



**Research Article**

## Impacts of Massive Earthquake 2015 AD on Coffee Production and Marketing in Western Hills of Nepal

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### Abstract

This study was conducted in Gulmi and Palpa districts in western hills of Nepal in 2017 AD with the main objective to assess the impacts of massive earthquake 2015 AD on coffee production and marketing. One hundred and sixty coffee producers were selected by a three-stage sampling procedure. In this study only 6.9% of coffee producers had said that they had experienced impacts of massive earthquake 2015 AD on coffee production and marketing. Among the coffee producers (6.9%) who said that they had experienced the impacts of earthquake 2015 AD, majority (37%) of them said that they had suffered some minor (repairable) cracks in their houses and sheds while 27% of them had said that rate of drying of water sources is accelerated after earthquake leading to shortage of water for drinking and irrigating coffee fields. Since earthquake 2015 AD had minor impacts on coffee production and marketing, pre earthquake preparedness like public awareness programs, trainings for coffee producers, entrepreneurs and other stakeholders, quality construction practices, preparation of new codes and standards for infrastructure design should be done in the study area to cope with the unforeseen consequences of earthquake in future.

**Key words:** Coffee; earthquake; impacts; pre earthquake preparedness; western hills

### Introduction

Earthquakes occur due to the vibrations created by the movement of earth crust. According to Statista (2018) around 9624 people died worldwide in 2015 due to earthquake. Nepal Disaster Management Reference Handbook (2015) had mentioned that Nepal is highly vulnerable to earthquake as it is situated upon the Alpine-Himalayan belt where 7% of world's largest earthquake occurs as the Indian plate pushes upwards into the Eurasian plate, causing great stress to build up in Earth's crust, only to be relieved through earthquakes

A devastating earthquake struck in Nepal on 25 April 2015 followed by several strong aftershocks that killed more than

9000 people and 23000 were injured (European commission, 2015). The epicenter of earthquake was located in Barpark, Gorkha which is approximately 77km northwest of Kathmandu (capital city of Nepal) and 73 km east of Pokhara (WHO, 2015). The earthquake has affected different socioeconomic sector of country overall, the event was catastrophic and had destroyed or damaged houses and animal shelters, livestock, crops and food stores, as well as social infrastructures such as school, health centers, banks, business centers, microenterprises, roads and trails. Therefore, the result is much stressful and disturbing as it has severely affected health, threatened food security, and disrupted production, employment, business, trade and services (ICIMOD, 2015). According to Post Disaster

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Needs Assessment (PDNA) report of the National Planning Commission (2015) had shown that the earthquake has already pushed a further 700,000 people below the poverty line.

The devastating earthquake had affected social, economic, cultural, tourism and other sectors including the agriculture sector of Nepal. Though Nepal began to experience food shortage in 1920 AD Kathmandu (the capital city of Nepal) faced food shortage in 1934, when a major earthquake hit Nepal. This was the first time in the history of the country, the prime minister appealed to the people for help (Dahal, 1997).

Though government of Nepal had not officially declared Gulmi and Palpa districts (potential site for highland, decaffeinated and organic coffee production) among the most affected regions of massive earthquake 2015 AD but it is not far from the indirect sufferings as the consequence of massive earthquake 2015 AD. Coffee being one of the potential exportable agricultural commodities of Nepal this study is focused on capturing the impact of massive earthquake 2015AD in coffee production in western hills of Nepal.

**Materials and Methods**

In order to select representative sample a multi-stage random sampling was implemented. In the first stage, Gulmi and Palpa districts were selected purposively considering their great potentiality of coffee production in Nepal. In second stage, four coffee producing villages from each district were selected randomly. In the third stage, twenty coffee producers were selected from each villages.e(Gaudakot, Digam, Baletaxar and Thanapati) from Gulmi and (Deurali, Madanpokhara, Jyamire and Barangdi) were selected from Palpa by using snow ball method. In this way one hundred and sixty coffee producers were selected by three- stage sampling procedure. Both primary and secondary sources were used for data collection. A preliminary survey was conducted by administering questionnaire to 10 respondents on 18th July

2017 at Dhurkot, Gulmi to identify major impacts of massive earthquake 2015 AD on coffee production and marketing. The pre-tested interview schedule was administered to respondents of study area. One comprehensive Focus Group Discussion (FGD) was conducted at the study area after completing the field survey with help of the checklist to verify the result obtained from field survey and to understand the various aspects of coffee value chain. In the FGD, participants were local farmers, all ethnic groups and both male and female were included. Similarly, key informant survey was carried out to gather the required information from individual stakeholders like Junior technicians (JT), Junior technical assistants (JTAs), proprietor of agricultural cooperatives, farmer group members, collectors, wholesalers, retailers, etc. The information collected from both primary and secondary sources were analyzed by using statistical packages for social science (SPSS) version 16.0 and Microsoft office excel 2013.

**Results and Discussion**

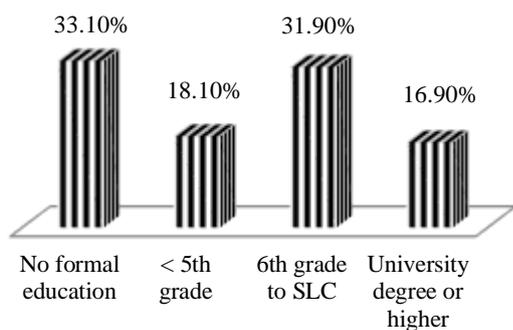
*Socio-Economic Characters of Respondents*

Household head plays important role in decision making. In this study, 25.60% (Table 1) of household head were female which is in consistent with national average female headed households according to CBS (2011) which was found 25.30%. Majority (45%) of the coffee farmers were found within the age range of 36 to 45 years (Table 1) while most of them (33.10%) were with no formal education (Fig. 1). Most of the respondents (43.8%) were of *Janajati* or tribe ethnic background (Fig. 2) while the average family size of the respondents in study area was found six (Fig.4). Discriminatory land distribution system based on gender was found because household heads with female land ownership was found only 13.8% while the households head with male land ownership was found 86.2% (Fig. 3). The average family size of respondents was found six (Fig 4). The cost per kg of fresh cherry was found NRs 69.48 while total variable cost of transformation of one kg cherry into dry parchment was found NRs 81.86. The benefit cost ratio of coffee producers and pulper operators was found 2.49 and 1.53 respectively which clearly indicates that coffee production is a profitable enterprise (Table 1).

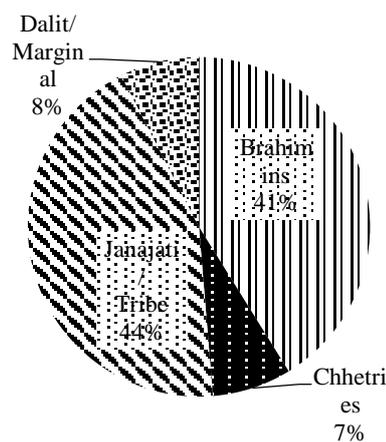
Table 1: Socio-economic characteristics of respondents in study area (2017)

Characteristics	Locations		Total	Pearson chi square
	Gulmi	Palpa		
Gender of household heads				
Male	57 (71.20)	62(77.50)	119(74.40)	0.820
Female	23(28.80)	18(22.50)	41(25.60)	
Total	80(100.00)	80(100.00)	160(100.00)	
Age of respondents ( years)				
15 to 25	1(1.20)	2(2.50)	3(1.90)	7.364 *
26 to 35	14(17.50)	17(21.20)	31(19.40)	
36 to 45	30(37.50)	42(52.50)	72(45.00)	
46 to 60	35 (43.80)	19(23.80)	54(33.70)	
Total	80(100.00)	80(100.00)	160(100.00)	
Cost per kg of fresh cherry in NRs (Mean ± SE)			69.48±0 .56	
Total variable costof transformation of one kg cherry into dry parchment in NRs (Mean ± SE)			81.86 ± 0.52	
B:C ratio (Producers, Pulper operators)			2.49, 1.53	

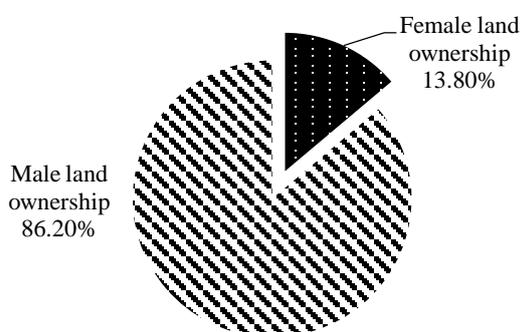
Note: Figures in parenthesis indicates percentage



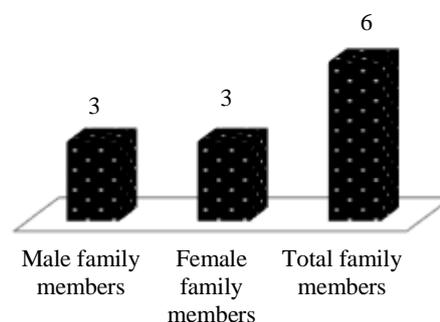
**Fig. 1:** Education level of respondents



**Fig. 2:** Ethnicity of respondents



**Fig. 3:** Land ownership based on gender



**Fig. 4:** Average family size of respondents

### **Social-Economic Impacts of Massive Earthquake 2015 AD**

In 2015 AD Nepal was shaken by devastating earthquake and the major temblors was experienced on April 25 to May 12 followed by many aftershocks with new epicentres that caused enormous loss of life and poverty. The result from this study showed that massive earthquake 2015 had minor effects on coffee producers of study area (Gulmi and Palpa districts) because 93.1% of total respondents had said that they had not experienced any negative consequence brought by earthquake 2015 AD while only 6.9 % of coffee producers had said that they had experienced indirect impacts of earthquake (Fig. 5). Among the coffee producers (6.9%) who said that they had experienced the impact of earthquake 2015 AD, majority (37%) of them said that they had suffered some minor (repairable) cracks in their houses and sheds (Fig. 7) and they were worried of economic cost of repair. Damages were mostly seen in older and unreinforced buildings as they are incapable to restrict

horizontal displacements or drift by seismic force of earthquake. Out of total respondents people claiming acceleration in rate of drying of water sources after earthquake, cracks in their houses and sheds, health issues, incidence of new pest and diseases and farmers experiencing more than one of these incidences were found 1.9%, 2.5%, 0.6%, 0.6% and 1.2% respectively (Fig. 6). According to (HELVETAS Nepal, 2018) when the devastating earthquake of 25 April 2015 hit Nepal, the buildings of many coffee cooperatives were destroyed or badly damaged. Helvetas supported them to “build back better”, with pulping (processing) centers designed in an environmentally friendly manner to minimize energy costs and water wastage and three central collection and processing units were also built. Thapa (2015) found food as the most pressing issue among respondents followed by the need for shelter. The loss of standing crops, loss of seeds and loss of livestock are going to affect the production, and thus, the availability of food as the post earthquake effects.

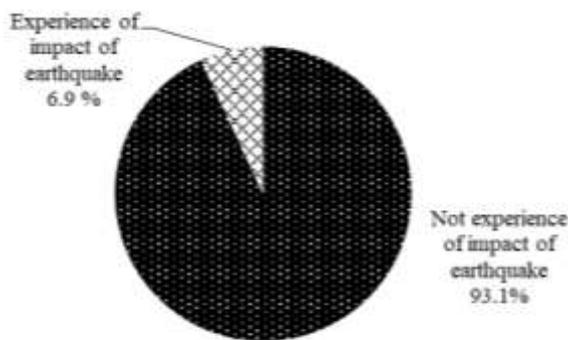


Fig. 5: Coffee producers experiencing and not experiencing the impact of massive earthquake 2015 AD

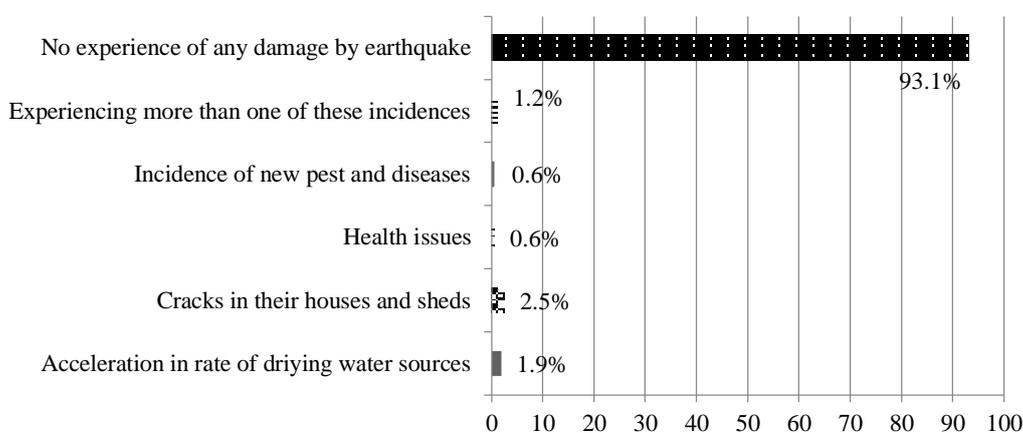


Figure 6 Impacts of massive earthquake 2015 AD on coffee production

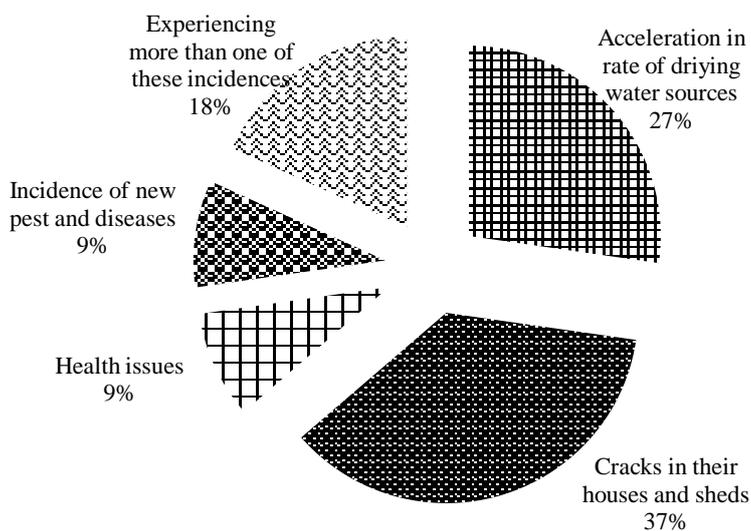


Figure 7 Different experiences of coffee producers after massive earthquake 2015AD

Source: Field survey 2017 AD

Note: The figure above represents for only those who have experienced the massive earthquake 2015 AD i.e. different responses of coffee producers assuming 6.9% as 100%

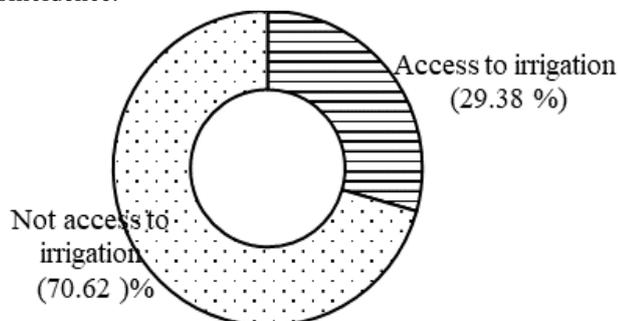
**Impacts of Earthquake on Coffee Orchard**

In this study none of the respondents had said that coffee plants were damaged by seismic action of earthquake but some (2.5%) of them had reported that they had experienced small cracks on their houses and sheds (Figure 6). Similar kind of incidence had happened in coffee growing region of Colombia in January 25, 1999 where coffee plants were found unharmed by the earthquake while the infrastructure problems on the coffee estates had caused massive problems, The coffee berries were not damaged by the seismic action as they were still early in the growth period, but the system used to care for the plants, process and store the beans had suffered complications (Ferrer, 1999).

**Impacts of Earthquake on Sources of Water for Irrigation**

Access to irrigation is one of the important aspects for increasing production and productivity of coffee because according to Chemura (2014) inorganic fertilizers are the most effective at high irrigation levels while organic manure performs better under moderate irrigation water levels. In this study only 29.38% of the coffee producers had access to irrigation facilities (Figure 8) which is a clear indication that they are facing problem of irrigating their crops.

In this study, some of the farmers (27%) had claimed that rate of drying of water sources is accelerated after earthquake (Figure 7) while most of them were confused to state the correlation between earthquake and drying of water sources as they think that it may be also the matter of coincidence.



**Fig. 8:** Coffee farmers with or without access to irrigation facilities

**Impacts of Earthquake in Incidence of Pest and Diseases on Coffee**

In this study, only 9% of the coffee producers had said that there is incidence of new pests and diseases on coffee after the earthquake 2015 AD (Figure 7). Majority of coffee producers pointed out infestation of white stem borer as the major problem of coffee production (Table 2).

**Impacts of Earthquake in Marketing of Coffee**

In this study none of the coffee producers had said that seismic action of earthquake 2015 AD had impact on marketing of coffee because 100% of the sampled coffee producers were found selling their fresh ripe cherry to

pulper operators mobilized by their respective coffee cooperatives. Besides, every pulping station was located in short distance from coffee farms and most of coffee producers carry coffee on their back by themselves or by the help of labors. According to CCUL Nepal (2018) many of the district level pulping centers were damaged and destroyed during the earthquake 2015 AD. The coffee beans that had been stored there were completely lost, leaving farmers struggling to recover with an entire year’s income.

**Table 2:** Major problems of coffee production (2017 AD)

Problems	Index	Rank
Infestation of coffee white stem borer	0.98	I
Low confidence on coffee business	0.65	II
Low availability of quality seedlings	0.51	III
Inadequate knowledge about new technologies	0.44	IV
High cost of inputs	0.44	V

Source: Field Survey 2017 AD

**Conclusion**

The massive earthquake 2015 AD had affected social, economic, cultural, tourism and other sectors including the agriculture sector of Nepal. Though government of Nepal had not officially declared Gulmi and Palpa districts (potential site for highland, decaffeinated and organic coffee production) among the most affected regions of massive earthquake 2015 AD but it was not left untouched by the indirect sufferings from the earthquake. Coffee being one of the potential exportable agricultural commodities of Nepal this study is focused on capturing the impact of massive earthquake 2015AD in coffee production in western hills of Nepal.

The direct impacts of earthquake 2015AD was not found in coffee production and marketing in the study area because only 6.9 % of coffee producers had said that they had experienced hurdles due to massive earthquake 2015 AD. Among the coffee producers (6.9%) who said that they had experienced the impacts of massive earthquake 2015 AD, majority (37%) of them said that they had suffered some minor (repairable) cracks in their houses and sheds which reveals the diffused impacts of seismic force.

Similarly, 27% of them had said that rate of drying of water sources is accelerated after earthquake leading to shortage water for drinking and irrigating coffee fields which alarm the future unforeseen hurdles of drought in study area.

Unlike hailstorms, frosts, diseases and other catastrophes coffee plants (coffee orchards) were not damaged by seismic action of earthquake which is a clear indication of coffee production activities not being directly affected by earthquake.

## Recommendations

In this study only 6.9 % of coffee producers had said that they had experienced impacts of massive earthquake 2015 AD on coffee production and marketing which clearly indicates that earthquake 2015 AD had minor impacts on coffee production and marketing. Hence, pre earthquake preparedness like public awareness programs, training coffee producers, entrepreneurs and other stakeholders, quality construction practices, preparation of new codes and standards for infrastructure design should be done in the study area to cope with the unforeseen consequences of earthquake in future.

Similarly, 27% of the farmers among those who had experienced the hurdles from earthquake (6.9%) had claimed that rate of water sources either for drinking or irrigating is accelerated after earthquake which alarms the future unforeseen hurdles of drought. Hence, appropriate strategies like rain water harvesting technologies (RWHT), afforestation and reforestation, optimum use or minimum wastage of available water and so on should be adopted to cope with those hurdles.

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