

National Parks and Local Development: Grasses and People in Royal Chitwan National Park, Nepal

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INTRODUCTION

The model for national park development and management that was developed in the 'western countries' has emphasized preservation and conservation of plants and animals. However, 'developing countries' with large rural populations and subsistence economies realized in the mid-1970s that this model must be variously tempered in their particular situations if the parks' projects were to be successful. Thus protected areas would need to provide some economic benefits for local development that were consistent with conservation goals and objectives (Eidsvik, 1980; Dasmann, 1982; Mishra, 1982; McNeely, 1984).

This approach has been successful in managing national parks and protected areas in southern Asia (Mishra, 1982; Panwar, 1982; Saharia, 1984), Africa (Western, 1982; Child, 1984), North America (Halfiter, 1981), and other areas (see McNeely & Miller, 1984). Some developed countries, such as Italy, have found this approach to be the only practical solution to problems of managing some protected areas (Tassi, 1984). This policy of integrating conservation and development has been embodied in the World Conservation Strategy (Eidsvik, 1980) and in the Bali Action Plan of the World Congress of National Parks (Miller, 1984).

Nepal has been a leader in the movement towards the twin goals of conservation and local development. The mountain parks of Langtang and Sagarmatha, when established in the mid-1970s, included villages of indigenous people, for which park management plans were formed to address their resource needs (Jeffries, 1982; Mishra, 1982). In addition, lowland Terai and middle-hill parks and reserves have allowed for the traditional collection of grasses and other natural products, such as pine needles and leaves for mulch, which are necessary for subsistence living.

Royal Chitwan National Park in lowland Terai has been represented as a model of conservation and local development (Mishra, 1982, 1984). Prior to its official establishment in 1973, local people had been using the Park area to collect firewood, graze livestock, and collect grass to be used as building material. For a two-years' period following establishment, all these activities were banned. Then from 1976, the Park authorities responded to a local outcry by allowing grass-cutting for 20 days each year during the winter season. The grass-cutting season was reduced to 15 days in 1981 in order to reduce firewood theft by grass-cutters. A further reduction of the season to 10 days is being considered to reduce further the theft of firewood. Meanwhile the Park remains the sole local source of grassland products, which Mishra (1982) estimated to have an annual value of about US \$600,000.

Villagers collect thatch-grass ('khar', primarily Siru, *Imperata cylindrica*), 'kharai' (the canes of tall grasses, mostly Phank [*Narenga porphyrocoma*] and Baruwa [*Saccharum bengalense*]), Babiyo (the grass *Eulaliopsis binata*), and 'Simti' (the shrub *Helicteres isora*). Park authorities have estimated that up to 130,000 people enter the Park annually during the two-weeks' cutting-season (Mishra, 1982). Villagers pay a nominal fee of NR 1 (US \$.04) and can enter the Park at will and carry out on their backs as much grass as they are able.

Grass-cutting has not been considered detrimental to wildlife, meaning mainly the dominant large herbivores, because grasses are cut at the end of the growing-season when most plant material is dead, of poor nutritional quality, and unattractive as food for wildlife. Moreover, concurrent grass fires stimulate production of lush new forage in both cut and uncut areas. However, current thinking is that more rigorous management of this process may be necessary to maintain continuous cover for some wildlife species, such as grassland birds and herpetofauna, and to

stagger the temporal availability of post-burn forage supplies to benefit herbivores and reduce crop depredation.

We were interested to determine what impact grass cutting was having on the grassland community, and how the Park's grassland resources were contributing to the local economy and the well-being of individual villagers. Our specific objectives were to find out:

- how much grass is removed from the Park, and what is its market value?
- how many people enter the Park, what are the number of visitor-days, and how far do people travel to cut grass?
- how important are these plant resources, and what alternatives to these resources do people have?
- what are the peoples' attitudes towards the Park, and towards the availability of Park resources?

The observations were made during January 1986 and January 1987, jointly by the staffs of the King Mahendra Trust for Nature Conservation/International Institute for Environment and Development Grassland Ecology and Human Use Project, and the Royal Chitwan National Park.

METHODS

Two thousand single-page questionnaires were distributed to selected guard-posts and administered by Park staff during the first two days of the 1986 grass-cutting season. Our original idea was to ask the questions of every tenth person who purchased a permit. However, a shortage of staff and the crush of villagers who were impatient to buy permits and get to the choice spots, required administering the questionnaire in the field, while people were cutting grass, or when they were leaving the Park on the first day.

The questionnaire was 'closed': a list of possible responses to each question was printed on the form, and questioners checked the chosen response matching each subject. The questions were designed to find out where people had come from; what they had come to collect; what they would do if they were not allowed to collect those materials; what other Park resources they would like to be permitted to collect; and their positive and negative attitudes towards the Park. The total number of people entering the Park was determined from the number of permits sold.

We intended to estimate visitor-days from the questionnaire. However, a mistake in the questionnaire precluded this method. We also thought that villagers would leave the Park from any point, so that counts would not be possible with our small staff. A sudden rule-change in 1986 forced people to leave *via* check-points, which would have made counts possible.

We did a follow-up survey in 1987, to improve the estimate of visitor-days. The number and types of grass loads leaving the Park from the Sauraha entrance were counted from 14.30 to 17.30 hours in the afternoon. The total number of loads counted as leaving the Sauraha exit on the first day was divided by the total number of permits sold, to estimate the proportion of total grass loads leaving *via* Sauraha. This proportion was applied to subsequent daily counts of the number and type of grass loads removed *via* Sauraha, to estimate the type and total number of grass

loads removed Park-wide. We assumed that all permit holders came on the first day. Staff limitations precluded Park-wide counts that would have given a more accurate estimate of the type and amount of products removed from the Park.

We weighed loads of grass in the field during the 1986 season to estimate load-weight per person leaving the Park.

RESULTS

Visitation

A total of 55,379 and 57,391 permits were sold to grass-cutters during the 1986 and 1987 seasons, respectively. We received 1,358 completed questionnaires from the guard-posts. This represents a sampling fraction of only 3.7% of the total number of permits sold during 1986.

Visitor days for the 15-days' period were estimated from the sample counts made at Sauraha, where 15–20% of the cutters enter and exit the Park. We found that these counts actually estimated loads of grass rather than visitor-days, because some people made several trips across the river to ferry loads of grass. The total number of 'khar' and 'kharai' loads removed was estimated as 162,592 and 134,265, respectively.

The total number of loads overestimates actual visitor-days by about 27%, based on counts of people returning to pick up additional loads of grass. Applying this reduction yields an estimated total of 216,706 visitor-days. The true figure may be slightly higher if adjusted for the people leaving the Park (uncounted) without a load.

Visitation peaked on the second day, then dropped sharply to remain fairly steady for the following six days, and thereafter became very small (Fig. 1). 'Khar' was removed mainly during the first two days, after which 'kharai' was the main product removed, when Fig. 1 suggests that there was little easily-cut 'khar' remaining to be removed.

Cutters were asked how far they had travelled from their homes to the Park boundary to cut grass. Nearly 57% had walked from 3–6 km to reach the Park (Fig. 2). An additional 32% had come 10–16 km; 2% had come from over 32 km away. Six kilometres was the distance which the grea-

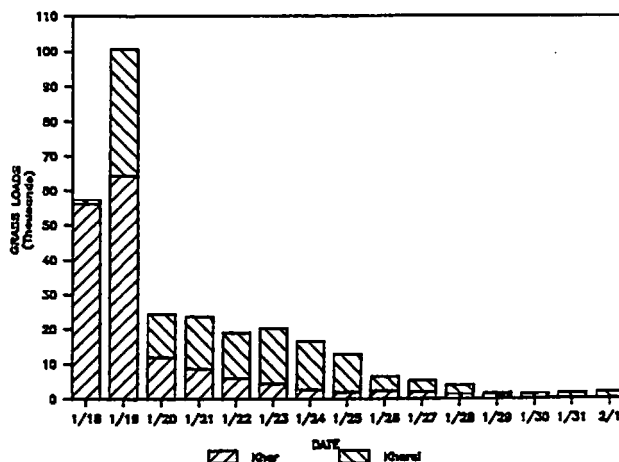


FIG. 1. Estimated number per day of 'khar' (thatch) and 'kharai' (reeds and stems) loads taken from Royal Chitwan National Park during the permitted cutting season of 1987. (The first of each pair of numbers indicates the month.)

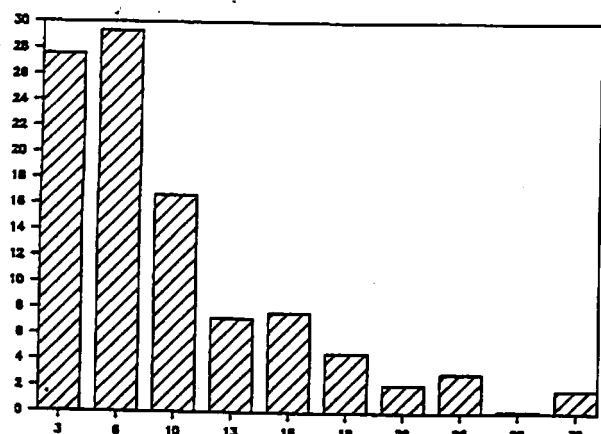


FIG. 2. Distance travelled to Park by grass-cutters responding to questionnaire.

test number of people had walked, but some had walked up to 10 additional kilometres inside the Park to claim the choice locations. Most cutters probably walked an additional 1–3 kilometres inside the Park. Seventy per cent of those questioned said that up to four members of their household had come to cut grass.

Amount and Value of Grass Products Removed

We attempted to estimate the amount and value of the 'khar' and 'kharai' removed from the Park. Only a rough estimate of visitation could be made, as a detailed and accurate survey of the amount and types of grassland products collected was beyond the means of the study. Reliable estimates for 'Simti' and 'Babiyo' are not available. We observed, however, that these products are taken in relatively small quantities compared with 'khar' and 'kharai'.

Khar:—Average-load weights for 'khar' were 39.4 kg (± 5.8 kg, $\alpha=0.05$; $n=326$). The value of 'khar', and 'kharai', is locally expressed in NR per 'muta', or bundle. We estimated that on average a muta of 'khar' weighed 2.8 kg (± 0.3 kg, $\alpha=0.05$; $N=16$), so that there would be about 14 mutas per load.

The value of a muta is NR 2 near the Park during the cutting season; the price rises to NR 5 farther from the Park and also even near the Park later in the year when 'khar' is not readily available.

A. We calculated the value of 'khar' per kg as: $(14 \text{ mutas/load}) \times (\text{NR } 2/\text{muta}) = \text{NR } 28/\text{load}$; $(\text{NR } 28/\text{load}) / (39.4 \text{ kg/load}) = \text{NR } 0.71/\text{kg}$.

B. The total amount of 'khar' removed was estimated, using the total number of loads removed (Fig. 1) and their mean load-weight, as: $(162,592 \text{ loads}) \times (39.4 \text{ kg/load}) = 6,406,143 \text{ kg total removed}$.

C. The total value of 'khar' removed was estimated as: $(6,406,143 \text{ kg removed}) \times (\text{NR } 0.71/\text{kg}) = \text{NR } 4,552,589$ value (US \$206,936 at NR 22/\$).

Kharai:—Average-load weights for 'kharai' were 35.2 kg (± 7.0 , $\alpha=0.05$; $n=258$). 'Kharai' is valued at about NR 5 per muta near the Park during the cutting season. We have no data on muta weights, but villagers told us that a load averages 8 mutas.

A. We calculated the value of 'kharai' per kg as: $(8 \text{ mutas/load}) \times (\text{NR } 5/\text{muta}) = \text{NR } 40/\text{load}$ $(\text{NR } 40/\text{load}) \times (35.2 \text{ kg/load}) = \text{NR } 1.14/\text{kg}$.

B. The total amount of 'kharai' removed was estimated as: $(134,265 \text{ loads}) \times (35.2 \text{ kg/load}) = 4,726,144 \text{ kg total removed}$.

C. The total value of 'kharai' removed from the Park was estimated as: $(4,726,144 \text{ kg removed}) \times (\text{NR } 1.14/\text{kg}) = \text{NR } 5,387,804$ (US \$244,900 at NR 22/\$).

Total 'Khar' and 'Kharai':—The total weight and value of all grass products removed was 11,132,287 kg valued at NR 9,940,393 (US \$451,836).

Resource Use

Cutters are legally allowed to cut 'khar', 'kharai', 'Babiyo', and 'Simti', and 69% responded that they had come to cut all four of these materials. Ninety-eight per cent responded that they were collecting for their own use; the other 2% said that they would keep some for their own use and sell the rest.

When asked what they would do if 'khar' thatching material was not available for them to cut, 76% responded that they would attempt to buy it from other villagers. Ceramic tiles were considered a suitable substitute by only 15%, probably because of their very high cost. Ten per cent responded that they would use some other plant material for thatching, probably straw.

Response to the same question with respect to 'kharai' found that 72% would attempt to buy 'kharai' from other villagers. Bricks were considered a suitable alternative to only 18%, due to the high cost. Ten per cent responded that they would use some other plant product, possibly wood.

'Babiyo' and 'Simti' were more easily replaced by commercial rope. About 55% of the respondents said that they would buy rope if these products were not available from the Park; 45% would attempt to buy 'Babiyo' and 'Simti' from other villagers. These products are available outside the Park and are for sale in the bazaars.

Resource Needs

When asked what other grassland and forest products they would like to be permitted to collect, people clearly expressed the desire to collect firewood, and to graze livestock or else cut grass for livestock (Fig. 3). Fifty-five per

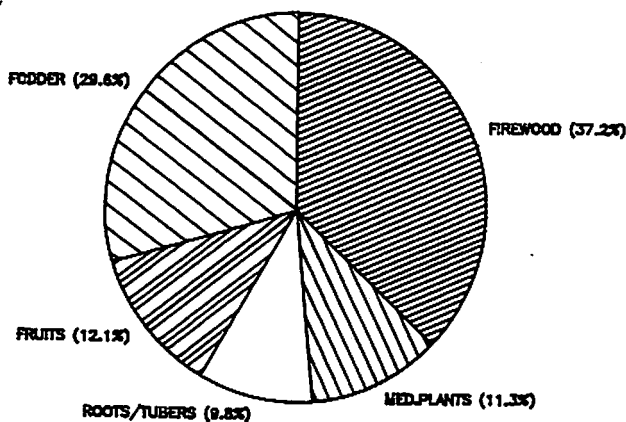


FIG. 3. Park grassland and forest products desired by respondents to questionnaire.

cent of the respondents now buy firewood, as opposed to collecting it themselves. Villagers are allowed to cut and collect dead wood from nearby reserve forests, but only as much as they can carry on their backs, i.e. ox-carts are not allowed. Most respondents had to provide fodder and grazing for three- to seven-head of livestock (mode = 6; Fig. 4). Most households keep at least two oxen for draft animals, and then possibly some immature oxen or cows to provide manure and replacement oxen. Financially secure households will keep more cattle and also may have a milk buffalo or two.

Attitudes Towards the Park

Cutters were asked what they liked about the Park. The availability of 'khar' scored highest (Table I). Firewood collection, an illegal activity, ranked second. Animal conservation and availability of employment tied for third place.

Principal complaints about the Park included prohibitions on fodder cutting and firewood collecting, crop depredation by wildlife, river erosion, and the ban on grazing (Table II).

DISCUSSION AND CONCLUSIONS

Visitation and Value of Grass Products

Visitation and value of grass products may be slightly overestimated because they are based on numbers of visi-

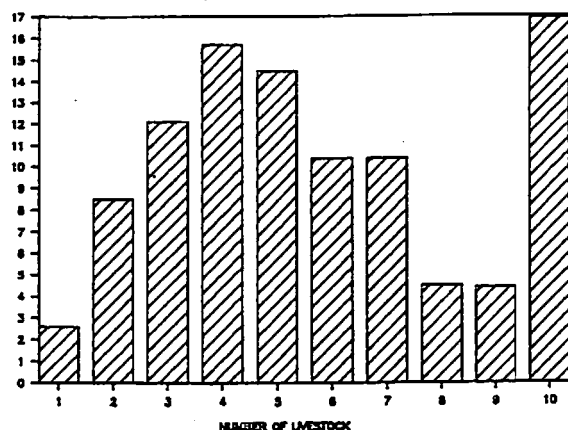


FIG. 4. Numbers of livestock owned by respondents to questionnaire.

TABLE I

What Grass-cutters Liked About the Park. (N = 7,282; respondents were able to give multiple answers.)

Aspects	Percentage
'Khar' collection	15.9
Firewood collection (illegal)	12.8
Animal conservation	10.2
Availability of work	10.2
Soil and water conservation	9.7
Visits to Park	9.6
Medicinal plants collection (illegal)	9.4
Meeting foreigners	7.9
Grazing (illegal)	7.3
Fishing	6.6

TABLE II

What People did Not Like About the Park. (N = 4,488; respondents were able to give multiple answers.)

Aspects	Percentage
No fodder-grass cutting	19.7
No firewood collection	17.8
Crop depredation by wildlife	14.9
Rapti River bank erosion	13.7
No grazing	11.6
Army guards cause problems	8.1
Lose livestock in Park	4.6
No agriculture in Park	4.2
Tourists a nuisance	2.8
Park staff problems	2.3

tors, not all of whom enter the Park and cut grasses. Many come in the guise of grass-cutters, to steal firewood concealed in grass. Removal of these cutters from the calculations would, however, decrease the indicated amount and value of grass products removed. Yet a bundle of firewood has a value equal to or greater than one of grass, so that the value of all grassland and forest products removed from the Park would not be substantially altered by selection between the two.

Estimates of the amount and total value of 'khar' removed during 1987 are definitely lower than usual. Perhaps 50% to 75% of the prime *Imperata cylindrica* stands were cut prior to the regular cutting-season, for maintenance of Park and hotel concessionaire buildings. Normally, visitation would continue to be high during the first 3 to 5 'open' days, instead of dropping after the second such day as in 1987.

Our values for weight and pecuniary worth of the grass products removed are admittedly rough. Different visitation rates at exit points, and differential removal of grass products, are two major variables that would need to be addressed in a more complete survey. In these respects, our figures are probably liberal; however, our estimates are very conservative, taking into account the reduced availability of 'khar' during 1987.

Moreover, we feel that our estimates of grass values are low because the prices *per muta* which we used are those quoted for the immediate Park area at the time of cutting. Nine months after grass-cutting the prices often double, and even during the cutting-season the prices may be double in the bazaar only 6 km away.

Mishra (1982) reported a 5-years' (1977-1981) annual average of 43,464 permits sold to grass cutters. Our 2-years' average was 56,385—a 30% increase in permit sales. He estimated the 'number of persons engaged' in cutting by multiplying the number of permits sold to families by an average family size of three cutters: his 5-years' average was 130,391 persons engaged. During our study, each individual cutter, not family, required a permit, so we were able to determine the 'number of persons engaged' directly from permit sales.

Mishra (1982) estimated a 5-years' total of 66,631 metric tonnes of grass removed, with an annual value of NR 7,775,920 (US \$ 598,148 at NR 13 per dollar). Our figures are 11,132 tonnes removed annually and valued at NR 9,940,393 (US \$ 451,836 at NR 22 per dollar). The discre-

pancies can be accounted for by Mishra's lower value per kg of grass (NR 0.1 for 'khar' and NR 0.2 for 'kharai'; NR 0.71 for 'khar' and NR 1.14 for kharai in this study), and higher estimates of 'persons engaged'. His methods for estimating these parameters were not completely divulged. We believe our estimates to be sound and realistic.

We have reported here the gross value of grasses to the local economy. Subtraction of permit costs and labour costs yields a net value. The average labour cost at NR 20 per man-day for total visitation adjusted for recounts (216,706) is NR 4,334,120, and permit costs are about NR 60,000 for a total cost of NR 4,394,120. Subtraction of this cost from a total grass value of NR 9,940,393, yields a net value of NR 5,546,273 (US \$252,103 at NR 22/\$) annually to the local economy.

Resource Use, Needs, and Management

What are the alternatives to Park grassland products for house construction? Seventy-six per cent of the people replied that they would buy 'khar' if not able to cut it themselves. However, if 'khar' were not available inside the Park, villagers would not be able to buy it outside, because there is virtually none to be found outside the Park. This indicates that the local people do not consider tiles or other plant products (wheat and rice straw, Sal [*Shorea robusta*] leaves, etc.) as suitable alternatives.

The free availability of 'khar' is a significant asset to the individual village family. Village roofing craftsmen estimated that to roof a typical 30 m² house with flat tiles would cost about NR 2,500, whereas coptas (U-shaped ceramic tiles) would cost about NR 3,700 in material and labour, and corrugated sheet metal would cost about NR 7,100. In contrast, thatching a house would cost about NR 2,000 to purchase 'khar', if it were not available free of charge, and NR 200 for labour. Tile and metal roofs are certainly sturdier than thatch, which needs to be replaced every 5 years or less; but, tiles of good quality are not readily available and involve additional transport costs, while the capital outlay is very large for cash-poor subsistence farmers.

The present amount of premium Siru (*Imperata cylindrica*) 'khar' available in the Park is inadequate to meet the demands of the people. It takes five people fifteen days to collect 300–400 mutas of 'khar' and miscellaneous materials to thatch a 30 m² house. Villagers say that their family is lucky to collect maybe 40 mutas a year, due to stiff competition for the dwindling supplies; so they commonly sneak into the Park before the official cutting-season, to cut 'khar' ahead of the crowd.

Good stands of Siru are found mainly on old agricultural lands. Since villages were removed from the Park 22 years ago, plant succession has led to the dominance of these grasslands by tall-grass types, which are less desirable than others or not suitable for thatch. Cutting and ploughing these lands during the dry season would be likely to lead to the re-establishment of Siru. It is unlikely, however, that management could ever meet the entire demand for Siru without jeopardizing wildlife conservation goals.

Converting large areas of tall grass to Siru would seriously reduce the cover and landscape diversity that are necessary to support viable wildlife populations. Large-scale management for Siru, at the expense of wildlife, is not

considered seriously as an option for grassland management in the Park.

'Kharai' supplies would be little affected by sensible management for Siru, because the villagers harvest only perhaps 5–10% of the available supplies. Demand is low because the sturdy canes are less often replaced than is 'khar', and less of that material is needed for construction. Seventy-two per cent of the respondents said that they would buy 'kharai' if they could not cut it themselves, implying that bricks and wood are not feasible alternatives in their view. The cost of building a 30 m² brick building is about NR 13,500; a similar building from Sal (*Shorea robusta*) wood would cost about NR 6,000. Stones are not plentiful in Chitwan or of the correct shape for construction. The cost of purchasing 'kharai' and labour to build such a house would be only about NR 500.

We have shown that Park grass resources are a valuable resource to the individual villager as well as to the local economy. Most villagers do not have the capital to invest in alternative building supplies, but do have time to cut their own grasses. We must conclude that their standard of living would be poorer without the resources provided by the Park.

CONCLUSIONS FOR PARK MANAGEMENT

This survey shows that Royal Chitwan National Park is a valuable asset to individual villagers living near the Park, and to the local economy. Limited management for local development does not appear to be seriously jeopardizing conservation goals. Villagers are beginning to realize the Park's value as a source of grassland and forest products that are not available elsewhere—so that sentiment among village leaders at the annual 'pancha bella' meeting with Park staff is positive. Legal collection of 'khar', and illegal collection of firewood were valued more highly by villagers responding to the questionnaire than were animal conservation and employment. It is remarkable that animal conservation was still considered quite highly by villagers who are typically regarded as having only subsistence concerns. However, some managers feel that this attitude may be a result of Park publicity; or may it perhaps be a concession to the ranger asking the questions?

Opening the Park to grazing and other activities would benefit people close to the Park for a short time, but at the expense of the community at large and of wildlife conservation—the main reason for establishing the Park. Improvement of pastures and woodlots around the Park should be considered to compensate locals for lost grazing and firewood collecting areas in the Park. Compatible uses of Park resources, however, should be encouraged and managed.

Grassland management programmes are now being considered to increase the amount of premium *Imperata cylindrica* 'khar' to help meet the demand for thatch grass. Management would emphasize the creation of a mosaic of tall-grass patches and short *I. cylindrica* grass patches, rather than converting large areas of tall grass into an *Imperata cylindrica* monoculture. Wildlife use of extensive tall-grass stands for foraging is low, but they have a high cover value. Short-grass stands are worthless for cover for large animals, but provide more palatable forage than tall grasses for a longer period during the year. The increased

'edge effect' provided by a more diverse landscape mosaic would be likely to increase the diversity of other wildlife at a site.

The recently-opened Bhrikuti Paper Mill at nearby Gaidakot is introducing a new dimension to the Park's grass-people interaction. The planned output of the mill is 10 metric tonnes of writing and printing paper per day. The initial 1986 projection of fibre requirements called for 4,394 tonnes of Sabai grass (Babiyo) and 4,986 tonnes of wheat straw. An inspection of their stockpile in 1987, however, showed that about 80% of their material was Kans (*Saccharum spontaneum*), 10% Sabai grass, and 10% wheat straw. Most of the Kans was bought from villagers who cut the grass in the Park during the permitted season. The mill paid NR 20 per hundred kg at the edge of the Park, which is the source of probably 90% of the Kans in the district.

The mill bought Kans for the first time in 1987, but few villagers knew about the opportunity. A villager can cut and carry out of the Park about 400 kg of grass per day, yielding a daily income of NR 80 per day: daily labour wages are only NR 20 per day, so this is a great opportunity to earn needed cash. The prediction is that succeeding years will experience a large increase in villagers cutting Kans for sale, after they have cut 'khar' and 'kharai' for their own needs, with concomitant increase in management problems for the Park authorities.

The local fuel-wood problem is serious and the illegal collection of firewood during the grass-cutting season is a hindrance to the proper management of the programme. Park authorities estimate that the amount of firewood taken from the Park during grass-cutting probably equals or exceeds the amount and value of all the grass materials that are removed. Many people come for the sole purpose of collecting a good supply of firewood. The value of this firewood is a substantial unauthorized contribution to the local economy.

The general firewood problem can be solved through a combination of short-term and long-term programmes. Cooperative programmes to collect and make depots of deadwood from the Park and adjacent forests would be a short-term solution. However, a collection programme should be carefully managed to consider and minimize possible impacts on wildlife. Long-term demands could be satisfied by establishing community fuel-wood plantations around the Park, in conjunction with the Forest Department's community forestry programme.

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SUMMARY

National parks in 'developing countries' have tended to deviate from the western model of strict protection in order to include economic development of local people in their park management philosophy. Royal Chitwan National Park, Nepal, has been managed in such a way as to allow for limited collection of grassland products to meet vital needs of villagers for structural material.

Nearly 60,000 people are annually allowed to cut thatch and reed grasses for a nominal fee during two weeks in January: such visitation amounts each year to over 216,000 visitor-days. The total weight and value of grass products removed from the Park each year is estimated at 11,132 metric tonnes, worth NR 9.9 millions (about US \$450,000). Subtraction of labour and permit costs yielded a net value of about NR 5.5 millions (about US \$250,000) to the local economy. Individual villagers save about NR 2,000 (US \$90) in costs for thatching material, and about NR 500 (US \$25) for building canes, compared with what they would have to pay for other materials to build a house. Alternative products available in the market were considered to be unaffordable substitutes by more than 75% of the villagers questioned.

Villager attitudes toward the Park are becoming more positive as they begin to realize that the Park is a valuable, needed source of managed resources that are not so easily, or not at all, available elsewhere.

REFERENCES

- CHILD, G. (1984). Managing wildlife for people in Zimbabwe. Pp. 119-21 in MCNEELY, J.A. & MILLER, K.R. (q.v.).
- DASMANN, R.F. (1982). The relationship between protected areas and indigenous peoples. Pp. 667-71 in MCNEELY, J.A. & MILLER, K.R. (q.v.).
- EIDSVIK, H.K. (1980). National parks and other protected areas: some reflections on the past and prescriptions for the future. *Environmental Conservation*, 7(3), pp. 185-90.
- HALFFTER, G. (1981). The Mapiimi Biosphere Reserve: local participation in conservation and development. *Parks*, 5, pp. 93-6.
- JEFFRIES, B. (1982). Sagarmatha National Park: the impact of tourism in the Himalayas. *Ambio*, 11, pp. 274-81.
- MCNEELY, J.A. (1984). Introduction: protected areas are adapting to new realities. Pp. 1-7 in MCNEELY, J.A. & MILLER, K.R. (q.v.).
- MCNEELY, J.A. & MILLER, K.R. (Eds) (1984). *National Parks, Conservation and Development*. Smithsonian Institution Press, Washington, DC, USA: xiii + 825 pp., illustr.
- MILLER, K.R. (1984). The Bali Action Plan: a framework for the future of protected areas. Pp. 756-64 in MCNEELY, J.A. & MILLER, K.R. (q.v.).
- MISHRA, H.R. (1982). Balancing human needs and conservation in Nepal's Royal Chitwan Park. *Ambio*, 11, pp. 246-51.
- MISHRA, H.R. (1984). A delicate balance: tigers, rhinoceros, tourists, and Park management vs the needs of local people in Royal Chitwan National Park, Nepal. Pp. 197-203 in MCNEELY, J.A. & MILLER, K.R. (q.v.).
- PANWAR, H.S. (1982). What to do when you've succeeded: Project Tiger ten years later. *Ambio*, 11, pp. 330-7.
- SAHARIA, V.B. (1984). Human dimensions in wildlife management: the Indian experience. Pp. 190-7 in MCNEELY, J.A. & MILLER, K.R. (q.v.).
- TASSI, F. (1984). Abruzzo's bears: reconciling the interests of wildlife and people in Abruzzo National Park, Italy. Pp. 446-9 in MCNEELY, J.A. & MILLER, K.R. (q.v.).
- WESTERN, D. (1982). Amboseli National Park: enlisting landowners to conserve migratory wildlife. *Ambio*, 11, pp. 302-8.