

Tropical kudzu (*Pueraria phaseoloides*): successful adoption in sustainable cattle production systems in the Western Brazilian Amazon

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Keywords: economic impacts, environmental benefits, legume, pasture reclamation

Introduction In 1976 the Program for Reclamation, Improvement and Management of Pastures in the Brazilian Amazon (PROPASTO), conducted by Embrapa, established on-farm experiments in the State of Acre. These experiments consisted of introducing and evaluating grass and grass-legume stands, both under cutting and grazing. Similar experiments were established in all states in the region. Since then, research has recommended new species of grasses, legumes and grass-legume associations for establishment of improved pastures in the Brazilian Amazon. The grass cultivars recommended were an instant success with farmers, with *Brachiaria brizantha* cv. Marandu becoming the predominant species, occupying approximately 80% of the total pasture area established in Acre until 1998. However, the legumes recommended had limited adoption and most failed to persist in the pastures after a few years under grazing, mainly due to the incidence of diseases and poor management. The exception occurred in Acre where the legume *Pueraria phaseoloides* (Tropical kudzu) became one of the most important forage resources and has maintained that position.

Technology adoption process Since the early 1980's Embrapa Acre has established grass-Tropical kudzu pastures in strategically selected areas owned by farmers that had been identified as leaders and innovators among their peers. Grass-legume associations were persistent and gave strong financial benefits due to increased carrying capacity from 0.5 to 1.5 animal units/ha and increased live weight gains from 90 to 360 kg/ha per year. Tropical kudzu showed excellent adaptation and high seed production in the environmental conditions of Acre. It soon became a cash crop for small farmers that started to use it also as an improved fallow in the reclamation of degraded agricultural land. This resulted in ready availability of low cost seeds in the market, making Acre a seed exporter to other regions of Brazil. Later in the 1980's, farmers began to be pressured by governmental and non-governmental organisations to reduce deforestation for establishment of new pastures and to reclaim degraded pasture areas. With the great distances from markets, poor roads and low profitability of extensive beef cattle production systems, the use of modern inputs such as fertilisers were not economically viable. At this point Embrapa Acre presented farmers once again with successful on-farm experiences with the availability of grass-Tropical kudzu pastures that, at that time, were 7 to 10 years old. After initial talks and field days conducted by researchers and extension agents, the owners of the demonstration farms became the true agents in the process of technology transfer. In 1989, there was a rush of farmers to establish grass-Tropical kudzu pastures and prices of the legume seeds increased from US\$ 4.00 to US\$ 11.00 per kg from July (harvest period) to November (the end of the planting season). Researchers had recommended a seed rate of 1.0 kg/ha of Tropical kudzu seeds in mixture with the grass seeds. However, in the next fifteen years it became common for farmers in Acre to use a seed rate of 1.0 kg of Tropical kudzu seeds for each 2.42 ha (one alqueire). It is estimated that Tropical kudzu is present in over 30% (480,000 hectares) of the total pasture area in Acre, in percentages ranging from less than 10%, in pastures under more intensive grazing, to over 90%, in areas where death of *B. brizantha* cv. Marandu is occurring, due to the lack of adaptation of this grass species to low permeability soils. In Marandu-Tropical kudzu pastures where the grass started to die, the legume acted as a buffer and saved farmers from complete bankruptcy. Tropical kudzu prevented weeds from completely taking over the pastures, supplied good quality forage for the animals and increased the nitrogen status of the soil. This allowed the farmers time to gradually re-establish their pastures.

Key factors for success (in order of importance): 1) the availability of appropriate technology and long term commitment of key players, particularly researchers from Embrapa Acre; 2) the socioeconomic situation of farmers and farming systems that were conducive to technological changes due to the increasing environmental restrictions on pasture area expansion; 3) farmer centred research and extension and capacity of local institutions to support the programme; 4) market access and strong financial benefits of the technology; and, 5) strategic partnership among stakeholders.

Conclusion Tropical kudzu is now considered a naturalised plant in the state of Acre, because of its widespread use in mixed pastures and in agricultural land reclamation for more than 20 years. Despite its low adaptation to high grazing pressures under rotational stocking, this legume continues to be an important forage resource in the cattle production systems in Acre. It is still the only legume used by farmers in the establishment of new pastures or in the reclamation of degraded pastures in the State. For more intensive production systems, *Arachis pintoi* cv. Belmonte has become the most important forage legume.