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ECONOMICS OF TOMATO CULTIVATION USING PLASTIC HOUSE: A CASE OF HEMJA VDC, KASKI, NEPAL

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ABSTRACT

A questionnaire based survey using purposive sampling technique was carried out in 2009 to explore the economics of production problems on the tomato production. Twenty five farmers were surveyed to getthe necessary information. Per ropani cost of cultivation in the first year was Rs114,507 . Cost of cultivation from the second year onwards was Rs 40,827. The gross average income was Rs1, 08,275. Thus the benefit- cost ratio in first year was negative and it was 1.65 from the second year onward. Most of the farmers sold tomato to middlemen. FM radio and daily magazines were the major source for daily price information. Market price of tomato was higher between August and October. The lack of quality seed was the major production problem and blight followed by nematode was the major disease and the pest affecting the production.

Keywords: Benefit Cost Analysis, Plastic House, Problems, Tomato, Total Cost.

Introduction

Tomato is one of the major vegetables produced and consumed in Nepal .It occupies 5th position in terms of area coverage and second in terms of productivity (VDD,2009). The year-round demand of tomato is increasing due to its multiple uses as a vegetable, salad, and pickle. Open cultivation of tomato during the rainy season is almost impossible because of heavy rainfall and therefore many farmers now construct plastic houses to protect it from rain. The regional agriculture research station at Lumle inKaski developed an offseason tomato cultivation technology using plastic house 25 years ago. Now days, this technology is popular among the farmers of the western development region and the number of offseason tomato growers is increasing every year. Tomato cultivation using plastic house is a popular mode of agro-entrepreneurship in Kaski district. Within 2008, there were more than 1310 plastic houses covering 9 hectares of land with more than 570 farmers directly engaged in its cultivation as an off season major commodity (DADO, 2008). Hemja is the pioneer VDC of Kaski district where 75 farmers are now directly involved in off-season tomato production technology using more than170 plastic houses (Shrestha and Kafle, 2009). According to the estimate of the famers, they

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can get profit up to Rs 85,400 every year from the cultivation of tomato under plastic house per ropani of land which makes it 2-3 times more profitable when done in open conditions (Budhathoki, 2006).

OBJECTIVES

The general objective of this study was to access the economics of tomato production inside plastic house with focus on:

- the cost incurred in the construction of plastic house,
- the income from the off-season tomato cultivation,
- scope for production and marketing system and the challenges.

THEORETICAL FRAMEWORK

The plastic house technology developed primarily by RARS, Lumle and HRD, Khumaltar, has gained popularity in districts like Kaski, Syanja, Palpa, and the Kathmandu valley. The plastic house is suitable for the areas of altitude between 1000 and 1400 masl (Regmi, 2005).The cultivation technology using plastic house is important for getting a higher return because of the yield and quality. Plastic house also extends crop life and protects the crop from extreme climate (Regmi, 2005). Tomato, cucumber, zucchini, sweet pepper, and bitter gourd are among the vegetables that can be profitably grown in plastic houses (Budhathoki, 2006). Studies conducted by the Horticulture Research Division, Khumaltar from 2000 to 2003 at Khumaltar, Thankot, Nakhu, and Lunghu showed that per *ropani* yield of tomato when plastic house is used ranges from 4 to 10 ton while in the open field it was just 1-2 ton.

Off-season tomato cultivation using plastic house has a long history but it is still a new technology among the farmers, although it is becoming popular. Many farmers are today interested in the plastic house but they don't know the costs of construction and mode of production of tomato. Even research and extension agencies are unable to offer the information needed. Realizing this, a questionnaire based field survey was done to explore the exact cost of production and construction of plastic house along with the major problems of production and marketing.

METHODOLOGY

The potential VDCs in Kaski district were identified; an inventory of farmers involved in plastic house cultivation technology was prepared; and from the 75 farmers of Hemja VDC, 25 farmers were selected purposively. Five tomato retailers were selected for market price survey and pretested semi-structured questionnaires were used to get information about the cost of construction, production volume, mode of selling, pricing mechanism, and problems in production and marketing. Focus group discussion, key informant survey, and individual farmer

interview were used to get necessary information. The three point indexing technique (1for minor, 2 for mild, and 3 for major) was used to prioritize production and marketing problems. Most of the farmers in Hemja used plastic houses of dimension 20X6 m^2 for tomato production and this was considered as the standard size. Economic analysis was done based on the basis of this size. The obtained information was tabulated and analyzed using simple descriptive statistics and indexing techniques.

RESULTS AND DISCUSSIONS

Cost of constructing plastic house

The total cost incurred in the first year in constructing plastic house of dimension 20X 6 m^2 was Rs 28,515(Annex 1). In one *ropani* land, farmers can setup 3 plastic houses. The total cost per *ropani* was thus Rs 85,545.From the survey, houses were found to be durable for up to 3-4 years and the cost incurred for maintenance including bank loan was Rs 13,665 per *ropani* from the second year onward.

Cost of cultivation of tomato

The total cos t(including fixed plus variable t) for cultivation including land rent was Rs 28,962 per *ropani* and excluding land rent Rs 27,162 (Annex 2).

Average production and selling price for various years

The commercial production of tomato under plastic house in Hemja started from 2005. Hence the average production and selling price from 2005 was used for analysis. Average tomato production per *ropani* was 5.66 MT with an average gross income of Rs 1, 08,275 (Table 1). Productivity was found decreasing year after year due to several problems.

Table1. Quantity of tomato produced and selling price

	Year	Production(MT/ *Ropani*	Selling price(Rs/MT)	Gross income (Rs/ *Ropani)*
1	2005	6.9	22,000	1,51,800
2	2006	5.15	20,000	1,03,000
3	2007	5.3	17,000	90,100
4	2008	4.9	18,000	88,200
	Average	5.56	19,250	1,08,275

Number of respondents =25

Benefit-cost ratio analysis

In order to calculate the profitability of tomatoes grown under plastic house, a benefit-cost ratio analysis was done. Under single cropping pattern condition, i.e. growing only tomato inside plastic the house, the ratio for the first year was negative (-0.05) due to high costs incurred on the construction of plastic house. The ratio was more than one (1.65) from the second year onward. Thus the venture became profitable from the second year onwards. (Annex 3).

Marketing practices analysis

Marketing system followed

Marketing system is a crucial factor in determining the price of a commodity. The actors involved in the marketing system influence the price of commodities. Five types of marketing practices were prevalent in the study area (Fig- 2).About 40% of the farmers sell tomato to the traders from Pokhara (middlemen). Farmers bring tomatoes to the collection center and middlemen buy and supply tomato to the wholesale and retail markets. Some farmers of the study area were working as local contractors. They buy tomatoes from the fields and supply them to the retail markets, hotels, and restaurants of Pokhara. About 28% of the farmers sell tomato to local contractors. The farmers, who produce tomatoes in small amounts, sell them the retailers of Hemja bazar (local market).

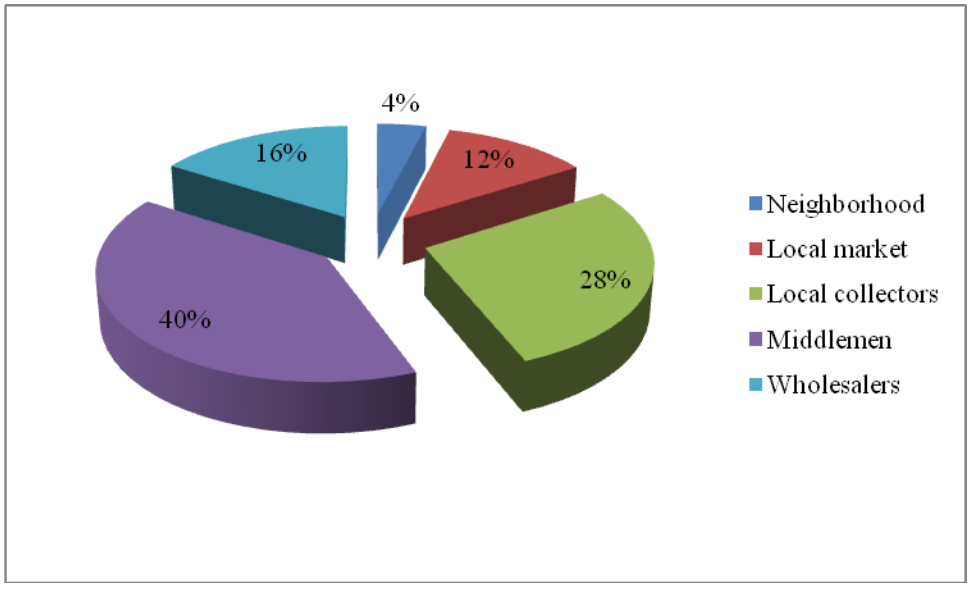

Fig- 2.Marketing system followed by the farmers of Hemja VDC

Market price information

Market price information plays a key role in price among traders and producers. If the producers have prior information on market price, they can bargain with the traders and get a higher price

.FM radio and magazines were the most common sources of information on market price (56%), followed by traders (28%) (Fig- 3). Most of the farmers bargain with the middlemen depending on the broadcasts through FM radio and magazines. The illiterate farmers depend on the traders in fixing price.

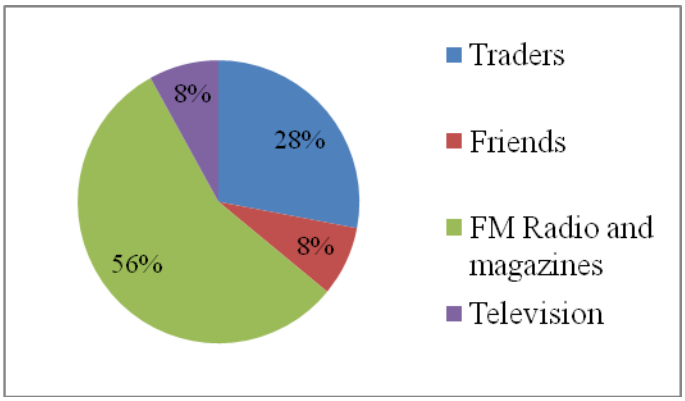

Fig- 3. Sources of daily information on the price of tomato

Price of tomato

Tomato is a perishable commodity and daily fluctuation in its price occurs due to uncertain production and demands. The tomato produced in plastic house is off- season in nature and major production is obtained within 6 months (June/July to November/December).The monthly average farm gate and retail price for this period is given in fig-4.The maximum average farm gate and retail price was recorded from August to October, because it is almost impossible to produce tomato in open fields during this period and the quality and size of the tomato is liked by the consumers. The minimum price was recorded during June/July and November/December. Tomato produced in open fields is supplied at a cheaper rate from November to June from different parts of the country.

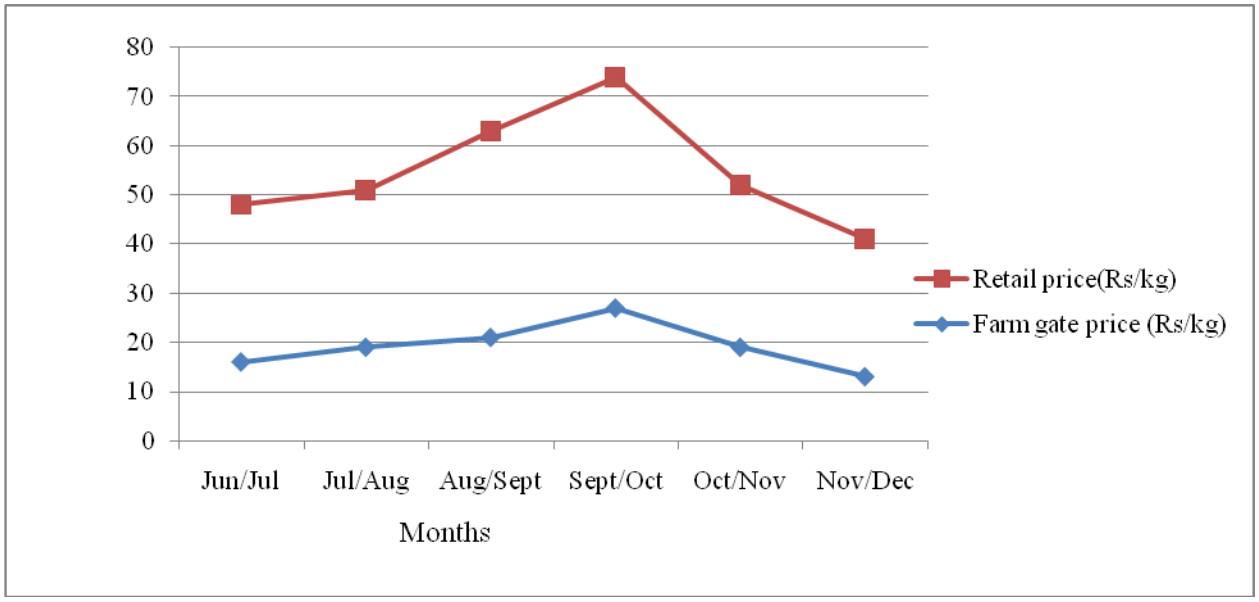

Fig- 4.Market price of tomato in 2008

Production and marketing problems

Production problems

A simple indexing technique was used to analyze the major production problem which is presented in Table 2.Lack of quality seed was the major problem in production. Most of the farmers use hybrid seed and farmers depend on a few suppliers for seeds. Due to improper quality control of hybrid seeds by the government, farmers faced the problem of quality degradation every year. Disease and insects/pests were the next most important problem.

Table 2.Major production problems of off-season tomato

S.N.	Major problem	Score			Total	Index value (∑fisi/N)	Priority ranking
		3	2	1			
1	Lack of quality seeds	22			66	2.64	I
2	Disease	14	1		44	1.76	II
3	Insect/Pest	13	2		43	1.72	III
4	Lack of loan facility	8	2		28	1.12	IV
5	Lack of technical knowledge	6	2		22	0.88	V
6	Timely unavailability of construction materials	4	2	1	17	0.68	VI
7	Lack of market	1	2	6	13	0.52	VII

8	Lack of irrigation facility		3	4	10	0.4	VIII
9	Lack of fertilizer		1	5	7	0.28	IX

Major insect/pest and disease

Disease and insects/pests are the major limiting the production of plastic house tomato and are presented in Figures 5,6. Nematode was the major pest problem (32%), followed by white fly (28%), and leaf minor (20%) whereas /late blight (64%) and viral complexes (36%) were the major diseases in Hemja VDC. Budhathoki (2006) and Regmi (2005) provide a list of the major diseases and insect pests of vegetables under plastic house: root knot nematode, wilt, leaf blight, whitefly, aphids, fruit flies, and tomato fruit borer.

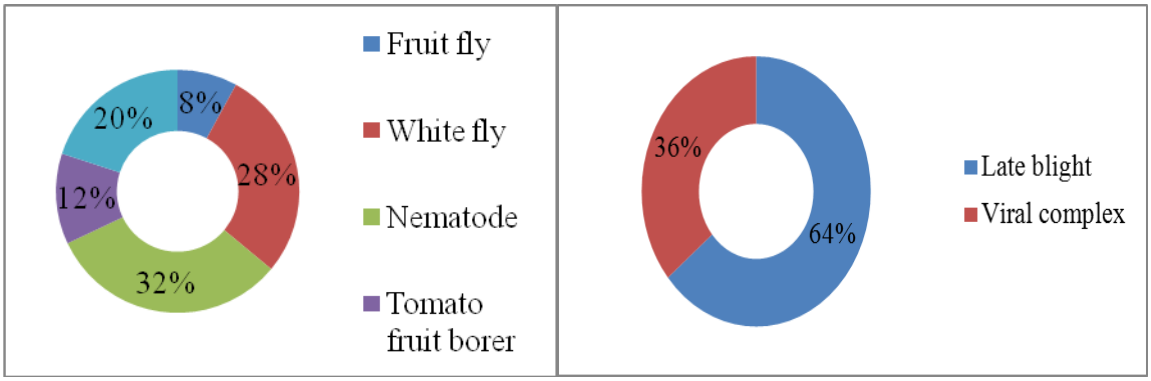

Fig-5.Major insects/pests of off-season tomato, Fig- 6.Major diseases of off-season tomato

Marketing problems

Several factors may be associated with the improper marketing of commodities, among whom the important ones identified in the course of survey given in Table 3. Variation in price according to the type of marketing agent was the major problem. Local level collectors gave a higher price compared to the middleman because local level collectors were also producers and take fewer margins from the neighboring farmers. The next problem was monopoly in price fixation by the traders. In most of the cases, the trader decided price irrespective of the prevalent market price. Lack of grading according to size and quality was the major reason for monopoly in traders pricing.

Table 3 . Major problems in marketing

S.N.	Problem	Score			Total	Index value (∑fisi/N)	Priority ranking
		3	2	1			
1	Price variation	20	1		64	2.56	I
2	Traders' monopoly in price fixation	18	1		56	2.24	II
3	Lack of market price information	14	2		46	1.84	III
4	Lack of quality packaging materials	8	2	2	30	1.2	IV
5	Lack of organized market			16	16	0.64	V

CONCLUSION

Tomato cultivation using plastic house is profitable from the second year onwards. Traders from Pokhara (middlemen) were the major actors in marketing. FM radio and local magazines were the most common sources of getting daily market price information .Most of the farmers listened to FM radios for getting information on prices in Pokhara market which was the basis for determining the price of tomato. Tomatoes produced in Hemja got higher price from August to October due to the limited supply from other districts. Lack of quality seed followed by insect/ pest and disease were the major problems in production. Among the insects/pests and diseases, Nematode, Whitefly and, blight caused heavy loss in production. Variation in price and monopoly of the traders in price fixation were the major marketing problems. Farmers should have prior knowledge on production cost, marketing mechanism, and the cost of cultivation to get maximum profit from unit area.

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LIST OF ANNEXES

Annex 1.Average cost of construction of plastic house of size 20X6 m^2 in 2008

	Material	**Unit**	**Quantity**	**Per unit cost (Rs)**	**Total cost (Rs)**
1	Bamboo	Piece	50	200	10,000
2	Silpaulin plastic(120 GSM)	Square meter	150	70	10,500
3	Rope	Kg	2	100	200
4	Nails (3 inch)	Kg	1	150	150
5	Binding wire	Kg	2	130	260
6	Labor cost				
6.1	Skilled	Person	5	350	1,750
6.2	Unskilled	Person	5	300	1,500
8	Used vehicle mobil/Coaltar	Liter	2	50	100
7	Transportation cost	Rs			1,000
	Total cost	Rs			**25,460**
	Annual repair cost(second year onwards)	Rs		1,500	1,500
	Bank interest	Percent	12%		3,055.2
	Total cost for the first year	Rs			**28,515.2**
	Total cost from second year	Rs			**4,555.2**

Annex 2. Average cost of cultivation of tomato inside plastic house of size 20X6 m^2 in 2008

S.N.	**Material**	**Unit**	**Quantity**	**Per unit cost (Rs)**	**Total cost (Rs)**
1	Variable cost items				
1.1	Seed	gram	2	80	160
1.2	Fertilizer				

1.2.1	Compost	[3]*Doko*	30	40	1,200
1.2.2	Poultry manure	[4]*Bora*	5	250	1,250
1.2.3	Organic fertiliser	Kg	5	20	100
1.2.4	Oil cakes	Kg	10	20	200
1.2.5	Urea	Kg	1	30	30
1.2.6	DAP	Kg	2	48	96
1.2.7	Potash	Kg	1	29	29
1.3	Micronutrients (soil)				300
1.4	Pesticides/Micronutrients				
1.4.1	Diathene	gram	100	0.9	90
1.4.2	Krilaxyl	gram	100	1.6	160
1.4.3	Blitox-50	gram	100	0.9	90
1.4.4	Nuvan	ml	100	0.55	55
1.4.5	Rougar	ml	100	0.65	65
1.4.6	Multiplex	ml	100	0.5	50
1.5	Animal power				
1.5.1	Land preparation		1	600	600
1.6	Manpower				
1.6.1	Land preparation	Person	3	125	375
1.6.2	Seed sowing /transplanting	Person	2	125	250
1.6.3	Staking	Person	3	300	900
1.6.4	Irrigation	Person	1	125	125
1.6.5	Manuring	Person	2	125	250
1.6.6	Intercultural operation	Person	2	125	250
1.6.7	Spraying	Person	1	125	125
1.6.8	Plucking	Person	3	125	375
1.6.9	Packaging	Person	1	125	125
1.6.10	Transportation(Fruit, fertilizer, pesticides)	Person	4	125	500
1.7	Tea and breakfast				1,000
1.8	Equipment maintenance				300
	Total variable cost	Rs			**9,050**
2	Fixed cost				
2.1	Land tax	Rs			4
2.2	Land rent	Rs			600
	Total fixed cost	Rs			**604**

[3] Bamboo basket, 1 basket nearly equals 25 kg

[4] nearly equals 40 kg of poultry manure

	Total cost (without land rent)	**Rs**			**9,054**
	Total cost(with land rent)	**Rs**			**9,654**

Annex 3.Benefit- cost analysis of plastic house tomato

Net benefit (for the first year) = Gross average income-Total cost (Fixed + Variable)

=1, 08,275-1, 14,507 =Rs 6,232(Negative benefit)

B/C ratio for the first year =Net benefit/Total cost=6,232/1, 14,507= **-0.05**

Net benefit from the second year = Gross average income-Total cost (Fixed + Variable)

=108275- 40827= NRs 67448

B/C ratio from the second year onward =Net benefit/Total cost=67,448/40,827= **1.65**