

**CB/16/2/Rev.1**  
17 April 2009

Original: ENGLISH  
Distr: RESTRICTED

**CONSULTATIVE BOARD ON THE WORLD COCOA ECONOMY**

Nineteenth meeting

Holiday Inn Suschevsky Hotel, Moscow, Monday, 1 June 2009 at 10.00 a.m.

**GUIDELINES ON BEST KNOWN PRACTICES IN THE COCOA VALUE CHAIN**

**NOTE BY THE SECRETARIAT:**

The present document, originating from the ICCO Consultative Board on the World Cocoa Economy, was reviewed in January 2009 both by the Board and by the Working Group for the Roundtable on a Sustainable Cocoa Economy (RSCE2). As earlier agreed, the amended document was submitted for consideration at the RSCE2 Preparatory Meeting which took place on 10-12 February 2009 in Abidjan, Côte d'Ivoire and was thereafter reviewed by the RSCE2 proper, at its meeting on 24-26 March 2009 in Port of Spain, Trinidad and Tobago.

The document is now submitted for the consideration of the Board at its 19th meeting in Moscow, on 1 June 2009.

## GUIDELINES ON BEST KNOWN PRACTICES IN THE COCOA VALUE CHAIN

### 1. INTRODUCTION

1. All stakeholders in the cocoa sector agree that it is essential that cocoa farmers apply best known practices in cocoa production. Firstly, this will yield cocoa of the highest physical quality. Secondly, the cocoa beans produced in this manner will meet the food safety standards advocated by relevant bodies, thus avoiding problems in the utilization and trade of the beans. Finally, through best known practices, sustainable cocoa can be produced that comply with economic, social and environmental requirements.

2. The present document comprises Version II of Guidelines on Best known Practices. It includes information from the Good Agricultural Practices (GAP) implemented in Malaysia and from other sources reviewed by the ICCO Secretariat. It is envisaged that this document will go some way towards greater clarity on defining Good Agricultural Practice for cocoa production.

### 2. CHARACTERISTICS OF GOOD QUALITY COCOA

3. 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*”.<sup>1</sup>

4. 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 yield and 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.

5. 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.

6. 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 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

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<sup>1</sup> Source: FAO/WHO 1969 – Codex Committee on Cocoa Products and Chocolate – Horgen, Switzerland 23-27 June 1969 – 5 P. For Report See /09794/.

eventually/possibly be monitored through indicators and, as the case may be, for the production of good quality cocoa that meets the food safety demands of consumers.

7. 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.

8. To facilitate the transfer of good agricultural practices to the target group of farmers, there should also be an adequate institutional framework to provide effective extension services to farmers with the required support services.

### **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 Cocoa farms/plantations should not be established on or adjacent to areas identified/recognized as high conservation value habitats. If rare, threatened or endangered species, or high conservation value habitats, are present on cocoa farms/plantations or nearby, appropriate measures for management planning and operations should be implemented. These should include:

- Ensuring that any legal requirements relating to the protection of the species or habitat are met.
- Avoiding damage to and deterioration of applicable habitats.
- Controlling any illegal or inappropriate hunting, fishing or collecting activities; and developing responsible measures to resolve human-wildlife conflicts.
- Maintaining a "corridor" to allow for the movement of protected species between habitats.

3.1.5 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.

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

3.1.7 Cocoa agro-forestry systems can provide an excellent opportunity for the partial reforestation of degraded agricultural land, or the protection of some existing forest canopy in situations where the alternative may be complete deforestation. Though cocoa agro-

forests do not provide the same ecosystem services and biodiversity benefits as natural forests, they are preferable to many other kinds of agricultural landscapes.

- 3.1.8 Farmers shall keep records of the site history and field layouts.
- 3.1.9 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.
- 3.1.10 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, ease of establishment and drought tolerance etc.
- 3.1.11 Multiplication of seeds should be done in a seed garden using scientifically recommended practices. Farmers shall keep records of all the parent stocks.
- 3.1.12 Each farm should have or be close to cocoa seeds and a seedling nursery that is properly maintained and shaded.
- 3.1.13 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. Others include liming, which is critical for good absorption of nutrients and other appropriate measures to replace depleted nutrients in the soil.
- 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 and their productivity, 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 establishing conditions that are not conducive to the spread and multiplication of pathogens, 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 or pheromones that can be used, in specific conditions, to control pests. 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 heaps in banana or plantain leaves, or in approved fermenting boxes depending on the best practice recommended for the region. The wet beans are poured into the boxes or in plantain leaves 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. On the other hand, in regions which ferment the beans in heaps, too frequent turning should be avoided as it will stimulate the proliferation of acetobacter and the production of more acetic acid. This causes excessive acid which reduces cocoa flavour development. 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 will result in cocoa beans that are brittle and break easily, causing a high proportion of waste. Incorrect drying can lead to off-flavours, while incorrect sun-drying that is too slow due to lack of sunshine can cause mould contamination. Musty/hammy off-flavours can arise if the drying takes too long. Incorrect artificial drying with poorly maintained driers will cause smoke contamination. Care should be taken to ensure that only well functioning and maintained driers 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. Smoke contamination and related PAH contamination are very obvious when beans are dried by wood fuelled kiln driers. However, when beans are dried with fuel burners, no obvious contamination or off-flavours are observed, although the beans will also be contaminated by PAH arising from the use of direct fuel burners. All artificial dryers with fuel burners should be fitted with a heat exchanger system to avoid direct contact of the fuel fumes with the cocoa beans being dried. 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. This is especially important with artificial dryers, as beans that are not well mixed during drying will be very unevenly dried, resulting in some beans being too dry and brittle. Beans that are not sufficiently dry will develop moulds that can give bad off-flavours.

- 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 bags, that do not attract insects and rodents and are sufficiently strong to resist storage for longer periods.
- 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. Appropriate

documentation accompanying the cargo should state in clear and correct terms the products and the quantities that were used for 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 agreed in the contract, 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 bags or prepared for bulk shipping.
- 3.4.14 Ideally, only cocoa beans should be stored, segregated from other cargoes 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, free from residue of previous cargo and well-ventilated.
- 3.4.16 Containers should not have been used to carry chemicals or other materials giving off strong odours.

### ***Cocoa food safety***

- 3.4.17 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.

- 3.4.18 In this connection, producers must always keep abreast of prevailing rules and regulations governing food safety and hygiene issues and take the necessary steps to prevent the occurrences of such incidents that do not conform to such standards set by the relevant authorities in consumer markets.
- 3.4.19 The International Standard ISO22000, "Food safety management systems – requirements for any organisation in the food chain" provides useful information, plans, principles and recommendations which will be useful for all stakeholders in the cocoa supply chain to work towards greater food safety in the cocoa supply chain.

### **3.5 *Human welfare, health and safety of cocoa producers***

13. The socio-economic welfare of farmers, farm workers and their communities remains an important part of the concept of sustainability.

- 3.5.1 Cocoa should be produced through practices that achieve an optimal balance between economic, social and environmental goals, recognizing however that certain rights are enshrined in international conventions and national laws which must be respected.
- 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.
- 3.5.5 Cocoa producers should ensure that no one will employ children under school-leaving age and that any possible work allocated to children will not damage their health.
- 3.5.6 No forced, bonded, trafficked or otherwise involuntary labour is used at any stage of production. Workers should not be coerced through withholding of identity papers, salary, benefits or property.

### **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. CONCLUSIONS**

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.