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INVENTORY OF NON-TIMBER FOREST PRODUCTS IN WESTERN NEPAL AND STRATEGIES FOR SUSTAINABLE MANAGEMENT

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Abstract

Non-timber Forest Products (NTFPs) play an important role as traditional source for food, fiber, fodder, and medicine and offer income opportunities for poverty alleviation especially in rural households in Nepal who engage in a widespread trade of NTFPs. Adequate planning for sustainable use of NTFPs is imperative so we explored the inventory of multipurpose trees and herbs that are being used as NTFPs in Chitwan, Nepal. 70 households from Sukranagar and Mangalpur VDCs of Chitwan district were randomly selected and personal interviews were taken with them as well as focus group discussions were done. The community had been utilizing 49 plant species from the nearby community forest. Implementation of the policy of community forestry was found to have a positive impact on the sustainable production of NTFPs. More than 80% of the respondents believed that indigenous knowledge promoted sustainable NTFP production. Kurilo (*Asparagus officinalis*) was found to be the best NTFP for the study site. Various policy level reforms are proposed that will help in improving the sustainable production of NTFPs. Better utilization of NTFPs as well as their conservation is possible with proper trainings given to community forest users.

Keywords: NTFP, MAPs, sustainable, community-forest, policy

Introduction

"Non-Timber Forest Products (NTFPs) encompasses all biological materials other than timber which are extracted from forests, other wooded land and trees outside forests that include products used as food and food additives (edible nuts, mushrooms, fruits, herbs, spices and condiments, aromatic plants, game), fibers (used in construction, furniture, clothing or utensils), resins, gums, and plant and animal products used for medicinal, cosmetic or cultural purpose for human use (FAO, 1982)".

NTFPs are considered important globally as they can contribute to proper nutrition as well as food security. They are vital in adding income to the families, thus improving rural livelihood. NTFP based enterprises that have high foreign demand can contribute to national income as well. NTFPs promote conservation activities and support biodiversity (FAO, 1995). NTFPs offer an opportunity to practice sustainable forestry in conjunction with agriculture. This can alleviate the local pressure to overharvest timber. Developing countries can benefit largely from the employment and income generation from NTFPs and this holds the potential to alleviate rural poverty (FAO, 1993; Ghimire, 2006).

In Nepal, many tree species can be grown that give multiple products (Khanal, 2006). Diverse landscape of Nepal ranging from tropical climate of the Terai to the alpine tundra of the high Himalayas has made it suitable to grow a variety of NTFPs. NTFPs, mostly Medicinal and Aromatic Plants (MAPs), are considered high value commodities. While the total impact of the forestry sector to national GDP at present is approximately 15 percent (BankoJanakari, 2004), NTFPs alone are estimated to contribute 5 percent to the national GDP (ANSAB, 1999).

The number of NTFPs in Nepal is estimated to be greater than 700 plant species (Khanal, 2006). Nepal trades around 10,000 to 15,000 tonnes of NTFPs annually in the international market. These NTFPs represent around 100 species. Most of the NTFPs (95%) are collected from the wild and most of the collected NTFPs are exported to India (90%) for processing in raw form. Amala (*Phyllanthus emblica*), Atis (*Aconitum heterophyllum*), Chiraito (*Swertia chirayita*), Tejpat (*Cinnamomum tamala*), Guchhi-chyau (*Morchella conica*), Jatamansi (*Nardostachys jatamansi*), Jhyau (*Parmellia* species), Kutki (*Picrorhiza kurroa*), Pipla (*Piper longum*), Ritha (*Sapindus mukorossi*), Sugandhawal (*Valeriana officinalis*), Sugandha-kokila(*Cinnamomum glaucescens*) and Timur (*Zanthoxylum armatum*) are the major NTFPs traded to India (Poudel,

2007). NTFPs traded are used as food, spices, condiments, herbal medicines, bast fibres, fodder, leaf litter, manure, tannins, dye stuffs, gums, resins, incenses, aromatic herbs, oils, rattan, canes, bamboos, and construction materials (Edwards, 1996; Shrestha, 1999). The price received by NTFP harvesters in Nepal is, on an average 32 percent of the final price given by Indian industries raw materials (Edwards, 1996).

NTFPs play productive role like uplifting the rural livelihood by production and marketing of MAPs as well as a protective role by improving soil, biodiversity, and maintaining ecological balance. Even though NTFPs have always been an important element of the forest resources in Nepal, they have not received proper attention. Sustainable growth and development of NTFPs has the potential to raise the livelihood options of the rural poor. However, increasing population pressure and poverty has compelled people to overharvest resources. Lack of local control over the resources creates enormous toll on the natural environment (Shrestha *et al.,* 1998).

Community participation is widely advocated for efficient resource management as well as the conservation of environment. Involvement of the community fosters improvement in socio-economic conditions, and also creates a feeling of ownership among the members. This builds up the capacity of communities to organize and help themselves, and also decreases state dependence (Karki, 2000). Community Forests (CF) can play an important role in promoting NTFPs in the local markets as well as provide local employment (Malla, 1993). CF attempts to establish institutions at the community level that can manage and use their forests efficiently. This helps in bringing about social changes and provides productive resources for the benefit of the poor (Sanwal, 1988). The Government of Nepal has prioritized CF program and ensured its successful implementation by supporting decentralization in resource allocation and encouraging social aspects of land use (IOF/ITTO, 1998). Indigenous knowledge based on plant's biology and ecology has been used to classify, harvest, and manage resources (Turner, 2002).

Limited research has been done on various aspects of commercializing NTFPs in Nepal because individuals extract NTFPs from the wild and trade it via different marketing channels and multiple traders (Kanel, 2000). Due to the exploitation of forest products in an unscientific way, there has been a decrease in Nepal's NTFP base. Lack of good supervision and management in collecting and trading NTPFs has made them vulnerable to extinction (Acharya, 2000).

In order to address the gap between NTFP use, indigenous knowledge, and policy recommendations, we conducted this research to create an inventory of commonly used NTFPs in the region as well as to see the economic potential of major important NTFPs. We analyzed the role of community forestry in NTFP and developed some policy reforms based on the response from our respondents.

Materials and methods

Sukranagar Village Development Committee (VDC) and Mangalpur VDC of Chitwan district were purposively selected as the study sites (Figure 1). The major land types of Chitwan valley are Upland (Tandi), Middle Wet Land (Khet) and Lower Wet Land (Ghol), which are also common in these study sites. These sites represent a typical ethnic composition that is mainly characterized by Tharu, Brahman, Chhetri, and Mongols. The major crops of Chitwan like paddy, maize, mustard and wheat are commonly grown in the study sites. The major multipurpose tree species adopted by Chitwan farmers such as Sissau (*Dalbergia sissoo*) and Bakaino (*Melia azedarach*) are also common in the farming systems of the research sites. Such trees are planted solely or in combination with some horticultural crops like pineapple, ginger and turmeric or with medicinal herbs like *Aloe vera, Ocimum sanctum, Acorus calamus,* etc.

Total farm households (HH) of all wards of Sukranagar VDC and Mangalpur VDC were considered as the sampling units. Sampling frame was prepared with the help of a household record available in the VDC office. A sample size of 70 households was taken by employing simple random sampling technique in sample selection. Primary data was collected from respondent farmers and the village key informants. The information obtained through researcher's observation and informal group discussion is also given due importance. Data on commodity prices was collected from local market functionaries to compare and cross check the farm gate price. Secondary information was obtained from various published articles and working reports. Relevant data were collected from Central Bureau of Statistics (CBS), Ministry of Agriculture (MoA), Department of Forestry (DoF), District Agriculture Development Office (DADO) and Institute of Agriculture and Animal Science (IAAS).

Figure 1: Map of Nepal showing the study site, Chitwan district

All the required variables as per research objectives were identified and listed in sequence. An interview schedule was designed by including all those variables. A checklist was prepared to discuss with key informants and to collect the general information on the utilization of multi-purpose trees species. The same checklist was employed in informal group discussion. Five copies of interview schedules were administered to carry out pretest in the survey sites to those farmers who were not selected while sampling. After pretest, the items were modified accordingly as needed. Microsoft Excel and Statistical Package for Social Science (SPSS) were used to analyze raw data.

Results and discussion

Socio-economic features

Table 1 shows the population structure of the households of the respondents. 49.64 percent were males and the remaining 50.36 percent were females. Among them, 7.06 percent were below 5 years, 25.79 percent were from 5 to 16 years, 59.85 percent were from 16-56 years and 7.30 percent were above 56 years.

Table 1. Population structure of the households of the respondents

	Sex		Total population	% of total population		
Age Group	**Male**	**Female**		**Male**	**Female**	**Total**
Below 5 yrs	18	11	29	4.38	2.68	7.06
5-16 years	49	57	106	11.92	13.87	25.79
16-56 years	121	125	246	29.44	30.41	59.85
Above 56 yrs	16	14	30	3.89	3.41	7.30
Total	204	207	411	49.64	50.36	100.00

25 percent (153) of the population were illiterate (unable to read and write), 62 percent (378) had schooling below the School Leaving Certificate (S.L.C.), and only 13 percent (81) of the population had education level higher than S.L.C.

More than 83 percent of the sample population was involved in agriculture while the remaining were involved in services, business, or daily wage labor (Figure 2). Most of the women were involved in agriculture and NTFP and the least number of women were involved in official work (Figure 3). This might be due to low level of education of the women. NTFPs provide an alternative source of income to the women, especially of the disadvantaged groups, because they are easy to collect and have greater economic potentiality. The women of the study sites responded to the use of NTFPs enthusiastically. However, lack of training on the proper use of NTFPs was one of the setbacks for its significant usage. Providing trainings to the women on the cultivation practices of NTFPs would lead to a substantial rise in their income. This will as well increase the decision making capacity of women in the family.

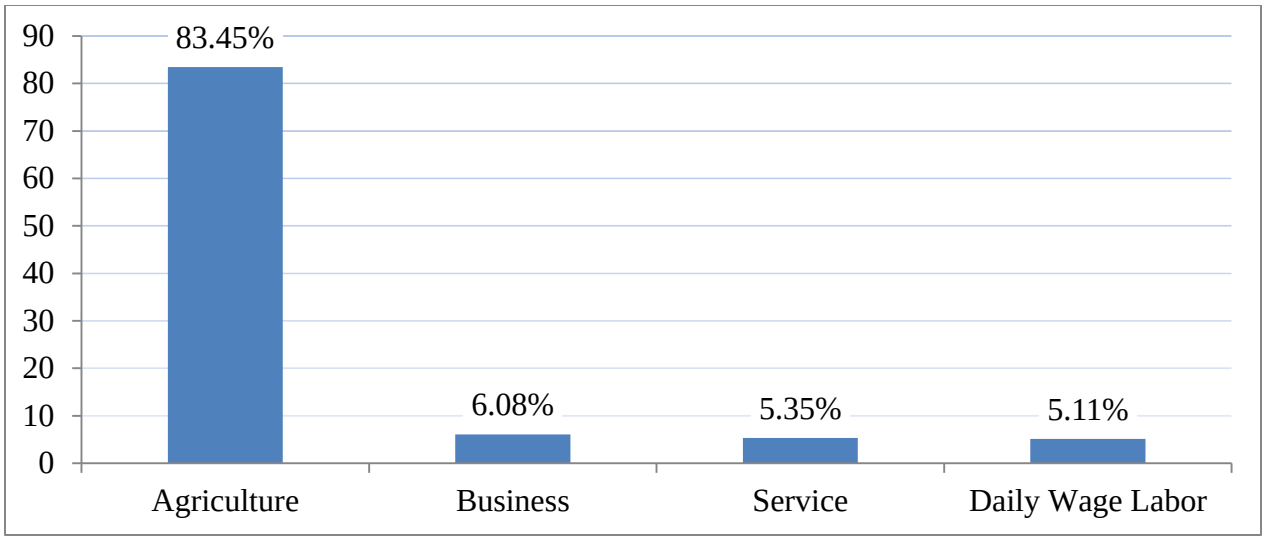

Figure 2. Percentage of sample population by occupation

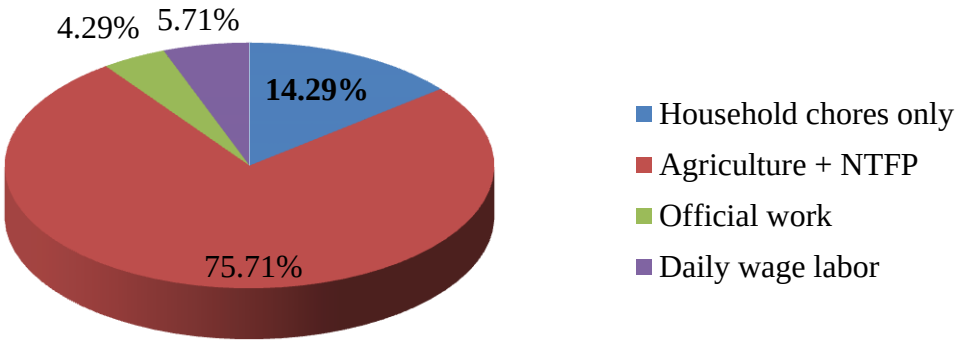

Figure 3: Involvement of women in economic activities

The households were classified based on the amount of land owned (small: below 0.06 ha, medium: 0.06-0.2 ha, and large: more than 0.2 ha). Out of the total respondents, 14.29 percent were small landholders and 30 percent were large landholders. Most of the respondents (55.71) percent were medium landholders and the average land holding per household was 0.18 ha.

Most of the uses of NTFPs were based on indigenous knowledge. 81.43 percent of the HHs realized the importance of indigenous knowledge for the sustainable use of NTFPs. Therefore, indigenous knowledge on the use of NTFPs should be promoted.

Proper information regarding cultivation practices, processing, and marketing of NTFPs is limited in Nepal. The domestic market in Nepal utilizes only a small proportion of the harvested

medicinal plants and most of the products are exported to India and other neighboring countries. Medicines processed from these products in India are then imported back to Nepal. Processing of the raw materials in Nepal could save valuable foreign exchange while encouraging resource management locally. NTFP stakeholders are not aware about proper resource utilization and marketing tools that will help in making the proper use of prevailing opportunities for sustainable development of NTFPs in Nepal (Sah and Dutta, 2009).

Status of NTFP-based income generation in forest-dependent households

The forest-dependent households were found to be cultivating or utilizing wild NTFPs for various purposes. Many plant species were being consumed by the households for income generation and other activities. A total of 49 types of plants were used by the respondents (Table 2). From these plants, most important species were selected and a pair-wise ranking of the important plants as perceived by the respondents was done (Table 3). It shows that Kurilo was found to be the most important plant in terms of NTFP potentials. The major uses of NTFPs gathered from indigenous knowledge of the respondents are presented in Table 4. Mostly the uses were medicinal in nature. A seasonal calendar is made on the basis of the time of harvest for the selected plants in Table 5. The economic potential of the potential plants as perceived by the farmers is given in Table 6. Sarpagandha was found to fetch the highest price kg^{-1} followed by Kurilo. Higher demand of Kurilo in the market made it the most important and promising NTFP.

Table 2. NTFPs commonly used by the forest-dependent households

S.N.	Local Name	Scientific Name
1	Akaash-belee	*Cuscuta reflexa*
2	Amala	*Phyllanthus emblica*
3	Areli	*Mimosa rubicaulis*
4	Ashuro	*Justicia adhatoda*
5	Aswagandha	*Withania somnifera*
6	Baabari	*Ocimum gratissimum*
7	Badahar	*Artocarpus lacucha*
8	Bakaino	*Melia azedarach*
9	Ban-kapash	*Thespesia lampas*
10	Barro	*Terminalia bellirica*

11	Buhari-jhaar	*Mimosa pudica*
12	Chitoo	*Plumbago zeylanicum*
13	Dahee-chaaunle	*Callicarpa macrophylla*
14	Dahee-kamlo	*Callicarpa incana*
15	Dalchini	*Cinnamomum zeylanicum*
16	Datiwan	*Achyranthes aspera*
17	Dhaturo	*Datura stramonium*
18	Ghodtapre	*Centella asiatica*
19	Ghyukumari	*Aloe vera*
20	Gineree	*Premna integrifolia*
21	Gurjo	*Tinospora sinensis*
22	Harro	*Terminalia chebula*
23	Indrajau	*Holarrhena pubescens*
24	Jaamoon	*Syzygium cumini*
25	Kaagati	*Citrus limon*
26	Kaalmedh	*Justicia paniculata*
27	Kamini	*Murraya paniculata*
28	Koiralo	*Bauhinia variegata*
29	Kurilo	*Asparagus racemosus*
30	Kyaamunaa	*Cleistocalyx operculatus*
31	Lemongrass	*Cymbopogon citratus*
32	Maalatee	*Mirabilis jalapa*
33	Marethee	*Acmella calva*
34	Neem	*Azadirachta indica*
35	Nibuwa	*Citrus lemon*
36	Paareejaat	*Nyctanthes arbor-tristis*
37	Palaash	*Butea monosperma*
38	Pipla	*Piper longum*
39	Rajbriksha	*Cassia fistula*
40	Rudilo	*Pogostemon benghalensis*

41	Sajiwan	*Jatropha curcas*
42	Sarpagandhaa	*Rauvolfia serpentina*
43	Simal	*Bombax cieba*
44	Sindoore	*Mallotus philippensis*
45	Sipleegaan	*Crateva unilocularis*
46	Taankee	*Bauhinia purpurea*
47	Tejpaat	*Cinnamomum tamala*
48	Titepatee	*Artemisia vulgaris*
49	Tulsi	*Ocimum sanctum*

Table 3. Pair-wise ranking of the potential plants

Species	**Bakaino (*Melia azedarach*)**	**Neem (*Azadirachta indica*)**	**Kurilo (*Asparagus officinalis*)**	**Lemon grass (*Cymbopogon citratus*)**	**Tulsi (*Ocimum sanctum*)**
Bakaino	*	Neem	Kurilo	Lemon grass	Tulsi
Neem		*	Kurilo	Lemon grass	Tulsi
Kurilo			*	Kurilo	Tulsi
Lemon grass				*	Kurilo
Tulsi					*
Ranking	**5th**	**4th**	**1st**	**3rd**	**2nd**

Table 4. Common use of the selected plants

S.N	**Plant name**	**Altitude**	**Uses**
1	Kurilo	600 - 1,400 m	Food, root is used for gastric, fever, tonic and fruit used as substitute of soap.
2	Tulsi	750-1750 m	Leaf is used for tonsil and eardrop. Seed is used for controlling headache.
3	Lemongrass	250-1500 m	Leaf is used during common cold
4	Neem	100-900 m	Useful in disorder of stomach and irritation of skin, insecticide and curing fever.
5	Bakaino	900-2100 m	Fodder, to make rosaries, insecticide

Table 5. Season of harvest of suitable trees

Plant	Bai	Jes	Ash	Shr	Bha	Aso	Kar	Man	Pou	Mag	Fal	Cha
Kurilo												
Tulsi												
Lemongrass												
Neem												
Bakaino												

Table 6. Farmer's price of the potential plants

S.N.	Local Name	Scientific Name	Price kg^{-1} (NPR)
1	Tulsi	*Ocimum sanctum*	50
2	Aswagandha	*Withania somnifera*	80
3	Sarpagandha	*Rauvolfia serpentina*	150
4	Kurilo	*Asparagus racemosus*	120
5	Harro	*Terminalia chebula*	20
6	Amala	*Phyllanthus emblica*	25
7	Bakaino	*Melia azedarach*	15
8	Neem	*Azadirachta indica*	30
9	Lemongrass	*Cymbopogon citratus*	40
10	Taankee	*Bauhinia purpurea*	50

Role of community forestry in NTFP

Community forestry is oriented towards production of major forest products, especially fuel wood and fodder (Edwards, 1996). The roles of community forestry in NTFP as identified are as follows:

a. Plantation of NTFPs

The CF was found to be promoting the use of NTFPs. Different types of NTFPs were planted in the CF. Kurilo was planted in and around the CF and few other farmers were

also encouraged for its plantation in their private land as well. However, the farmers' main challenge was in successfully growing the plants as they lacked proper knowledge on cultivation practices as well as due to the uncertainty of market for their product. Hence there is a need of a good marketing system and proper technical knowledge transfer to the farmers before plantation.

b. Trainings on the cultivation and use of NTFPs

Community Forest Users Group (CFUG) was found to give trainings to the farmers on the plantation, cultivation practices and harvesting techniques of some NTFPs. CF can be one of the best places for farmers to share, practice and solve their specific problems related to NTFP production.

c. Management of the forest

The major role of community forest has been on the improvement of forest condition. The respondents shared a positive perception on the condition of the forest after the handing over of community forest (Table 7). However, the respondents complained about the lower amount of firewood that they get from the community forest. Limited amount of firewood was allowed to be collected from community forests from the viewpoint of sustainability.

Table 7. Forest condition before and after handing over of Community Forest (CF)

Forest Condition	Before CF handover		Now	
	Frequency	Percentage	Frequency	Percentage
Best	0	0	31	44.29
Good	0	0	39	55.71
Moderate	27	38.57	0	0
Bad	43	61.43	0	0

Reforms at different policy levels to encourage sustainable use of NTFPs

For sustainable management of NTFPs in Nepal, the following policy reforms are suggested.

a. Ground Level (User level)

i. Awareness raising programs should be conducted to the users of the forest on the benefits of NTFPs.

ii. Trainings should be provided about cultivation techniques and proper harvesting and storage techniques of NTFPs.

iii. Training should be provided about processing of NTFPs.

iv. A mechanism for proper understanding between the user groups and non-user groups should be made to avoid conflicts in benefit sharing.

v. The users should be made aware about harvesting period of the NTFPs.

vi. Sustainable harvesting should be practiced.

b. Community Forests

i. Appropriate NTFPs should be planted.

ii. Wise use of NTFPs should be promoted.

iii. Harvesting of NTFPs should be made sustainable.

iv. Barriers should be built so that the wild animals do not enter residential areas.

v. Ecosystem approach to forest management should be facilitated so that the tendency to monoculture is minimized.

vi. Habitat should be extended and potential species should be distributed.

c. District Level

i. Proper database needs to be created on the suitable varieties of NTFPs for the district.

ii. CFUGs should be promoted for taking proper care of NTFPs.

iii. Trainings should be provided to the interested farmers who are eager to cultivate NTFPs.

iv. Awareness raising campaigns should be conducted about the harvesting or maturity period of NTFPs and proper coordination needs to be done for sustainable harvesting of NTFPs.

v. Financial and technical assistance should be provided to the CFUGs in NTFP development.
vi. Market Information System (MIS) about the trade of NTFPs should be updated and made up to date.
vii. Proper marketing channel for the sale of NTFPs needs to be established.
viii. Investment should be done in processing factories for NTFPs.
ix. Collection depots for NTFPs should be established.
x. Plantation stocks should be bought of good quality.
xi. The District Forest Office should facilitate the combined harvesting and selling of NTFPs.
xii. Proper agenda needs to be created to identify the distribution of NTFPs in the district and appropriate management strategies need to be prepared for execution.
xiii. Workshops to share know-how on ethno-botanical uses of NTFPs and medicinal plants needs to be organized.
xiv. Nurseries should be built to distribute potential high value species in their suitable natural habitats.
xv. Primary collectors and harvesters should get a reasonable price for the NTFPs collected by them.

d. National Level

i. Proper and up to date guidelines need to be prepared on the sustainable use of NTFPs.
ii. Government should take initiatives in establishing processing facilities within the country.
iii. Small entrepreneurship should be facilitated through micro-credit and essential linkages should be provided.
iv. Knowledge about traditional health care practices should be shared.
v. Cost-effective processing technologies should be developed.
vi. Conservation education should be provided to the villagers as well as to the students in schools.

vii. Government should liaise with international agencies to certify processed products and export abroad.

Conclusion

NTFPs are predominantly used as food, medicines, fodder, and housing materials. Respondents concur that community forest and indigenous knowledge have a positive impact on the sustainable production of NTFPs. Community forestry had improved the condition and helped in conservation of NTFPs Proper trainings on cultivation practices of NTFPs need to be given to the local people so that they can better utilize NTFPs. Government should focus on building processing facilities inside the country. Among the major NTFPs, Kurilo (*Asparagus officinalis*) was found as the best NTFP from pair wise ranking done in the study and it is recommended for the commercial plantation in the test site.

Proper co-ordination and information sharing between the holders of traditional knowledge and the scientists of research institutions is imperative for the development of improved systems of NTFP development, utilization, and conservation. A shift from the current demand based approach to a need based approach is necessary in order to ensure sustainable and non-destructive harvesting of NTFPs. With proper planning and development, NTFPs could be successfully utilized as an alternative resource to uplift the livelihood of local people.

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