Research Article

Role of Non-Timber Forest Products in Income Enhancement of Mountainous People of Swat and Mansehra Districts of Khyber Pakhtunkhwa, Pakistan

Ayaz Ahmed[1]*, Muhammad Zulfiqar[1] and Saadutullah Khan[2]

[1]Institute of Development Studies, The University of Agriculture Peshawar, Pakistan; [2]Department of Statistics, Allama Iqbal Open University Islamabad, Pakistan.

Abstract | This study analyzed the role of non-timber forest products in income enhancement of mountainous people of purposively selected two districts of Khyber Pakhtunkhwa namely Swat and Mansehra. From these districts six villages were selected purposively and from those villages sample size of 321 households was selected randomly. In the study areas majority (45%) of sample households had 5 to 10 family members which indicated joint family system. Literacy status in study areas was very low (30%). Sayed, Swati, Awan, Gujjar and Kohistani tribes were residing in the study villages. Crop production was their primary occupation, secondary livestock rearing; tertiary sale of non-timber forest products; fourth source of income was remittances and fifth was labor work respectively. Study results discovered that 69% of sample households had earned income from the sale of NTFPs above mean income (60458 Pakistani rupees) per season while 31% of sample households had earned income from the sale of NTFPs below mean income (60458 Pakistani rupees) per season. Sample households reported that during emergencies, only income earned from non-timber forest products stabilized their economy. Sample households identified certain market constraints that were responsible for low earning from NTFPs. These were lack of road infrastructure, communication, storage and market facilities, no information about product price, negative role of middleman and informal money lending process. Based on these findings this study made following recommendations. Road, communication and storage facilities should be built in the study areas. Villager's access to information about certain NTFP price and its market should be enhanced through radio and other media. Forest department should design plan for management and sustainable extraction of NTFPs in study areas and also provide tools and trainings to local collectors.

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***Correspondence** | Ayaz Ahmed, Institute of Development Studies, The University of Agriculture, Peshawar, Khyber Pakhtunkhwa, Pakistan; **Email:** bluetown65@yahoo.com
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Introduction

Forests importance as a valuable source of livelihood of the people living around the forests is recognized by many researchers of the world (Yemiru *et al*., 2010). Usually, forests are situated in remote mountainous areas which lack income and other infrastructure opportunities such as health, education, markets and roads etc. Therefore, local communities of those areas face high level of poverty and they mostly depend on forest resources for their livelihood requirements (Sunderlin *et al*., 2005; Shackleton *et al*., 2007). They mostly depend on non-timber forest products in order to satisfy their basic needs such as food, medicine and income (Belem *et al*., 2007).

NTFPs are an important source of nutrition, food and healthcare to majority of rural household living around the forests (Pandey *et al*., 2016). Fuel wood is collected for energy generation while wild fruits and leaves are the major source of micronutrients for rural households (Sunderland *et al*., 2003). Hence NTFPs are important to rural households in developing countries because they provide them income which may be used on health and education for the family (Shackleton and Shackleton, 2004).

NTFPs play crucial role in the income enhancement of a rural area and reduce poverty (Islam and Sato, 2012; Islam *et al*., 2012, 2013). Forest based income and savings can be used to reinvest in other income generation activities that are more profitable for lifting the households out of poverty. Poor people are more dependent of NTFPs as compared to rich people for their livelihood needs. Women are more related with this enterprise and they spend most of their time in collection, processing and marketing.

According to FAO (2020) Pakistan is a forest poor country with a small area of 4.47 million ha (5.1 percent) under forests. This amounts to 0.021 ha per person, compared to the world average of 1 ha/person. Khyber Pakhtunkhwa province is most forested than other provinces which constituted about one-third of the forest area of Pakistan. Bukhari *et al*. (2012) estimated that the total forest area of the KP was 20.3% of its land surface. However, FAO (2020) reported that forest area of KP has been increased from 20.3 percent to 26.6 percent (6.3%) after the implementation of one Billion Tree Afforestation Project (from 2014 to 2018). Table 1 shows the area under forests in study forest districts.

Table 1: *Forest areas of study districts.*

S. No.	District	Total area under forests (ha)
01.	Mansehra	169423
02.	Swat	132538

Sources: *(Land cover maps Mansehra and Swat forests. GIS lab, Forestry planning and monitoring circle, Peshawar, 2018).*

These forests are of high significance, providing natural resource-based livelihoods to millions of rural people in study areas. People, who live in or around forest mostly, depend on forest for meeting the livelihood requirements of their daily life. They earn cash income by selling forest products, earn wages and extract environmental services. Forest greatly serves a household in the hard times (FAO, 2016).

In Khyber Pakhtunkhwa, mountainous people living near the forests largely depend on NTFPs for meeting the demands of their livelihood. They get benefits like fuel wood, food, fruits, medicinal plants and raw material for cottage industries (Adnan *et al*., 2006). Such households are the marginal segments of society and heavily depend on natural environment. Environmental degradation negatively affects their livelihoods and increased household's poverty in these areas (Durr, 2002).

Although NTFPs are important source of income of majority of mountainous people of Khyber Pakhtunkhwa, there is growing concern that informal marketing, unsustainable harvesting, lack of institutional arrangements for sustainable management of NTFPs and lack of storage, information and road facilities leaded to depletion of NTFPs stock in most of the Khyber Pakhtunkhwa forests. There is dearth of literature about the said problems. So, present study was designed to investigate the role of NTFPs in income enhancement and also explore other constraints in NTFPs extraction, consumption, storage and marketing in study areas. This study will be useful for forest policy makers to design clearly defined action plan for the conservation, sustainable management and harvesting of NTFPs in light of the ground realities and facts.

Materials and Methods

Study sites selection

Khyber Pakhtunkhwa province blessed with large area

of natural forests than other provinces of Pakistan was purposively chosen. According to Government of Pakistan, (2010) statistics forty percent of the total forest area of Pakistan exists in Khyber Pakhtunkhwa province.

Upper Dir, Swat, Shangla, Mansehra and Battagram districts of Khyber Pakhtunkhwa are mostly forest dense districts. Out of these Swat and Mansehra districts of Khyber Pakhtunkhwa were selected purposively (Figure 1) because these two districts have maximum forests and local communities greatly depend on it for their livelihood. In second stage four villages (Utror, Gabral, Lalku and Fazal Baig Garhi) from Swat district and two villages (Doga and Keri) from Manshera district were selected purposively. Doga and Keri siteis located between 1475–1800 m above sea level and receives around 1000 mm annual rainfall. Lalku and Fazal Baig Garhi siteis located between 1475–1800 m above sea level and also receives around 1000 mm annual rainfall while Utror and Gabral site is located between 1475–1800 m above sea level and receives around 1000 mm annual rainfall.

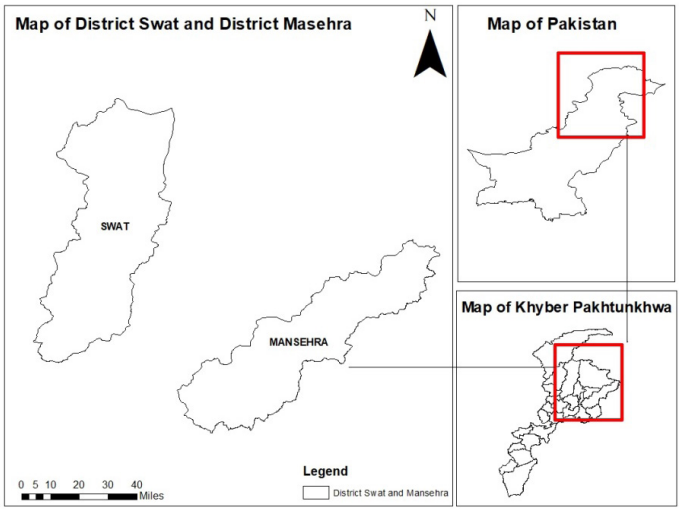

Figure 1: *Map showing the study areas.*
Source: *GIS Lab, Forestry Planning and Monitoring Circle Peshawar.*

Sampling of households

The study six villages were comprised of total 1946 households. By using the Sekaran (2003) model table, the 321 households were selected randomly from given total population of 1946 households. Furthermore, these 321 households were allocated through proportionate sampling method among six villages (Table 2). While applying Bowley (1926) proportional allocation formula, the allocated sample size of each village along with the proportional allocation formula is given as under.

$$n_i = (N_i / N).n$$

Where; n_i is the sample size for stratum*i*, N_i is the population size for stratum *i*, N is total population size, and n is total sample size.

Table 2: *Village based proportional allocation of sample size.*

District	Villages	No of total HH	No of sample HH
Mansehra	Doga	412	68
Swat	Keri	238	39
	Lalku	195	32
	Fazal Baig Garhi	371	61
	Utror	346	57
	Gabral	384	64

Source: *(Mansehra andSwat Forest Office Record, 2018).*

Participatory wealth ranking exercised was carried out for the justification of selection of 321 sample households from the perspective of household's economic categories. This approach is frequently used by development practitioners for the categorization of a community into different economic classes such as poor, middle and rich. The main advantage of this approach is that community members themselves categories the all villagers in three economic classes according to their village situations and resources (McGee, 2000).

Data collection and analysis

Pre tested household interview schedule and focus group discussion tools were used for data collection. The statistical package for the social sciences (SPSS) and Microsoft Excel was used for analyzing the data. Data was summarized by using descriptive statistics such as percentages, mean and standard deviations.

Results and Discussion

Sample households profile

The 'household' has been defined as group of blood related people that eat from the same kitchen and contribute to the same budget. Large size joint families are recognized as supply of labor for household economy and source of power in the study areas. Results showed that majority (45%) of sample

households had 5 to 10 family members. This result reflects the prevalence of the joint family system in those areas. Ali and Rahut (2018) concluded that collection of NTFPs depends on the household size.

Literacy has been defined as the ability to read and write. The results showed that only 30% of sample respondents were literate. Literate group further classified into five groups according to number of years of education. Majority (61%) of sample respondents were educated up to primary level. 28% were educated up to standard 6 to 8 level while 11% were educated up to standard level 10. It is evident from these results that most of sample respondents were educated up to primary level. Poulton and Poole (2001) stated that poverty force children towards collection of NTFPs for the earning of income for their families and also to meet the basic requirements of their homes (Pattanayak and Sills, 2001). Such children sacrifice their education and their personality development for earning income (Zubair *et al*., 2019).

Farooq and Kai (2016) summarized the factors responsible for the drop out of children from schools in mountainous areas such as poor financial conditions of families, lack of physical infrastructure and educational facilities. Piya *et al*. (2013) and Mulenga *et al*. (2014) found that there is direct relationship between the household's head education with their children labor in non-timber forest products (NTFP) collection. Uneducated heads of households engage more their children in forest products collection and selling. These results are in line with Soe *et al*. (2019) which stated that educated people dependency on forest resources is comparatively less than uneducated people because of more income generation opportunities outside the forest for them.

The study areas were characterized by different casts. In Doga village, 50% of heads of sample households were Sayed, 35% Gujar and 15% were Awan while in Keri village there were 57% of heads of sample households were Swati, 28% Gujar and 15% were Awan. In Swat district Lalku village sample household's heads were comprised of 56% Syed and 44% Gujar while in Fazal Baig Garhai village 47% heads of sample households were belong to Swati tribe, 28% were Mughal and 25% were Gujar. In Utror village all the heads of sample households were Kohistani. While in village Gabral 56% of heads of sample households were Kohistani while 44% sample household' heads were Gujjar.

In study villages the households were involved in different earning activities for securing their livelihood as because of large households size single income source has become inadequate to meet the socio-economic needs of the household. The sample households were inquired to list their various sources of income according to their share in household total income as primary, secondary, tertiary and so on. The overall response of sample households was that crop production was primary source of income, secondary livestock rearing; tertiary sale of non-timber forest products, fourth source of income was remittances and fifth was labor work, respectively.

Income earned from the sale of non-timber forest products (NTFPs)

The forests in Mansehra and Swat districts are important natural assets which provide local communities both low-priced and expensive type NTFPs. Low-priced are mostly consumed by the local people domestically for subsistence purpose while expensive products have commercial value which support the poor households in terms of income. Income earned from the sale of NTFPs was one of the key elements of livelihood of poor households in shape of food security and decreasing their vulnerability to different shocks (Kaimowitz, 2003). Negi *et al*. (2010) inferred that income gained from forest products helped in poverty reduction and reduced the level of income inequality. If forest income was excluded, the incidence of poverty could be high in the mountainous areas.

Non-timber forest products supported families in their livelihoods through enhancing their socio-economic status. According to several authors, Abdul-Latif and Shinwari (2005); Adnan (2011) and Nasir *et al*. (2014), non-timber forest products are the sources of income generation of the poor households in Pakistan. Langat *et al*. (2016) carried out a survey in Kenya and reported that for the poor household contribution of forests products in the household economy was 33% in average.

Table 3 results explained income earned by the sample households. The results showed that 69% of sample households had earned income above mean income (60458 Pakistani rupees) per season while 31% of sample households had earned income below mean income (60458 Pakistani rupees) per season. Sample households identified the non-timber forest products

which make significant contribution to household's cash income were Gujai/morels/mashroom, Banafshah, Mameekh, Medicinal plants and Walnuts. They said that different varities of mashroom/ morels naturally grow in their areas.

Local collectors sell these morels to local merchants who further sold them to nearby town dealers. Town dealers linked with wholesalers of nearby cities such as Mansehra, Rawalpindi and Peshawar. Wholesalers of these cities supply the morels to big cities such as Lahore, Islamabad and Karachi from where these are exported to other countries to generate foreign exchange.

Although local population gather different type of NTFP, however, sample households in study areas ranked a few NTFPs such as Gujai, Matarjharai, Mameekh and Banafshaas most important because they extensively collected them for cash income. Relatively poor households depend more on NTFPs for money as compared to wealthier households. Our study results are also reported by other authors (Belcher and Schreckenberg, 2007). In study villages sample households were of the view that they collected average 40-50 kg different NTFPs per year or season. During the interview sample households identified the main commercially important non-timber forest products which are summarized in Table 4. It was illustrated by sample households that they utilized the non-timber forest products for fulfilling their daily needs for their survival and also to gain economic benefits.

In focus group discussions, sample households of all study villages shared the information that collection season of Mashroom/morel was spring and early summer (March to July). In study areas nine species of morels were found. The collectors sold them to local shopkeepers of Madyan, Mingora and Shinkiari which further transported to big cities markets (Rawalpindi, Lahor and Karachi). From these big cities these were exported finally to Germany, Switzerland, France, Belgium, Austria etc.

Table 3: *Income earned from non-timber forest products (NTFPs).*

Categories	Mansehra						Swat						Total	
	Doga		Keri		Utror		Gabral		Lalku		F.B.G			
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Low (below mean income)	10	15	24	61	11	19	23	36	14	44	18	30	100	31
High (more than mean income)	58	85	15	39	46	81	41	64	18	56	43	70	221	69
Total	68	100	39	100	57	100	64	100	32	100	61	100	321	100

Source: *Field Survey, 2019. Note: (Mean income was 60458).*

Table 4: *Commercially important non timber forest products (NTFPs).*

Local name	Botanical name	Sell price, 2019 (PK-Rs)/Kg	Use
Gujai	*Morchella esculenta,*	20000-30000	Commercial
Matarjharai	*Trillilum govanianum*	10000	Commercial
Mamekh	*Paeoniaemodi*	200-500	Commercial
Mameera	*Corydalis govaniana*	300-500	Commercial
Banafsha	*Viola serpens*	1000-1500	Commercial
Salam panja	*Dactylo rhizahatagirea*	15000	Commercial
Salam misri	*Poly gonatum verticillatum*	15000	Commercial
Kutch	*Sassuracostus*	300-400	Commercial
Mushkibala	*Valeriana wallichii*	500	Commercial
Anjabar	*Bistorta amplexicaulis*	1500-2000	Commercial
Kakora	*Podophyll umhexandrum*	400-500	Commercial
Sumbal	*Adiantum venustum*	100-200	Commercial
Kowanjey	*Dryopteris jaxtaposta*	50-100	Commercial
Amaltaas	*Cassia fistula*	120-150	Commercial
Amla	*Phyllanthus emblica*	200	Commercial
Khukhan	*Myrsine Africana*	200	Commercial

Source: *Field survey, 2019.*

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Marketing price of Mashrooms/Morels was high and therefore greatly contributed to the total household's income of mountainous people of study areas.

The collectors included men, women and children. Firewood collectors usually collect morels and when they came from mountains, everyone can see them with a bundle of firewood on their heads and a bundle of Mashroom in their hands. They sell Mashroom to local merchants and earn money which they consume on households daily needs (Hamayun *et al.*, 2003). Mostly poor people of the study areas take keen interest and search them in remote mountains. Some time they spent days and nights in the mountains for their collection.

Beside the commercial use sample households also identified different type of NTFPs which were domestically used by the local communities for food and for curing many diseases of human and animals both. Important domestic used NTFPs reported by sample households were Wild podena, Wild sperkai, Kunjai, Cherry, Tooramlook, Wild fig, Wild almond, Wall nut, Band kakri, Tarkha, Charitia, Ladoori (for cooking/saag), Aqarkarha, Bargak, Salfar, Zeera, Chotal (for stomach diseases), Panrkash (for fever) Wardah, Mameekh (for animal diseases) Sarbazeela, Ghraoga (for cooking), Sumbal, and Zakhmihayat.

Non-timber forest products as a mean of improving household resilience during emergencies

Forest dependent communities face natural hazards as well as certain emergencies in their lives which negatively affect their livelihood. Sample households in focus group discussion in all the study villages illustrated that sometimes failure in agricultural crop or reduction in market price of certain crop, increase in prices of farm inputs like fertilizes, irrigation, labor and pesticides negatively affect the food requirements of the mountainous people. Natural hazards like livestock diseases, floods, storms and droughts also scratch the livelihood of the people of the study areas. In these emergencies only non-timber forest products considerably contribute to livelihood of affected household and stabilize their economy.

Non-timber forest products role as a safety net during the emergencies and natural hazards is appreciated by many authors like Shackleton and Shackleton (2004) explored the role of non-timber forest products as a safety net during the emergencies in South Africa. Similarly, Fisher *et al.* (2010) concluded that in southern Malawi non-timber forest products are the key coping strategies to climate change vulnerabilities and food shortage periods.

NTFPs marketing mechanism, constraints and suggestion for improvement

The non-timber forest products value chain was complex and dynamic. It comprised of multiple stages and various actors were involved in the chain of getting a product from forest and giving it in the hands of consumer. As the quantity, quality and the price of the NTFPs products was not static, therefore, it was very important for collectors to get right information about the price, quality, quantity and market of the product.

In focus group discussions in study villages all the sample households shared the same information that NTFP were marketed in their areas through both formal and informal processes, activities and structures. Formal structures were mostly in form of a shop or gathering of sellers and buyers along-side the river at a particular place and day. Beside road and river side markets, every area had specific market day, usually once weekly. Villagers carry the non-timber forest products to sell there on that particular day. While informal market mechanism runs by traders/ middlemen of Punjab province who come to study areas with cash and purchase the forest products from collectors or order them along with advance money lending for the future supply.

Through this informal market mechanism influential local traders trap the collectors by giving them advance money in low amount for the collection of particular non-timber forest product and sell it exclusively to them. Such type of marketing was actually a trap for the local collectors because they were paid low price by the money lenders than the price of local market.

Town traders usually use middlemen locally known as Kuchias to lend the money to collectors before the start of harvesting season. In the supply channel there were 3-5 middlemen who supply the forest products from local collectors to urban traders. These middlemen perform the role of a bridge between the local collectors and traders and work on commission basis. They speak to locals in their language, cheat them on weights and rates because tribal people usually use traditional measurement scales than metric

measurement scale. Middlemen take advantages of poverty of local collectors and purchase the forest products from them on low prices as local collectors always in need of money to buy daily supplies. Local collectors often do not know the market price of a certain forest product due to their illiteracy. Low bargaining power of local collectors compels them to depend on Kuchias to sell their products on low prices.

There are certain market constraints identified by sample households in focus group discussions in all the study villages that were responsible for low earning from forest products. These were lack of road infrastructure and communication facilities, lack of nearby market place and market information about the product price, lack of storage facilities, illiteracy and low awareness about the importance of certain forest product, negative role of middleman and informal money lending process. Amusa *et al.* (2017) found that in Nigeria poor storage, road and market facilities and lack of price information of a certain NTFPs are the major constraints that restricted collector's income. The study suggested that roads and storage structures should be built. Price information dissemination mechanism and product transportation should be improved in study areas. Franzel *et al.* (2007) reported that unstable price of forest products is the major problem in the trade of NTFPs which reduce the bargaining power of poor collectors and they sell the product on low prices (Bhattarai *et al.*, 2003).

During the focus group discussions in all the study villages, sample households portrayed various suggestions which are necessary for minimizing the marketing constraints of local collectors and providing them with a better and fair market for selling their forest products. These are as developing more transport and storage facilities, enhancing the villager's access to non-timber forest product market through extension officers and through radio and other media, dissemination of information about the forest product price and market, value addition, provision of tools for sustainable extraction of non-timber forest products, awareness creation among the collectors and enhancing their bargaining power. At village level a social network of local collectors and other stakeholders must be develop for the exchange of information. Kar and Jacobson (2012) also suggested similarly that collector's access to market information through mass media and extension officer and provision of more transportation and storage facilities should enhance the NTFPs business in mountainous areas.

One of the samples household of Utror village in a focus group discussion was of the view that domestication of non-timber forest products can play a vital role in better conservation of forest resources and providing an alternative enhanced income to villagers. He said that domestication of non-timber forest products would minimize the entry of local collectors in natural forests and also their time in reaching remote natural forests and searching forest products would be saved. So, domestication would encourage more restocking and regeneration of NTFPs in natural forests.

Sample household's perceptions about the reasons for the decline in availability of non-timber forest products in their forests

In focus group discussions in study villages, sample households depicted many reasons of low non-timber forest products in their forests. These included over harvesting of non-timber forest products due to increase in population, bush fire, destructive harvesting practices, logging operations, clearance of forest areas for farming and illegal cutting. All these factors were responsible for the decline in stock of forest products in their villages.

Some sample households believed that due to absence of strong social structure in their villages in shape of Joint Forest Management Committee, there were no rules and regulations about the NTFPs extraction and people of the area destructively harvested the NTFPs stock. Beside this local people also illegally cut the big trees as a result some of the NTFPs disappeared.

Sample households shared their views that villagers over exploited the stock of non-timber forest products in previous ten years and no improvement plans were made due to which stock of NTFPs was low. They indicated that current stock of NTFPs compared to that of 10 years ago was fifty percent less. Stock of medicinal plants depleted on large scale during the last decade due to commercial extraction without following sustainable extraction practices such as scientific extraction of bark, leaves and shoots.

Shinwari (2010) and Guenther *et al.* (2005) findings are similar to our findings that over harvesting

vanished numerous important species in Hindukush region. Grazing pressure also depleted important medicinal plants in the Swat. UNDP (2018) analyzed that forest department mostly focus on management and protection of timber and no or less attention paid to NTFPs management and conservation as a result NTFPs exploitation is more than timber in Khyber Pakhtunkhwa. Customary and access rights for extraction of NTFPs are also not clear which also result in over exploitation of valuable forest products.

Conclusions and Recommendations

On the basis of findings, it is concluded that NTFPs positively contributed in enhancing sample households income and thus reduced their vulnerability to stresses. However, certain constraints such as lack of road infrastructure and communication facilities, lack of nearby market place and storage facilities, illiteracy, low awareness about the importance of certain forest product, no price information, negative role of middleman and informal money lending process were responsible for low earning from the sale of NTFPs in study areas.

Based on these findings this study made following recommendations. Road and communication facilities should be built in the study areas. Villager's access to information about certain NTFP price and its market should be enhanced through radio and other media. Forest department should design plan for conservation, management and sustainable extraction of NTFPs in study areas and also provide tools and trainings to local collectors for sustainable extraction of non-timber forest products.

Novelty Statement

This study discovered the role of non-timber forest products in income enhancement of mountainous people and also reported some major marketing constraints which should be removed to promote NTFPs collection more profitable for mountainous poor population of Khyber Pakhtunkhwa, Pakistan.

Author's Contribution

Ayaz Ahmed: Collected data, analyzed and wrote draft of the manuscript.
Muhammad Zulfiqar: Provided technical guidelines and supervised over all research work.
Saadutullah Khan: Provided help in writing research methods and analyzing the data.

Conflict of interest
The authors have declared no conflict of interest.

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