

Perspective of Farm Gate Agroforestry Product in the Emergency of the Chepangs Community: A Case Study of Mega earthquake of Central Nepal.

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Abstract

Agroforestry is one of the major sources of sustenance among the people of Nepal, and only one mode of livelihood at the Chepangs in present days. National Seismological Centre (NSC-Nepal), recorded mega earthquake (7.8 Mw) that hit the country on the 25th of April in 2015, and many of its aftershocks had catastrophic effects. As a result, big structures collapsed, which incurred great losses on fabrication, collection centers, schools, markets, and other potential government, and private service centers. Continue aftershocks, and after two weeks later another earthquake hit (6.3 Mw) jeopardize Chepangs food security in Makwanpur.

This study was designed to find out the food security, and market situation of agroforestry product of the Chepang community in Raksirang (One of the Severely affected VDC in Makwanpur district) due to the earthquake. A total of 40 households (12 %) were selected as a sample size. Questionnaires, Focus Groups Discussion (FGD), Observation, key informant interview tool were applied, and detail information from District Disaster Response Committee (DDRC), and emergency support agencies (UNICEF, WFP, PLAN, TEAR Fund) were consulted for additional narrative information.

The research illustrated that approx. 370 hectares of land, with agroforestry plantation, ruptured by the earthquake, caused severe damages to the household's structure, and a loss of food-stock up to 2/3 portion. Instead of regular cereal (rice, maize, and vegetables) intake, banana (*Musa paradisiaca*) consumption was in high scale during the emergency period. The market price of rice increased by 18.9 % due to demand. Income variation found before, and after the disaster. Prior to earthquake, agroforestry-livestock product was accelerating, but after the earthquake, agroforestry remains the only one means of livelihood among Chepangs. Nearly, half of agroforestry production of banana (*Musa paradisiaca*), citrus (*Citrus lemon*), pineapple (*Ananus comosus*) and broom grass (*Thysanolaena maxima*) declined, which was ready to harvest within 2-3 weeks. Heavy demands of agroforestry product above lay high farm gate prices (Up to doubled) helps surveyed community to continue livelihood from its sale. Nearly, 75 % respondents migrated to safe location due to land rupture, ongoing aftershocks, and occurring landslides. Overall food security situation in this community is acute, and challenging for the days to come. Immediate, and long-term response through relief agency concerning food, shelter, and safe stocking of agroforestry product is required. Agroforestry plantation and technical support to increase production, and to balance the food security and livelihood for longer period are the upcoming challenges in the coming days.

Keywords: Earthquake, rupture, agroforestry, livelihood, indigenous, food security.

Introduction

The Gorkha (Nepal) earthquake (Mw 7.8) occurred at 11:56 National Standard Time (NST) on 25 April 2015 with an epicenter 77 km (48 miles) northwest of Kathmandu, the capital city of Nepal, that is home to nearly 1.5 million inhabitants, and at a focal depth of approximately 10-15 km; Around 60 aftershocks, of up to magnitudes of 6.6 have occurred, and were concentrated in the region of the epicenter, and up to 150 kilometers to the east (WHO, 2015). This earthquake was the one of the most powerful earthquakes to strike

Nepal since the 1934 Nepal-Bihar earthquake (Mw 8.1) (NSC, 2015) Based on the information from the United Nations, nearly one, and half million people have been affected by the massive 2015 earthquake in Nepal (WFP, 2015)



(Severely damage houses in Churidanda, Raksirang (Surveyed hhs Debris in Raksirang)

Coordinates: -27.59° N 84.86°E)

Agroforestry means planting trees in agricultural or foraging areas. But in many parts of the world, agroforestry is the traditional method of farming. (Chloe, 2006). Agroforestry is the traditional practice of growing trees on farms for the benefits of the farm family. It has been in use for at least 1300 years, according to pollen record (Padoch, 1994), although tree domestication probably started much earlier (Simmonds, 1985). Agroforestry was brought from the realm of indigenous knowledge into the forefront of agricultural research less than two decades ago, and was promoted widely as a sustainable enhancing practice that combines the best attributes of forestry, and agricultural (Bene et al., 1997), and (Nair, 1987) (Sanchez, 1995).

The deliberate growth of woody perennials on the same unit of land along with agricultural crop and/or animals either in some form of spatial mixture and in some temporal sequence; and there must be, significant interaction-ecological and/or economic (positive or negative) between the wood and other component of the practices (Tejwani, 1994)

Shifting cultivation is also called slash & burn farming. It is an old age farming system; in fact, a rotational agroforestry practices adopted mostly by indigenous people in the world. In Nepal, this practice is locally known as “*Khoria Kheti*” and is a dominant farming practice in the hilly areas of Central and Western Region of Nepal (Singh, 1993).

Hill farmers in Nepal have long been growing a variety of native trees in their farm lands to maintain land productivity, and to provide for subsistence needs, such as timber, fodder for livestock, and fuel wood for cooking (Neupane et al., 2001)



(Banana in Raksirang) (AF product, bakaino (*Melia azedarach*), ipil-ipil (*Leucaena leucocephala*), and banana (*Musa paradisiaca*) all together) (Source=Field visit 2015)

Agroforestry Practice in context of Nepal

The rural landscape that encompasses an agrarian economy, fragile ecology, and a complex, and differentiated society is changing rapidly in Nepal, with creation of new opportunities, and challenges. Despite this rapidly changing environment, the rural economy is still based on subsistence agriculture. In the middle hills, the agroforestry system, particularly the integration of fodder trees, and grasses with livestock system, has been an important source of livelihood for poor people. This also has potential to become a steady source of green employment opportunities (Neupane R. P and Thapa, 2001); (Miller R. P. and Nair, 2006); (Barakoti, 2007). Growing of trees, shrubs, and herb species on private lands to fulfill the basic household needs has been a long-established tradition in the mountains of Nepal. Species of trees, shrubs, and herbs are mostly from forests, but which are also grown in private lands are called agroforestry species. Farmers have long experience, and know-how of propagating the agroforestry species grown in their farmlands. Some examples of the agroforestry species in the middle hills of Nepal are *Choerospondias axillaris* (Lapsi), *Sapindus mukorossi* (soap nut), *Cinnamomum tamala* (tejpatta), guava, mango, and litchi (Pandit et al, 2014)

Agroforestry practices in Nepal can be described in two broad categories: farm-based, and forest-based. The farm-based practices are home gardens, planting trees on, and around agriculture fields, tree wood lots, and commercial crop under shade trees or agriculture crops inter-cropped with commercial trees. The forest-based practices involve specific agricultural practices associated with forests where farmers collect food, fruits, and gums (Tejwani and Lai, 1992). In this study, agroforestry is referred to as farm-based practices. Farming or agriculture is the main source of livelihoods for the people of Nepal. Trees on farmland or in forest form an integral part of the farming system. Nutrients for cropland come from animal manure, and leaf material. Timber for construction, firewood as a form of energy, fodder, grass, and bedding materials for livestock all come from both the forest, and the farmland. Trees are also important for the protection of environment, and conservation of biodiversity (Gilmour and Fisher, 1991); (Grimble et al., 1994). Nonetheless the food, fuel and fodder requirements of continuously increasing human, and livestock population have generated enormous pressure on forest and arable land, leading to depletion of natural resources thereby affecting natural, and human environment (MPFS, 1991). Literature indicates that forest resources are dwindling day by day in quantity, quality, and diversity. It has been estimated that forest in Nepal in 1964 was more than 45 % of the total land area.

In this context agroforestry can play a vital role to meet the need of the growing population in terms of sustaining crop agriculture and livestock, production of commodities for exchange, and as a form of energy, and providing diverse tree products for sustaining rural livelihoods (Chew, 2001); (Arnold, 1997) (Regmee, 2003).

Chepangs of Nepal

The Chepang, one of the 59 groups of indigenous peoples of Nepal have practiced shifting cultivation or "*Khoriya in Nepali*" for centuries. The Chepang people, also called "*Praja*", are regarded as the most marginalized, and resource poor group in Nepal. They are distributed in Chitwan, Dhading, and Tanahun. Out of the total population of 52,236 (CBS, 2003), most of them live in Makawanpur. The north-western Makawanpur where Chepang, and Tamang family live are most dependent on Khoriya farming. Earlier, the agriculture period was shorter, followed by a long forestry period (which is known as Fallow period). During the time of vegetation grew during the fallow period by Chepangs of Makwanpur was slashed and burnt that provided nutrients to the agricultural crop. As the need arose for more crops, people started cultivating in the gap of 3 to 4 months, followed by a shorter fallow period with frequent slash and burn (MDI, 2008)

Most of the Chepangs normally can survive only for 5-6 months from the maize and millet they produced from own. For the rest of the year, they must depend on food gathered from the wild, which is as important as agriculture, as well as by fishing, hunting and wages earned as laborers (Bastakoti et al., 2008). Food security is a major concern, and a study in Kharsang village, where 47 percent of the population were Chepang, showed that 97 % of the people suffered from varying degrees of food deficiency during 3-9 months per year (Balla et al., 2002). Because the land is hardly fitting for permanent cultivation, the ability to practice shifting cultivation contributes to their subsistence, but this practice might lead to periods of food insecurity. The search for wild, and uncultivated foods might therefore be an important supplement for livelihood, support (Aryal et al., 2007).

Chepang households covered by the survey are dependent upon Non-Timber Forest Products (NTFP) for their livelihoods for the domestic purposes like fodder, fuel wood, litter, food, and medicine. On an average, NTFPs contributed 13.2 % to the total income of the households, ranging from (0- 60.3) %. The income generated from NTFPs thus varied greatly across the sample households (Piya et al., 2011)

As per visit over a Laitak village in Dhading district of Central Nepal, it was found that the introduction of banana, other vegetables, fruits in the farm, and home garden helps farmers to increase their income status as well as increase the diversity of nutrition (ICIMOD, 2009)

A report by District Food Security Network (reporting period Mid-November 2014-Mid-March 2015), Makwanpur revealed that household food stock of north-eastern part including Raksirang videos have sufficient for between 3-4 months for more than 50 % population from recent harvesting of Millet, and previous harvesting of Maize. In case of Chepangs community, an estimate of banana, Pineapple and fruits are available for sale, and for self-consumption (DFSN, 2015)

Situation of Chepangs before earthquake

According to recent study stated that agroforestry is the main reason behind improved livelihood; 32 % Chepangs are earning between a range of 15001-20000 NPR (\$ 150-\$ 200) /month from the sale of agroforestry product such as Banana (*Muas paradisiac*), Kurilo (*Asparagus racemosus*), and Amrisho (*Thysanolaena maxima*) (Chetry, 2015)

Maize, Millet, and purchased rice are the recent food stock in Chepangs houses which last for 4-6 months from own; an average of 3-5 small goats, 2-3 buffalo/ cows and, an average of 300-400Rs/ day wage

generated from the different development activity reported in Chepangs of Makwanpur of the north-eastern part (DFSN, 2015).

Recent harvesting of Millet, was increased by 2 % compared to last year this season, Chepangs households are highly supported by this crop which used for consumption as well for earning. (DADO, 2015). Broom grass (*Thysanolaena maxima*), banana (*Musa paradisiaca*), asparagus (*Asparagus racemosus*), bakaino (*Melia azedarach*), and some of the fruits as Citrus (*Citrus x limon*), Aru (*Prunus persica*), Mango (*Mangifera indica*) are standing crops in Chepangs which is the main source of income for coming days to survive, estimated 20-30 thousands Nepalese rupees (\$200-\$300) income generated from the sale of banana, broom grass itself (DFO, 2015)

According to Focus Group Discussion (FGD) with participants in Raksirang look over that an average of 4-5 goats, 2-3 animals (buffalo/ cow), 10-12 poultry, 20-150 trees of Banana, 1-2 houses, 1-2 cattle stall and a maximum of 1 temporary toilets were available, and functional before the earthquake arrives. Whereas 1-2 vegetable/ agroforestry collection centres, 3 schools (2 lower secondary, and 1 primary), 3 churches, 1 co-operative building, were available structure for this surveyed community before the earthquake which has a different number of figures, as almost all structures are partially or fully damaged after earthquake arrive.

Situation of Chepangs after earthquake

Initial rapid assessment based on consultation by different agencies by United Nations World Food Programme (UN-WFP) quoted through report that more than 30 percent houses under north-western area of Makwanpur are Severely damaged, and estimated 50-% foods stock (Maize, Millet, and purchased Rice) assumed to be lost due to it (WFPa, 2015).

Approximately, 600-700-hectare land ruptured due to earthquake in Makwanpur district among which Namtar, Raksirang, Kankada, and Dandakharkha VDCs are highly affected from it; From Raksirang itself approx. 370 hectares land rupture, and reported to entire losses on agroforestry product within the area (DDRC, 2015).

DDRC, and local correspondence noted a total of 33 deaths (4 from study area), more than thousand seriously injured, 5 handicapped in Makwanpur district due to the mega earthquake. Similarly, a total of 125 cattle's (Cow and buffalo), 85 goats, and nearby 2000 poultry was death in the district; statistically, nearby 9-10 % livestock belongs to the Chepangs area.

No research regarding earthquake and its impact to agroforestry was seen in internet or district profile which notify that research in this sector would be interesting and result oriented for the policy makers. Probably this study is the first in the district and national level to find out the situation of Chepangs, and their agroforestry product situation after the earthquake.

However, some impact/ initial study has done in the sector of health, wash, shelter by various agencies but not in the field of food security and agroforestry.

(Interview with Mr. Man Bahadur Praja, well-off Chepangs of survey community became poor after earthquake due agroforestry to loss of home, assets and products)



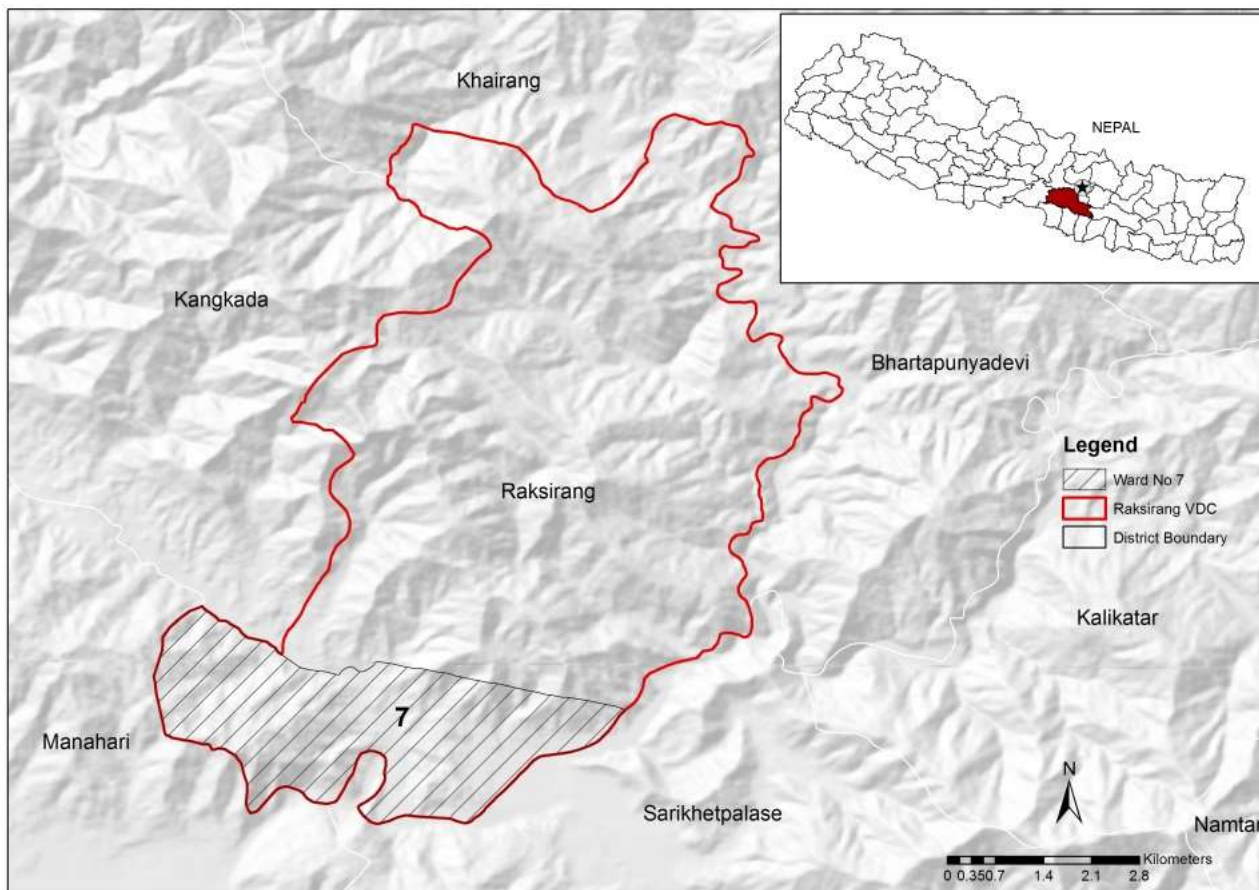
The objective of this study was paved as: -

- To describe the current food security situation of Raksirang VDCs in Makwanpur district after earthquake, and the challenges left for this community.
- To analyze the market situation of the agroforestry product with price.

Methods

Study Site with map

Makwanpur district is located within the Central Development Region of Nepal is one of the earthquake affected districts in Nepal. Raksirang Village Development Committee (VDC) is located (N 27°34'59.96", E 84°50'46.92") in the northwestern part of Makwanpur where majority of Chepangs (Indigenous) is near about 68 percent, and are comprehensively involved in agroforestry. Ward number 7 was purposely selected for this study which was Severely affected by earthquake hit, only Chepangs households were selected for this study, a total of 40 (12 percent) households were selected as sample size. A study was carried out between a period of the third week of May (Just after 9 days of second heavy earthquake with a magnitude of 7.3 Richter scale) to 29th of June 2015.



(GIS based, map of the study area)

Respondent Selection, and pre-test

A total of 40 households from Raksirng VDCs were selected purposely from the earthquake affected area; the respondent mandatory as Chepang households only, belong to the same wards, doing agroforestry farming. A focus group discussion was executed in ward number 7 following standard questions which explains that three different impact situations of earthquakes in terms of house damages found, such as "Severely" damaged, "Partially" damaged, and "No" damages of houses obtained from this group discussion; A simple random method (random selection) used to identify Chepangs, households. Before execution of final data collection, 5 sample households were tested in the nearby community of Raksirang (Churidanda) on dates 7th to 8th June 2015, which were the outline as well as feedback for the final roll out of household questionnaire.

Some pictures of the study area were also taken, and shown in this study for interpretation of the real situation of Chepangs after earthquake.

Data Collection

After feedback from pre-tested questions, a final questionnaire was prepared, and further translated into Nepali for easy understanding. Since, Chepangs are mostly using their own languages in daily life; hence a local citizen of Raksirang (Mr. Sita Ram Praja) of same wards was hired for easier execution of data collection. The household data collection was carried between (10-20)th June 2015. A consultation meeting with the District Disaster Response Committee (DDRC), District Development Committee (DDC), District Agricultural Development Office (DADO), District Livestock support Office (DLSO), District Forest Office (DFO), District Soil Conservation Office (DSCO), and Chief District Officer (CDO) was done to verify out the effect of the earthquake on lands, livestock, houses, and other livelihood needs.

Data Analysis

Statistical software Package for social science (SPSS) version 20 was used to interpret the data. A statistical figure obtained from SPSS is further modified in MS Excel to show better diagrams and tables.

Contribution of research into the today Scientific Society: -

This research may contribute to the development agencies such as government, I/NGOs, local agencies to prepare their planning process, and for policy implication. Following points are mentioned below to better explain the uses of this research: -

- In any disaster, media and development team are responsible to deployed aid and help the community to save the victims life. The challenging part of this study is the primary data collection, group discussion within the earthquake area conducted just after the incident happened. This shows a real, and field based recommendation which directly infer to the disaster based agency for their priority in terms of planning for migration /displacement and immediate, mid-term and long-term development plan.
- Another vital part of this article is the agroforestry promotion. Nutritional values, and balanced livelihood are more popular phenomena in the present time. This article shows that how Chepangs are using their household agroforestry stock in the emergency. Recent development projects are also promoting farmers for higher production, and good cash income from it but no one is interesting about it nutritional values and benefits from consumption. Therefore, this article may also have revealed a message to the international society to encourage the agroforestry production worldwide and teach the value of its production, and its nutritional requirement. In addition, a safe stock mechanism required to keep the household product for longer period.

- In research career, different type of picture may also be a source of information for the researcher to obtain the result and conclusion. This study not only captured the picture of debris, rupture scene and death scenes which we won't see in other research. Development research may have a photo of plantation, growing and so on but this disaster and its evidences are the best to explain the situation of severity. As an example, a picture of land rupture was captured during field visit was the proof of the earthquake area which won't see after few months of the disaster. This signify that disaster study always generates so many observational evidences which helped the researcher to conclude the result.
- This article not only highlighting to the international audience about the importance of farm gate agroforestry rather its uses in the human life. In Nepal livestock and agriculture practice are inter-related. This integrated approach including forest approach is required to promote in the national international level. During a loss of livestock, the human livelihood is ongoing from the farm based agroforestry. An integrated development approach is required to strengthen the community such as farm and livestock production including tree may help the livelihood situation of the people.
- This article also drawn an attention to the international scientific community to show a great example of sustainable development. Instead of little support from many of the agencies a long-term agroforestry development plan and execution required in the affected area which will not only encourage to the affected area but also will generate income for individual as well as nations.
- A new concept of agroforestry insurance has generated from this phenomenon. Nepal had recently underway of agricultural and livestock insurance which are just promoting in small scale. Now, agroforestry required some policy implication along with some insurance safety for the farmers who are promoting using their investment. This article also drawing attention to the world that similar or different situation may arrived in worldwide and international advocacy and policy related activities need to execute. Like, agricultural science agroforestry also required an international agenda for its sustainable and technical support for the farmers.
- A concept of buffer stock required from this study because during a period of crisis market situation was worse and almost not functioning. From this study, a message in spreading to the worldwide that a concept of buffer stock for cereals, and agroforestry are the upcoming development priority for the nations and development agencies.

Results

Food Security situation of the study area

Raksirang VDCs having a total of 1,152 households with 6,542 populations across the whole wards as per Central Bureau of Statistics (CBS) 2011; there is a total of 97 households in ward number 7.

(Availability situation)

The overall availability situation of surveyed community seems to be minimal from own production due to less productive area, lack of adequate knowledge on farming system; The major crop cereal in the area is maize, and millet which are planted in rainfed area. Irrigation facility is nil in the area due to geographically disorder (rugged, fragile, non-terraced land and so on).

According to Chamber of Commerce and Industries nearby market Manahari is a commercial hub for the Raksirang, and its surrounding 6 more VDC where Chepangs, and other ethnics are buying-selling their products.

(Table-1) HH food stock	Maize		Banana		Millet		Rice	
HH Food Stock	Before (No)	After (HHs)	Before (HHs)	After (HHs)	Before (HHs)	After (HHs)	Before (HHs)	After (HHs)
0-20 Kg	1	13	1	11	2	1	0	2
21-30 Kg	3	7	0	0	2	20	2	13
31-40 Kg	4	11	0	2	7	5	5	5
41-50 kg	13	6	0	1	6	5	10	2
51-60 kg	9	1	2	1	16	0	3	1
61-70 kg	4	1	1	0	2	0	0	0
71-90 kg	4	1	1	1	2	1	0	0
91-100 kg	1	0	0	0	2	2	0	1
101, and above	1	0	12	1	1	1	12	1

(Source-Field Survey 2015)

According to table-1, many of the households have their food stock from own/purchase till one month before the earthquake, and after the earthquake, commodity (millet grains and purchased rice) was ruin due to debris. According to data 82.5 % households holding 0.3-0.5 hectare* land of their own, in which 0.1-0.2 hectare is used for agroforestry; Beside this an estimated average of 0.4-0.5-hectare land used for agroforestry in the lease (Community Forestry). According to FGD, it was found that those houses which are fully damaged (Debris) have lost their food stock up to 60-80 %. Whereas, Partial damaged (cracked) houses have lost around 20 % commodity since some amount is recovered. Normal trend before disaster manifest that community do sale 75 % in market and keep rest 25 % for consumption and distribution but after earthquake it was just adverse, sale was less and consumption/ distribution was high. Field observation shows that Ipil-Ipil (*Leucaena leucocephala*), Bakaino (*Melia azedarach*), fodder plant, Broom grass (*Thysanolaena maxima*) and Taki (*Bauhinia purpurea*) are planted in most of the surveyed households. This indicates that apart from relief food support, banana (*Musa paradisiaca*), Peach (*Prunus persica*) was the most important consumable fruits during emergency for Chepangs. UN World Food Programme, Nepal Red Cross Society and DDRC supported rice with 15-20 kg each house, \$ 80 per houses (Npr. 8000) for market support including a tarpaulin as emergency relief support. Because of disaster maize plantation was delayed by one month and production was down during a time of harvesting due to inadequate rainfall, technical support.

Access

Nearest road head markets are Manahari had adequate food/ non-food stock in normal situation, just after the quake market was fully closed (non-operational) for so many days, and reopen it with a partially functioning with high market prices; Road connection to market was poor as rupture observed during a field visit. For market price, the cost of raw rice (mostly useable) was 44 Nrs/ kg (\$0.44) after earthquake followed by 37 Nrs/ kg (\$0.37) before that. Similarly, other food items such as noodles (\$0.15-\$0.50) / PCs, biscuits (\$0.20-\$0.50) / PCs, pulses (\$1.2-\$1.5) /Kg, tarpaulins (\$15-\$25) / Pieces were hiked in this market for long times. Till now rice price is stable with 44 Nrs/kg (\$0.43).

Income tables (Table-2, Income range per months)

Income (Nrs)	0-500(Up to \$ 5)	501-1000(\$5.1-\$10)	1501-2000(\$15.01-\$20)	2001-2500(\$20.01-\$25)	2501-3000(\$25.01-\$30)	3001-5000(\$30.01-\$50)	5001-7000(\$50.01-\$70)	7001-10000(\$70.01-\$100)	15001-20000(\$150.01-\$200)
Before	0	0	3	0	16	13	6	1	1
After	1	2	2	5	3	13	6	6	2

*1 Hectare=29.58 Kattha or 10,000 Square Meter; 1 Kattha=338 Square Meter ; (Source:-Yearly bulletin 2014, Ministry of Agricultural Development (MoAD), Nepal.

(1 \$=Nepalese Rupees 1,00) (Source=Field Survey 2015)

From the table-2, we can explain that there is a huge income difference before-after due to the earthquake impact on livelihoods of Chepangs. Prior to earthquake trend show that agroforestry income range of community is 2501-5000 Nrs (\$25.01-\$ 50) and higher than this in average. But after earthquakes only banana, citrus, broom grass was left to sale in the market. It was analyzed from community group discussion that an average household keep 3-5 piece of goats with cost 14,000-15,000 NRs (\$140-\$150), and 8-10 pieces of poultry which cost is estimated 2000 NRs (\$ 20) each, after earthquake an average of 60 % small animals along with stalls reported to be dead or severely injured, which indicates a big loss of livestock which is another mean of livelihood.



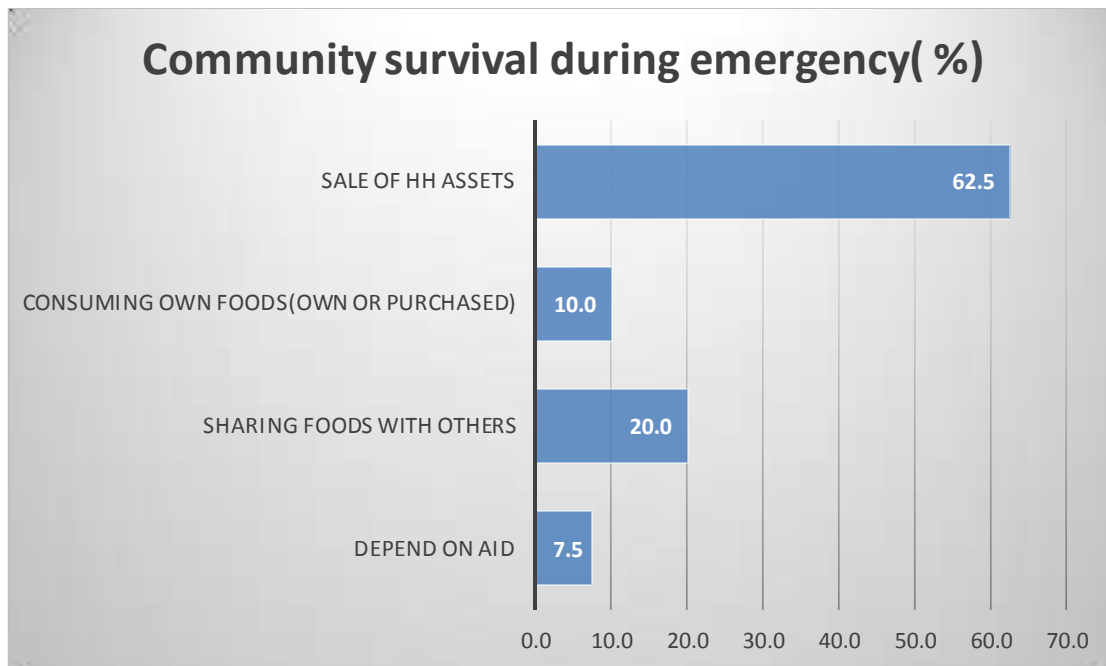
(Land rupture in Raksirang, Source-Field visit 2015)

Utilization

It was found that banana (*Musa paradisiaca*), and local fruits was the only available food item in the houses which was using frequently during a critical period of earthquake by Chepangs; income opportunity from farm/ off farm work was almost nil due to delay and less plantation of cereal crops, similarly sale of livestock was almost off due to massive death of animals in the study area. Data revealed that estimated 60 % small animals in average was dead or injured under debris. Therefore, only agroforestry product banana (*Musa paradisiaca*), citrus (*Citrus x limon*), pineapple (*Ananus comosus*) and broom grass (*Thysanolaena maxima*) only prospectus for surviving life's in terms of cash income as well as consumption both. According to survey data, a total of 4-7 days' household's skipped meals, and live under forest/ cattle stall/ open field due to earthquakes, and terrible after socks. According to District Agricultural Development Office (DADO), District Forest Office (DFO) and FGD participants, near about 50-60 % agroforestry lands with growing broom grass (*Thysanolaena maxima*), fodders, banana (*Musa paradisiaca*), was damaged in land due to multiple rupture of land.

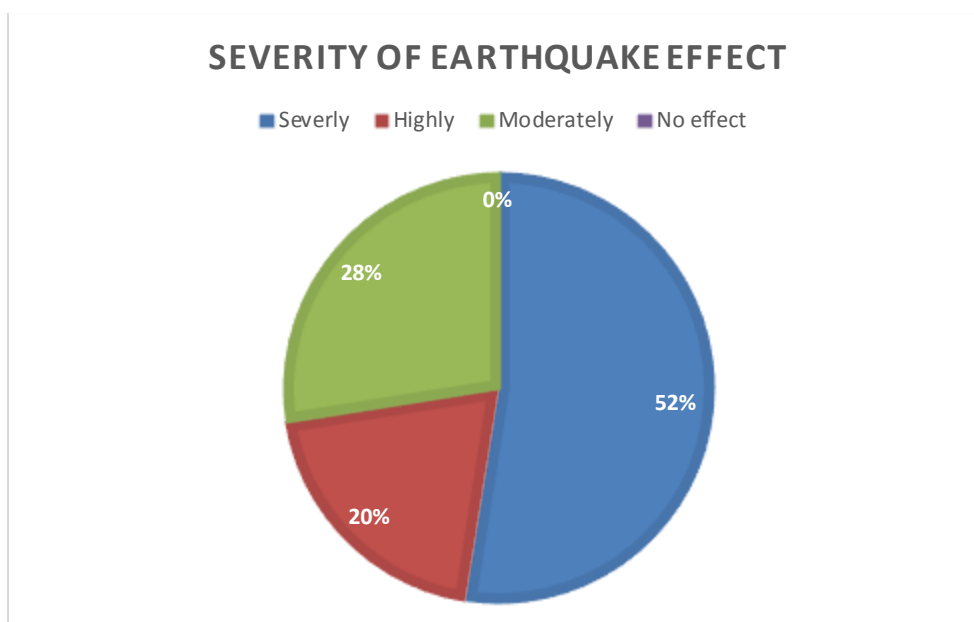
Stability and Challenges

(Table-3, Survival strategy during emergency)



From table-3 it can be easy understood that 25 household respondents said that they have sale the hh assets as a survival strategy whereas 3 hh (7.5 %) respondent were fully depending on relied aid-rice through development agency (WFP, DDRC). Rest 4 and 8 hhs were sharing foods with other and consuming own hhs product as a survival Strategy.

(Table-4, Severity of household through their opinion and research judgement)



From table-4, It can be find that every surveyed household had adverse effect from Severely to Moderate due to earthquake. “Severity” is classified as complete losses of houses, cattle sheds, drinking water, toilets no chances of repair; more than losses of 90 % household stocks, high rupture and landslides on the grounds, losses of more than 50 % Livestock’s, and almost a group of people who are required migration. On the other hand, “Highly” affected peoples are defined as losses of houses, few chances of repair; more than losses of 50 % household stocks is recovered, losses of more than 40 % livestock’s, and who are less

affected compare to severe group. On the other hand, “Moderately” is defined as partial crack of houses with a high chance of repair, more than 80 % household’s stocks are recovered, and less damages of cattle stalls, drinking water, and other assets.

From field visit, it was found that most of the surveyed houses were debris as well as agroforestry cover land became rupture due to the earthquake, as a result farmers were living under plastic/ tarpaulin, due to fear of death, and ongoing after socks; most of the Chepangs (agroforestry adopter) demand to displaced some other part of the area. DDRC, and political parties also listed some area as high propriety for immediate community displacement, but did not due to lack of policy by Government and challenged to manage larger area, funding for temporary/ long term period.

(Table-5, Opinion, as most important priority)

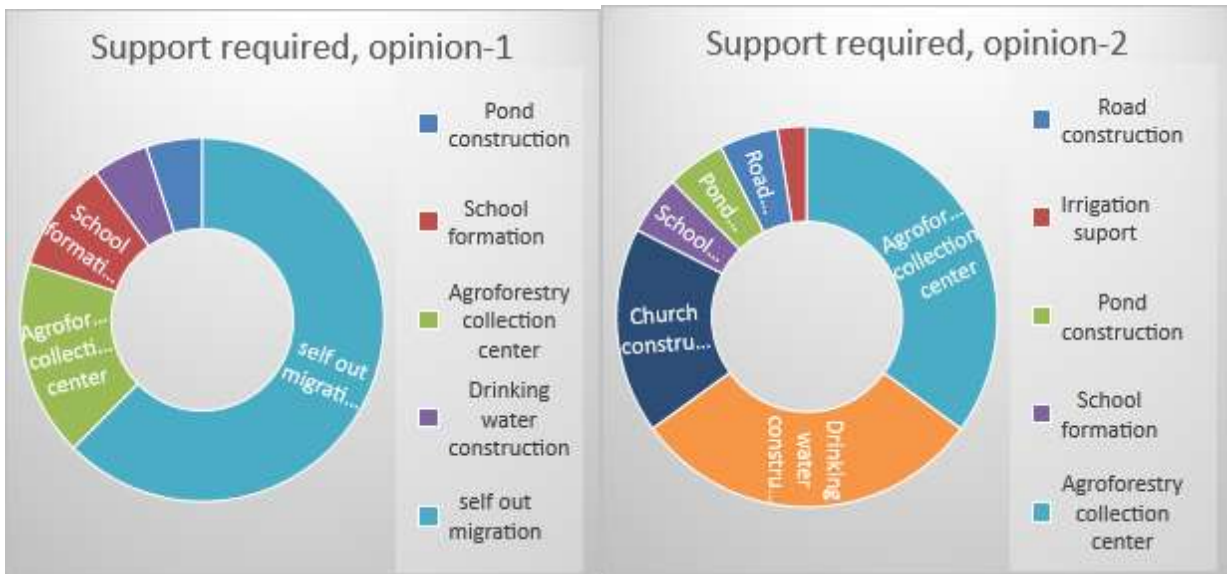
What immediate support is required	Nos	%	Why wish to displace	Nos	%	What will do with existing lands/agroforestry area	Nos	%
Displacement	30	75	Fear of death due to land rupture	20	50	If alive, will rebuild again	4	10
Rebuilding on AF collection center	7	17.5	Lack of HH food security	4	10	Leave it but want same lands	8	20
Drinking water support	1	2.5	Better opportunity	2	5	Leave it, if similar income opportunity found	18	45
Reconstruction of Schools	1	2.5	Not able to rebuild houses	4	10	NA	10	25
Rural road construction	1	2.5	NA	10	25			

(Source-Field visit 2015)

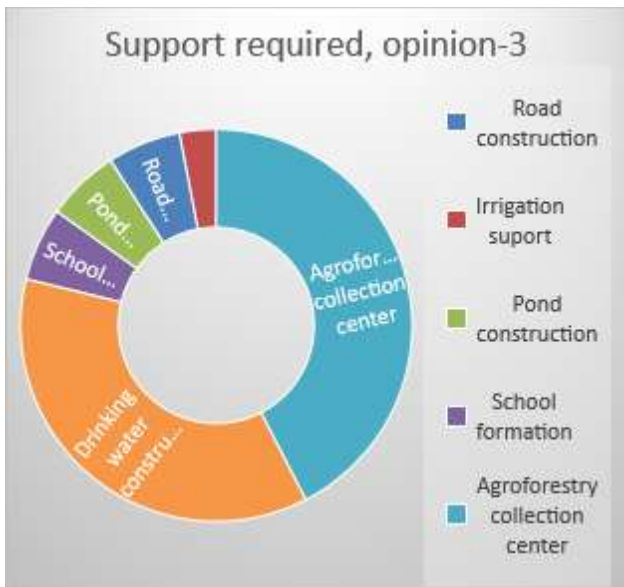
According to table-5, Nearby 75 % survey households chosen to displace option due to fear of land rupture and upcoming monsoons period in coming 4 weeks, this rainfall in future will certainly occurred landslides. Majority of respondent urged to receive similar size of land and optional livelihood opportunity (wage, grant, seedling, shelter, etc.) to survive their family.

(Figure-1)

(Figure-2)



(Figure-3)



(Source: - Field Visit, 2015)

Figure-1,2 and 3 is the result of opinion asked by hhs respondent about the support required in community and individual level. According to figure -1, majority indicating that respondent want to migrate (62.5 %) to another location due to the fear of death caused by earthquake, where as 17.5 % respondent selected construction of agroforestry collection center, and least 5 % respondent agreed on both drinking water and pond construction.

Similarly, in Figure-2, majority indicate that respondent selected for construction of agroforestry collection center (35 %), where as 30 % want to reconstruct their drinking water system, and 17.5 % respondent prioritized to rebuild Church as priority for them to visit and pray, survey also shows that a total of 72 % peoples are Hinduism and rest 28 % belongs to the Christian religion.

Finally, in figure-3, majority indicated that agroforestry collection center (35 %) is prioritize higher in this figure, where as 30 % majority indicates a construction of drinking water system is demanded, and 17.5 % people demanded for Church reconstruction.

The opinion indicates that migration, agroforestry collection center, drinking water system and church rebuilding is the most important requirement of this community.

All, above phenomena indicates that food security situation of this communities are in critical conditions since, Chepangs are marginal people, and do not have food security throughout year and mostly manage their food by using coping strategy, similarly in the case after the incidence of earthquake livelihood situation worsen and lay challenges for future. High market price, losses of house/ animals/ lands/ agroforestry production, and upcoming monsoons infer highly food insecurity situation.

(Table-6, Market Situation of agroforestry Product)

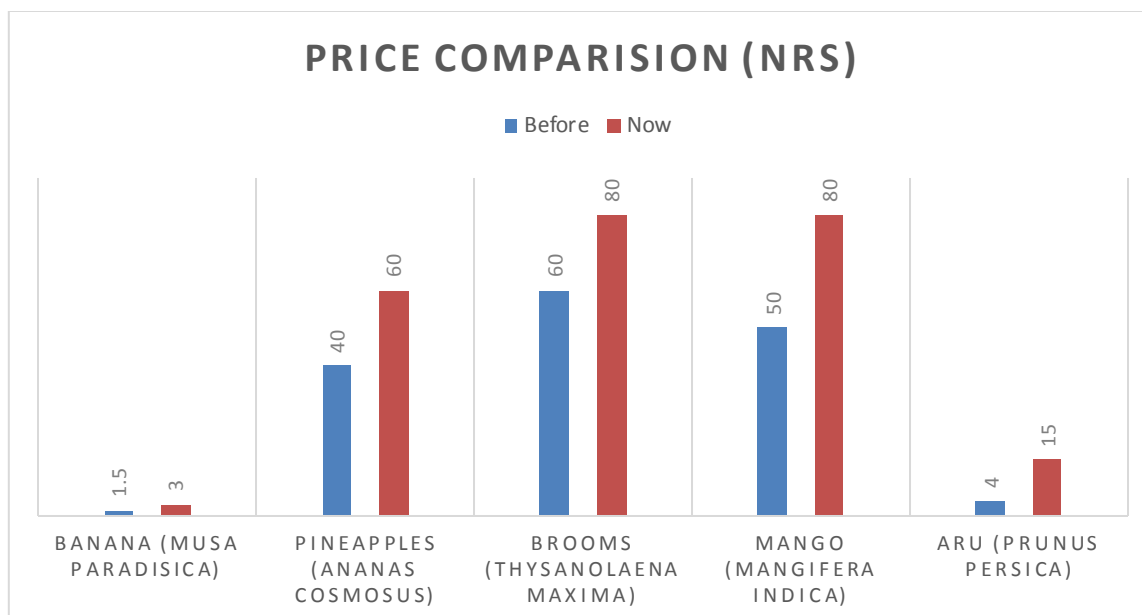
Losses(Kg)	0-20	21-40	41-60	61-80	81-100	More than100	NA
Banana(<i>Muas paradisica</i>)	0	5	7	5	10	2	11
Pineapples(<i>Ananus Comosus</i>)	0	2	1	0	0	1	36
Broom grass(<i>Thysanolaena maxima</i>)	0	1	2	5	5	15	12
Amount(Nrs)	501-1000 (\$ 5.01-\$ 10)	1001-1500 (\$10.01-\$ 15)	1501-2000 (\$ 15.01-\$ 20)	2001-2500 (\$20.01-\$ 25)	3001-5000 (\$30.01-\$ 50)	5001-7000 (\$50.01-\$70)	NA
Banana(<i>Muas paradisica</i>)		5	6	4	10	1	14
Pineapples(<i>Ananus Comosus</i>)	1	1	0	1	1	0	36
Broom grass(<i>Thysanolaena maxima</i>)	0	2	1	6	4	14	13

(1 \$=Nepalese Rupees 100) (Source-Field visit 2015)

It can be seen from table-4 that banana, and broom grasses which are ready for harvesting was mostly impaired due to earthquake, and land rupture. According to field visit an average of 50 % agroforestry production was loss due to the earthquake which was ready for sale within a week. On other hand, the residue production saves villager's life's using as regular meal, because relief food aids delayed, and most of the households survive their family consuming banana (*Musa paradisiaca*), aru/ Peach (*Prunus persica*), pineapple (*Ananus cosmosus*) from the day of the earthquake. During field visit and group interaction it was found that a total of 3 vegetable collection centers at Raksirang were fully damaged. All rural roads were blocked due to huge landslides in multiple locations, as a result peoples were using their product for sale to nearby markets (Manahari) by carry themselves by walking, as traders did not come to collect the product from the collection centers within the village.

(Table-7)

Market rates of most of the food product were hiked up due to the demands. Most Interestingly the value of farm based agroforestry products of fruits were high in demands due to its availability in local level and its nutritional value. Now household have only farm based agroforestry production to sale in the market because grains, livestock and legumes were either standing or got debris in earthquake. Because of this market price were inclined, and farmers were benefited from this.



(Source-Field visit 2015)

From the above table-5, the price of banana, and other fruits with fodder was highest once in the history of this community, and in Manahari markets due to excess demands. Due to the high market cum farm gate price people of this area do sale their rest of the production into the market and purchased domestic goods from this cash income. District agriculture Office reported that near about 25 MT bananas, 10 MT Pineapple, and around 10 MT broom grasses lost due to the earthquake in the district.

Conclusion

Following conclusion has drawn based on this study, are: -

- Earthquake, and land rupture with a heavy losses of agroforestry production among Chepangs caused a need of migration and displacement.
- The food security situation of this stage is determined as acute or critical situation.
- Agroforestry farm products help to mitigating situation in the crisis.
- Livelihood of Chepangs became worsen due to damages of structures.
- Farm gate agroforestry products was the only production to sale in the market by the earthquake victims in the study area.

Recommendation

Following recommendations has drawn up based on the study here: -

- An immediate requirement of migration (displacement) demanded by survey people's due to huge land rupture, a safe location proposing as "Manahari" would be appropriate to keep this community safe until the monsoons ended. Short, and long-term reconstruction agency at local, and district level need to established by government, and to the development agency to monitor and support(houses) the earthquake people.
- To increase food security and livelihood situation District Forest Office (DFO), Manahari Development Institute (MDI), District Agricultural Development Office (DADO), and other local institutes need to do plantation support to this community (existing, and displaced households), In

this case banana (*Musa paradisiaca*), Broom grass (*Thysanolaena maxima*), Kurilo (*Asparagus racemosus*), Citrus (*Citrus x limon*) would be suitable to stimulate as demanded by communities.

- Vegetable collection centers, Schools, toilets, Markets and other social institutions need to rebuild immediately to restart the lives on way. District Development Committee (DDC), Nepal Red Cross Society (NRCS), International and National agencies are requested to start Cash for Work (CfW)-Shelter and Food or Food for Shelter or Work. On which some 4-6 months conditional or Aid cash or food support required to rebuild their own structures including community. Estimated 60 Kg of rice (Coarse/Medium) is required or Nrs 10,000 or \$ 100 per months (20 days' wage, 500Rs/day as per local wage rates).

Footnotes:

1. Study area has a larger majority of Chepangs community who are hunter and gatherer in the past. Due to gradual development activity, this community is intervened by agroforestry practice (Farm based), Since the land where they reside are fragile and rugged or in too some extend we can say sloping land.
2. Only maize, and millet was the cereal crop production in this community, and irrigation facility is nil and following traditional agriculture method. Still now during food in scarcity people uses wild food to mitigate the gap of food and after harvesting of cereal normal life continue.
3. Disaster occurred year after year in this community in terms of landslides, and flood which are common cases in this area. Due to disaster livelihood situation of the community getting worsen day by day. Trees and NTFP are in challenging situation to growing due to disaster and climate change.
4. After agroforestry intervention banana, broom grass, pineapple, aquaculture (few hhs) and NTFP got promoted and within a span of 8-10 Years the livelihood condition of the Chepangs get increased due to cash income and social networking.
5. Nearby market is Manahari which is 2 hrs by walking in both side, due to seasonal road local production farm gate price vary on the nature of production and circumstances related to climate and market. It was noticed that traders belong to the local area and are not too much commercialized. This purchased products are mostly sent to the nearby large market such as Hetauda (District Head quarter of the study area), Kathmandu and Pokhara which are two national markets of the Country.

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Annexes

Questionnaires

Agroforestry Product in Emergency situation			
Household Name:-	Community:-		
Total family size:-.....Nos.	Total arable land:.....; Used for agroforestry:.....(Kattha)		
What agroforestry you planted in your lands?	a).....b).....c).....d).....e).....		
Impact of earthquake in your agricultural land, opinion.	a) No impact on land, b) Due to land rupture difficult in planting, c) Due to continue rain and ongoing landslides facing difficulties for agriculture.		
What is the market price of Agroforestry product, before and after? Product Before Now	Details of Agroforestry collection center (Damaged). Before:-.....Nos Now:-.....Nos	Income from Agroforestry per months. Before.....Rs/Months Now.....Rs/Months	
.....		
.....		
How is the trend of traders?	a) same no change, b) More traders are coming for purchase, c) Traders stop coming, self-carrying to nearby markets.		
Household food stock situation?	Maize Kg (Before) Kg (Now)		
Banana Kg Kg	Millet Kg Kg		
others Kg Kg	Rice Kg Kg		
How you are surviving now?	a) Fully rely on aid by different agencies, b) Distributing food, reducing food, sometime eat some time skipping. ,c) Sale of household assets) Others.		
How is the market price of needful food stuffs?	Rice Kg (Before) Kg (Now)		
	Pulses Kg Kg		
	Veg oil Kg Kg		
	Others Kg Kg		
In your opinion, what immediate support you are required? (Up to three at least)	Displacement, Road construction, Irrigation construction, Pond construction, School building, Health post, Agroforestry collection center, Drinking water, Church, Co-operative house, Others (specify....)		
If Displaced/ Migration, Why you wish to do so?	a) Fear of death due to rupture, b) Lack of HH Food security, c) For better opportunity, d) Not able to rebuild house.		
What will do with existing lands(agroforestry area)	a) If alive will rebuild again, b) will leave it, but want some land, c) Leave it if similar income opportunity get.		

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