

LOCAL KNOWLEDGE ABOUT TREE COVER IN CATTLE PRODUCTION SYSTEMS IN TWO PLACES IN COSTA RICA

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Summary

Esta investigación buscó recopilar el conocimiento local sobre cobertura arbórea en fincas ganaderas de Cañas y Río Frío (Costa Rica). No se detectaron diferencias entre las dos zonas, ni entre tipos de finqueros (fincas mixtas y ganaderas). La percepción de los finqueros sobre los árboles y sus interacciones con el suelo, agua, pasto y animales es similar en ambas zonas. Los finqueros conocen bien los tipos de árboles apropiados para diferentes propósitos (madera, cerca viva, leña, forraje y sombra). Tal conocimiento les permite clasificar los árboles de acuerdo con las características físicas y biológicas que ellos reconocen.

1. Introduction

In Costa Rica, more than 90% of cattle farms have dispersed trees in pastures to provide shade for animals and other benefits, like timber for sale (Souza *et al.* 2000). This means that cattle farmers have experience and knowledge on tree cover and its relationship with grass and animals. The amount and quality of local knowledge on tree cover can vary between the members of a community and communities or zones. For example, the farmers who have received qualifications or with a higher level of education, have a different vision from those who have never formally studied (Johnson 1992). This accumulated local knowledge, which varies from one region to another, can be useful in planning strategies for the appropriate handling of natural resources with agroforestry and silvopastoral systems (FAO 2000).

The objective of this study was to identify, systematize and compare the local knowledge about use and handling of tree components in cattle farms from two different places in Costa Rica. The purpose is to develop a knowledge base that can serve as a tool in decision making for future agroforestry and silvopastoral projects.

2. Material and Methods

The study was carried out in Cañas and Río Frío (Costa Rica). These two zones present differences both in climate and production systems. Cañas has a tropical dry climate, and Río Frío a humid climate (Table 1).

Table 1. Climate conditions in Cañas and Río Frío

	Cañas	Río Frío
Location	Guanacaste	Heredia
Annual average precipitation (mm)	1544	4120
Annual average temperature (°C)	27	25
Average relative humidity (%)	62 - 82	88
Altitude (masl)	20 - 80	100 - 150
Production system	Primarily meat production	Primarily milk production

2.1 Collection of information

The local knowledge was compiled through key informants who were chosen according to the production system in their farms. In Cañas, these were cattle farmers (beef cattle production) and mixed farmers (agricultural production and cattle raising for beef). In Río Frío farms were classified as dairy (milk production), mixed farms (same as in Cañas) and dual purpose farms (both meat and milk). From each group 3 to 8 key informants were selected (25 key informants in each zone). Selection of key informants considered their agreement to collaborate. Each key informant was interviewed on subjects related to tree cover; interactions between trees, cattle and grass; useful species for live fences, firewood or forage.

2.2 Representation of knowledge

Local knowledge from key informants can be represented using the AKT5 software (Dixon *et al.* 2001), created to serve as a tool in studies of local knowledge. This software structures data

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based on dissemination of information in unitary phrases, using a defined specific syntax in a special grammar program (Sinclair and Walker 1998). The resulting group of unitary phrases forms a knowledge base that can be evaluated through diagrams and hierarchies, and the use of special software tools (Kendon *et al.* 1995). With the results obtained from the key informants, a knowledge base model was created using 680 unitary phrases for Cañas and 619 for Río Frío.

2.3 Validation of the information

In order to validate the data obtained from the key informants in each zone, 50 semistructured surveys were applied to farmers selected at random from two farm type groups (cattle farms and mixed farms). These surveys covered 15 subjects included in the interviews because they were considered important in each zone. The results were tabulated and analyzed by means of standard statistical tests.

2.4 Comparison of local knowledge

Local knowledge was compared between groups of farmers and zones, and validated using the information from the key informants. This comparison was made through an analysis of knowledge about the level of complexity of tree cover and its interactions with soil, water, animals, and grass. The basis of comparison was the number of attributes for a known tree species and the farmers' forms of classification.

3. Results and Discussion

Both in Cañas and Río Frío, farmers have a broad knowledge on tree species, especially those useful for live fences, timber, firewood or fence posts. They recognize physical, biological and phenological attributes. This knowledge is a product of both their personal experience and acquired and inherited knowledge. For example, the Cañas farmers identified ten tree species used in live fences, two of which they have considerable knowledge: jiñote (*Bursera simaruba*) and pochote (*Pachira quinata*). In Río Frío, farmers identified seven tree species used for live fences; also, they have good knowledge on two particular ones: poró (*Erythrina costarricensis*) and madero negro (*Gliricidia sepium*). For the most familiar species, farmers in both zones know about physical characteristics (hardness and porosity of the wood). As a fact, they are capable of identifying high hardness species, like quebracho (*Lysiloma divaricatum*) in Cañas and manu negro (*Minquartia guianensis*) in Río Frío; and porous species like jiñote in Cañas and poró in Río Frío. In both places, farmers know about the durability in years of tree species used for dead fence posts; they also know the time required for cut stakes used in live fences to root. For example, in Cañas the rooting time for stakes of jiñote and pochote is two months; and in Río Frío, poró and madero negro root in 22 and 30 days, respectively.

With regard to the interactions between tree cover and components of the farm, the farmers in the two zones clearly identified the interactions between trees and cattle, and those between animals and grass. Both in Cañas and Río Frío, they understand that the main interactions between trees and cattle are shade, fruits and forage. In both places, they classified the shade type of trees into 'fresh' shades (those that produce a fresh atmosphere under the crown) and 'bad' shades (those that do not allow growth of vegetation and produce injurious effects on animals and people). In Cañas, 16 tree species were recognised as producing 'fresh' shade and 7 'bad' shade; in Río Frío, 28 species give 'fresh' shade and 16 'bad' shade. In addition, farmers identified fruit trees that cattle consume; for example, cenízaro (*Samanea saman*) and guanacaste (*Enterolobium cyclocarpum*) in Cañas, and guayaba (*Psidium guajaba*) and orange (*Citrus* spp.) in Río Frío. Farmers also know the reasons why cattle prefer certain fruits and forages (flavor of fruits and nutritional content of forage). They also know about the nutritional value of different species.

There were no great differences in knowledge between groups of farmers, demonstrating that knowledge is independent of the farm production system, and that in each zone there is an adequate exchange of knowledge among farmers. Both in Cañas and Río Frío, farmers have similar knowledge, perception and vision about tree cover and its integration with the other components of the farm. This indicates that the tree component is important in cattle farms, and for that reason farmers pay considerable attention to the tree species present in their farms; especially to those most utilized. The only remarkable difference was that in Río Frío some aspects of this knowledge were described using more technical terms than in Cañas; for example, the recognition of leguminous species that fix nitrogen (poró and madero negro) and the salinity and acidity effect that gavián produces in the soil. Perhaps, this demonstrates that farmers in Río Frío have had more contact with rural extension organizations that have taught them these concepts.

4. Conclusions

In both places, farmers have a broad knowledge about tree species in their farms, recognizing physical, biological and phenological attributes and uses; and this is a product of their experience, acquired, and inherited knowledge. In addition, they identify interactions between tree cover and components of the farm, recognizing positive and negative interactions between these components. Within an applied context, the local knowledge about the tree cover compiled by this study may be useful for the planning of silvopastoral or agroforestry programs in these zones. Because farmers have this accumulated and highly relevant traditional knowledge, they will use it to decide whether they accept certain tree species in their pastures. Technicians may not have paid enough

attention to this knowledge: a good example is the classification of tree shades ('fresh' and 'bad' shades), which has not previously been reported in Costa Rican literature, but for the farmers from Cañas and Río Frío this classification plays an important role in the management and selection of species.

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