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Economic analysis of Ginger cultivation in selected locations of Palpa, Nepal

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ABSTRACT

Although Ginger is the main cash crop for small farmers across the country, there are many problems associated with the cost of product. The study was conducted in four ginger growing areas (60 farmers from each area) of Palpa, Nepal in 2012. Study was focused on cost factors for various inputs and problem of production. The study revealed that benefit cost ratio for ginger production was profitable on cash cost basis (7.22). Seed has major cost share for ginger production (65.1%). The estimated coefficients of Cobb-Douglas production function showed that seed, labor and number of years for crop rotation were the significant factors for ginger production. Major problems faced by farmers were availability of source seed and pest management. Study concluded that ginger production can be made viable enterprise with increased focus on managing source seed and plant protection.

INTRODUCTION

Agriculture is the mainstay of Nepalese economy. . It contributes about one third of GDP and provides employment opportunity to approximately 66% of the population (MOAD 2014), among which the majority are small farmers. Although the government's policies have placed agriculture sector in priorities over the years but agriculture growth is in sluggish motion. It is fully dependent on season. The production and productivity of this sector is low. The agricultural policies e has emphasized on the agricultural growth through increased agricultural productivity, crop diversification and commercialization of high value agricultural commodities in the past. Now Agriculture Development Strategy 2015-2035 has internalized these policies. Ginger (*Zingiber officinale Roscoe*) is an important spice crop in Nepal. It is grown all over the country. Government has given priority to ginger as a valuable crop due to which its cultivated area has increased. Climate of hilly areas is more suitable for ginger cultivation though Terai land is also an alternative area for cultivation. The hilly region contributes 72% of ginger production, Terai 23% and the mountainous region 5% (MOAD 2014). On the basis of development region, production contribution of Eastern region is largest (35.5%) following western region (24.4%). Similarly, mid - western and far western regions have contribution of 16.6% and 10.8%, respectively (MOAD 2014). The area and production of ginger in 2013 was 19376 ha and 235033 ton, respectively (FAO 2015) (Table 1). Nepal ranks third in world ginger production with 11.0 percent of the global share, and eighth in yield (12.13 mt ha-1) in 2013. The annual expansion of 5.94% of area contributed to increase of 7.88% annual production with marginal contribution from growth in yield (1.83% annually). The high variation in ginger production is due to market, climate and pest problems.

Even though Nepal ranks third in world ginger production, there are various reasons for the poor yields, and low amount of benefit, which need to be identified for appropriate research findings and policy interventions. These lack of information are limiting on policy-making and planning to identify and prioritize programmers. Farmers were not clear about their cost of production and profitability. Due to which they would feel unfair on prices. Therefore, the research was done with

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the objectives of supporting planners and farmers on evaluating profitability, estimating production factors and identifying the constraints of ginger production in western Nepal.

MATERIALS AND METHODS

The study was conducted in four Villages Development Committee (VDC) of Palpa Nepal during 2012. The site was Bhairabsthan, Khanigaun, Mujhung and Siluwa VDCs, which selected on the basis of production pocket, level of commercialization, access and remoteness. Structured questionnaire was used for data collection. Sixty household were selected using random sampling method from each four VDCs totaling 240 samples. Data taken were on area, production, input costs, product prices, and constraint on ginger production. Field investigators, under the direct supervision of the researcher, collected the data.

To fulfill the objectives of the study, collected data, summarized, tabulated, and analyzed with Ms-Excel and IBM-SPSS statistics. Profitability of ginger production was examined based on gross return, gross margin, and benefit cost ratio analysis. Purchased cost for ginger production was taken as cash cost and total cost as full cost. In calculating gross margin, and benefit cost ratios, all operating costs were considered as variable cost.

Gross margin

The gross margin provides simple and quick method of farm business analysis. Household owned inputs had major share for production, so the cost incurred was separated on full cost and cast cost basis. Seed, labor, manure, rent on land and interest on investment was taken as independent variables. Gross margin was estimated by taking gross return and the total variable cost incurred.

$$GM = [(P_y * Y) + (P_z * Z)] - \sum_{i=1}^{n} P_{x_i} * X_i$$

Where

GM = gross margin,

P_y = price of main product,

Y = quantity of main product or output,

Pz = price of byproduct, and

Z = quantity of byproduct,

P_{Xi} = price of i^{th} input

X_i = quantity of i^{th} input

Value of ginger byproduct is nominal in the study area, so it is omitted in calculation.

Benefit-cost ratio

Benefit-cost ratio is the ratio between the gross return and total cost of any enterprise. In this study, benefit-cost ratio was calculated by using the following formula:

$$B/C \text{ Ratio} = \frac{G\,\mathrm{R}}{\mathrm{TC}}$$

Where,

B/C Ratio= Benefit-Cost ratio

GR=gross return (it was obtained by adding income from ginger)

TC= total cost (it was obtained by adding all the expenditures in production process)

Estimation of production function analysis

The general form of Cobb-Douglas type production function was used to determine the contribution of different factors of production. The estimating model for the coefficients of ginger production is, the following:

$Yg = a\, S^{b1} M^{b2}\, L^{b3} Cr^{b4}\, Fz^{b5} e^{u}$

In log linear form, the above model can be expressed as follows

$\ln Yg = \ln a + b_1 \ln S + b_2 \ln M + b_3 \ln L + b_4 \ln Cr + b_5 \ln Fz$

where:

Yg= Ginger production (NRs), S = Cost of seed (NRs)

M= Manure cost (NRs) L = Labor cost (NRs), Cr= Crop rotation (No. of Yrs), Fz = Family size (Number), α = Coefficient

The intercept has been denoted by 'a' and 'b_i' are the associated slope coefficient of the variable X_i, where i = 1…5.

RESULTS AND DISCUSSION

Ginger cultivation practices

On an average, per farmer, 0.067 hectare of land was devoted to ginger cultivation in the study areas. Farmers supplied most of the inputs through own household efforts. Own labor, seed and manure supply was 83.44%, 85% and 99%, respectively (Table 2). Ginger in Palpa was mostly

Table 1. Annual area, production and productivity of ginger from 2001 to 2013 in Nepal.

Year	Area (ha)	Production (t)	Productivity m(t ha^{-1})
2001	8956	84366	9.56
2002	9189	87909	5.69
2003	11830	150593	12.73
2004	11930	152704	12.80
2005	12000	154200	12.85
2006	12994	154179	11.86
2007	13025	158905	12.20
2008	14007	161171	11.50
2009	15838	178987	11.30
2010	18041	210790	11.68
2011	19081	213353	11.33
2012	20256	255208	12.60
2013	19376	235033	12.13
Mean	14347.9	151338	11.4024
CV (%)	26.66	38.03	16.94
GR (%)	5.94	7.88	1.83

Source: FAO, 2015

intercropped with maize (99.25%). As it is moderate shade loving plant, intercropping with maize provide both grain and shed. This is similar to the result derived by Lyocks, et al. (2013). Crop rotation in ginger is very important and year after year, the cultivation of ginger in the same land is not recommended (Rahman 2009). In the study areas average years of crop rotation was 2.1 years. . Sowing period lasted from March to May. Within the month of April 78% of farmers completed sowing rhizomes indicated that main season for planting in mid hill was April. Respondent farmers reported different species of tree leaves using as mulching material. The most common three tree species were chestnut (*Castonopsis indica*), needlewood (*Schkima wallichii*) and Nepalese alder (*Alnus nepalensis*).

Input use pattern

Table 3 gives an idea about the Pattern of input use. On an average, ginger farmers used 266 man-days of human labor per hectare, of which 83.44% were from family. The farmers of Siluwa used the highest number of human labor (442 man-days ha^{-1}) compared to average use (225 man-days ha^{-1}). It was for more organic manure application and collection of mulching materials from the forest. Mean value of two type of labor use was tested by t-test to know differences between the labor use pattern. The t-test for own and hired labor showed significant difference in all study areas. On an average, 2873 kg of seed per hectare was used which was higher than the recommended. At the time of harvest farmer get lower price of fresh ginger. They prefer to sell mother rhizome at higher price as early harvest. Another reason for higher rate of seed is that they use larger size for robust growth. This result is similar to the findings of Monnaf et al. (2010). Farmers used more than 85% of required seed from their own sources. On an average, farmers used 26275 kg manures ha^{-1}, which was more (38657 kg ha^{-1}) in Siluwa (remote and semi-commercial farming VDC). It was because of the highest livestock unit (LSU) holdings per household (Poudel, et al. 2015). The least use of manure was (16373 kg ha^{-1}) in Bhairabsthan (access and commercial farming VDC). There was no use of chemical fertilizer in the study areas.

Cost of production

The cost of production included land preparation, human labor, seed, manure, pesticides, interest on operating cost and rental value of land. Both cash expenditure and imputed value of family supplied inputs were included in the analysis and shown in table 4.

It was found that the highest cost was incurred for seed (rhizome) (65.1%). Similarly, the studies by USAID (2011), GOK (2011) and Ewuziem and Onyenobi (2012) reported up to 46%, 30.38% and 25% cost for seed, respectively. The percentage of cost share observed on human labor and organic manure was 15.3% and 10.5%, respectively in the study area. Mulching cost was included in the labor as it is collected from own land or from nearby forest free of cost.

Table 2. Ginger cultivation practices of the sample farmers in the study areas.

Particulars	Study Area				All Areas
	Bhairabsthan	Khanigaun	Mujhung	Siluwa	
Average ginger areas (ha)	0.11	0.08	0.05	0.03	0.067
Own land use (%)	98	95	100	100	98.5
Own labor use (%)	72.5	88.5	88.58	84.16	83.44
Own seed use (%)	59.2	92.9	82.71	91.58	85
Own Manure use (%)	99.3	99.3	98.75	100	99
Intercropped with maize (%)	98	99	100	100	99.25
Crop rotation (Years)	2.67	1.73	1.7	2.37	2.1
Organic pesticide use (%)	8	-	-	-	2
Month of Sowing (%):					
March	6	2	3	10	5.25
April	90	75	82	65	78
May	4	23	15	25	16.75
Mulching materials	*Different species tree, mostly Castonopsis indica, Schkima wallichiin and Alnus nepalensis*				

Table 3. Level of input use per hectare for ginger cultivation in the study areas

Type of input	Bhairabsthan	Khanigaun	Mujhung	Siluwa	All Areas
Human labor (man-day ha^{-1})	164	215	245	442	266
Own	119	191	217	372	225 (83.44)
Hired	45	24	28	70	41
t-value	3.039**	3.992**	5.684**	8.213**	12.08**
Land preparation cost (Rs ha^{-1})	8870	9202	8628	10852	9388
Seed (kg ha^{-1})	2935	3219	2733	2605	2873
Own	1737	2992	2699	2386	2454(85)
Purchased	1198	227	34	219	419
Organic manures (kg ha^{-1})	16373	26392	23680	38657	26275
Own	16258	26215	23384	38657	26129 (99)
Purchased	121	177	296	0	148
Organic insecticides (NRs ha^{-1})	210	0	0	0	52.

Figures in the Parentheses indicate the percentage. ** indicates the values at 0.01 level of significance

Cost for human labor was higher in Siluwa 1.5 times the cost of other remaining areas. It was due to higher labor use for organic manure application. The use of organic manure in Siluwa was almost double to other three areas. Seed cost was observed less in Siluwa; it was mostly due to excess use of local seed at lower price. The average cost of production for cash cost basis in Bhairabsthan was higher (NRs ha^{-1}83195) among four sites.

Profitability

Profitability is the ability of a business to earn a profit. It is left of the revenue a business pays all expenses. If production increased in an area, it automatically increases the productivity making cost effective. Table 5 shows that farmers received on an average 11378 kg ha^{-1} of total yield. Main yield was found higher in Khanigaun. This VDC is famous for ginger seed production in Palpa as well as in western region of Nepal. In the four study only two sites have practices of collecting mother rhizome. Among them Bhairabsthan has higher practices of collecting the rhizome. The average gross return from ginger production was found NRs ha^{-1}198518 (USD 2545.1).

Gross margin on full cost basis was the highest in Bhairabsthan (NRs ha^{-1}33880) while on cash cost basis the highest gross margin was found in Mujhung (NRs ha^{-1}176668). Average gross margin on full cost basis was NRs ha^{-1} 16585 (USD 212.56). But in cash cost basis the average gross margin was 160857 (USD 2062.27).

The average benefit cost ratio was 7.22 and 1.09 on cash cost basis and full cost basis, respectively. The Lowest benefit cost ratio on cash cost basis in Bhairabsthan was due to high charges for labor and other external inputs. From this study, it can be said that commercial and access areas are cost effective on cash cost basis compared to

Table 4. Cost of ginger cultivation by the sample farmers in the study areas

Cost items	(Nepalese Rupees ha^{-1})				
	Bhairabsthan	Khanigaun	Mujhung	Siluwa	All area
Land preparation:	8870	9202	8628	10852	9388(5.2)
Own	4374	3288	4488	6931	4770
Hired	4496	5914	4140	3921	4618
Human labor:	24275	22565	24563	39664	27767 (15.3)
Own	16193	18924	19966	33720	22201
Hired	8082	3641	4597	5944	5566
Seed	139021	122035	136834	76200	118523(65.1)
Own	74731	107963	122315	71802	94203
Purchased	64291	14072	14519	4398	24320
Organic manures:	13248	16007	14208	33184	19162(10.5)
Own	12936	15632	13989	33184	18935
Purchased	312	375	219	0	226
Organic Insecticides	210	0	0	0	52(0.0)
Interest on hired and purchased operating capital (10-12% for 9-12 months)	5804	2880	1761	1070	2879(1.6)
Land use cost	5357	3958	3853	3479	4162(2.3)
Total cost:					
Cash cost basis	83195	26882	25235	15333	37661
Full cost basis	196786	176648	189846	164449	181933(100)

Note: Conversion rate: 1 USD=78.0 NR, Figures in the parentheses are percentages of total cost.

Table 5. Profitability of ginger cultivation in the study areas

Items	Bhairabsthan	Khanigaun	Mujhung	Siluwa	All Areas
Main yield (kg ha^{-1})	9940	11848	11642	9635	10766
Yield of mother rhizome (kg ha^{-1})	1644	0	804	0	612
Total yield (kg ha^{-1})	11584	11848	12446	9635	11378
Gross return (NRs ha^{-1})	230666	195796	201903	165708	198518
Total cost (NRs. ha^{-1})					
Cash cost basis	83195	26882	25235	15333	37661
Full cost basis	196786	176648	189846	164449	181933
Gross margin (NRs ha^{-1})					
Cash cost basis	147471	168914	176668	150375	160857
Full cost basis	33880	19148	12057	1259	16585
Benefit cost ratio (BCR)					
Cash cost basis	2.77	7.28	8.00	10.81	7.22
Full cost basis	1.17	1.11	1.06	1.01	1.09
Cost of ginger (NRs ha^{-1})					
Cash cost basis	7.18	2.27	2.03	1.59	3.27
Full cost basis	16.99	14.91	15.25	17.07	16.05
Return from ginger(NRs.kg^{-1})	19.91	16.53	16.22	17.20	17.46

Source: Field survey, 2012

remote and semi-commercial farming areas. The average cost of ginger was NRs. 3.27 on cash cost basis and NRs.16.05 on full cost basis.

Factors affecting ginger production

The maximum likelihood estimates for parameter of the Cobb Douglas production function of ginger is presented in Table 6. Among the five, three were statistically significant and positive. The empirical results indicated that the co-efficient of seed cost and labor cost were positive and significant at 1%. Years of crop rotation was found positive and significant at 5 % level. The equation for parameters is, Yg = -0.344+0.554S-0.033M+0.347L+0.074Cr+0.035Fz+0.49

The regression coefficient for seed cost was 0.554, which depicted that with 100 % increase in cost on seed production could be increased by 55.4%. Andwith the increase in labor cost by100 % increase in production could be increased by 34.7% as the coefficient is 0.347. Number of years on crop rotation if increased by 100% the production is increased by 7.4%. Total output (revenue) is more responsive to seed, labor and years of crop rotation. Such result was also found on the study of Thakur and Gautam (2005) and Poudel et al. (2010).

Cobb Douglas production function also indicates the elasticity of production. The sum of the coefficients (output elasticity) of the variables of Cobb-Douglas production function is 0.977. The value is near to unity; suggest farming need judicious use of such inputs.

Constraints

Although ginger was observed as more profitable crop only at own input use condition, there are several constraints to its higher production. Producers are facing several production related problems like input supply, technical knowhow, pest management and infrastructure development. In the study areas, 35 percent farmers responded that they are facing problem of unavailability of quality planting materials. The next most felt problem was the pest management. Some respondents reported that their crop was destroyed by the diseases like rhizome rot and leaf spot in the field as well as in stored condition. The third prioritized problem was the lack of technical

Table 6. Maximum likelihood estimates of Cobb-Douglas production function.

	Unstandardized Coefficients		Standardized Coefficients	T Value	Sig. Level
	B	Std. Error	Beta		
(Constant)	-0.344	0.429		-0.802	0.424
ln Seedc	0.589	0.063	0.554	9.288	0.000**
lnManurec	-0.049	0.090	-0.033	-0.540	0.589
ln Labc	0.568	0.111	0.347	5.108	0.000**
lnCropr	0.190	0.092	0.074	2.059	0.041*
lnFamilyz	0.112	0.116	0.035	0.966	0.335

a. Dependent Variable: lnYg, R^2=0.715, ** and * indicate the significant at 1% and 5% level of probability respectively

Table 7. Problems of ginger cultivation in the study areas

Problems	Bhairabsthan	Khanigaun	Mujhung	Siluwa	All areas	Rank
Insufficient supply of manure and mulch	6 (10)	9 (11.7)	6 (10)	3 (5)	24 (10.0)	V
Lack of quality planting materials	34 (56.7)	13 (21.7)	13 (21.7)	24 (40)	84 (35.0)	I
Poor rural infrastructure	2 (3.3)	6 (10)	4 (6.7)	14 (23.3)	26 (10.8)	IV
Lack of technical knowledge and skills	8 (13.3	13 (21.7)	7 (11.7)	8 (13.3)	36 (15.0)	III
Problem of pest management	10 (16.7)	19 (31.7)	30 (50)	11 (18.3)	70 (29.2)	II

Source: Field Survey, 2012; Figures in parentheses indicate the percentage. (N = 240) Multiple responses.

knowledge and skills for ginger production (Table 7).

CONCLUSION

Based on the study it can be concluded that the growth rate of ginger area and production is in increasing trend. Farmers are using more own resources on ginger farming compared to hired. Ginger cultivation is highly profitable on cash cost basis (BCR=7.22). Seed cost is the major share incurred (65.1 percent) on total cost of production. Gross margin on cash cost basis is higher. The estimated coefficient of factors of production indicated that seed, labor and number of years for crop rotation has significant positive effects in selected locations of Palpa Nepal. Farmer perceived that quality seed, pest management and technical knowledge are major three bottlenecks for ginger production. The study concluded that cost and quality of seed is the major hindrance for ginger farming in study areas.

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REFERENCES

Ewuziem J.E. and Onyenobi V.O. (2012) Cost and return analysis of ginger production in the Guinea Savannah of Nigeria. Journal of Agriculture and Food Sciences, 10(2):26-36.

FAO. (2015) Food and Agriculture Organization of the United Nations, Statistics Division. Retrieved from http://faostat3.fao.org/home/E in 2015/6/14.

GOK. (2011) Report on cost of cultivation of important crops in Kerala (2010-11) Government of Kerala. Department of Economics & Statistics. Thiruvananthapuram. http://www.ecostat.kerala.gov.in/docs/pdf/reports/cost_culti/cost1011.pdf (Retrieved in 24/5/2014)

Lyocks S.W. J. Tanimu J. Dauji L.Z. (2013) Growth and yield parameters of ginger as influenced by varying populations of maize intercrop. Journal of Agricultural Crop Research, 1(2): 24-29.

MOAD. (2014) Statistical information on Nepalese agriculture (2013/14) Ministry of Agricultural Development. Singhadarbar, Kathmandu, Nepal.

Monnaf M.A. Rahim M.A. Hossain M.M.A. Alam M.S. (2010) Effect of planting method and rhizome size on the growth and yield of ginger. Journal of Agroforestry and Environment. Bangladesh Agricultural University, Mymensingh, 4 (2): 73-76.

Poudel R.R. Adhikari K.B. Regmi P.P. Gurung D.B. (2010) Factors contributing to total revenue: A case study of community based maize seed production program in Chitwan, Nepal. In: Nepalese Journal of Agricultural Sciences, 8: 72-75.

Poudel R.R. Regmi P.P. Thapa R.B. GC Y.D. KC D.B. (2015) Socio economic aspects of ginger producers in the western hills of Nepal. Nepalese Journal of Agricultural Sciences, 13:48-59.

Rahman H. Karuppaiyan R. Kishor K. Denzognpa R. (2009) Traditional practices of ginger cultivation in Northeast India. Indian Journal of Traditional Knowledge, 8(1): 23-28.

RPQO. (2015) Annual report. Regional Plant Quarantine Office, Rupandehi, Nepal.

Thakur N.S. and Gautam J.C. (2005) Factors contributing to enhanced productivity of improved maize technology in rain fed hill areas of Nepal: A case study of Deurali agro-ecological research site in Palpa District. In: Proceedings of the Ninth Asian Regional Maize Workshop held September, 5-9, 2005, Beijing, China, CAAS and CIMMYT, 353-357

USAID. (2011) Value chain/market analysis of the ginger sub-sector. Nepal economic agriculture and trade activity-USAID. General development office, Kathmandu, Nepal.

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