

Cocoa can be stored in bulk in large heaps confined by walls to form bays, each bay containing 1000 or more tonnes of beans. A more expensive way of bulk storage is in silos. Storage bays and silos can have forced ventilation systems. This enables control of the temperature and humidity of the beans. It is also possible to apply modified atmosphere – usually air that has a low level of oxygen and a high level of carbon dioxide. This will control any pests within the cocoa (see Section 2.4.6).

2.4.6 Infestation of cocoa

Various insect pests can feed on cocoa beans and many lots of cocoa will have some low level of infestation. However, significant infestations are nowadays quite rare.

Cocoa is vulnerable to a very small moth, the Tropical Warehouse moth (*Ephestia cautella*). The larva (caterpillar) enters a bean, usually where the shell is damaged, and feeds on the nib leaving a residue of silk and droppings. Various beetles and their larvae also feed on cocoa beans. Insect damage will be visible in the “cut test” (see Section 2.6.3).

Some insects only rarely enter the beans, feeding mostly on the residue of pulp adherent to the outside. Their presence can result in a consignment being described as severely infested, even though the cut test on a sample of beans does not reveal any insect damage.

Precautions must be taken to prevent infestation developing during storage and shipment. This should include routine monitoring for the major pest species. Control measures need to be applied as required to the structure of the store or ship. Only pesticides approved for use in food stores should be used.

Cocoa beans can be fumigated with phosphine under gas-proof sheeting. When carried out properly, fumigation is very effective and the cocoa should not need fumigating again. Unfortunately, very few fumigations are carried out effectively and frequently some stages of the insects (e.g. the eggs) survive the treatment. In some countries, there is evidence that some pests are becoming resistant to phosphine. Various alternative solutions are available. Some methods rely on the use of very low temperatures (below freezing) or warm temperatures (around 50°C; 122°F) to kill the insects. Another method is to use modified atmosphere, usually oxygen depleted with high levels of carbon dioxide. These methods have the advantage that there are no chemical residues. In any case, insects will be killed and fragments of insects will be removed during the bean cleaning and roasting steps.

2.5 The cocoa value chain: long-term perspectives and challenges

The long-term viability of the chocolate industry depends on a sustainable cocoa supply chain. One of the most fundamental prerequisites for a supply chain to be sustainable is that its participants make a reasonable living from it. The vast

majority of cocoa is grown by small-holders for whom it is a cash crop with no food or cultural value. Most farmers live below the poverty line and this does not encourage investment and development of the farms. In many cases, other crops are more profitable or require less labour. Although crop diversification is good, as it provides more stable incomes, there is an issue relating to the small size of many farms which means efficiencies and overall income will remain low. Another crucial element is the poor level of maintenance of the cocoa plantations, including lack of control of pests and diseases. In many areas, a further threat to the cocoa supply chain is that the farmers are ageing and the younger generations tend to migrate to the cities.

Therefore, the challenge is to transform cocoa farming into a more profitable business. This would help to make cocoa more competitive versus other crops. Ultimately, bringing cocoa farmers out of chronic poverty would help to retain or attract young farmers.

Consumers are becoming more aware and conscious of where and how their food is grown and processed. In response to this and other concerns, governments and the industry have implemented sustainability programmes in collaboration with NGOs and certification programmes such as Rainforest Alliance™, Fairtrade International® and UTZ Certified™ (see Figure 2.16). The main objectives of these certification programmes are detailed in Table 2.3.



Figure 2.16 Example of a chocolate manufacturer's sustainability programme. Reproduced with permission of Mark Fowler.