

Agronomic and economic performances of improved cacao clones under different agro-ecological conditions in Costa Rica.

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ABSTRACT

To reactivate cacao production in Mesoamerican countries, in the late 2010s the Tropical Agricultural Research and High Education Center (CATIE) started to disseminate 6 cacao clones (CATIE-R1, CATIE-R4, CATIE-R6, PMCT-58, CC-137 and ICS-95) with high production potential, resistance to diseases and good quality. Ten years later, the agronomic and economic performances of these clones were assessed in three regions of Costa Rica (North, Caribbean and Pacific), in order to identify the factors that influence cacao actual yields and family benefits. The sample of cacao farms was selected from a list of 267 cacao growers provided by the Ministry of Agriculture. From this list, 30 farmers cultivating the clones were selected (10 per region): half with good yields and half with low yields according to producers' perceptions. Visits to the plantations and inquiries allowed characterizing the socio-economic and agronomic context of the farms and households. Agronomic and agroforestry variables, cacao yields, as well as costs and incomes were measured. Statistical analyses focused on differences among yield classes and on the identification of factors that contribute most to the benefits obtained. Farms were grouped into four classes of cacao yield. From the first to the fourth class, the yield increased from 268 to 1770 kg/ha/year, as did the frequency of agronomic practices and application of inputs. Therefore, the production costs also increased according to yield classes but in acceptable levels for smallholders and leading to high cacao yields and incomes (especially classes 2 and 3 with respectively 830 and 1430 kg/ha/year). Class 4 reported the highest yields but not the highest net incomes due to elevated production costs. The two main agronomic factors that led to higher yields and profits were pruning and fertilization. Cacao plantations were between 4 and 10 years old and the shade trees were still in the growth phase. At this age, none of the plantations surpassed 40% of shade cover and other variables of agroforestry structure did not show any influence on clone performance. Another important finding was that there

was no genotype x environment interaction in yield results. The three most promising clones were CATIE-R6, CATIE-R4 and CATIE-R1, in this order. Results reveal that the exploitation of the high productive potential of improved clones must be complemented by an efficient agronomic management. Thus, government agencies and development projects should provide technical support and training to producers in addition to the supply of new varieties, especially clones.

Keywords: Cacao yield, agroforestry, cacao breeding