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Systems and Managements Related Differences in Phenology of 12 Cocoa (*Theobroma cacao* L.) Cultivars

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Abstract

Cocoa production systems can vary from a mono-cropping (MC) full sun plantation to a highly diversified successional agroforestry (SAFS). Mono-cropping is still the most common one but recently agroforestry (AF) systems have raised more interest because of their expected long-term resilience. Nevertheless, information about the influence of cropping systems and management methods such as organic versus conventional in cocoa production and phenology in South America is missing.

This study is based on the SysCom program's framework located in Alto Beni (Bolivia), where three cropping system (MC, AF and SAFS) are compared. Additionally, MC and AF systems are conventionally and organically managed. A total of 12 cultivars including local clones, foreign clones (from the Imperial College Selections and Trinidad Selections) and hybrids are planted in each system. The aim of the present study is to identify differences between systems, management methods, cultivars and the respective interactions on cocoa phenology. Data on flushing and number of flowers, small, medium and big fruits and cherelles are being recorded every 15 days from March 2015. The trial was designed according to a split-plot design with four replicates. Principal component analysis (PCA) and cluster analysis were performed on the cultivar level. Additionally, the collected data will be statistically analysed with a generalised mixed model (Poisson distribution) to test the effect of the different cultivars, systems and their interactions on the phenological traits.

Preliminary results of the PCA and cluster analysis do not show a clear grouping pattern between the three types of genotypes analysed. This suggests that there are differences between cultivars but they are not consistent within the three groups. Preliminary descriptive results of the collected traits show differences between single cultivars and systems, but not between managements (organic vs. conventional). Some of the traits seem to be more system dependent than others. For instance, the number of cherelles seems to be higher in the SAFS than in the other systems. Additionally, interactions between systems and cultivars are expected to be present. This would be positive in terms of potentiality for selection of cultivars adapted to each different system.

Keywords: Agroforestry, Bolivia, cherelle wilt, monoculture, organic farming