the study area

Production constraints	Index	Rank	Marketing constraints	Index	Rank
lack of irrigation	0.93	I	Low price	0.94	I
lack of knowledge	0.75	II	Lack of Processing	0.43	VI
Disease and pest incident	0.41	V	Lack of organized market	0.59	IV
lack of skilled manpower	0.75	II	Lack of Market information	0.56	V
Unavailability of labor	0.64	III	No certification	0.60	III
lack of quality sampling	0.60	IV	Transportation	0.81	II
Poor soil fertility status	0.31	VI	low production	0.27	VIII
lack of crop insurance	0.19	VII	low Quality production	0.36	VII

Table 4: Reasons for the cultivation of coffee in the study area.

Reasons	1	0.8	0.6	0.4	0.2	0	Index	Rank
More Income	21	13	5	1	0	0	0.87	I
Easy to sell	11	17	9	2	1	0	0.775	II
High Quality of produced	5	8	13	13	1	0	0.615	III
High demand and price	3	2	2	16	15	2	0.38	IV
Organizational support	0	0	0	3	12	25	0.09	VI
Utilization of marginalized land	0	0	11	5	11	13	0.27	V

ducers were satisfied with the current price. Poudel *et al.*, (2009) in their analysis found the major problem of organic coffee production in Gulmi district of Nepal were unavailability of skilled labor, farm yard manure unavailability and insect pest ranked 1st, 2nd and 3rd respectively.

Reasons for the cultivation of coffee

From the table below, it can be concluded that, more income from cofee was rank as the top priority followed by easy to sell, high quality of produced, high demand and price, organizational support and utilization of marginal land respectively as a reasons for the cultivation of coffee (Table 4).

Factors affecting the production of coffee; Production function analysis

In table 5, the number of productive plant was the most significant factor affecting production of coffee in Parbat. The output elasticity of number of productive plant was 0.894 indicating that holding the other explanatory variables constant, one percent change in number of productive plant contributed 0.894 percent increase in output. Also, the cost on sapling/plant was significant and 1 percent increased in cost of sapling contributed 0.151 percent increased in the output of coffee. The summation of all the values of parameter was 1.26, which indicated the increasing returns to scale means that all input addition by one percent would increase output by 1.26 percent.

Contribution of coffee in household income

The average income from the different sources is shown in the table 6. Table revealed that overall contribution of coffee to household income was 16.26 percent. It can be concluded that 16.26 percent contribution to the household income from a single crop was a good sign for its commercialization. Similar case was reported by Pandit (2008) and Kattel (2009). Income from coffee could be raised and it could be an important source of household income. Further, vegetable, livestock and cereal crops contributes 16.05, 18.19 and 7.43 percent respectively (Table 6).

CONCLUSIONS

Nepali coffee has a great potentiality and ever-increasing scope at the domestic and international market. Similarly, Parbat district is with immense potentialities for coffee business in Nepal. High gross margin, return to scale, benefit-cost ratio and more than one profitability index on coffee production in the study area

Table 5: Estimated coefficients for the factors affecting production of coffee in the study area

Variables	Coefficient	Std. Error	t-value	p-value
Constant	0.145	1.047	0.14	0.891
Number of productive plant	0.894	0.072	12.37 **	0.000
Area under coffee cultivation	-0.058	0.052	-1.12	0.271
Labor	0.417	0.282	1.48	0.149
Manure	-0.289	0.247	-1.17	0.251
Sapling	0.151	0.067	2.25 *	0.031
R^2	0.963			
F-value	180.67			
Return to Scale (∑bi)	1.26			

**p<0.01 *p<0.05

Table 6. Major source of household income in the study area (2014)

Particulars (Rs.)	Average income	Percentage contribution
Annual income from Coffee (NRs.)	22733.7	16.26*
Annual income from cereals (NRs.)	10395.3	7.43
Annual income from vegetables (NRs.)	22428.5	16.05
Annual income from livestock and livestock products (NRs.)	25428.5	18.19
Annual income from off farm and other sources (NRs.)	58825.0	42.07
Annual household income	139816.8	100.00

* More than 10% contribution in household income shows good sign of commercialization
*Buying rate 1USD=106.17NRs. (As of 24th April, 2016)

showed that coffee cultivation is suitable enterprise for income generation. Further more than 15% contribution of coffee sector in household income implies positive sign for its commercialization. Reasons more income and easy to sell were stand for the coffee cultivation which shows future involvement of majority of farmers if irrigation facility will be provided as lack of irrigation was found as the most hindering factor. Also, package trainings on improved technology and organic disease pest management techniques should be given frequently. Coffee sapling and numbers of productive plants were found most significant factors in coffee production such that good variety and quality of sapling should be provided and farmers should done plantation based on scientific methods. Price fixation and stabilization along with establishment of well organized market will be done from Government level to overcome marketing problems in the study area. Although the coffee market was small and still proper channel was not developed, demand of organic coffee is far higher than its supply. For better market, marketing channel with lower marketing margin should be developed through value addition concept. Lastly, the study concluded coffee enterprise as profitable and economically feasible in the study area. Hence, its increment in area and adoption of best production and marketing mechanism should be followed.

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اهمیت اقتصادی تولید قهوه (*Coffee Arabica*) در منطقه پاربات نپال

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چکیده

این مطالعه به بررسی اقتصادی تولید قهوه در کمیته توسعه روستای پاکوآت منطقه پاربات، نپال می‌پردازد. مطالعه پیمایشی در ژوئن ۲۰۱۴ انجام شده بود. جمع‌آوری داده‌ها با استفاده از پرسشنامه نیمه ساختار یافته و پیش آزمون در بین ۴۰ نفر از تولیدکنندگان قهوه که به صورت تصادفی انتخاب شدند، صورت پذیرفته بود. برای تجزیه و تحلیل اقتصادی تولید قهوه در منطقه مورد مطالعه از تجزیه و تحلیل سود ناخالص، شاخص سودآوری و نسبت سود به هزینه استفاده شده بود. نتایج نشان داد که کشت قهوه به عنوان یک سرمایه‌گذاری سودآور در منطقه مورد مطالعه می‌باشد. که این با حاشیه ناخالص NRs منعکس می‌شود. ۹۰۲۰۵/۴۳ در هر هکتار، نسبت سود به هزینه ۳/۸۴ و شاخص سودآوری ۱/۲۳. بخش قهوه به تنهایی با ۱۶/۲۶ درصد از مجموع درآمد خانوار، نشان مثبتی برای تجاری‌سازی بود. تعداد گیاهان مولد و هزینه نهال مهم‌ترین عامل موثر در تولید قهوه بودند. با سایر متغیرهای توضیحی، تجزیه و تحلیل تابع تولید منتج به یک درصد تغییر نسبت به گیاهان مولد و هزینه نهال شد، که به ترتیب افزایش محصول قهوه با ۰/۸۹۴ درصد و ۰/۱۵۱ درصد را به همراه داشت. علاوه بر این، افزایش بازگشت به مقیاس در تولید قهوه با ارزش ۱/۲۶ مشاهده شد. کشاورزان دلایل اصلی خود برای کشت قهوه را کسب درآمد بیشتر از آن و فروش آسان قهوه شرح دادند. عدم آبیاری و عدم آگاهی دقیق در مورد بهبود تکنولوژی تولید قهوه به عنوان محدودیت‌های تولید رتبه‌بندی شدند، درحالی‌که قیمت پایین و عدم امکان پردازش به عنوان محدودیت‌های بازاریابی قهوه در منطقه مورد مطالعه بوده است. مطالعه منتج به اهمیت اقتصادی مثبت قهوه شد و این نشان دهنده نیاز بسیار زیاد به دولت، سازمان‌های غیردولتی، تجار و دیگر سازمان‌های پیشرو تا تلاش‌هایی را در جهت مدیریت تولید و بازاریابی پایه‌گذاری کنند به‌طوری‌که بتواند کیفیت تولید و درآمد خانوار را بالا ببرند.

واژگان کلیدی:
اقتصاد تولید، قهوه، شاخص سودآوری، نسبت سود به هزینه، بازگشت به مقیاس، نپال

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