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# LIVING FENCES FOR IMPROVED LIVESTOCK FEED IN CAMBODIAN SMALLHOLDER SYSTEMS

This project examines the production of tree species as living fences for added nutrition and crop protection for Cambodian smallholder livestock systems. The activity is a one year sub-award under the Feed the Future Innovation Lab for Livestock Systems, led by University of Tennessee Institute of Agriculture and Royal University of Agriculture, Cambodia.


Cambodian Farmer tethers his livestock in a field (D.Ader/UTIA)

Smallholder farmers in Cambodia often engage in a variety of agricultural activities. Many farmers have rice, vegetables and livestock. This "systems approach" provides tradeoffs and synergies to farming in Cambodia. The majority of smallholder households face multiple challenges to improving their systems and generating sustainable livelihoods. These challenges affect their ability to ensure food security for their households.

## Lowland Rice Systems

In the provinces in northwest Cambodia around the Tonle Sap, rice-based smallholder agriculture is the primary farming system. This system incorporates rainfed lowland rice, animal production (cattle, buffalo, pigs, chickens, ducks, frogs and fish), and other activities such as vegetable production, palm sugar production and wild food collection and trade. The majority (50-70%) of these smallholder households own livestock. Cattle and buffalo are the main types of livestock owned by these households. These livestock are particularly important to smallholder livelihoods as a source of wealth accumulation in the absence of extensive participation in the banking sector. Cattle and buffalo are typically restricted to forage of rice straw, supplemented by small quantities of fodder of native grasses collected at roadsides or in paddies.


Typical rice-based farm with livestock (D.Ader/UTIA)

## Seasonality of fodder production and feed gaps

As the majority of smallholders do not have access to irrigation, but rely on rain fed cropping, there is considerable seasonal variability in the availability and quality of forages and fodder for livestock. Consequently, there is little consistency in high-quality livestock feed supply throughout the year, which is a

major constraint to livestock performance, resulting in low productivity. Smallholder households face regular hunger seasons or, "feed gaps", for both animal and human nutrition. For animal production, these feed gaps are primarily associated with the seasonality of production of adequate nutritional options to supplement rice straw. The first feed gap is at the end of the dry season when the temperatures are high and there is limited soil moisture. A second feed gap is encountered when soil moisture is at its peak towards the latter period of the rainy season. During this feed gap, the excessive humidity also provides greater opportunity for the spread of pests and diseases making fodder and forage production difficult.

## Trees as Living Fences and Fodder

One of the most important constraints to sustainably intensifying crop and livestock production in the dry season is livestock management. It is common practice for smallholders to allow cattle and buffalo to roam for forage during this time of the year and the vast majority of farmers have either no way or no knowledge of how to protect a post-rice crop. As such, if smallholders wished to cultivate a fodder crop or a high-value crop for human nutrition or market sale in a post-rice field, this crop would be at high-risk to grazing livestock unless adequate fencing or other forms of crop protection are provided

Livestock in rice paddy (D. Ader/UTIA)

Trees can provide high quality feed for livestock throughout the year, including the dry season, due to their ability to access subsurface water not available to tropical forage grasses. Various tree species are widely grown as living fences throughout Southeast Asia, yet their fodder value has been poorly recognized by smallholder farmers in Cambodia. The most important potential benefits of living fences for livestock systems in smallholder systems in Cambodia are twofold: 1) the provision of perennial livestock feed sources and 2) the protection of land from roaming livestock (especially in the dry season), or the opportunity to confine livestock in an enclosed space to control diet provision or protection of other field space.

## Objectives

This one-year activity is researching: 1) the effectiveness of three tree species (*Gliricidia sepium*, *Moringa oleifera*, and *Leuceana leucocephala*) as supplements to rice straw for improving livestock nutrition, 2) the effectiveness of these species as living fences for control of livestock movement, and 3) the impact of these fences in the Cambodian dry season as both provision of supplementary forage for livestock and also nutritional diversification for smallholder households.

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