

Sustainably Managing Montane Forests in Arid Mountain Regions: The Oyttag Valley of West Kunlun

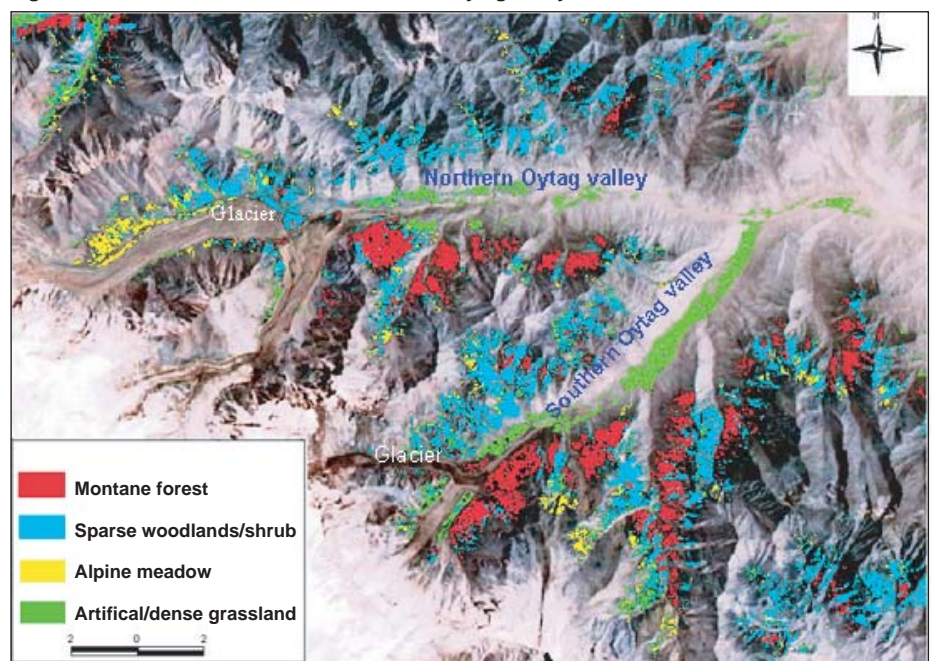
The Oyttag valley, about 100 km west of Kashi (Kashgar), is one of the few valleys with forests in the Kunlun Mountains. It underwent severe forest destruction in the late 1950s, and about only one fourth of the natural forest remains. Since the early 1980s, forest conservation and artificial regeneration have been carried out in the valley.

In arid mountain regions, forests only develop on slopes with a relatively humid climate, and usually a limited area. To the local people, these forests are rare resources and of special value. The ecology of these forests is often very fragile. It is very difficult or even impossible for these forests to recover if they are seriously destroyed. As a result, sustainably managing these forests is important for the local and downstream people and environment. In the vast northwestern arid China, desert landscape dominates, and extensive arid mountain areas (e.g. the Kunlun, Tianshan, Qilian, etc.) and deserts (e.g. the Taklimakan Desert, the Gurbantungut Desert, etc.) alternate, with the very sparsely scattered oases on the lower piedmont plains of the mountains. Mountain forests only occur in the middle parts of these mountain ranges, e.g. 2700–3600 m a.s.l. in West Kunlun, 1600–2700 m in the Tianshan, 2600–3300 m in the Qilian, and 1500–2500 in the Altai. In these regions, mountain forests have many functions

such as stabilizing highland/lowland hydrological system, reducing natural disasters, ensuring oases development downstream, etc. Consequently, sustainably managing these mountain forests looms especially large in northwestern arid China.

The Kunlun Mountain range, lies between the world famous Tibetan Plateau and the low-lying Tarim Basin, and is one of the most extensive extremely high and arid mountain ranges in the world. It is characterized by an arid climate and desert landscape (1). The annual rainfall is 61.3 mm for Kashi (1289 m a.s.l.), 35.0 mm for Hotan (1375 m a.s.l.), 36.6 mm for Kangxiwar (3986 m a.s.l.), 23.8 mm for Tianshuihai (4860 m a.s.l.). But the middle mountains (2700–3600 m a.s.l.) of the northern flank are relatively humid, e.g. the annual rainfall amounts to 195 mm for Oyttag (2030 m a.s.l.) and 210.9 mm for Heishan (2540 a.s.l.). Conversion between annual runoff depth and rainfall shows that the rainfall can be expected to reach

Figure 1. Distribution of montane forest in the Oyttag valley of West Kunlun.



about 300–400 mm at elevations of about 3000 m in some valleys of West Kunlun (2). As a result, in some areas of the middle mountain belt there are some patches of montane forest, and these only appear intermittently to the west of the Shangzu River (East longitude 78°20') in the Kunlun Mountains. Their total area is about 20 000 ha (3). They do not constitute an altitudinal belt; instead, they are usually scattered in the upper part (2700–3600 m a.s.l.) of the montane steppe belt, and only in some relatively humid valleys. These montane forest has only 2 species of needle-leaved trees, spruce (*Picea schrenkiana*) mainly on shady slopes and juniper (*Sabina centrasiatic*) mostly on sunny slopes (4). Considering the extent of the Kunlun Range and the Tarim Basin, montane forests are both rare and precious in southern Xinjiang. Most of the forests are situated far from population centers and are difficult to reach. The Oyttag valley is somewhat different. It is only about 100 km west of Kashi (Kashgar) (Fig. 1) close to the Sino-Pakistan International Highway; the central forest area of the valley is only 37 km away from the highway, and can be easily reached by car. It is in this valley that a mechanism for managing montane forests was formed; the “Oyttag Model.”

DYNAMICS OF MONTANE FORESTS

The dynamics of montane forests are subject to many factors. The first being human activities. Our on-site investigation revealed that in the early 1950s, the area of montane forests in the Oyttag valley was more than 3 times as large as it is at present; in 1954, the Oyttag Forest Farm, of the Kizilsu Kirgiz Autonomous Prefecture of Xinjiang, was organized to cut trees; in 1958–1959, almost all of the trees that could be used as timber in this valley were logged by more than 2000 soldiers with tractors. In 1979, logging was banned. From 1984–1985 on, measures were taken to conserve forests. In 1990, a seedling nursery was established. Since 1992, with some mountain shady slopes fenced, natural and artificial forest regeneration and restoration have been greatly promoted. On the relatively gentle, shady slopes, more than 85% of the seedlings planted in the early 1990s have survived. Investigations show that montane forests can recover quite rapidly on shady slopes, if the slopes are fenced. Sunny slopes are generally extremely degraded, and the local forest workers believe it is impossible to restore them. As a result, forest regeneration has been abandoned on the sunny slopes.

Natural degradation of montane forests can be easily observed in the Oyttag val-

ley. The lower parts of the valleys are mainly loose materials weathered from Quaternary basaltic moraines. Landslides easily occur on the steep slopes, and the forest developing on these slopes is pushed to the middle slopes or to the bottom of the valley.

Since 1986, animal husbandry has been the main production source in the Oyttag valley. Income from animal husbandry amounted to about 70% in 1995 of the total income of farming, forestry and animal husbandry. Development of animal husbandry in the valley is important for production and daily lives in the Oyttag valley. The forest and meadow areas are the most important summer pasturelands; in late spring, the local Kirgiz people drive their livestock up to the pastureland, and in late August return. In the early 1990s, when the shady and gentle slopes were considered to close for forest regeneration, only 20 ha were fenced in the south valley, and about 14 ha in the north valley (Atoynak valley). The reason for this is simple; the development of local animal husbandry needs a considerable amount of pastureland. It has been planned to extend the fenced slopes for forest regeneration to about 800 ha before 2010. There is a long way to go, as the dispute over land use constitutes a problem for both forestry and animal husbandry. Coordination of the relationship between animal husbandry and forestry development is a challenge for the local government.

The local people collect dry or semidry tree trunks and branches for firewood and sell them to merchants who transport them by car to the lowland market. This constitutes part of the local income. To prevent outright logging, the Forest Bureau of the Kizilsu Prefecture formulated a penalty system and conducts strict inspections of the collected wood.

The Oyttag valley is characterized by relatively rich natural resources, such as alpine meadow, montane steppe and forests, snow-capped mountains, 4 large glaciers extending into the forest areas, and a cool and comfortable summer climate. All of this contrasts sharply with the extremely arid Tarim Basin, and can thus serve as a valuable tourist attraction. Since 1992, tourism has developed quickly in the Oyttag valley. In recent years, more and more people in the oases of the western Tarim Basin come to this valley in summer for sightseeing and recreation, even including the Uyghurs. However, increasing tourism adds pressure to the limited forest and the fragile environment of this valley. Some patches of meadow and woodland have seriously degraded or have been demolished, and the increasing rubbish has not been properly disposed. Properly managing these valuable forest resources is significant both to the local and

downstream people and ecology.

THE OYTAG MODEL FOR MANAGING MONTANE FORESTS AS RARE RESOURCES IN ARID MOUNTAIN REGIONS

The formation of the Oyttag Model for managing montane forests was closely related to the development of tourism in the Oyttag valley. This valley is cool and comfortable in summer. The upper Oyttag valley is covered with montane forests, alpine meadow, snow-capped mountains, and large glaciers. This valley is relatively close (about 100 km) to the city of Kashgar, an international tourist city famous for its Islamic culture and customs. The Oyttag valley is the only potential mountain tourist site close to population centers (oases) in the extensive southern Xinjiang. In the early 1990s, the people in the oases began to come to this valley for recreation and sightseeing. To coordinate overall development of forestry, animal husbandry, and tourism, the Tourist and Forestry bureaus and Forest Police of the Kizilsu Prefecture, and the local government of Oyttag Town jointly organized a management group; the members of the group work together in the valley. To effectively protect mountain ecosystems, especially the rare montane forests, a toll-gate was installed near the old forest farm office in 1992 (the Farm Office was later moved to the side of the Sino-Pakistan International Highway at the outlet of the Oyttag valley). All visitors and cars are charged for entering Oyttag tourist areas, and the Oyttag valley is now under relatively strict management.

The members of the group of the Forestry Bureau are workers of the Oyttag Forest Farm, mainly Uyghurs from the downstream oases. They perform the main task of forest regeneration and conservation, including protection of the forest regeneration base and fostering the planted seedlings. They usually buy juniper seedlings from the Tianshan Forest Farm and the Kunlun Forest Farm, and then plant them in the forest nursery; after 2–3 years, they transfer the seedlings to the fenced forest base. One of their daily tasks is to keep a close eye on the fenced reserves and drive out livestock entering the base, (cows and sheep can destroy seedlings if allowed to enter the base). They also inspect trucks and donkeys carrying firewood, and if they find fresh tree branches or trunks, the owners of the trucks and donkeys are heavily fined.

The members of the managing group of the Tourist Bureau come from the capital of the Kizilsu Prefecture, namely, Artush, which is 45 km north of Kashgar. Most of them are Chinese (Han nationality), they are responsible for establishing and

improving tourist facilities. The members of the local government represent the interests of the local Kirgiz (Khakas) people, and are mainly responsible for coordinating the relationship between the local herdsman and tourism. The forest police take care of forest security. All the members live and work together in the Oyttag Hotel (actually tents and simple and crude houses). When problems arise, they discuss and solve them. In the meantime, the members of the group provide services to the tourists. The four parties share the income of tourism. By this, various contradictions can be mitigated to a large extent, and the development of forestry, animal husbandry, and tourism is gradually channelled into sustainable management. In the summer of 1999, the new management group was organized. The coordinator is the vice-president of the Tourist Bureau, who comes from Jiangxi Province in East China to help the prefecture to develop tourism. This is part of the governmental program of China: "East China Helps West China to Develop." Thanks to this development program, new ideas and techniques are being brought into the underdeveloped mountain areas of West China.

PROBLEMS AND FUTURE DEVELOPMENT

Animal husbandry is the backbone of the local economy; maintaining considerably large areas of pastureland is necessary for the local people. So, only about 34 ha forested area was fenced in the 1990s for forest regeneration. Fencing more woodland is actually quite difficult, requiring a permit from the local government and local people. Owing to this, fencing 800 ha woodland for forest regeneration before 2010 is a real challenge for the Forest Bureau of the Kizilsu Prefecture.

The income of tourism in the Oyttag valley is still very low and unstable. It was more than USD 6000 in 1998, but less than USD 1200 in 1999. One factor limiting tourist development is the condition of the road from the Sino-Pakistan International Highway to the tourist sites. Tourists in the lowland oases usually come at the weekend, however if the weather is bad only a few tourists come. This is mainly due to the fact that flooding can easily damage the road from the new Forest Farm Office to the tourist site, sometimes even for a whole month (e. g. in July 1999), making it impossible for the tourists to get to the tourist site.

The present tents were set up with the Tourist Bureau of the Kizilsu Prefecture. But, in 1999 the members of the Oyttag Forest Farm built several sheet-iron houses as their own "tent hotel" for the tourists. The establishment of these houses

destroyed a large area of meadow and altered landscape. They were evidently not the result of coordination of the management group. There is no doubt that the group does not have absolute authority for the management of the Oyttag valley. Effective coordination of land use in the Oyttag valley should be strengthened, otherwise, this wonderful landscape could be damaged, and tourism development would be negatively affected. Some officers of the Kizilsu Prefecture want to set up brick and cement buildings in the Oyttag tourist area. However, the Oyttag tourist area is quite small. The tents of Mongolian style are part of the landscape, and the tourists like them. It is strongly suggested that tents should be kept and solid buildings avoided.

Traffic conditions need to be improved. It has become imperative to construct a 37 km long road from the outlet to the forested areas. Fortunately, the government of the Kizilsu Prefecture made a decision in 1999 to invest in improving traffic conditions in the Oyttag valley. The Oyttag tourist area has no electric power and no communication facilities at present. These inconveniences hamper the development of tourism in the Oyttag valley.

The handling of rubbish brought in by tourists must be given special attention. The Oyttag tourist area is small and the ecology very fragile; environmental pollution could easily damage this landscape and ecology. Therefore, effective measures must be taken for the proper disposal of the waste.

Montane forest management and tourism development are still at a very early stage in the Oyttag valley. Tourist planning and an overall development plan for the valley are urgently needed. The following points need to be taken into account *i*) montane forests are rare and precious resources in the arid southern Xinjiang. Forest degradation must be avoided in the process of tourist development; *ii*) the number of tourists should be controlled, simply because the forest area is small and the ecology is fragile; *iii*) gradually fencing more degraded woodland for forest regeneration is absolutely necessary, and new techniques must be developed to restore forests on the sunny slopes; and *iv*) the Oyttag model for managing mountain forests needs to be further improved.

References and Notes

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