After harvest, the cocoa fruit is fermented, dried, and stored. Farmers remain vulnerable to production losses during these processes and the quality and flavor of the product is defined by the environment and the methods used. Post-harvest processing falls upon the CSA pillars of productivity and adaptation. Farmer incomes are dependent on the amount of cocoa they can sell and the success in post-harvest processing is dependent on the interaction between environmental factors (e.g. humidity) and factors related to the process (e.g. bacteria during fermentation).

Climate change impact

Prolonged intensive rainfall and low temperatures increase pod infection rates and rotting. High temperatures and drought lead to smaller bean sizes and delayed maturation. Post-harvest management of cocoa pods and beans will also be more challenging as intensified rainfall slows down the fermentation process and increases contamination by mycotoxins Changes in temperatures and droughts will significantly alter the flavor and acidity of cocoa beans whereas a prolonged dry season will increase the sugar content of cocoa beans creating problems during fermentation. Drying will be more complicated under high humidity conditions, although during droughts and prolonged dry seasons farmers must ensure beans do not become burnt. After drying, cocoa beans must be stored in an adequate facility that protects them from pests during high temperatures and droughts, and from mycotoxins during low temperatures (Dohmen, et al. 2017).

Fermentation

There are various ways in which farmers can engage in the process of cocoa fermentation. After the cocoa beans and pulp are removed from the husk, smallholders typically cover the heaps of cocoa with plantain or banana leaves and let them ferment for approximately five days (ICCO, 1998). This traditional approach to fermentation, however, is susceptible to environmental risk factors. Periods of intense rainfall increase the time required for fermentation. Temperature changes, droughts, and prolonged dry seasons affect the flavor and overall quality of the product (Dohmen, et al. 2018). Unlike farmers in West Africa, cocoa farmers in Latin America tend to ferment the cocoa pulp surrounding the beans using wooden boxes. In Indonesia, farmers rarely take part in the fermentation process because their production is valued mostly for cocoa butter which is unaffected by fermentation (Neilson, 2007).

Drying

The next step after fermentation is the drying of the cocoa beans. Under inadequate methods and circumstances, drying can result in production losses and loss of quality. According to the ICCO (2000), farmers may either sun dry their beans or use an artificial drying technique. The former is common in countries that have a significant dry period during which to carry out drying and it involves placing the cocoa seeds on a surface exposed to the sun either on mats, trays, or concrete. Artificial drying involves the use of an artificial source of heat such as fires (ICCO, 2000). Intensive rainfall can cause molding of cocoa beans and reduce quality. While temperature changes alter the time required for drying, droughts and dry periods will increase the speed at which cocoa dries. CSC recommends the use of solar dryers, which are easy to build using wood and clear plastic. Solar dryers avoid the GHG emissions of artificial drying and protect cocoa from excessive humidity.

Storage

The last step in cocoa processing is storage of dried beans. During storage, beans are risk of damage from humidity, pests (e.g. warehouse moths and red flout beetles), and mycotoxins (a fungus that can spoil and contaminate cocoa) (Dohmen, et al. 2018). Environmental risk factors increase the probability of damage to cocoa during storage. To reduce these effects, the use of vegetable treated jute bags for storage and ventilated storage rooms are recommended to adaptive capacity and reduce post-harvest production losses.