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Management of Gum and Resin Bearing Vegetations North-Western Zone of Tigray Region

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Abstract
This study was conducted in Tselemti and AsgedeTsimbla districts of North Western Zone of Tigray region. The objectives of the study were to evaluate the management of Gum and resin bearing vegetations, identify management practices applied and management constraints. A survey method which included interview and focus group discussions guided by semi-structured questionnaires were conducted to collect data from private enterprises, district offices of agriculture, experts and randomly selected 80 sample respondents from local communities. From the study it was found that different management practices are applied primarily by private enterprises with limited participation of local communities. The current utilization system which favors to private enterprises is hindering local communities from the management of the vegetation and leading to conflict of interest and human encroachment. In general the result revealed that the management of the vegetation is very low affected by low participation of local people, lack of coordination and lack of monitoring and follow-up. Establishing strong institutional arrangement which can strengthen the coordination among stakeholders and introduction of management and utilization system that empowers local people as users and managers of the vegetation could promote sustainable management and utilization of the vegetation.
Keywords: Dry land vegetations, Gum and resin, Management practices, Management constraints

1. Introduction

Ethiopia is endowed with highly diverse agro-ecological zones attributed to the diverse Climate and altitude variations. Arid and semiarid areas cover the largest proportion; which is about 50-55% of the total landmass of the country (Lemenih and Kassa, 2011). Despite the prevailing poor perception about the resource base of dry lands, arid and semiarid areas of Africa have very high potential of flora and fauna diversity. Dry land vegetations in arid and semi-arid areas are specially recognized for their potential of non timber forest products which are highly valued for their socio-economic ecological role (Shephered, 1992; FAO, 1995; Lemenih, 2005; Simitu, 2005; Hassan and Dregne, 1997).

Vegetations in many dry lands of Sub-Saharan African in general and Ethiopia in particular are well known for their potential of gum and resin bearing species such as; various species of *Acacia*, *Boswellia* and *Commiphora* that are known to produce gum Arabic, frankincense and myrrh respectively (Shephered, 1992; FAO, 1995; Gebrehiwet et al., 2003; GTZ, 1998). These products support the livelihood of rural poor and indigenous communities through providing employment opportunities, as a source of income and contribute to the national economy of many developing countries through generating foreign currency from export of these products (EFAP, 1994; Haile et al., 2009; FAO, 2010; Lemenih and Kassa, 2011). More over gum and resin bearing vegetations play an important role in environmental protection, desertification control and biodiversity conservation through providing fodder for different domestic and wild animals. Despite the significant ecological and socio-economic role of dry land resources, land degradation, deforestation and loss of productivity has continued to be the most critical problem of many dry land vegetations of sub Saharan Africa and Ethiopia in particular (Deffar, 1998; Tadesse and Mbogga, 2004; Eshete et al, 2005; Gebre Egziabher, 2006; Tadesse et al., 2007).

Ethiopia has a long history of the use and trade of gum and resin products and generating considerable foreign currency from export of these products. Various studies indicated that Ethiopia is one of the countries with very high potential of gum and resin bearing species widely distributed throughout its arid and semi arid agro-ecological zones which cover a total area of about 2.9 million ha of land are (GTZ, 1998; Tadesse et al., 2007; Haile et al., 2009). The western, northwestern and central low lands of Tigray regional state also have very high potential of gum and resin bearing vegetations. However, exploitation of these resources has not yet generated useful gains due to unwise and traditional techniques of tapping and collection. Besides, different studies made in Ethiopia and in the study area in particular have indicated that these vegetations are declining from time to time (Gebrehiwet et al., 2002; Tadesse and Mbogga, 2004; Eshete et al., 2005; Lemenih and Kassa, 2011).

Despite the growing recognition of the ecological and socio economic importance of gum and resin products and the vegetations, very little attention is given to the management of dry land vegetations as compared to the forests in humid and sub humid areas of the country. In addition, most studies made on gum and resins have been focusing on the socio-economic importance of the products with little or no focus on the management aspect of the vegetations (Eshete et al., 2005; Kassa et al., 2011).

Hence, little is known about the management patterns and management constraints of the vegetations in Northwestern zone of Tigray region. Moreover, sustainable utilization and management of dry land resources like gum and resins highly demands information relating to the management patterns of the vegetation which can help to strengthen the management and utilization system and maintain the long-term sustainability of the resources.

Therefore, the aim of the study was evaluate the management of gm and resin vegetation, identify the management practices currently applied and constraints affecting sustainable management and utilization of the resources.

2. Materials and methods

2.1. The study area

This study was conducted Tselemti and Asgede tsimbela districts of North Western zone of Tigray region, Northern Ethiopia (figure 1). This zone is found in Northern Ethiopia with zonal city Shire Endaselassie which is located at 1087 km distance from Addis Ababa and at about 300 km from Mekelle, the regional capital city. The altitude of the area/zone ranges between 700-2300 m.a.s.l. It is categorized under hot to warm semi-arid lowlands, hot to warm sub moist lowlands and tepid to cool sub moist highland. It receives a mean annual rainfall of 500-900mm and it is mostly seasonal particularly in the summer (kiremt) season (July, August and September) with peak in August. The mean annual temperature of the zone ranges from 25-27^{o}C. The vegetation cover of the zone is estimated to be 196325ha made up of bush, shrubs and scattered gum and acacia trees. The zone's vegetation resources fall in the broad leaved deciduous wood land and *Acacia-Commiphora* wood land vegetation types.

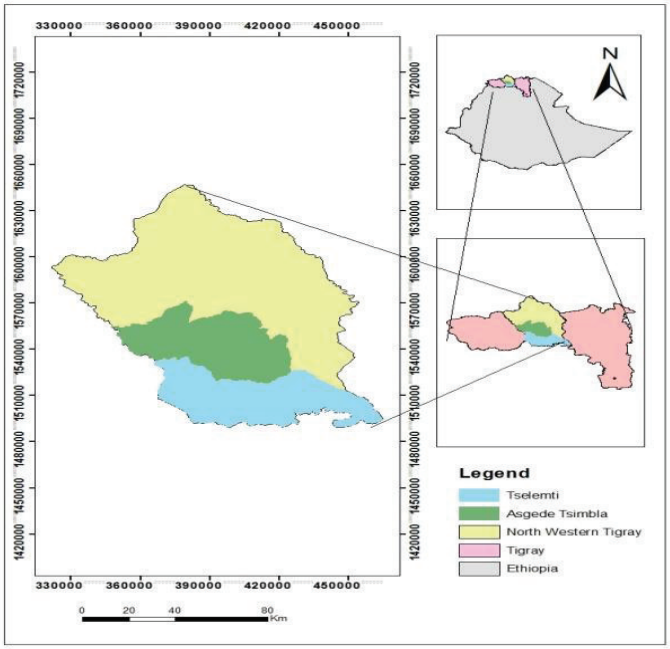

Figure 1: Location of the study area

2.2. Methods

The study utilized two stage sampling techniques where in the first stage four kebeles were selected from the two districts purposively on the basis the information from of reconnaissance survey (Table 1). Then a sample of 20 households was selected randomly from each kebele which resulted in total 80 sample households. To collect data about the management practices currently applied, four enterprises that involves in the production of gum and resins were selected (Table 3 on page 8). Moreover key informants were purposively selected which include local elders and leaders, kebele administrators, natural resource and forestry experts from the districts offices of agriculture, development extension workers in the selected kebeles.

Finally data was collected employing survey techniques which included personal interview, key informant interview and focus group discussions with local elders and leaders, kebele administrators, experts, extension workers and representatives of the selected private enterprises. The survey was guided by semi-structured questionnaires which included both open-ended and close-ended questions. Moreover, published and unpublished records from different offices such as management and utilization guidelines, management plans and reports of enterprises were reviewed to validate the information from the survey.

2.3 Method of data analysis

The collected data was analyzed using excel spreadsheet, SPSS version 17.0 software and descriptive analysis such as percentage and mean. In addition secondary data from review of management plan and reports of enterprises, management and utilization guideline and other published and unpublished records were summarized and synthesized. Finally the result is presented in the form of text, tables and figures to make things clear and understandable.

3. Result and discussion

3.1. Socio-demographic Characteristics of sample respondents

Regarding the characteristics of the respondents, there was no significant difference across the kebeles. Most of the households heads were male and only 20% were female (Table 1). More than half of the respondents can read and write which comprises priests who learnt traditional education in churches and farmers who took modern education. About 27.5%of the respondents were illiterate, about 32.5% were attended grade high school and 5% of the household leaders found trained in technical and vocational college. The mean age of the household heads were 41 (Table 4.1).

Table 1: Characteristics of respondents

Dependent variables		**Kebele of respondent**				
		May-Ayni	**Mizan**	**May-Ambesa**	**Medhanialem**	**Total**
		N %	N %	N %	N %	N %
Sex of respondent	Male	85.0%	85.0%	80.0%	70.0%	80.0%
	Female	15.0%	15.0%	20.0%	30.0%	20.0%
Level of education	Illiterate	40.0%	35.0%	5.0%	30.0%	27.5%
	Read and write only	30.0%	25.0%	35.0%	50.0%	35.0%
	Grade 5-12	30.0%	40.0%	40.0%	20.0%	32.5%
	College trained	.0%	.0%	20.0%	.0%	5.0%
Marital status	Un married	10.0%	5.0%	15.0%	10.0%	10.0%
	Married	85.0%	75.0%	80.0%	85.0%	81.3%
	Widowed & divorced	5.0%	20.0%	5.0%	5.0%	8.8%

The major livelihood means of the people in the study area were subsistence agriculture. As indicated in Table 4.2, 88.6 % of the sample households lead their livelihood by agriculture which is dominated by food crop production and livestock rearing with high reliance on the former (Table 2).

Table 2: Means of livelihood of Respondents

Kebeles	**Means of livelihood of households**					
	Crop production		Livestock production		Mixed farming and others	
	No.	N %	No.	N %	No.	N %
May-Ayni	20	100.0%	0	.0%	0	.0%
Mizan	17	85.0%	0	.0%	3	15.0%
May-Ambesa	18	94.7%	1	5.3%	0	.0%
Medhanialem	15	75.0%	0	.0%	5	25.0%
Total	70	88.6%	1	1.3%	8	10.1%

Agricultural activities in the area are mainly dependant on the long summer (*kiremti*) rains. The respondents pointed out that, in addition to the subsistent crop production they undertake different off-farm activities to supplement their household consumption. These include, collection of wood and non wood forest products and gum and resins in particular, earning income as daily wage from the nearby towns and getting temporary and/or permanent employment opportunities in locally operating government and non government organizations.

3.2. Management responsibility and utilization system

The forest resources in general and gum and resin resources of Tigray region in particular is administered by the regional bureau of Agriculture and rural development. With respect to gum and resin resources, this institution is responsible to provide management and utilization guidelines and regulations, oversee the utilization and management of the vegetation and authorizing gum and resins production and marketing licenses. The bureau of

agriculture and rural development of Tigray region has issued a guideline aimed at regulating the utilization and management system of gum and resin bearing species aimed at maintaining the sustainability of the resources in 2004.

The issue of the management of gum and resin bearing species in the study area can be seen from two directions; i.e. those licensed for production and marketing of gum and resins and those where production of gum and resins are not allowed. The management responsibility of gum and resin species within the licensed area is officially given to the user enterprises. According to the regulation, the user enterprises should provide management plan and agree to submit yearly implementation reports in order to get the license and the enterprises should accomplish their activities having the goal of improving the environmental and economic benefits that could be obtained from the vegetation. The Guideline also stresses that, beyond the management of gum and resin bearing species, the management plan of the enterprises should give due consideration for land management, management of wildlife and other natural resources that occurs in the area (Box 1). Among the major requirements of agreement for licensing production and marketing of gum and resins which must be accepted and fulfilled by the user enterprises are shown in Box 1 below.

Box 1. Gum and resin production and vegetation Management Guidelines

1. They should provide five years broad and one year detailed management plan for the area given within six months from the date licensed
2. Register their capital in the license
3. Accept and follow management and production technical advices given by the bureau of agriculture and rural development or other offices and should undertake coordination activities during monitoring of their institution
4. Provide a written periodic report their activities on time as per any request from the regulating agency
5. Use the area given only for the licensed project/activity
6. Employ expert that fulfills the necessary expertise and guards who protects the vegetation
7. They should properly implement their management plan in undertaking activities like
   - Development of nursery site
   - Producing and planting seedlings
   - Protection and management and
   - Control degradation and damage to other resources in the vegetation including wild animals
8. Prevent fire in the vegetation and when it emerges undertake fire control activities
9. Provide a suitable situation for workers employed
10. Provide employment opportunity primarily for local community
11. Give workers the necessary orientations and trainings
12. Allow local communities around the vegetation to take grass in the vegetation freely in a way that don't affect environmental protection
13. Produce, buy, transport, manage and protect gum and resins following the rules and regulations
14. Pay 20% royalty to the government based on timely price
15. Build/rent the necessary infrastructures and stores
16. Implement their project as per the natural resource management procedures derived from forest and wildlife management proclamations and regulations and accept changes to the proclamations in the future

Source: BARD of Tigray region, (2004)

Finally to get the license the enterprises should accept the duties and responsibilities listed above putting their signature. The enterprises are accountable for limitations in the implementation of the guidelines and for any negative impacts on the vegetation and its resources in general. The punishment for not obeying the regulations may extend up to disqualifying license, accusation to the court and other punishments. Accordingly the regulatory agency regularly undertakes the following activities.

- ✓ Checking up the enterprises trade license
- ✓ Checking whether the area given is used for the proposed activity or not
- ✓ Giving technical advices to the enterprises regarding the management and utilization and utilization of gum and resins
- ✓ Giving certificate containing the duties and responsibilities of the users which is approved by land use, land administration and environmental authority
- ✓ Undertake follow up and monitoring of the operation of the enterprises
- ✓ Evaluation of periodic management reports of the enterprises with respect to their management plans and making decisions based on the implementation status of the management plans

For the vegetations exempted from production of gum and resins, the district bureau of agriculture and rural development and local people are responsible for its protection and management. These include areas which are degraded, with low productivity and mostly enclosed for natural regeneration. In these areas local community are allowed to use the vegetation. However, the use by local community is very low mostly limited to the collection of dead trees for firewood and grasses for livestock under the permission of local administration and local experts.

3.3. Management practices applied on the vegetation

Among the different agencies that involved in the management and utilization of gum and resins in the study area, four enterprises where taken as a sample to identify the management practices applied on the vegetation/their licensed holdings. As described in Table 3 below, Natural Gum Production and Marketing Enterprise (NGPME) is a government enterprise and the rest three are private enterprises.

Table 3: Description of the sample gum and resin production and marketing organizations

Name of enterprise	Established	Ownership	Major activities
NGPME	1968	Government	Production and marketing of gum and resins
Sehul Trading PLC	1986	Private association	Production and marketing of gum and resins Distribution of goods like sugar, oil soft drink
Mebrahtom Shila General Trading	1995	Private association	Production and marketing of gum and resins and Distribution of goods like sugar, oil soft drink and transport services
Gere Guduat Akal	1995	Group of disabled peoples	Production and marketing of gum and resins

Source: Office of the private enterprises

According to the management plans of the enterprises and discussions with line and management staffs, the major management practices currently applied on the vegetation are discussed as follows.

1. Capacity building

Capacity building with respect to the management of gum and resin bearing species focuses on trainings workers that involves in the management of the species, tapping and collection of gum and resins as well as to local communities. So far among the trainings given by the enterprises include protection, tapping and collection techniques, management and handling of seedlings, fire control mechanisms and other management related aspects. This is done to equip workers with the necessary tapping, collection and other management technique there by minimize damages to the trees and improve management of the vegetations (also reported by FAO, 2010; Limenih and kassa, 2011).

2. Fencing and protection

This is made to ensure the protection of the species from free grazing, human encroachment and fire. According to the information obtained from the enterprises, different structural fences that controls human and animals' entry and fire controlling furrow are being constructed. For instance the information from NGPME indicated that the organization has made 72 ha of fencings in the budget year 2011/2012 in the site located at Mizan Kebele. In addition, guards are hired to control free grazing, human encroachment, and other factors that cause damage to the vegetation. In line to this Gebrehiwet et al., (2002); Blay et al., (2000) and Mekuria et al., (2009) reported that, area closure and fencing can facilitates regeneration of gum and resin bearing tree species and enables to maintain healthy seedlings.

3. Enrichment planting

Enrichment planting is done both through transplanting seedlings and vegetative propagation for different gum and resin bearing species (Table 4). Among the gum and resin bearing species in the study area to which vegetative propagation is being done includes different species of *Boswellia, Commiphora* and *Stericullia*. Different species of Acacia such as *A.senegal* and *A.seyal* are propagated by raising seedlings form seeds. For instance NGPME has covered 48ha of land with 35000 seedlings of *Acacia* species in the year 2011/2012. The enterprises were also engaged in the production of seedlings and the enrichment planting plan of thre enterprises for the budget year of 2012/13is given in Table 4.

Table 4: Enrichment planting plan of the enterprises

Enterprises	No. of Seedlings/trees cuttings		Total
	From cuttings	From raised seedlings	
NGPME	122,000	135,542	257,542
Mebrahtom Shila	500	40000	40,500
Gere Guduat Akal	400	45,800	46,200
Sehul Trading PLC	NA	NA	NA
Total	**122,900**	**221,342**	**344,242**

Source: Management plans of the enterprises

4. Fallowing/Resting

It is done for the vegetations that need resting from production of gum and resin products there by recover to their original state. Even though the management and utilization guideline states that, the species should be fallowed for at least four years after two years of tapping and collection; the information from the enterprises revealed that, the timing and length of the fallow period depends on the intensity of tapping and collection activities. The same to this it is recommended by GTZ, (1998) and Limenih and kassa, (2011) reported that,

allowing a sufficient resting period of three to five years after trees are consecutively tapped for a couple of years can enable the trees to regain vigor and vitality.

5. Tillage

Tillage is done for seedlings in nursery sites, newly transplanted trees as well as naturally grown young trees. The tillage activity is done to improve aeration, infiltration capacity and make root penetration to the soil easier. According to the information from the private organizations, this is done two times a year i.e. first on October and second on April.

3.4. Management constraints

Despite the claim of the enterprises that they are applying different management activates as evidenced by the attractive management plans, the survey result revealed that, the management of the vegetation is very low affected by different constraints. The respondents from local community were asked to rate the current level of management as good, high and low. Accordingly the result of analysis of their views indicates that, the management of the species is very low (Figure 2).

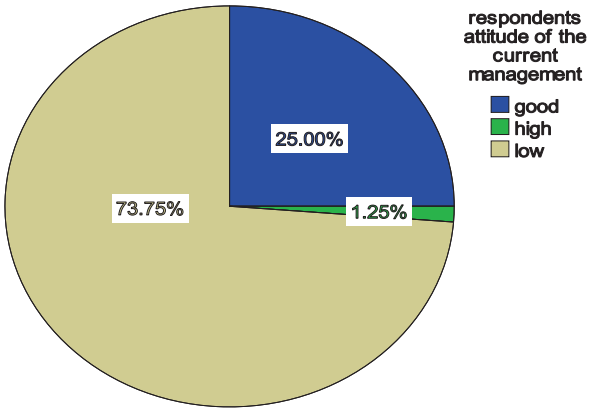

Figure 2: Respondents view on the current management of the vegetations

As indicated in figure 2 above 73.8% of the respondents mentioned that, the current management is low and the cover of the vegetation is declining from time to time due to different degrading factors. Moreover, key informants from different offices also mentioned that, the management of the gum and resin resources is very low and the species are declining due to multiple human and natural factors. Some of the major constraints affecting the management and sustainability of the vegetations in the area are described below.

1. Lack of local involvement

Many studies witnessed that local level participation is the key for success in forest management and this only becomes meaningful when real power to manage is given and local peoples get benefits from forests (FAO, 2010; Wily, 2002; Irwin and Mitiku, 2004). However, the participation of local community in the management of the vegetation in the area is very low (Figue3).

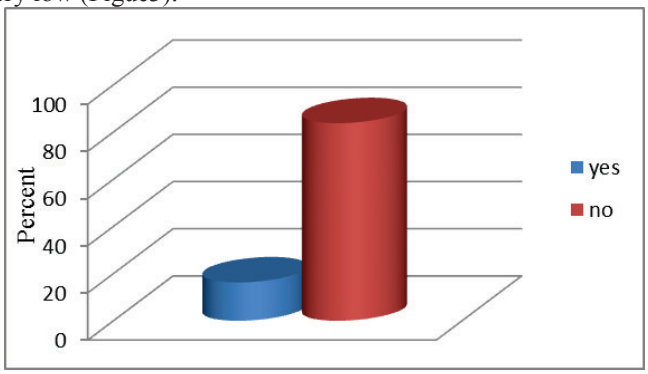

Figure 3: Respondents involvement on the management of vegetations

The figure above indicates that, more than 83% of the respondents do not involve in the management of the vegetation. They mentioned that they are not participating in management because they believe, '*the private organizations currently using the vegetation are responsible for the management of the vegetation'*. Even though local communities are allowed to use gum and resins outside the licensed holdings of private enterprises, their activities are limited to collection of dried wood for fire wood and grasses for livestock. This limits the benefits local communities can drive from the vegetation and this has changed the people's attitude towards the management responsibility.

The informants from the enterprises and districts offices of agriculture also pointed out that, human encroachment is one of the most important factors affecting the vegetations. This is due to the restriction of local community from the use of the resources is leading to conflict of interests and human encroachment. Therefore local participation which is the key for success in forest management is lacking in the area. In line to this wily, (2002), also reported that restriction of local communities leads to conflict of interest and forest degradation.

2. *Low management efforts:*

Low management effort from the user enterprises and other stakeholders is also identified as one of the constraints in the area. Even though, the enterprises have smart management plans which can maintain the sustainability of the resources if implemented accordingly, there are different limitations in the implementation of the management plans of the enterprises. According to district bureau of agriculture and rural development, there is a huge difference between the management plan and implementation reports of the enterprises. The enterprises are primarily engaged on profit maximization through intensive tapping and collection with little emphasis on the management and sustainability of the vegetations. The informants from the enterprises also admitted that, there is little of emphasis on the management vegetations by the private enterprises and the management of the resources is very low. For instance NGPME Shire Endaselassie office representative Mr. Endale has mentioned that;

"*Even though we do have attractive management plan, its implementation is very low and even we are not being guided by the management plan*." He added "*For example our enterprise had a planed to hire 12 guards last year 2011/2012 but we have only three guards hired*."

On the other hand the vegetations outside the holdings of the private organizations are being damaged due to multiple human pressure and lack of management. Experts from the offices of agriculture have discussed that there is no action taken to manage these resources beyond hiring guards.

3. *Lack of follow up and monitoring*

The management and utilization activities of the enterprises lacks follow up by the regulatory agency. The agencies responsible for regulating the management and utilization of gum and resin bearing species are undertaking limited actions in monitoring and regulating the activities of the licensed enterprises. Most of the actions of these agencies do not go beyond giving license, approving management plan and receiving reports. The informants pointed out that, the absence of follow up and monitoring is making the user organizations to focus on maximizing their profits through intensive tapping and collection with little emphasis on the management aspect.

4. *Lack of coordination and information exchange*

Coordination between different stake holders is one of the most important factors for the successful management of forest resources; particularly vegetations that provides multiple socio-economic and environmental benefits (Willy, 2002; Irwin and Mitiku, 2004; FAO, 2010). However the management and utilization of gum and resin bearing vegetation in the study area lacks coordination and information exchange between different parties concerned with the resources. The informants mentioned that, there is limited coordination and information exchange among different agencies regarding the management and utilization of gum and resin bearing vegetations in the study area. For instance they mentioned that, areas exempted from production of gum and resins by the regional bureau of agriculture and rural development are currently licensed to private enterprise by the bureau of agriculture and rural development of Tselemti district. Such gaps in information are leading to the low management, damage and consequent decline of the coverage of gum and resin bearing vegetations in the area. Different authors also indicated that, the absence of clear strategy, low information exchange and lack of appropriate institutional arrangement are among the most important factors that causes deforestation many dry land vegetations (Blay et al., 2000; Derero et al., 2011).

4. Conclusion and recommendation

The result of the study revealed that, even though different management practices are currently applied on gum and resin bearing vegetations in the study area, the management of the vegetations is very low. These management practices are mainly applied by the private enterprises with low involvement of local community. The unfair benefit sharing which excludes local communities from the benefits of the vegetations is leading to conflict of interest, human encroachment and degradation of the vegetation. Moreover, low management efforts by all stakeholders, lack of follow up and monitoring, lack of coordination among different agencies concerned with the management and utilization of gum and resins are among the management constraints affecting sustainability of the resources. Therefore, establishment of strong institutional arrangement and management and utilization system which can enable local peoples to act as owner, managers of the vegetation could contribute towards effective and sustainable management of the vegetation.

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