Figure 1. Mato Grosso state, the frontier of agricultural development in the Brazilian Amazon, is shown here in the context of the Brazilian legal Amazon and with potential natural vegetation (Mello 2007) and the extent of pastures in 2001 (Morton et al. 2006; Morton et al. 2009). Field data points used for validation are shown with orange dots.

2008; Brown et al. 2005; Nepstad et al. 2006). These cropland operations are very large. Over 75% of the mechanized soybean farms cultivate areas ranging from 500 to over 5000 ha (Fundação Agrisus 2006). The rapid growth in row-crop agriculture has been enabled by recent advances in mechanized farm technology, crop breeding, and crop engineering in response to global product demand and national development activities (Brown et al. 2007; Fearnside 2001; Nepstad et al. 2006). The result has been large-scale conversions of natural ecosystems or lower-production agricultural lands (e.g., pasture) to row-crop agriculture (Jepson et al. 2008). Large-scale deforestation continues with little transition back to forest (Rudel et al. 2005). In the agricultural frontier of the Brazilian Amazon, the major expansion of croplands with mechanized agriculture is emerging as a significant new dynamic that needs to be further examined (Morton et al. 2006).

The dynamics of land use in Mato Grosso are complex and represent a variety of pathways leading to cropland establishment (Figure 2). Desired increases in crop production may be met through clearing natural lands for additional agricultural production (extensification) or through increased production on existing agricultural lands (intensification; Boserup 1965). In Mato Grosso, cropland extensification involves land clearing through slash and burn and leaves no residual slash or woody debris that could hinder the mechanized tilling and planting. Intensification, or the increased production per unit area or per unit time by switching patterns of agricultural management, can be implemented in many different ways,