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TRADITIONAL USES OF PLANTS OF COMMONLAND HABITATS IN WESTERN CHITWAN, NEPAL

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Abstract

This paper is based on the flora data gathered from 138 common land plots as part of a multi-method longitudinal study of the reciprocal relations between population and environment in western Chitwan, Nepal. The paper also describes the uses and availability of different species drawing upon both field data and knowledge of indigenous and local residents in the study area. Land use in western Chitwan is changing rapidly and common land areas have been under much stress due to population increase, whereas the common land areas are valuable to local residents. Both indigenous and new migrant residents in this area use the available plant resources for different purposes which bring economic benefit to the households. Plant species provide valuable food, vegetable and medicinal products that maintain human health and general wellbeing of the household. These plants are also economically valuable to farmers with high quality forage value as well as useful for crop management (e.g., pesticide, compost, green manure). Moreover, some plant species are used as fish poison to harvest fish from rivers and streams. Likewise, the common land areas provide materials for use in house construction (e.g., thatch) and making tools with the potential and viable sites as communal grazing land. It is evident that access and utilization of common land resources are important for many households, especially those in remote and poor agricultural areas such as western Chitwan.

Keywords

Ethnobotany; medicinal plants; plant resources; traditional knowledge; wild edible plants

INTRODUCTION

A significant portion of Nepalese people depends on agriculture and animal husbandry for survival. They rely mostly on the plant and animal resources of forests, wetlands, cultivated lands, and common lands. These resources are harvested and used in many ways, for example, as food plants, fodder plants, wild vegetables, spices/ condiments, and fruits and also for constructing huts and houses, buildings, animal sheds, as wild genetic resources for improving crop plants, etc. People obtain important medicines of both plant and animal origin that maintain their own health and/or the health of their animals. This knowledge of utilization of biological resources is still survived in the minds of economically poor people who are living in remote rural areas, near by forest or wetlands, etc. Now days, documentation of traditional botanical knowledge is receiving much attention.

The history on the utilization of the plant resources in Nepal dates back to the work of Banerji (1955). In this study, he documented the various food and medicinal plants of eastern Nepal. After his work, some workers continued the ethnobotanical study in the 60's and 70's (Dobremez, 1976; Pandey, 1964; Singh, 1968). The reports on uses of plants by different Nepalese ethnic groups have been recorded only onwards 80's (Coburn, 1984; Bhattarai, 1989, 1990, 1991, 1992, 1993; Joshi and Edington, 1990; Manandhar 1989ab,

1990, 1992, 1993ab, 1995, 1996ab, 1997; Mueller-Boeker, 1993; Pohle, 1990; Shrestha, 1985; Shrestha and Pradhan, 1986). These reports documented information of uses of plant resources. The investigators reported the uses of plant resources from six districts of the west, eighteen districts of the central Nepal, and two districts of the east. Among the useful plants reported by the Nepalese people, 800 species were recorded as medicinal plants, 440 species as wild food plants, 100 species as fodder and for animal bedding, 71 species as fiber bearing plants, and 30 species as spices (Manandhar, 1997). Manandhar (1997) concluded that, if systematic surveys are undertaken regularly in different regions and among different tribes, many more useful plants from Nepal will be documented. Shrestha (1997) compiled more than 300 publications on ethnobotanical researches related to Nepal. Some studies on economic uses of plant resources in the Chitwan district have already been reported (Dangol and Gurung, 1991; Dangol and Gurung, 1995; Manandhar, 1990; Mueller-Boeker, 1993; Shakya et al., 1995; Pant et al., 1995). This paper discusses the economic uses of plant resources of the common lands in western Chitwan.

STUDY SITE, DATA AND METHODS

Study site

A total of 138 plots in the common lands of 38 different locations in western Chitwan were selected. These plots represent plantation areas, flood affected areas, common grazing areas, Barandavar (Tikauli) grazing and grass cutting areas, school ground and airport areas, Pokhari and Ghole (ponds and wetland) areas, road ways and canal ways. The areas have different floristic compositions.

Plot size and study procedure

The plant communities were studied using two types of quadrats: $10 \times 10 \text{ m}^2$ and $1 \times 25 \text{ m}^2$. The former quadrat was used for all the common land types except roadways and canal ways. The latter sampling unit was used for canal ways and roadways where the former type of quadrat was not possible to use because the roads and canal ways were less than $10 \times 10 \text{ m}$. Each quadrat of $10 \times 10 \text{ m}^2$ was marked starting from the reference point i.e. south-west corner and moving 10 meter each in clock wise direction due north then east, south and west. Later three sampling units of 1 m^2 were positioned diagonally in each $10 \times 10 \text{ m}^2$ quadrat to count the plants within in the common lands. In canal ways and road ways, the south-west corner was marked and measured 1 m due NW, 25 m NE and 1 m ES and then 25 m to the SW corner. The three $1 \times 1 \text{ m}^2$ were determined making quadrats in 2–3 m, 12–13 m and 23–24 m.

Data and Methods

Field study was conducted in two months (March and April) in 1996 and 2000. The plant species encountered inside the quadrats were noted in the Flora Forms. Information on the economic uses of plant species in the common land of western Chitwan with the assistance of elders and healers of the Darai, Tharus, and other people who migrated from the hills. Published literatures on ethnobotany and indigenous knowledge were also consulted to incorporate the use value of plants.

RESULTS AND DISCUSSION

Plants used as food, vegetable, spices and marcha

The grains of *Echinochloa colona*, *Echinochloa crus-galli*, *Paspalum scrobiculatum* and *Setaria pallide-fusca* are edible. The seeds of *E. colona* and *E. crus-galli* were also reported as a major food of southwestern Indians (Doebly, 1984). The Darai people use the seeds of

wild mung (*Phaseolus mungo*) as Dal (a kind of soup). This plant is rarely found in the common lands.

The fruits of the following wild plants are edible: *Callicarpa macrophylla*, *Lantana camara*, *Physalis divaricata*, *Solanum nigrum*, *Vicia angustifolia*, and *Solena heterophylla*. Among them, *C. macrophylla* is very rare in the common lands, but *L. camara* is becoming very invasive mostly on roadsides and forests, especially in Nagarban of the Chitwan district. *P. divaricata* is found mostly during the summer season on the roadsides, canal ways and crop fields (example sesame cultivation) (Dangol and Gurung, 1988).

During times of scarcity, Chitwan people use their knowledge of wild plants to obtain vegetables for sustenance. They collect tender plants and their parts from the common lands. Some of the wild vegetables are as follows: *Alternanthera sessilis*, *Bombax ceiba*, *Ceratopteris thalictroides*, *Chenopodium album*, *Cirsium arvense*, *Colocasia esculenta*, *Commelina benghalensis*, *Eclipta prostrata*, *Emilia sonchifolia*, *Ipomoea aquatica*, *Launaea aspleniifolia*, *Lygodium flexuosum*, *Monochoria hastata*, *Monochoria vaginalis*, *Oenanthe javanica*, *Ophioglossum reticulatum*, *Pistia stratioides*, *Polygonum plebeium*, *Pouzolzia zeylanica*, *Sagittaria quayanensis*, *Solanum nigrum*, *Sphenoclea zeylanica*, *Tectoria macrodonta*, *Thelypteris auriculata*, *Typha angustifolia*, *Vicia angustifolia* and *Xeromphis spinosa*. Among them, species of *Ipomoea*, *Pistia*, *Monochoria*, *Oenanthe*, *Eclipta*, *Ceratopteris* and *Alternanthera* are harvested from the wetland ghoses. *Chenopodium* (Bethe) and edible fern (Neuro) are also sold in the urban as well as rural markets.

The tender leafy parts of *Oenanthe javanica* and the flower heads of *Spilanthes uliginosa*, *S. ciliata*, and *S. calva* are used as spice/condiments. *S. ciliata* and *S. calva* can be harvested from the in large quantities field bunds and roadways of western Chitwan (example Sharadanagar).

Tharu and Darai ethnic people know a number of plants useful for making "marcha" a substrate used to prepare beverages such as "raksi" (local whisky) and "moat" (beers). The plants, alone or along with other ingredients, are first dried, then powdered and mixed with wheat flour to make cake. The Darai people find that the "moat" prepared by packing in the leaves of *Clerodendrum viscosum* makes the local beer "moat" very tasty. The plants of fermenting value, along with distribution in the study area, are listed in Box 1.

Plants as medicines

The common land plant resources are used medicinally on both humans and livestock to treat a wide array of health problems (Box 2). For humans, ailments (such as open wounds, stomach disorder, indigestion, ulcers, sprains, bone fractures, abortion, measles, headache and bodyache, fevers, coughs and colds) are treated with these healing plants. Some common land plants are also used as veterinary medicine. To treat different diseases, the plants as a whole or its parts in the form of juice, decoction, ash, or infusion are prescribed externally or internally. Some important medicinal plants found in the common lands include *Calotropis gigantea*, *Achyranthes aspera*, *Centella asiatica*, *Hydrocotyle sibthorpioides* and *Cissampelos pareira*. The Chitwan people use *A. aspera* medicinally in very small scale, but harvest in mass scale especially for religious purpose in "Rishi Tarpani". This plant has not been reported to be found in the grazing grounds, school grounds, or airports, but they are found on the roadsides.

Plants used as fodder

The common lands are most frequently used for grazing animals, cutting grasses for stall feeding, and other purposes. The plants that have fodder value are comprise of 6 species of legumes, 24 species of grasses, 3 species of Commelinaceae, 7 species of Cyperaceae, other

6 dicot species and one species of fern (Table 1). Among the legumes, most frequently occurring species in one or more common lands are *Vicia* spp. (*V. angustifolia*, *V. hirsuta*, *V. tetrasperma*), *Desmodium triflorum*, and *Medicago lupulina*. *Vicia* spp. and *Medicago lupulina* are also reported by Dangol (1998–99) as common weeds from the winter cultivated fields of wheat, rape mustard, and pulse. Farmers of the western Chitwan supply the fodder requirement of their livestock from the common lands and the cultivated fields. The most common grasses of the common lands were *Saccharum spontaneum*, *Imperata cylindrica*, *Chrysopogon aciculatus*, *Paspalum distichum*, *Setaria pallide-fusca*, and *Leersia hexandra*. *Saccharum spontaneum* is the main species of the flood plain common lands, whereas *Imperata cylindrica*, *Paspalum distichum*, *P. scrobiculatum* and *Setaria pallide-fusca* were the dominant species of common lands like airports, school grounds and common lands of the forest areas. *L. hexandra* is the main species of the Ghole (Marsh lands) area. Some ghole areas are co-dominated by *Aeschynomene indica*, a legume species. This species was also reported as a frequent weed of rice in Chitwan (Dangol, 1998–99). This weed as well as other grasses and sedges are collected by the farmers to feed the domesticated animals.

Animals graze on the following: *Saccharum spontaneum*, *Imperata cylindrica*, *Setaria pallide-fusca*, *Euphorbia hirta*, *Polygala linifolia*, *Vicia angustifolia*, *Vicia hirsuta*, *Vicia tetrasperma*, *Tridax procumbens*, *Cassia tora* and many more species found in different common lands with low to high density and coverage. Goats eat even the dry pods of *Cassia tora*. Animals are selective in grazing and do not eat certain plants such as *Ageratum houstonianum*, even though although they are found abundantly in roadways, canal ways, and fallow lands.

Plants used in crop management

Farmers use the leaves of *Justicia adhatoda* as green manure for the kitchen gardens and fields. The leaves of some plants such as *Eupatorium odoratum*, *Lantana camara* and *Melia azedarach* (kernels) are used as botanical insecticide to protect the crops. The dried stems of some plants (for example *Clerodendrum viscosum* and *Ipomoea fistulosa*) are used to make fence to protect especially kitchen gardens from the domestic fowls.

Plants used as piscicide

The common land plant resources include 3 piscicidal plants such as *Anagallis arvensis*, *Polygonum barbatum* and *Solanum aculeatissimum*. To catch fish in streams or the rivers, the whole plant (*A. arvensis* and *P. barbatum*) or the fruit (*S. aculeatissimum*) is crushed and spread in the water. Manandhar (1989) reported 50 species of fish poisoning plants used by rural communities in various parts of Nepal. In a study of the effectiveness of the 3 piscicidal plants, *P. hydropiper* was found most effective in poisoning the fish (Karki et al., 1982).

Plants used as construction materials and for making household implements

The common land plants like *Typha angustifolia* and *Cyperus* spp. are used to prepare mats. Both these species are found in wetlands. Brooms are also made from the *Sida* spp. (such as *S. acuta*, *S. rhombifolia*), undershrubs growing on the roadsides or canal ways. *Saccharum spontaneum* (Kans), *Imperata cylindrica* (Siru), and *Chrysopogon aciculatus* are used for thatching and also for making brooms and baskets. Kans and Siru are also used to make ropes for fastening the fodder and forages. These plants grow abundantly in the common lands such as the flood plains or grazing ground. In cultivated fields of pineapple in Chitwan, they are reported to be most problematic weeds (Dangol and Baral, 1986).

Dye

Eclipta prostrata yields black dye used to blacken the hair. The leaves and young shoot of *Pogostemon benghalensis* yield blackish blue. The Darai community uses the dye to decorate the house walls.

CONCLUSION

The common lands of western Chitwan are the habitats for growing variety plants. These plant resources are useful to neighborhood for a variety of purposes, and the also bring economic benefits to the households. First, plant species provide valuable food, vegetable and medicinal products that maintain human health and the general wellbeing of the households. Secondly, these same plants are economically valuable to farmers because they provide a high-grade fodder, as well as plant useful in crop management (e.g. pesticide, compost, and green manure). Thirdly, some plant species are used as fish poison to harvest fish from rivers and streams. Fourth, the common land areas provide materials for use in household construction (e.g. thatch) and tool making. Finally, the common land areas are themselves important for grazing. It is evident that access and utilization of common land resources are important for many households, especially those in remote and poor agricultural areas such as the Western Chitwan. Domesticated animals are selective in grazing and this selectivity causes stress in most palatable species. This problem of selectivity allows some species to over propagate: for example *Lantana camara*, *Parthenium hysterophorus*, *Eupatorium adenophorum* and *Eupatorium odoratum*. Recently, *Parthenium hysterophorus* and *Mikania micrantha* are invading the common land areas of Chitwan, especially the roadsides of Narayangadh city. This species doesn't allow other species to grow with it, reducing other grasses important for animal grazing. Thus, this species is responsible reducing grazing lands in Chitwan. Such invasive species should be controlled for the benefit of the local people. The use of the common lands for development and in construction of schools, clubs, health posts or other social institutions, which results in the loss of habitat for economically important common land plants.

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Box 1. The plants having fermenting substrate value

Acrocephalus indicus- Found frequently in road ways, canal ways, school ground, and playing grounds.

Crotalaria prostrata- Found in common lands of Laukhuri, also abundant in the Tikauli, National Park and grasslands.

Clerodendrum viscosum- Very abundant in the common lands, especially in shady places. One of the main plants in the forest, sometimes attended up to 4 m in the forests. Flowers attractive, white and pinkish at the center, visited by wild bees.

Elephantopus scaber- Mostly found in the sal forest grounds.

Barleria cristata. Very rare in common lands, but common in the forest ground of the Tikauli forest. Plants have attractive blue flowers.

Vernonia cinerea- Commonly found on the roadways, canal ways, school ground, grazing lands, and grasslands and forest grounds of the National Park.

Box 2. Medicinal plant resources of common lands in western Chitwan

- Achyranthes aspera*- Plants as facilitator in delivery case.
- Aeschynomene indica*- Spermicidal in rats and human (Asolkar et al., 1992).
- Ageratum conyzoides*- Leaf juice in cuts and wounds as an antiseptic.
- Ageratum houstonianum*- Leaf juice in cuts and wounds as an antiseptic.
- Artemisia dubia*- Root juice in stomach disorder.
- Barleria cristata*- Root decoction given in anemia (Asolkar et al., 1992)
- Bidens pilosa*- Leaf juice in cuts and wounds.
- Bombax ceiba*- The spines pounded and put over measles.
- Calotropis gigantea*- Latex in bone fractures and sprains.
- Cassia occidentalis*- Pounded seeds applied in headache.
- Cassia tora*- Roasted seeds in coughs.
- Centella asiatica*- Leaf juice in fevers.
- Cissampelos pareira*- Root powders useful in ulcers. Paraguayan indigenous people use the root decoction for abortion (Arenas and Azorero, 1977).
- Clerodendrum viscosum*- Leaf juice as a wormicide.
- Colebrookea oppositaefolia*- Leaf juices taken in indigestion.
- Eclipta prostrata*- Plant juice in wounds in between toes.
- Equisetum debile*- Plant juice in bone fractures and sprains.
- Eupatorium odoratum*- Leaf juice as an antiseptic in cuts and wounds.
- Euphorbia hirta*- Young tips of the plants taken to cool stomach burning after ingesting too much chili or spice.
- Hydrocotyle sibthorpioides*- Plant juice used as a diuretic and febrifuge.
- Hygrophila spinosa*- Seeds tonic and aphrodisiac (Asolkar et al., 1992).
- Lippia nodiflora*- Squeezed plant inhaled in case of cough and cold.
- Ludwigia perennis*- The plant is boiled in oil and applied externally to reduce fever (Datta and Banerjee, 1979).
- Lygodium flexuosum*- Plant ash for treating herpes, plant fed to domestic animals to treat foot and mouth diseases.
- Pogostemon benghalensis*- Root juice in fevers.
- Rungia parviflora*- Plant juice in cuts and wounds.
- Scoparia dulcis*- Plant juice for cooling effect.
- Stephania elegans*- Root juice as a wormicide in calves.
- Vernonea cinerea*- Seeds effective against roundworms and thread worms (Tewary et al., 1991), root decoction in diarrhea and stomachache (Singh et al., 1965).

Table 1

Fodder and forage resources of common lands in western Chitwan.

Categories	Species	Total
Legumes	<i>Aeschynomene indica</i> , <i>Desmodium triflorum</i> , <i>Medicago lupulina</i> , <i>Uraria lagopoides</i> , <i>Vicia angustifolia</i> , <i>Vicia hirsute</i> , <i>Vicia tetrasperma</i>	7
Grasses	<i>Brachiaria distachya</i> , <i>Brachiaria ramosa</i> , <i>Chrysopogon aciculatus</i> , <i>Dactyloctenium aegypticum</i> , <i>Digitaria ciliaris</i> , <i>Digitaria longiflora</i> , <i>Digitaria sanguinalis</i> , <i>Echinochloa colona</i> , <i>Eleusine indica</i> , <i>Eragrostis tenella</i> , <i>Eragrostis unioloides</i> , <i>Hemarthria compressa</i> , <i>Imperata cylindrica</i> , <i>Isachne globosa</i> , <i>Ischaemum rugosum</i> , <i>Leersia hexandra</i> , <i>Oplismenus burmannii</i> , <i>Panicum repens</i> , <i>Paspalidium flavidum</i> , <i>Paspalum distichum</i> , <i>Papalum scrobiculatum</i> , <i>Saccharum spontaneum</i> , <i>Sacciolepis indica</i> , <i>Setaria pallide-fusca</i>	24
Monocots	<i>Commelina benghalensis</i> , <i>Commelina diffusa</i> , <i>Commelina paludosa</i> , <i>Cyperus compressus</i> , <i>Cyperus cyperoides</i> , <i>Cyperus globosus</i> , <i>Floscopa scadens</i> , <i>Cyperus sanguinolentus</i> , <i>Fimbristylis dichotoma</i> , <i>Fimbristylis miliacea</i> , <i>Scleria biflora</i>	11
Dicots	<i>Euphorbia hirta</i> , <i>Hedyotis lineate</i> , <i>Melochia corchorifolia</i> , <i>Polygala linifolia</i> , <i>Sida acuta</i> , <i>Tridax procumbens</i>	6
Ferns	<i>Lygodium flexuosum</i>	1