CONSULTATIVE BOARD ON THE WORLD COCOA ECONOMY
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MANUAL OF BEST KNOWN PRACTICES IN COCOA PRODUCTION

VERSION I

Note by the Secretariat
This is an update of document CB/4/5 Rev.1 on “Overview of Best Practices in Cocoa Production”, which was reviewed by the Consultative Board at its fourth meeting in March 2005. The current document incorporates comments and inputs since the last CB meeting in January 2008. The main changes are highlighted in bold and underlined.
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1. INTRODUCTION

1. For several reasons, it is essential that cocoa farmers apply best known practices in cocoa production. The first reason is that, only in this way can the highest physical quality standards be reached, given the planting material used. The second reason is that, in this way, food safety legislative standards can be met, thus avoiding any problems in the utilization and trade of the beans. Finally, through best known practices, the standards can be reached to achieve sustainable cocoa production, covering the aspects of economic, social and environmental sustainability.

2. The present document comprises Version I of a Manual of Best known Practices. It includes information from the Good Agricultural Practices (GAP) implemented in Malaysia and from other sources reviewed by the ICCO Secretariat.

3. The Consultative Board may wish to review this document as a first step to the production of field manuals on best known practices. The Secretariat is well aware of the need for greater detail and specificity to arrive at manuals which can be used in a certain concrete situation in the field.

2. CHARACTERISTICS OF GOOD QUALITY COCOA

4. The Model Ordinance of the International Cocoa Standards provides that cocoa of merchant quality must be: “(a) Fermented, thoroughly dry, free from smoky beans, free from abnormal or foreign odours and free from any evidence of adulteration. (b) Reasonably uniform in size, reasonably free from broken beans, fragments and pieces of shell, and be virtually free from foreign matter”.  

5. In the case of cocoa, “quality” is used in the broadest sense to include not just the all-important aspects of flavour and purity, but also the physical characteristics that have a direct bearing on manufacturing performance, especially yield of the cocoa nib (Biscuit, Cake, Chocolate and Confectionery Alliance (BCCCA), 1996). The different aspects or specifications of quality in cocoa therefore include: Flavour, Purity or wholesomeness, Consistency, Yield of edible material and Cocoa butter characteristics. These are the key criteria affecting a manufacturer’s assessment of “value” of a particular parcel of beans and the price he is willing to pay for it.

6. Cocoa farmers have little or no influence over the cultural factors of cocoa growing, as parameters such as the chemical characteristics of the soil available to them, the genetic make-up of the planting material used and the climatic environment are imposed on them by nature and science. While the farmer may exercise some latitude in choosing his planting material, this choice is naturally constrained by the diversity and characteristics of the cocoa varieties available to him from research and extension services. In any case, once the choice of planting material is made, there is not much the farmer can do to affect the end result in terms of quality, apart from concentrating on good cultivation and post-harvest practices.

7. Through good husbandry of the cocoa farm, including pest and disease control and harvest and post-harvest handling, farmers can ensure the production of good quality cocoa. The best known

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practices outlined below have attempted to integrate parameters related to the social and environmental dimensions of sustainability into production practices. It is hoped that these practices could eventually/possibly serve as monitoring and certification indicators and, as the case may be, for the production of good quality cocoa that meets the food safety demands of consumers.

8. In this context, it is important to recognize the role that farmers’ groups can play in the dissemination and adoption of best known practices. When farmers are organized in groups, it is easier to reach them and therefore easier to achieve the adoption of improved cultivation practices because of possible positive group dynamics.

3. BEST KNOWN PRACTICES IN COCOA PRODUCTION

3.1 Establishment of the cocoa farm

3.1.1 Cocoa should be cultivated in the areas where it thrives best, i.e. areas with hot, moist climates, with average rainfall of between 1150mm and 2500mm, and a temperature range of 18°C to 32°C. Such areas lie along the equator in West Africa, Central and South America, and in Asia/Oceania.

3.1.2 Cocoa should be grown on land where there are no land tenure problems.

3.1.3 Establishment of new cocoa farms on forest land should be avoided as far as practically possible.

3.1.4 The soil for cocoa growing should be rich in nutrients and should have the appropriate physical and chemical properties, level of acidity, and organic matter content that are favourable to the development of the cocoa tree.

3.1.5 Depending on varietal requirements, adequate permanent shade trees should be provided in cocoa farms.

3.1.6 Farmers shall keep records of the site history and field layouts.

3.1.7 Land tillage practices that improve the soil structure should be encouraged. Land preparation for new cocoa farms should be done at least one year before cocoa seedlings are planted. Permanent and some temporary shade trees should be established and well arranged to shelter young plants.

3.1.8 Choice of planting materials and rootstocks should be based on characteristics such as high productivity, quality of the bean, consumer acceptability, resistance to pests and diseases, etc.

3.1.9 Multiplication of seeds should be done in a seed garden using scientifically recommended practices. Farmers shall keep records of all the parent stocks.

3.1.10 Each farm should have or be close to cocoa seeds and a seedling nursery that is properly maintained and shaded.

3.1.11 Cocoa should be planted in the most suitable pattern and density according to the varietal requirements to ensure high productivity and easy management of the farms.
3.2 Cocoa Farm maintenance and crop husbandry

9. The length of time that a cocoa farm remains productive and financially viable is determined by the application of good maintenance practices, in particular pest and disease control. It is therefore important to maintain a high standard of farm management so that the cocoa tree is less susceptible to disease and insect attacks, as well as to ensure an appropriate response to specific outbreaks when they do occur. The following practices are recommended.

3.2.1 Improve and maintain soil organic matter through manure application.

3.2.2 Adopt field cultivation techniques that minimize soil erosion e.g. maintaining soil cover.

3.2.3 Encourage the most efficient use of farm resources (labour, inputs, etc.).

3.2.4 Optimize the use of labour, in particular avoiding the worst forms of child labour.

3.2.5 Use management practices that minimize nutrient loss but maintain or improve the soil nutrient balance.

3.2.6 Apply appropriate inorganic and organic fertilizers in accordance with scientific recommendations so as to maximize benefits and minimize losses.

3.2.7 Use efficient irrigation technologies and water management to minimize wastage and avoid leaching and salinization.

3.2.8 Adopt appropriate weed control measures to keep the ground around the cocoa tree and the shade tree free from weeds. In weed control, two different techniques can be distinguished: manual/mechanical and chemical control. Manual/mechanical control involves the use of grass knives or mechanical slashers. Chemical control involves the use of spraying machines to apply herbicides to the weeds that need to be controlled.

3.2.9 Pruning is the removal of unwanted branches from a cocoa tree. It is an important operation and can affect yield for months, even years, as well as affecting the shape and structure of the tree for the rest of its life. Insects and diseases multiply more on un-pruned cocoa trees with dense canopies than on trees that have been opened up by pruning and display well-aired canopies. Pruning can also stimulate flowering and pod production. Pruning can be carried out properly by using good tools such as a bow saw, a secateur, a chupon knife and a long-handle pruner.

3.2.10 Shade has a very substantial effect on the growth and productivity of the cocoa tree throughout its development into a mature tree. Some degree of shade control is needed through pruning and thinning, to achieve the desired level of shade and maximize growth and production. The effect of shade on cocoa is very complex. Shade influences the microclimate of the cocoa block through its effect on the amount of solar radiation received by the cocoa trees, the wind, the relative humidity and through its effect on the metabolic rate of the cocoa trees, it indirectly influences the nutrient status of the soil. The micro-climate, in turn, influences the incidence of pests and diseases.
3.2.11 Taken together, the above mentioned practices imply the application of appropriate integrated crop management to ensure sustainable productivity of cocoa farms.

3.3 *Cocoa crop protection*

10. Disease is one of the major reasons for loss of cocoa production in the world. Controlling it is therefore a key part of efficient management of a cocoa farm. To be able to better control diseases on their farms, growers need to be able to recognize the symptoms, understand the causes of the diseases and know how the disease organisms operate.

11. In controlling cocoa diseases, all trees should receive individual attention, as a single infected plant is likely to act as a source of infection for all the other trees on the farm. If left unattended, one sick tree will eventually lead to all the others also contracting the disease. There are four methods used to prevent diseases developing and/or controlling them if they do become established. These methods are: regulatory, cultural, biological and chemical.

12. In regulatory control, measures are taken, usually by law, to prevent material contaminated with a pathogen from being transported from one area that already has a particular disease to another area which does not yet have the disease. Cultural control is a broad approach that involves preventing the pathogen from coming into contact with and infecting the cocoa trees or eradicating the pathogen or significantly reducing its numbers in an individual plant or within an area. Biological control involves a range of measures that include directly introducing other micro-organisms that are enemies of the pathogen. Chemical control usually seeks to remove the pathogen from the disease location. Chemicals that are toxic to the pathogen are applied to the cocoa or shade trees, either to prevent pathogen inoculum from establishing in a host, or to cure an infection that is already in progress.

3.3.1 Minimize the use of pesticides as much as possible to protect the crop. More emphasis should be placed on resistant varieties, cultural and biological control of pests and diseases.

3.3.2 Where possible, apply early warning mechanisms for pests and diseases i.e. pests and diseases forecasting techniques.

3.3.3 Adoption of Integrated Pest Management (IPM) regimes should be encouraged. Farmers should seek professional advice on IPM to control pests and diseases.

3.3.4 The use of agrochemicals should be restricted to the officially registered ones and should be in accordance with legal, scientific and technical requirements. Only appropriate agrochemicals at the prescribed doses, timing and intervals of applications should be used.

3.3.5 Use only pesticides that are target specific with minimal effect on the agro-ecosystem and minimal negative environmental implications.

3.3.6 Agrochemicals should only be applied by adequately trained adults who are knowledgeable on the safe and proper use of the products. Equipment used for the handling and application of agrochemicals must comply with safety and maintenance standards.
3.3.7 Routine application of broad spectrum insecticides to prevent pests from establishing themselves should not be carried out for the following reasons: Insecticides are expensive, and potentially dangerous/hazardous for the health of the person carrying out the spraying. Furthermore, it can contaminate the local environment (soil and water streams) and the cocoa tree and pods with unacceptably high levels of chemical residues. In addition, excessive use of chemicals can create resistance in the target pests, and can reduce the population of useful predators. If chemical control is over-used, it can lead to yet greater pest problems that may not be controllable even with the recommended insecticide applications.

3.3.8 Agrochemicals must be stored in accordance with local regulations and secured away from other materials in a well ventilated and well lit location.

3.4 Cocoa harvest, post harvest, on-farm processing and storage

3.4.1 Pods should be harvested as soon as they are ripe. Harvesting should be done every two weeks if there are not many ripe pods, and every week during peak periods. Likewise, it is important to do a separate round of the farm every week to remove sick pods and cherelles with a cocoa hook that is used only for removing diseased material. It is essential that the pods do not become over-ripe as they are more likely to become infected with diseases, and the beans inside over-ripe pods will germinate. Evidence to date suggests that Ochratoxin “A” producing organisms enter the cocoa supply chain via damaged pods. To reduce Ochratoxin “A” in the cocoa supply chain, it is recommended that farmers do not wound pods with a machete. Wounded pods of any kind should not be stored for any longer than one day.

3.4.2 It is equally important not to harvest unripe pods. The beans inside unripe pods will not be ready for fermenting. Unripe beans are hard, without mucilage, and they will neither separate easily nor ferment properly. Beans from unripe pods must not be included in the wet beans for fermentation.

3.4.3 Harvesting must be carried out using specific techniques and tools. Farmers should always use a sharp cocoa hook on a stick. Secateurs can be used to harvest pods within easy reach. These tools should be kept clean - ideally disinfected every day and sharpened regularly with a file. They should not be used for removing diseased pods or cherelles as this will spread the fungus to healthy trees. If a grower only has one long-handled cocoa hook, it is essential that it be disinfected after being used on diseased pods. A bush knife should not be used.

Pod breaking

3.4.4 Pod breaking should be conducted in an appropriate manner to avoid damage and contamination to the beans.
3.4.5 Once a sufficiently large quantity of pods has been harvested, the pods must be broken and the beans extracted. It is best to do this straight away or within a couple of days after harvesting in order to avoid losses from diseases.

**Fermentation**

3.4.6 Fermentation of wet beans should be done in accordance with recommended practices. It is recommended or preferable to conduct the fermentation process in approved fermenting boxes. The wet beans are poured into the boxes and “turned” once a day. This process of turning is important as it ensures the even heating of the beans, allows air to enter the ferment, breaks up any lumps and prevents the formation of mould on the beans. If beans are not “turned”, they will not ferment properly and will become mouldy and bad-smelling. The length of the fermentation process is usually five to seven days.

**Drying**

3.4.7 After fermentation, the cocoa beans must be taken out and immediately spread on adequate surfaces to dry, preferably under direct, natural sunlight. If the drying is not started immediately, the cocoa beans will keep fermenting and rot. **Excessive drying, particularly related to artificial drying, can cause off-flavours.** Care should be taken to ensure that only well functioning dryers which do not allow direct contact of the beans with smoke are used in order to reduce or eliminate smoke contamination of the beans. ECA/CAOBISCO research on the sources and prevention of PAH contamination of cocoa beans in producing countries concluded that the main cause of PAH is smoke contamination during artificial drying. Although the nibs are protected from contamination by the outer shell, research has established that good drying and storage practices are essential in minimizing PAH contamination of the beans. Good drying is as important as good fermenting. The beans will only develop the right brown colour inside if they are properly dried. While on the drying bed, the beans must be turned several times each day.

3.4.8 When the beans are completely dry, they must be sorted to remove the flat beans, shrivelled beans, black beans, mouldy beans, small and/or double beans, beans with insect damage, etc.

**Packaging and storage**

3.4.9 Cocoa beans should be packaged in clean bags which are sufficiently strong and properly sewn or sealed. The bags should be made of non-toxic materials, preferably food grade hydrocarbon-free jute bags.

3.4.10 Once the drying and sorting out process has been completed, the cocoa beans must be put into appropriate bags and stored. Proper bagging and storage of the processed beans is just as important as proper fermentation and drying. Incorrect or careless bagging and storage can lead to rejection of the beans, meaning that time and efforts as well as money have been wasted. The bagged cocoa beans must be placed in storage sheds that are
weatherproof, well aired, free from damp and insect pests and away from smoke and other smells that would contaminate the cocoa. The bags must be kept above ground level and away from walls. The storage areas must be kept locked and clean at all times. Following proper fermentation, drying and bagging, the cocoa beans are ready to be sold. **Any infestation must be dealt with by proper and approved methods of fumigation.**

**Quality control**

3.4.11 Using the appropriate equipment (moisture meters, knives for cut-test, weighing machine, etc.), the quality of the cocoa beans in the bags must be checked before the cocoa is sold. This process is a crucial one as it can considerably affect the final price paid to the farmer. At this stage, the cocoa beans must fulfil certain criteria to the satisfaction of the buyer, including the following: the cocoa must be properly fermented and dried; the cocoa must be free from any foreign odours; the beans must comply with limits in contents of slaty, flat, double, broken, mouldy, insect-damage, foreign matter and germinated beans; the cocoa must conform to the required moisture level; and there have to be a number of cocoa beans per unit weight (100 or 1000 grammes).

3.4.12 While under the present circumstances, quality control is mostly carried out by officials from cooperatives and buyers, it is highly desirable that, in the context of sustainable and more modern cocoa production and marketing, farmers would play a larger role in the marketing of their cocoa. Eventually, they should take over quality control and carry it out at farm level before selling the cocoa beans, thus taking more responsibility for the quality of their cocoa and enabling them to command higher selling prices. In such an approach of closer involvement of farmers in the cocoa production and marketing process, current important issues such as traceability could also be addressed.

**Transportation and Shipping Practices**

3.4.13 Cocoa beans should be well prepared, free from infestation and off-flavours. The cocoa should be loaded in food grade jute bags or prepared for bulk shipping.

3.4.14 Ideally, only cocoa beans should be stored in one location of the cargo vessel. High-fire-risk materials, hazardous or poisonous chemicals, should never be stored with cocoa beans.

3.4.15 Containers for cocoa shipping should be clean and free from residue of previous cargo.

3.4.16 Containers should not have been used to carry chemicals or other materials giving off strong odours.
Cocoa food safety

3.4.18 In view of increasing consumer awareness of food safety issues, traceability is becoming an important agenda for the global cocoa market. Markets now require minimum residue levels of pesticides, mycotoxins, PAH, heavy metals etc, in cocoa beans. To be able to trace the source of contamination, the cocoa beans should be traceable from the farm to the consumer. Increasingly, countries are imposing stricter food regulations driven by consumers’ demand for food that is safe for consumption worldwide.

3.5 Human welfare, health and safety of cocoa producers

13. Human welfare, health and safety are the principal components of sustainability, as the social and economic welfare of farmers, farm workers and their communities greatly depends upon it.

3.5.1 Cocoa should be produced through practices that achieve an optimal balance between economic, social and environmental goals.

3.5.2 Cocoa production should provide adequate household income and food security to producers.

3.5.3 Cocoa producers must adhere to safe working procedures with acceptable working hours.

3.5.4 Reasonable wages must be paid to all hired labour, including where applicable, to women and to children.

3.6 Farm record keeping

3.6.1 Farmers shall keep up-to-date records of all farming activities, including the use of inputs. A comprehensive record keeping system shall be established in which all the essential elements of cocoa production are captured. Records should be kept on the types and sources of planting materials; types of pesticides, fertilizers and usage; etc.

4. Conclusion

14. In order to ensure high quality cocoa, no effort should be spared to implement recommended best known practices. Every step in the process contributes to the final quality of the cocoa produce. From choosing the structure and texture of the soil, preparing and establishing the farm, selecting the planting material, managing the farm (good husbandry), harvesting, through to processing and quality control, all are vital factors and therefore should be taken very seriously by the producers.

15. Based on the above, the ICCO Secretariat could, under guidelines from the Consultative Board, co-operate with experts in this field to bring together best known practices for producing high quality cocoa in a useful practical format, such as posters and/or manuals. Guidance by the Board might include any desired geographical differentiation and specification.