

one of the experimental fodders, to be unpalatable. Those Bali cattle that had been born and raised in the immediate test area, however, didn't have any problem with it.

As compensation for lower-than-expected weight gains, farmers were able to stock more cattle under TSF. Additionally, more feed was being stored for use in the dry season—a period when animals grazed the traditional way normally lose weight.

Farmers preferred TSF's stall feeding method over the practice of tethering because it saved time and made it easier to collect manure. They noted, though, that the TSF cattle, having been deprived of the handling associated with tethering, were wilder. And, because the open stalls exposed the animals to the natural elements, the TSF cattle were also more prone to disease.

The TSF system has been modified to overcome these difficulties. Cattle are now housed in roofed sheds and, to make them more manageable, they are walked to water once a day.

The impact of the new techniques is just beginning to be felt, in the view of the six-member evaluation team. Not only have farmers from 60 percent of farm associations in the region visited the test site, but many of the plant species used in the proj-

ect have been disseminated through a nearby nursery.

Farmers in and near the project area have begun to substitute the shrub *Gliricidia* for cactus, the traditional living fence species. Tracts of sloping land that have been steadily eroded by wind and water have been targeted by farmers as ideal sites for pure stands of the trees and shrubs promoted in the project.

Among other things, the evaluators recommend that the researchers make the TSF system as flexible as possible by giving farmers a wider choice of fodder species to plant. Perhaps their most important observation, though, is the need for the research team to strengthen its understanding of the socioeconomic aspects of both TSF and existing farming systems in Bali. By doing so, they will improve the chances of TSF being tried out by other Indonesian farmers. As evaluator Brian Carson, a Canadian soil scientist, observed: "The in-depth documentation and study of physical and socioeconomic characteristics of the farming systems of the project area could provide a springboard for the expansion of the technology to similar agroecosystems throughout Indonesia." ■

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AN IDEAL PLOT

Under the Three Strata Forage system, farmers make changes to only about one third of their land in order to increase forage production.

An ideal TSF plot would be 50 by 50 metres, or a quarter hectare. The core area of 40 by 40 metres is planted to traditional cash or food crops such as peanuts, cassava, corn, soybeans, and

sorghum. The surrounding 5-metre-wide strip is reserved for three kinds of cattle forage: grasses and legumes; shrubs; and trees.

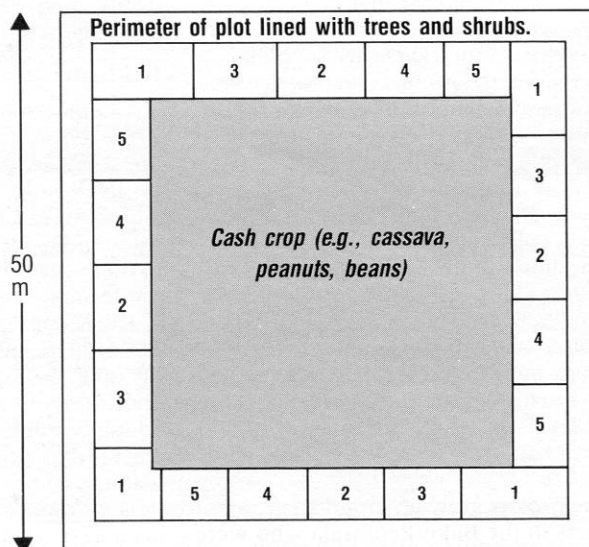
The TSF system is not meant to be rigid. Rather, farmers can adapt the shape of the plot and the combination of forage species to their own circumstances.

Trees:
Ficus
Lannea
Hibiscus

Shrubs:
Gliricidia
Leucaena

Grasses:
Cenchrus (1)
Panicum (2)

Legumes:
Cv. Graham (3)
Centrosema (4)
Cv. Verano (5)



Photos: C. Devendra / IDRC



A young Pakistani grazes his flock of sheep and goats on the stubble of a harvested grain crop.

FRIENDS OF THE FAMILY

THE IMPORTANCE OF GOATS AND SHEEP

Mexican girls with homemade goat's cheese.



ghurt, butter, ghee (semifluid clarified butter), and sweets. Secondly, these animals forage on a wide variety of plants, including crop residues such as cassava leaves and cereal straws. Thirdly, when they are penned in farmers' fields, they give fertilizer for food crops in the form of dung and urine. Lastly, they provide skins, hair, and wool from which to make clothing and handicrafts.

These qualities make goats and sheep valuable and versatile commodities. They can be bought and sold for security and income, and rearing and tending them create employment.

Women and children are usually involved in the management of goats and sheep. This role, often underestimated, is of great benefit to the economic stability of households and small farm systems. Evidence of this can be seen in Africa, the Near East, the Indian subcontinent, Southeast Asia, and the altiplano regions of Latin America.

The management role of women and children is associated with two main benefits: family income and human nutrition. Income from rearing goats and sheep enables women to cover a number of household expenses such as school uniforms, shoes, medicine for sick children, and ceremonial occasions. Goat meat and

milk products help to promote nutrition and health. This supply of animal protein is particularly important to pregnant and nursing mothers and the young.

Goats and sheep provide employment for landless farm labourers who are paid to take the animals out to graze daily. Children too are often given the job of shepherding outside school hours. This provides them with companionship and engenders in them a sense of responsibility and even affection.

Ownership of animals provides security to women in the event of divorce or seasonal migration of the husband. In many countries, it also brings respect in the community. The more animals, the greater the prestige—and the easier it is to meet social obligations such as providing gifts or food for ceremonies and feasts.

With better use of family labour, it may be possible to intensify production of goats and sheep. The social and economic benefits of raising and owning these species need to be more widely studied by researchers concerned with rural development and with improving the lot of poor people in the Third World. ■

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Goats and sheep are found on millions of small farms throughout the developing world—and often in the cities too. In the lingo of the animal scientist, they are “small ruminants”.

A ruminant is a mammal that chews its cud and has a stomach with four separate compartments for digesting food. In addition to goats and sheep, ruminants include larger animals—buffaloes, cattle, camels, llamas, alpacas, and yaks.

Nearly all of the world's goats (94 percent) and over half of its sheep (52 percent) are found in the developing countries. They contribute in numerous ways to the well-being of people, especially small farmers and landless agricultural labourers.

First of all, goats and sheep are an important source of milk and meat. Goat's milk can be processed into cheese, yo-



Nepali children carrying forage to feed their goats.