



# Facilitator's Guide

TO THE

# Cacao Taster Training Curriculum



# Facilitator's Guide Overview

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1. History
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3. Harvest and Post-Harvest Processing
4. Sensory Analysis
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6. Physical Analysis

### Additional Resources and Acknowledgements

## How To Use This Guide

1. Review the welcome statement and general guidelines.
  2. Familiarize yourself with the structure and flow of each class by reading through the lesson plan and accompanying documents. Each class has a lesson plan which contains a class outline, materials needed and step-by-step instructions for the facilitator to understand the important details in order to teach the class. In addition, facilitators have access to slide presentations that work in unison with the class content. The slide presentations will be offered in a format that will be editable and customizable by the user, though we ask that you please respect the indications of the Creative Commons License.
  3. Familiarize yourself with the tools and materials that are necessary to conduct the class. Many of the materials necessary to teach the class are easily available or provided to you through the class activity sheets, others will require more time to acquire.
  4. Practice the class in advance. Delivering the class in advance will help you to be more organized, refine your presentation and ensure that the class goes as planned.
  5. Have fun!
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## Welcome, Purpose and Use

Welcome to the Facilitator's Guide to the Cacao Taster Training Curriculum!

In 2010, Equal Exchange and TCHO Chocolate began the Cooperative Development Program aimed at strengthening their supply chain partners and interacting with them in new and innovative ways. When this project started, there was no universal methodology for physical and organoleptic evaluation of cacao beans. Through strategic alliances with cooperatives in Peru, Ecuador and the Dominican Republic, we proposed to develop the following tools to evaluate the quality of cacao: a Cacao Sensory Analysis Tasting Form and Guide, a standard Protocol for the Preparation of Liquor Samples, and a Cacao Taster Training Curriculum. The objective of these tools is to achieve a common and inclusive language for all cacao stakeholders.

We are pleased to present this guide to the curriculum and hope that it will support experienced cacao professionals to train new tasters. The intention is to make this material understandable and accessible through the entire value chain. We believe that this guide will provide cocoa taster trainers with a system and tools to cover the fundamentals of cocoa tasting in a clear and concise way.

### Purpose

Designed by cacao and coffee professionals, this Facilitator's Guide should be used by cocoa tasters and trainers with knowledge and experience that is more advanced than the materials presented. All of the material has been designed to provide facilitators with detailed tools that are replicable and easy to use for each class.

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### Audience

The content of these classes is designed for students that have some basic knowledge of cacao. It is intended to be used to teach working cacao professionals, from the laboratory, collection centers, buyers and sellers of cacao beans and chocolate makers. These classes are designed for students that are looking for more knowledge and more formal training.

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### Agreement of use

The materials of the Cacao Taster Training Curriculum are protected under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. Commercial purposes are not permitted. Sharing and modifications are allowed under the same license if appropriate credit and changes are indicated.



USAID-Equal Exchange-TCHO Cooperative Development Project

Version 2019

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### Class Structure Overview

For each class, there is a Lesson Plan and a Slide Presentation provided. Each class is meant to be interactive with a combination of ice breakers, presentations and hands-on activities. These classes are intended to be taught together over a 2-3-day period. The individual classes are broken down by time, materials needed and intended activities. The class size can be as small as 5 students or as large as 15 students.

## Lesson Plan

Each lesson provides a detailed overview of the following:

- Class Name
- Summary: An overview of the class content
- Design & Duration
- Objectives
- Materials
- Link to Slide Presentation
- Class Outline with activities, presentations and timing for each section
- Detailed Methodology and step-by-step guide
- Appendices

## Slide Presentation

You will have access to a slide presentation file for each class. These files are suitable for presentation from the web or download. We encourage facilitators to tailor each presentation to their specific skills and knowledge, therefore you will be able to add additional slides. If you do modify the slide presentation, however, we ask that you respect the *Agreement of Use* and the Creative Commons licensing.

In this guide, thumbnails of the original slide presentations are included with space for facilitators to make notes about their presentation.

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## Additional Resources and Acknowledgements

### Additional Resources

#### Link to Slide Presentation to Welcome Students to the Course

[https://drive.google.com/open?id=144Yvpi-2hu5JBwgCfPqLFVbCVD\\_BceXh9Qo\\_LbOdwQk](https://drive.google.com/open?id=144Yvpi-2hu5JBwgCfPqLFVbCVD_BceXh9Qo_LbOdwQk)

During the 2010-2019 Cooperative Development Program, we created several other resources that you might find valuable and relevant to this material. Please use the following link to find templates for our *Guide to the Cacao Sensory Analysis Tasting Form*, the *Protocol for the Preparation of Cocoa Liquor*, and other resources.

<https://equalexchange.coop/usaaid-cooperative-development-program>

## Acknowledgements

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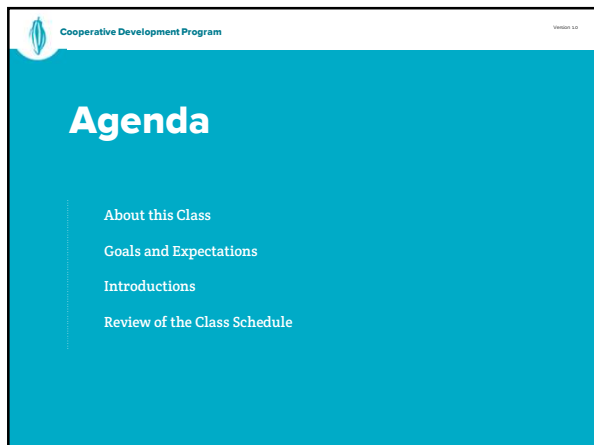
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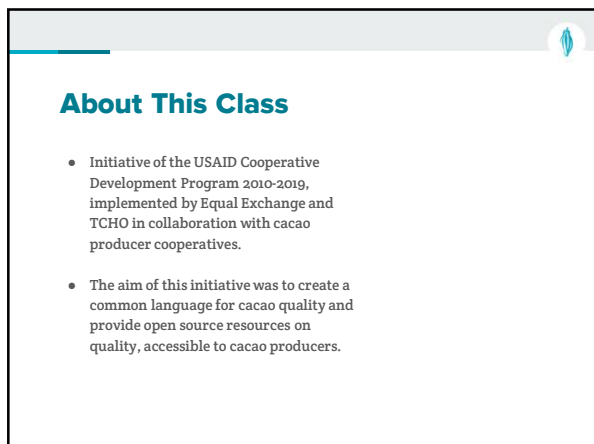
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Cooperative Development Program

### Goals and Expectations

- Students will gain a broader knowledge of cacao, with classes that cover topics ranging from historical context, to plant characteristics, to processing and quality analysis
- Students will have the opportunity to network with other cacao professionals and enthusiasts, from laboratories, collection centers, buyers and sellers of cacao beans, as well as chocolate makers

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### Introductions

- Name
- Experience with Sensory Analysis
- Individual Participant Goals and Expectations

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## Sample of the Class Schedule

DAY 1		DAY 2	
9:00-9:30	Welcome and Introductions	9:00-9:30	Welcome Back
9:30-10:30	History	9:30-12:30	Intro to the Cacao Sensory Analysis Tasting Form
10:30-11:30	Break	12:30-1:30	Lunch
10:30-11:30	Genetics	1:30-3:30	Physical Analysis
11:30-12:30	Harvest and Post-Harvest Processing	3:30-4:30	Evaluation and Wrap Up
12:30 -1:30	Lunch		
1:30-4:30	Sensory Analysis		
4:30-5:00	Wrap up		

*\*Agenda with no field component, with a field component please plan for an additional day*

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# History

Lesson Plan

This class will give students an abbreviated history of cacao to set the stage for the other classes in the curriculum.

## Class design and duration

An interactive presentation with opportunities for Q&A, lasting approximately 60 minutes.

## Objectives

To provide a basic overview of cacao and chocolate history, and relevance to different cultures.

## Materials

- Computer
- Projector
- Name tags
- Flipchart and markers
- Pencils

## Link to Slide Presentation

[https://docs.google.com/presentation/d/1-nfZuOUk6uIP\\_qrGAhoHylm3Yfg5s25eUuw5MGxhWFY/edit?usp=sharing](https://docs.google.com/presentation/d/1-nfZuOUk6uIP_qrGAhoHylm3Yfg5s25eUuw5MGxhWFY/edit?usp=sharing)

ACTIVITY	CONTENT	MATERIALS	TIME	RESPONSIBLE
<b>Introduction</b>	Welcome, contents, objectives and methodology	Computer, Projector	5 minutes	Facilitator/Coordinator/ Director
<b>Slide presentation</b>	Cacao History	Computer, projector, flip chart, markers	30 minutes	Facilitator + participants
<b>The Price is Right game: Special Aztec Cacao Edition</b>	Team game where students guess values of historical items in beans	Computer/Projector and or Flash cards	20 minutes	Facilitator + participants
<b>Conclusions and Q&amp;A</b>	Final discussion, questions		5minutes	Facilitator + participants

## Methodology

### Step 1

Welcome and Review Agenda

### Step 2

Present slide presentation with the following components:

#### **Step 2a - OPTIONAL ACTIVITY**

The Price is Right Game - Special Aztec Cacao Edition. The values in this game are based on historical research related to cacao during the Aztec Empire. (Note: This is an additional, optional activity that can be inserted as an icebreaker after the discussion of cacao beans as currency. The slides are provided along with instructions for the game and the answer key).

#### **Participant Instructions** for The Price is Right: Special Aztec Cacao Edition Game

- Divide into teams of 3, and choose a team name.
- For each item on the following slides, each team will make a wager, based on how many cacao beans they think that item or group of items was worth during Aztec times. If you have actual cacao beans that players can wager, even better!
- The team that is closest to the value of the item, will get one point for each correct answer.
- If there is a tie, no points will be awarded for that round.
- The team with the most points at the end will win the game.

#### **Answer Key** for The Price is Right: Special Aztec Cacao Edition Game

1 cacao bean = 5 long narrow green chilies
1 cacao bean = 1 fully ripe avocado
1 cacao bean = 1 large tomato
2 cacao beans = 20 small tomatoes
3 cacao beans = 1 turkey egg
4 cacao beans = 1 pumpkin
5 cacao beans = 1 large strip of pine bark
30 cacao beans = 1 small rabbit
20 cacao beans = 1 trip for a porter
100 cacao beans = 1 slave
100 full cacao beans or 120 shrunken beans= 1 good turkey hen
200 full cacao beans = 230 shrunken beans
240-300 cacao beans = 1 fine white cotton cloak
300 cacao beans = 1 turkey cock

**Step 3**

Conclusions, Q&A and Comments

**Appendices**

None



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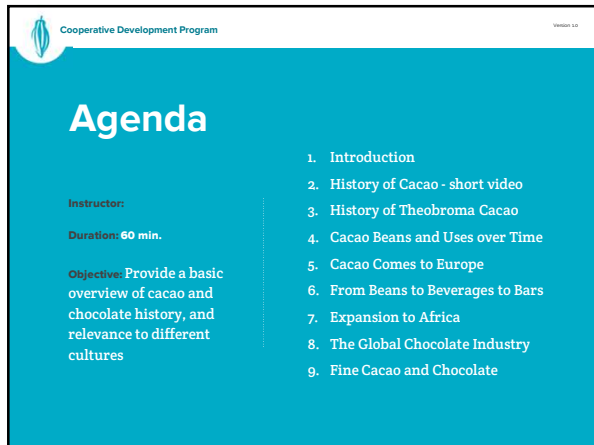
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## The Tree: Theobroma Cacao

- The genus Theobroma originated in South America millions of years ago, east of the Andes mountain range
- Theobroma has 22 species
- Birthplace of species Theobroma Cacao is uncertain
- Split eventually into 2 subspecies, criollo and forastero




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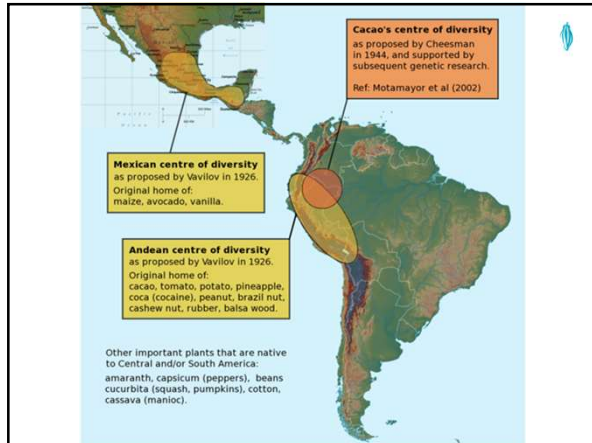
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## Theobroma Cacao Producing Countries Today




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## The Beans: Uses by different cultures

- Maya - Popol Vuh 7900 BCE
  - "xocolatl"
- Aztecs - 1300 CE-1500 CE
  - "cacahuatl"
  - Rituals: fertility, marriage, healing, sacrifice, social contracts
  - Currency
- Theobroma Cacao - food of the gods
  - Mostly consumed as a drink throughout history




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## Popol Vuh - Legendary Connection of Maize and Cacao



- Story of maize god Centeotl who buries himself and from his body emerge new crops such as cotton, chia and cacao.
- "...in the ritual act of sipping chocolate: for the ancient Maya it was a way of remembering and commemorating the old corn god on his triumphant journey from the underworld to the earth, skies and beyond, a journey of death and life, of rebirth, and in the end of complete union with the cosmos."

*"Image of a Late Classic Maya vase in the Popol Vuh Museum in Guatemala; head of maize god as a cacao pod."*

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## The Beans: Aztec \$\$\$

- Widely accepted as a currency for multiple uses, ushered in the Aztec "money economy"
- Value shifted based on size of beans (200 fat beans = 230 shrunken beans)
- Counterfeit beans




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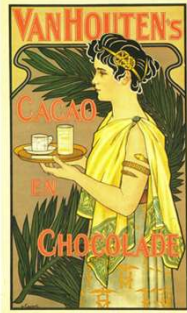
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### From Beans to Beverage to Bars

- 1650s - Cafés and Chocolate Houses
- 1765 - Baker Chocolate Factory opens in USA
- 1828 - Van Houten press
- 1840s - Fry's solid bars
- 1875 - Nestlé adds milk
- 1879 - Lindt invents conche
- Price ↘, Demand ↗



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### Cacao Production Expansion to Africa

- In 1824, European merchants brought cacao from Brazil to São Tomé
- Production expands to Ghana and Ivory Coast at turn of 20th century
- Today, Africa produces 72% of the world's cacao and consumes only 4%



WITH STACKS OF CACAO READY FOR SHIP  
Illustration of the Editor of "West Africa"

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### Forced Child Labor and Trafficking

- 1876 - Portuguese decree to release slaves
- 1905 - Cadbury sends Anti-Slavery Society to investigate plantations
- 2000 - BBC documentary *Slavery*
- 2001 - Harkin-Engel Protocol aims to eliminate slavery in industry by 2005
- Tulane University Studies - forced child labor shows increases from 2008 to 2013 in Cote D'Ivoire, decreases in Ghana

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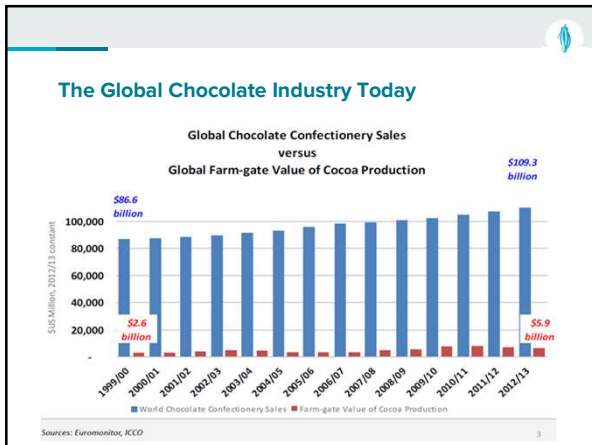
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### The Fine Cacao and Chocolate Movement

- What is "fine"?
  - a. Forastero, Trinitario, Criollo
  - b. Origin
  - c. % Cacao
- ICCO estimates fine cacao is 5-7% of current global production
- 480 craft chocolate companies worldwide, single digit market share
- Trending ↑

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## Questions?

References and Recommendations for Further Reading:

- The True History of Chocolate by Sophie and Michael Coe
- <http://www.mexicolore.co.uk/> - search the site for cacao articles
- <https://chocolateclass.wordpress.com/>
- <https://www.c-spot.com/atlas/historical-timeline/>
- <https://www.cadbury.com.au/about-chocolate/discovering-chocolate.aspx>
- [https://americanhistory.si.edu/sites/default/files/Lange\\_Chocolate%20Preparation.pdf](https://americanhistory.si.edu/sites/default/files/Lange_Chocolate%20Preparation.pdf)
- <https://www.c-spot.com/atlas/historical-timeline/>
- [http://www.ilo.org/washington/areas/elimination-of-the-worst-forms-of-child-labor/WCMS\\_159406/lang-en/index.htm](http://www.ilo.org/washington/areas/elimination-of-the-worst-forms-of-child-labor/WCMS_159406/lang-en/index.htm)

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## The Price is Right

Special Aztec Cacao Edition

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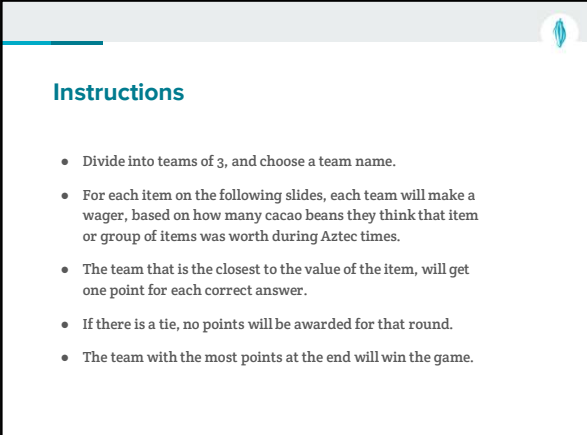
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## Instructions

- Divide into teams of 3, and choose a team name.
- For each item on the following slides, each team will make a wager, based on how many cacao beans they think that item or group of items was worth during Aztec times.
- The team that is the closest to the value of the item, will get one point for each correct answer.
- If there is a tie, no points will be awarded for that round.
- The team with the most points at the end will win the game.

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**5 Narrow  
Green Chillies**



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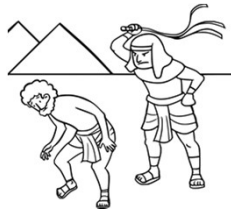
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**1 Slave**



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**20 Small Tomatoes**



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**1 Fully Ripe Avocado**



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**1 Turkey Cock**



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**1 Strip of Pine Bark**



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1 Large Tomato



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1 Turkey Egg



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1 Pumpkin



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### 230 Shrunken Cacao Beans (for full ones)



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### 1 Trip for a Porter



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### 1 Turkey Hen



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## 1 Fine White Cloak



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## 1 Rabbit



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## Answer Key for Facilitator



### The Price is Right: Special Aztec Cacao Edition Game

- 1 cacao bean = 5 long narrow green chilies
- 1 cacao bean = 1 fully ripe avocado
- 1 cacao bean = 1 large tomato
- 2 cacao beans = 20 small tomatoes
- 3 cacao beans = 1 turkey egg
- 4 cacao beans = 1 pumpkin
- 5 cacao beans = 1 large strip of pine bark
- 30 cacao beans = 1 small rabbit
- 20 cacao beans = 1 trip for a porter
- 100 cacao beans = 1 slave
- 100 full cacao beans or 100 shrunken beans = 1 good turkey hen
- 200 full cacao beans = 230 shrunken beans
- 240-300 cacao beans = 1 fine white cotton cloak
- 300 cacao beans = 1 turkey cock

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## Genetics

### Lesson Plan

This class will introduce participants to the general concepts of cacao genetics. There are modified options based on the ability for the facilitator to bring the participants to the field. If a field component is offered, students will observe, compare and contrast different genetic varieties of cacao with guidance from an experienced facilitator.

### Class design and duration

An interactive presentation with opportunities for Q&A, lasting approximately 1 hour. If the class takes place in a location with easy access to a cacao farm or clonal research facility, a field component lasting approximately 1 hours may be included. The facilitator could also select cacao pods and leaves prior to the class and bring the material to the classroom for the exercise.

### Objectives

- Support participants' knowledge of cacao genetics and help them to understand the influence of genetics on quality

### Materials

- Computer
- Projector
- Name tags
- Flipchart and markers
- Pencils
- If possible: Approximately 5 cacao beans and 10 grams of chocolate (made from the same beans) per student
- If possible: cocoa pods from different genetic varieties and dried beans, a tool for cut tests, adequate safety gear

### Link to Slide Presentation

[https://drive.google.com/open?id=1yJMtLOuiaGnc76vwP65Qt6owT3838K41oSD4732Sb\\_E](https://drive.google.com/open?id=1yJMtLOuiaGnc76vwP65Qt6owT3838K41oSD4732Sb_E)

ACTIVITY	CONTENT	MATERIALS	TIME	RESPONSIBLE
Introduction	Welcome, presentation of content, objectives and methodology	Computer, Projector	5 minutes	Facilitator/ Coordinator/ Director
Icebreaker	Facilitator's choice		5 minutes	Facilitator

Talk /Slide Presentation		Computer projector, flipchart, markers	35 minutes	Facilitator
Tasting Exercise: Beans and Chocolate (optional)	Identification of flavors and aromas consistent in samples	Approximately 5 cacao beans and 10 grams of chocolate per student	10 minutes	Facilitator
If a field component is included:				
Practice/group work: the participants are divided into groups and describe characteristics that differentiate one cacao pod/bean from other**	Identification of characteristics of beans and pods from different clones	Mature cacao pods, dry beans of different cacao clones, guillotine or pruning shears, safety gear	45 minutes	Facilitator
Group discussion	Discussion to share similarities and differences found, and relate discussion to the material in the slides		15 minutes	Facilitator
Conclusions, questions and answers.	Final discussion, questions and answers about the content	Cardboard, markers, flipchart	5 minutes	Facilitator

## Methodology *without* a Field Component

### Step 1: Welcome and Review Agenda

### Step 2: Slide Presentation

### Step 3: Tasting Exercise: Beans and Chocolate (optional)

During the slide presentation, you will see a cue for a tasting exercise called Beans and Chocolate. If you are able, please acquire cacao beans and a chocolate made from the same cacao beans prior to the class. It does not have to be the same lot or harvest of beans that was used to make the chocolate, but the goal is to have students identify flavor characteristics that are consistent across the two. The flavor characteristics should be associated with the topic of genetics, so the chocolate should have no added ingredients (a small quantity of sugar, vanilla or added cocoa butter is acceptable)..

You will provide students with a small sample size of the beans, and of the chocolate (approximately 5 beans and 10 grams of chocolate each). Please ask the students to remove the shells from the beans and discard the shells.

They will then have approximately 5 minutes to taste both and should note aroma or flavor characteristics of each on a piece of notebook paper. The whole class should then discuss their observations for 5 minutes. The facilitator should relate the tasting back to the theme of the relationship of genetics to flavor characteristics, noting that the post-harvest and chocolate-making processes can enhance or minimize the inherent flavor characteristics of the beans.

### Step 4: Conclusions, Q&A and comments

## Methodology *with* a Field Component

### Steps 1-2: Same as above

### Step 3: Field Visit (or with access to fresh cacao pods that can be brought to the classroom)

Group work - participants will be divided into small groups, they are given 4 different cacao pods to describe the characteristics that differentiate one from another and establish their similarities. The variables to be evaluated and analyzed are pods' size, color, shape, as well as cotyledons color and mucilage flavor.

Group Discussion - the facilitator will guide a discussion to share similarities and differences found, and relate the discussion to the material presented in the slides.

Possible Discussion Questions:

1. Are the pods the same shape, size and color? How are they similar? How are they different?
2. Can you tell if the pods are of the same genetic variety? How?

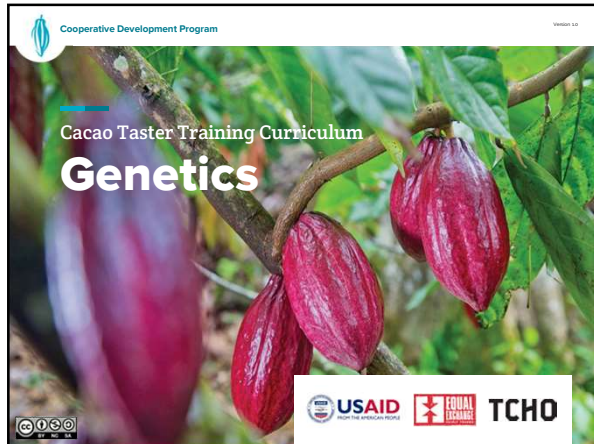
3. How would you identify the genetic variety of this cacao?
4. What are the most predominant aromas of the baba/mucilage in each pod?
5. Are the seeds (all chosen from the same pod) the same shape, size and internal color?
6. Taste at least three of the seeds. Are there any differences in flavor between any of them?
7. What are the most predominant aromas of the baba?

#### **Step 4: Conclusions, Q&A and comments**




#### **Appendices**

None

Cooperative Development Program VERSION 1.0



Cacao Taster Training Curriculum  
**Genetics**


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Cooperative Development Program VERSION 1.0

# Agenda

**Instructor:**

**Duration:** 1 hour\* or 2 hours\*\*

**Objective:** Provide a basic overview of the genetic diversity of cacao, and the relationship this has to cacao quality

1. Theobroma
2. Theobroma Cacao
  - a. Seeds
  - b. Flowers
  - c. Pods
3. Genetic Compatibility and Breeding
4. Genetics and Quality, Flavor

\*without a field component  
\*\*with a field component

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**Theobroma**

- 22 species
- "Food of the Gods"
- Common Fruit Varieties
  - *Theobroma Grandiflorum*
  - *Theobroma Bicolor*
  - *Theobroma Speciosum*
  - *Theobroma Cacao*




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## Theobroma Cacao

3 main agricultural groupings (Chessman 1944)

	Criollo	Forastero	Trinitario
<i>Pod Husk</i>			
Texture	soft	hard	mostly hard
Color	red	green	variable
<i>Seeds</i>			
Avg per pod	20-30	30 or more	30 or more
Color of cotyledons	White, ivory, or pale purple	Pale to deep purple	Variable, white seeds occur rarely

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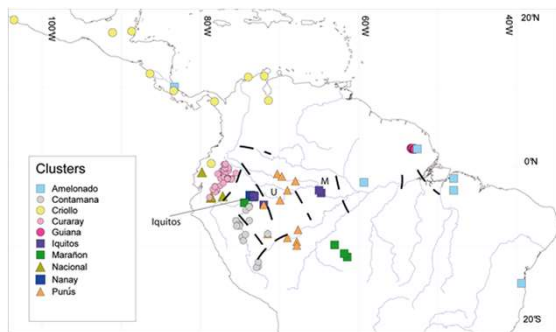
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## Motamayor's 10 Genetic Clusters




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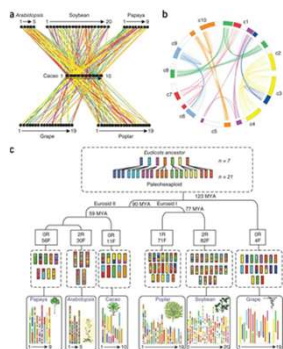
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## Mars Cacao Genome Project

"In 2008, Mars launched the **Cacao Genome Project**, an effort to publicly release the sequence of the cacao gene so breeders could begin identifying traits of climate change adaptability, enhanced yield, and efficiency in water and nutrient use."




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### Theobroma Cacao: An Odd Tree for Three Reasons

1. **Caulifory** - growth of flowers directly from the trunk
2. **Reproduction** - "Typically conservative reproductive proclivity"
3. **Multiple genetic varieties** - on one tree and in one pod



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### Cacao Pods

- Shapes
- Sizes
- Colors
- Ripening

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### Compatibility and Breeding - Juxtapositions

- Self-compatible
- Pollination/Sexual
- Productivity
- Farm
- Cross-compatible
- Grafting/Asexual
- Flavor
- Research Center

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### Reproduction

**Sexual**  
Reproduction

**Asexual**  
Reproduction

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## Genetics and Quality, Flavor

- There is a relationship but no automatic conclusions can be drawn
- Criollo and trinitario varieties considered more aromatic, but there are exceptions
- Flavor potential is developed during processing stages

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# Harvest and Post-harvest Processing

## Lesson Plan

A basic overview of harvest and post-harvest processes for cacao, and the relationship these have to cacao quality. There are modified options based on the ability for the facilitator to bring the participants to the field.

### Class design and duration

An interactive presentation with opportunities for Q&A, lasting approximately 1 hours. If the class takes place in a location with easy access to a post-harvest processing center, a field component lasting approximately 1 hours may be included.

### Objectives

- Participants strengthen their knowledge of cacao harvest and post-harvest, and are able to relate their effects on the organoleptic quality

### Materials

- Computer
- Projector
- Name tags
- Flip chart and markers
- Pencils
- If you have a field component at a post-harvest processing center you will also need: a tool for cut test of fermenting beans and any other safety gear as required by the site

### Link to Slide Presentation

<https://docs.google.com/presentation/d/1d0-2h8ui217NrKUVmHJj1K7xmE6JTU3lQhJUC5P0jk0/edit?usp=sharing>

ACTIVITY	CONTENT	MATERIALS	TIME	RESPONSIBLE
Introduction	Welcome, indications about the workshop	Computer, Projector	5 minutes	Facilitator/Coordinator/Director
Slide presentation	Cacao harvest and post-harvest	Projector, computer, flip chart, markers	50 minutes	Facilitator
If the course includes a field component:	Observation in the field	Cacao harvest and post-harvest center	60 minutes	Facilitator

Hands-on tour of the fermentation and drying process	with fermentation, drying and storage areas, tool for cutting beans, safety gear		
Conclusions, Q&A	Flip chart and markers	5 minutes	Facilitator

### Methodology *without* a Field Component

#### Step 1: Welcome and Review Agenda

#### Step 2: Slide Presentation

#### Step 3: Conclusions, Q&A and comments

### Methodology *with* a Field Component

#### Steps 1-3: Same as above

#### Step 4: Field Visit

Visit the processing center in order to observe cacao in fermentation boxes at different stages, doing a cut test of beans from the different stages. Then observe drying and storage areas. Identify control procedures and defects, discuss their influence on flavor and any possible corrective measures.

Possible discussion questions:

- What do you mean by quality in this context?
- How does the harvest influence cacao quality?
- What common mistakes are made during fermentation?
- What measures are taken into account to remove the cacao from fermentation boxes to the drying beds?
- What measures should be considered for proper storage?
- What happens when different types of cacao are mixed in the same fermentation box?
- What percentage of bean moisture is optimal during storage?


### Appendices

None

Cooperative Development Program

Cacao Taster Training Curriculum

# Harvest and Post-Harvest Processing



USAID WITH THE AMERICAN PEOPLE EQUAL OPPORTUNITY TCHO

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Cooperative Development Program

## Agenda

**Instructor:**

**Duration:** 1 hour\* or 2 hours\*\*

**Objective:** Provide a basic overview of harvest and post-harvest processes for cacao, and the relationship these have to cacao quality

1. Harvest
2. Fermentation
3. Drying
4. Storage

\*without a field component  
\*\*with a field component

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# HARVEST

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**Harvest**

- The process of collection of fruit (pods) - One must observe for color, size, sound, etc.
- Pods should be fully ripe for optimal quality - Care must be taken not to harvest underripe, overripe, or diseased pods




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**Common Diseases and Pests**

- Moniliasis or Frosty Pod Rot
- Phytophthora or Black Pod Rot
- Witches' Broom
- Cocoa Pod Borer
- Cocoa Mirid

**Bad Fruit = Bad Chocolate**




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**Pod Collection and Removing the Seeds**




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### Removing the Pods



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Always use clean buckets!



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Once the pods are collected, they are piled up at various points within the farm, empty pods serve as a natural refuge for pollinating insects



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Transporting the Cacao to the Collection Center



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Reception and Pre-draining



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FERMENTATION

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## Fermentation - Stages

1. **ANAEROBIC:** Fermentation of the sugars in the pulp that covers the seeds/beans. Sugars are transformed into alcohol and then into acetic acid (similar to grape fermentation to produce wine and vinegar)
2. **AEROBIC:** Acetic acid, produced externally, penetrates through the shell and produces biochemical reactions in the grain that are responsible for the formation of chocolate flavor precursors

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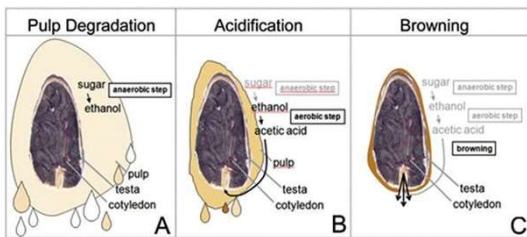
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## Fermentation



Fermentation time will depend on several factors: temperature, humidity, method, etc.

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## Monitoring the Fermentation: Time and Temperatures



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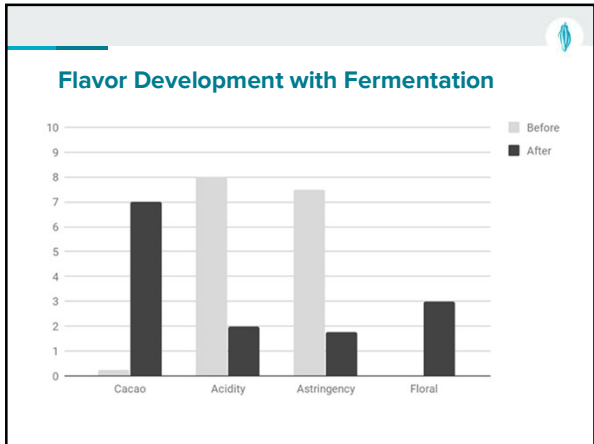
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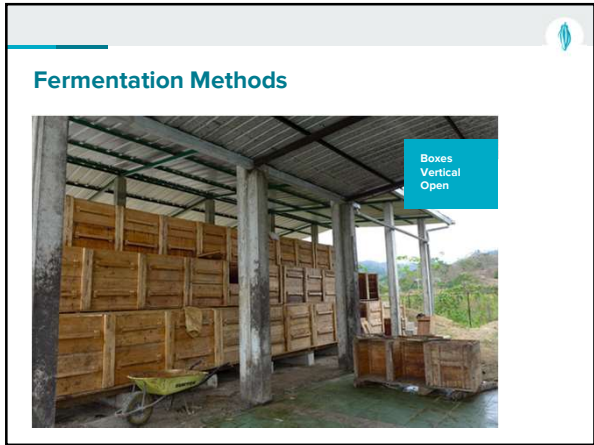
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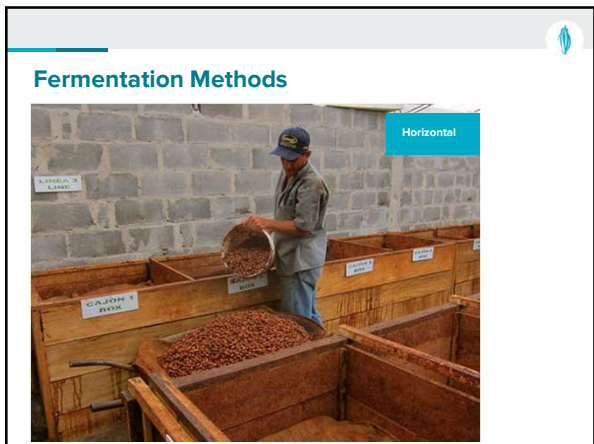
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## Fermentation Methods



Boxes  
Horizontal  
Pulley System  
Semi-Closed

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## Fermentation Methods



Tray  
Fermentation  
Modules

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## DRYING

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### Drying

Drying times are generally about 7 days, but like fermentation times, they will vary with weather conditions, the type of cacao, and other factors.



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### Drying Methods



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### Drying Methods



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**Drying Methods**



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**Drying Methods**



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**Monitoring the Drying Process**



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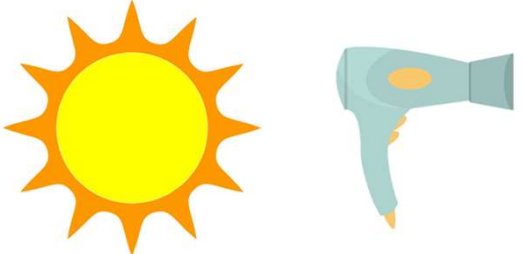
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**Drying Methods**



The image shows two methods of drying: a bright yellow sun with orange rays on the left, and a light blue hair dryer on the right. Both are set against a white background within a rectangular frame.

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**STORAGE**

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**Storage Considerations**

- 7% Humidity
- Due to its high hygroscopic power (ability to absorb moisture from the environment), dry cacao beans should be stored in suitable dry conditions, avoiding contact with floors and walls.
- Avoid storage near agrochemicals, fuels, trash
- Contact with domestic animals should be prevented
- Bags should never be reused

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# Sensory Analysis

## Lesson Plan

A theoretical and practical workshop that will provide a basic explanation of sensory analysis through hands on activities. Students will learn to identify basic flavors and experience a variety of natural products that are commonly used to describe attributes found in cacao.

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### Class design and duration

2.5 hours

### Objectives

- Introduce participants to sensory analysis
- Explain how humans identify and understand flavors
- Develop skills to recognize basic flavors
- Introduce participants to natural flavors that can be found in cacao tasting

### Materials

- Computer
- Projector
- Name tags
- Flipchart and markers
- Pencils
- Soft candies
- Bottled water, white sugar, white salt and citric acid
- Plastic cups (18 per participant)
- Products for the “Flavors Buffet” - cocoa, nuts, dry fruits, fresh fruits, floral, spices and vegetables (detailed below)
- Bowls for the products at each station in the buffet
- Water for drinking
- Activity Forms: see Appendix

### Link to Slide Presentation

<https://docs.google.com/presentation/d/1WFGuLPIBWwD8m4BnmBWxP2lrw7nggan9lXbV-K45WPg/edit?usp=sharing>

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ACTIVITY	CONTENT	MATERIALS	TIME	RESPONSIBLE
<b>Welcome</b>	Agenda Review	multimedia	5 minutes	Facilitator
<b>Slide presentation</b>	Sensory Analysis Overview	multimedia	25 minutes	Facilitator
<b>Tasting</b>	Basic Flavor Identification	Solutions, taste sheet, exam copies	40 minutes	Facilitator + participants
<b>Break</b>			5 minutes	Facilitator + participants
<b>Tasting</b>	Flavor Buffet	Specific flavors: a) Nuts b) Dry fruits c) Fresh fruits d) Floral e) Spices f) Vegetable	60 minutes	Facilitator + participants

## Methodology - Advance Preparation

### Step 1: Preparation of basic flavors (previous night)

The instructor will prepare the solutions of three basic flavors: white salt, white sugar (refined) and citric acid. It is very important to prepare the blends the night before because sugar and salt need time to dissolve. The citric acid can be liquid or powder; both are available through several suppliers. Check that the citric acid is food grade. Write the corresponding code on each container. The instructor should taste each flavor and intensity to confirm that the recipe is correct before using it for the class. The amount of water and materials to be purchased for this exercise will depend on the size of the group. Generally, two liters of each flavor for a group of 8-10. The instructor will need to calculate the amount of liquid needed depending on the number of students in the class. See the recipes below:

### Step 2: Basic Flavor Recipes: concentration of flavors in grams for 2 liters of water

#### White Salt

INTENSITY	CONCENTRATION	PRACTICE CODE	EXAM CODE
1	2 grams/2 liters	126	236
2	4 grams/2 liters	131	291
3	6 grams/2 liters	126	278



## White Sugar

INTENSITY	CONCENTRATION	PRACTICE CODE	EXAM CODE
1	15 grams/2 liters	146	263
2	30 grams/2 liters	195	284
3	45 grams/2 liters	108	241

## Citric Acid

INTENSITY	CONCENTRATION	PRACTICE CODE	EXAM CODE
1	3 grams/2 liters	129	217
2	6 grams/2 liters	184	273
3	9 grams/2 liters	135	258

### Step 3: Label Plastic Cups

Calculate how many glasses of each flavor are needed for the samples. Each participant will receive nine glasses (three for each basic flavor). The glasses should be between three and four ounces. The instructor will label plastic cups with all of the Practice Codes and the Exam Codes listed above.

### Step 4: Preparation of Flavors Buffet (morning or day before event)

In order to prepare the Flavors Buffet, it is important to use a clean space that does not contain aromatic foods (such as garlic). There is a list of specific products for this exercise. If any of the mentioned products are not available, you can substitute them with something similar or local. Each station will include 3 or 4 products. Cut the products into small pieces and place them in bowls. For each product, write the name and its category. (Example: "Orange - fresh fruit")

### Recommendations:

**Cocoa/Cacao:** nibs, cocoa powder, brownie, chocolate

**Nuts:** peanuts, cashew, almonds, walnut

**Fresh fruits:** lime, orange, banana, pineapple

**Dry fruits:** raisins, prunes, cherry, peach

**Floral:** honey, black tea, orange flower, jasmine

**Sweet:** brown sugar, powdered sugar, agave syrup

**Spices:** cinnamon, black pepper

**Other:** cucumber, green pepper, green beans

## Methodology - Day of the Class

### Step 1: Welcome and Review Agenda

### Step 2: Activity/Ice Breaker

Sensory analysis involves all the senses: sight, smell, taste, touch and hearing. The objective of this activity is to connect the participants with their senses and explain what happens between the mind and the body.

Give all the participants a wrapped candy to observe. It is important to use a soft, not hard candy, because part of the candy may remain in the teeth. Start with sight, ask the class: What can you see? It is important to wait a moment in silence so that participants can think about their experience. After a few seconds, ask about their observations. Continue with the rest of the senses one by one and have the students unwrap the candy

- Sight
- Touch
- Hearing
- Smell
- Taste

Thank participants.

### **Step 3: Slide Presentation**

The instructor will describe the basics of sensory analysis through a slide presentation. Each slide has detailed notes in the presenter notes section of the presentation.

### **Step 4: Pouring basic flavor samples**

The instructor or assistant will prepare the samples for the Practice exercise. All of the sample bottles should be shaken vigorously to ensure that they have been well blended. Samples are then poured into the corresponding coded cup. For example, the cups marked with code 150 will be filled with the solution marked as 150. Fill all of the cups for the Practice activity. Each student will receive 9 cups for the Practice activity. All Codes are listed above in the recipes section.

When all 9 cups are ready, give them to each participant. Do not put the glasses in numerical order. Participants will also receive a form for the practice.

### **Step 5: Order of Cups**

The instructor will explain how to order the cups and will clarify any questions. This information will have been reviewed in the slide presentation.

### **Step 6: Basic Flavors Practice**

The participants will taste the 9 flavors of different intensities and write the flavor code. See Appendix A. The instructor will review the answers at the end of the exercise.

### **Step 7: Pouring exam cups**

The instructor or assistant will prepare the samples for the exam. For example, the cups marked with code 263 will be filled with the solution labelled as 263. Fill all of the cups for the EXAM. Each student will receive 9 cups for the Exam. All Codes are listed above in recipes section

### **Step 8: Order of Cups**

The instructor will review how to order the glasses and will clarify any questions.

### **Step 9: Basic Flavors Exam**

The participants will taste the 9 flavors of different intensities and write the code on the sheet that matches the flavor and intensity.

### **Break**

### **Step 10: Organizing Flavor Buffet Stations**

Each station will have its own table. The instructor or assistant will place the products of each flavor on the table in the corresponding station.

### **Step 13: Form small groups**

Participants will be divided into small groups of 3-4 people. The instructor will assign each group a number and their first station.

### **Step 14: Flavors Buffet**

Each student will receive a form to describe the flavors they experience at each station. Participants will spend 8 - 10 minutes at each station: 3-5 minutes to smell, taste and write their observations in silence and then to discuss as a group. The group will then go to another station to perform the same activity with another group of flavors. It is important that the instructor guides participants to smell before tasting the flavors and to work in silence.

### **Step 15: Q & A**

Finally, everyone is thanked for participating and the facilitator takes time for Questions

## **Appendices**

Appendix A: Basic Flavor Practice and Exam Sheet

Appendix B: Flavor Buffet Worksheet

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Basic Flavor Practice Sheet

	Intensity 1 (LOW)	Intensity 2 (MEDIUM)	Intensity 3 (HIGH)
Sweet			
Sour			
Salt			

## Basic Flavor Exam

	Intensity 1 (LOW)	Intensity 2 (MEDIUM)	Intensity 3 (HIGH)
Sweet			
Sour			
Salt			

Name: \_\_\_\_\_

Date: \_\_\_\_\_

# Flavor Buffet Worksheet

Page 1 of 2

**Station:**

Product	Aroma	Flavor

**Station:**

Product	Aroma	Flavor

**Station:**

Product	Aroma	Flavor

**Station:**

Product	Aroma	Flavor

# Flavor Buffet Worksheet

**Station:**

Product	Aroma	Flavor

**Station:**

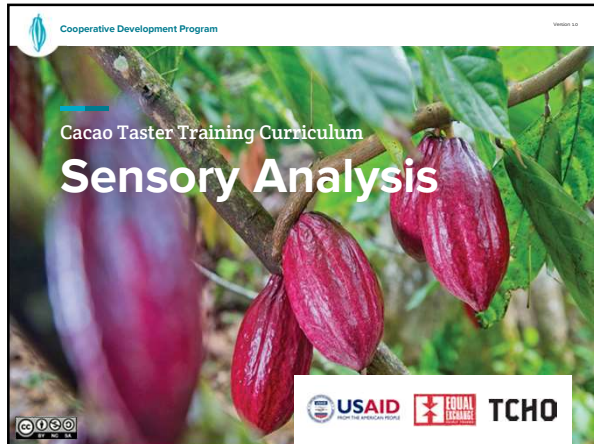
Product	Aroma	Flavor

**Station:**

Product	Aroma	Flavor

**Station:**

Product	Aroma	Flavor




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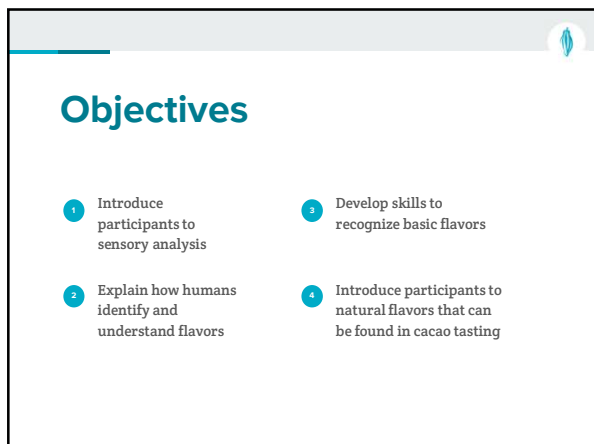
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## What is Sensory Analysis?

Description and evaluation of food products' flavor:  
I.e: wine, coffee, cheese, etc.

Scientific discipline used to describe, measure, analyze and interpret those characteristics that are perceived by the senses:  
**sight, smell, taste, touch, and hearing.**



### Training

To be a cacao taster it is necessary to understand the purpose and the required skills to analyze cacao in a subjective way.

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## The Senses

Senses can not be separated from interaction. The mind perceives all stimuli in a multimodal way. Expectation and psychology influence the perception of taste.

- 01 | Sight
- 02 | Touch
- 03 | Hearing
- 04 | Smell
- 05 | Taste



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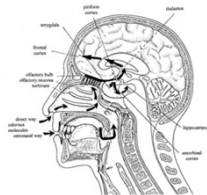
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## Aroma and Flavor

- Odor receptors are found in the nasal membrane.
- The nasal membrane can distinguish between thousands of different aromas.
- Taste is a combination of the basic flavors and aromas experienced retronasally in the nasal cavity connected to the mouth through the throat.
- The average person can differentiate between 2000 and 4000 aromas.



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## Basic Flavors

The tongue map has been misinterpreted for more than 100 years.

- 01 | Sweet
- 02 | Sour
- 03 | Bitter
- 04 | Salty
- 05 | Umami



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## Each person is different

Super taster

25%

Very sensitive to all flavors.

Taster

50%

Most tasters.

Non taster

25%

Does not have (much) sensitivity to bitter or can not learn how to taste bitter. A person is born with this ability.

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## Sensory Memory

Familiar flavors and developing a flavor vocabulary



We can only recognize what we already know.

Everything we perceive is compared to information recorded in the memory.



The more information and experience you have with different flavors, the easier and faster it will be to identify them.

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## Tasting Space and Rules

- It is important to work in a proper place without odor and without noise that may hinder concentration.
- Avoid spicy foods, alcoholic beverages or tobacco.
- You should not have a cold, flu or cough, as you will not be able to participate in tasting sessions.
- Silence during the tasting.




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Exercise

## Basic Flavors

Recognize three of the four basic flavors in solutions:

- 01 | Sweet
- 02 | Salty
- 03 | Sour

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Exercise

## 1 - Practice Round

Sort the randomized samples by taste and intensity into the following grid:

	Intensity 1 Low	Intensity 2 Medium	Intensity 3 High
Flavor: Sweet	●	●	●
Flavor: Sour	●	●	●
Flavor: Salty	●	●	●

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Exercise

## 2 - Exam Round

Sort the randomized samples by taste and intensity into the following grid:

	Intensity 1 Low	Intensity 2 Medium	Intensity 3 High
Flavor: Sweet	●	●	●
Flavor: Sour	●	●	●
Flavor: Salty	●	●	●

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Exercise

## Flavor Buffet

Familiar and unfamiliar flavors expand sensory memory and vocabulary

- 1 Smell all products on the table. Write down your observations.
- 2 Taste each flavor and describe flavors.
  - Sweet, sour, bitter or salty?
  - Other flavors?

*10 minutes at each station*

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Questions?

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# Introduction to the Cacao Sensory Analysis Tasting Form

Lesson Plan

The concept of tasting and its objectives are presented, as well as an explanation on tasters' training, the preparation of cacao liquor, and the tasting of cacao liquor. Tasting is presented in 3 different ways: descriptive analysis, intensity and the CDP Cacao Sensory Analysis Tasting Form. Students will taste cacao liquor multiple times.

## Class design and duration

Approximately 03 hours

## Objectives

- This class will offer guidance on how to prepare a cacao tasting session, instruct users on the use of the Tasting Form and ends with practical exercise in tasting cacao liquor
- Introduce the CDP Cacao Sensory Analysis Tasting Form
- Develop tasters abilities and confidence in the use of the Tasting Form

## Materials

- Computer
- Projector
- Name tags
- Flip Chart and markers
- Pencils
- Drinking water (at room temperature)

## Additional Materials by Quantity

Quantity	Item
15-20	Descriptive Analysis Tasting Form
15-20	Intensity Analysis Form
30-40	Cacao Sensory Analysis Tasting Form
15-20	Guide to the Cacao Sensory Analysis Tasting Form
6	Cocoa liquor samples (min. 300 gm of each sample)
100	Crackers without salt
50	Disposable cups
2	Rolls of paper unscented paper towels

**Link to Slide Presentation**

<https://docs.google.com/presentation/d/1aNEbICiqXpF0fyWpclghUVuWM0e7HUNCfCSfhcpmFNc/edit?usp=sharing>

ACTIVITY	CONTENT	MATERIALS	TIME	RESPONSIBLE
<b>Welcome and review agenda</b>			5 minutes	Facilitator
<b>Introduction to Concepts</b>	Tasting concepts will be introduced/ reviewed, objectives and tasters' training will be defined, the different ways that people taste cacao liquor	Projector, computer	25 minutes	Facilitator
<b>Tasting Exercise: Descriptive</b>	Descriptive Analysis: Taste Chocolate liquor	Descriptive Analysis form, paper and pencils	15 minutes	Facilitator
<b>Tasting Exercise: Intensity</b>	Intensity: Taste 2 types of Chocolate liquor	Intensity form, pencils	15 minutes	Facilitator
<b>Break</b>			5 minutes	
<b>Introduction to the Cacao Tasting Form</b>		Projector, computer	25 minutes	Facilitator
<b>Tasting Exercise: Whole Form</b>	Taste 1 sample using the CDP Sensory Analysis Tasting form & discuss	CDP Cacao Sensory Analysis Tasting Form	30 minutes	Facilitator

<b>Tasting Exercise: Astringency and Bitterness</b>	Taste 1 sample focusing on Astringency & Bitterness and discuss	CDP Cacao Sensory Analysis Tasting Form	30 minutes	Facilitator
<b>Tasting Exercise: Whole Form</b>	Taste 1 sample- Use entire form & discuss	<b>Tasting Form</b>	30 minutes	Facilitator
<b>Workshop Evaluation</b>			10 minutes	Facilitator

## Methodology

### Step 1: Welcome

The instructor reviews the agenda, asks students to turn off cell phones and reviews the rules of silent work during tastings.

### Step 2: Slide Presentation

Instructors will use the information presented on the slides in combination with the presenter notes written on each slide to guide the presentation.

### Step 3: Descriptive Analysis

Students will receive a small empty cup, a napkin, descriptive analysis sheet to write their comments on before the activity begins. A bowl of the blind coded chocolate liquor sample will then be passed around the table and students will use the spoon or tongs to remove one sample and place it into their respective cups.

### Step 4: Intensity Analysis

Students will utilize the same small empty cup from the previous activity, but will be given additional napkins if necessary and a copy of the Intensity worksheet before the activity begins. A bowl of the blind coded chocolate liquor sample will then be passed around the table and students will use the spoon or tongs to remove one sample and place it into their respective cups.

### Step 5: Presentation: Introduction to the CDP Cacao Sensory Analysis Tasting Form

Instructors will use the information presented on the slides in combination with the presenter notes written on each slide to guide the presentation.

### Step 6: Activity: Cacao Tasting (3 parts)

Cacao Tasting 1- Use the whole form:

Students will be presented with one blind labelled sample and using the information given in the presentation will work to silently smell and then taste the sample and fill out the form. Students will have 10 minutes for the tasting exercise. Once students have completed the form, they will write

down their observations on a joint tasting form at the front of the classroom. The facilitator will then discuss the results.

Cacao Tasting 2- Astringency and Bitterness

Repeat the steps above from Cacao Tasting 1, however students will be instructed to only focus on astringency and bitterness in the CDP Sensory Analysis Tasting Form.

Cacao Tasting 3- Use the whole form

Repeat the steps above from Cacao Tasting 1

### **Step 6: Q&A**

### **Appendices**

Appendix A: Descriptive Analysis Form

Appendix B: Intensity Form

Appendix C: CDP Cacao Sensory Analysis Tasting Form and Instructions

## **DESCRIPTIVE ANALYSIS PROFILE**

PRODUCT: \_\_\_\_\_

CODE NUMBER: \_\_\_\_\_

EVALUATION DATE: \_\_\_\_\_

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**AROMA:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**FLAVOR (in order of appearance):**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

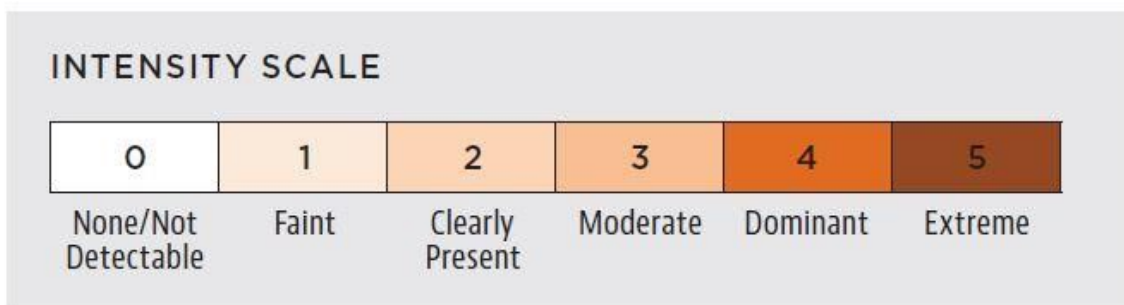


Name:

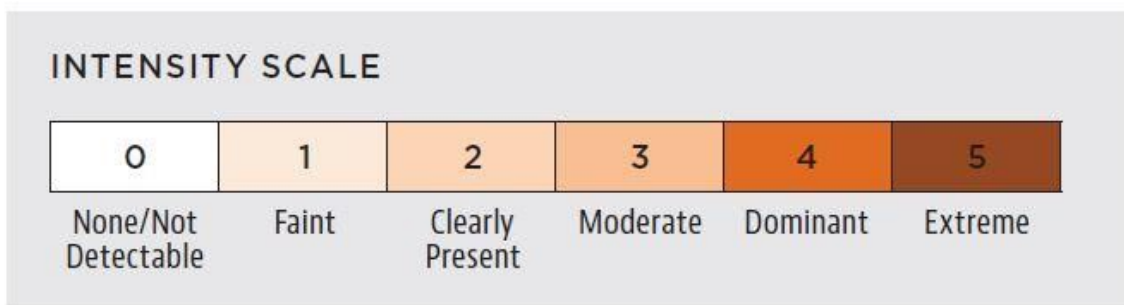
Date:

## Intensity Tasting Exercise

Sample Code:



Sample Code:





# CACAO SENSORY ANALYSIS

Tasting Form

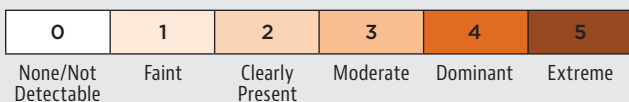
SAMPLE \_\_\_\_\_

TASTER \_\_\_\_\_

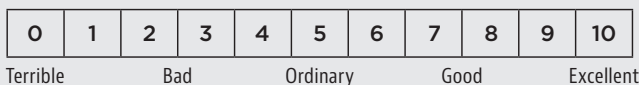
DATE \_\_\_\_\_

CATEGORIES		INTENSITY	NOTES	QUALITY (0-10)	POINTS
<b>Aroma</b>		0 1 2 3 4 5 			x 1 =
<b>Acidity</b>		0 1 2 3 4 5 			x 1 =
<b>Bitterness</b>	<b>INTENSITY</b> 0 to 2.5: ≥ 5 in quality 2.5 to 5: ≤ 5 in quality	0 1 2 3 4 5 			x 1 =
<b>Astringency</b>		0 1 2 3 4 5 			x 1 =
<b>Defects</b>		0 1 2 3 4 5 			x 2 =
<b>Flavor</b>	Cocoa/Cacao	0 1 2 3 4 5 			x 2 =
	Sweet	0 1 2 3 4 5 			
	Nutty	0 1 2 3 4 5 			
	Dried Fruit	0 1 2 3 4 5 			
	Fresh Fruit	0 1 2 3 4 5 			
	Floral	0 1 2 3 4 5 			
	Spices	0 1 2 3 4 5 			
	Other				
<b>Aftertaste</b>		0 1 2 3 4 5 			x 1 =
<b>COMMENTS:</b>			<b>TASTER'S POINTS</b>		x 1 =
<b>FINAL SCORE</b>					

### INTENSITY SCALE



### QUALITY SCALE



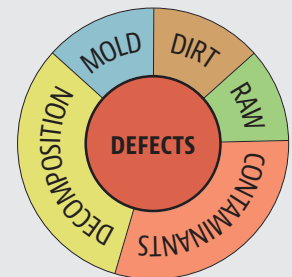
### TIPS TO SCORE QUALITY FOR DEFECTS

#### Name the defect:

A reduction in quality points should be defined in the notes.

#### Inverse relationship:

As the defect flavor(s) increase in intensity, the quality score decreases.



# Tasting Form Instructions

The goal of these instructions is to give users of the form a quick and basic guide to its use. For more in-depth information, please reference the *Guide to the Cacao Sensory Analysis Tasting Form* or contact us at [cacaoquality@gmail.com](mailto:cacaoquality@gmail.com)

## Filling in the Form

**Aroma** Smell the sample. Mark the intensity of the aroma on the first scale, write any characteristics that you find in the notes section, and score the quality. Remember that a low intensity or even absence of aroma does not imply a lower quality.

**Acidity** The relationship between intensity and quality varies depending on the perception and description of the acids that the taster finds during the evaluation. For example, if the taster perceives a citric or fruity acid, the score may be higher than if the acidity is more like vinegar (acetic acid).

**Bitterness and Astringency** These are inherent characteristics of cacao, but the level of intensity can influence the quality, and there is often an inverse relationship. For example, a bitterness level that is 'Clearly Present' with an intensity of 2, might have a score between 'Good' and 'Excellent' in quality; while a higher intensity of bitterness may decrease the quality.

Example:

CATEGORIES	INTENSITY	NOTES	QUALITY (0-10)	POINTS
<b>Bitterness</b>	0 1 2 3 4 5 [ ] [ ] [X] [ ] [ ] [ ]	mild bitterness	8	x 1 = 8

This example is consistent with the guideline provided on the form for bitterness and astringency, which indicates that an intensity score lower than or equal to 2.5 may result in a quality score of 5 or higher.

**Defects** Increased intensity of defects means a lower score in quality. For example, if you find a strong flavor such as dirt that is 'Dominant' with an intensity of 4, your quality score will likely be between 'Terrible' and 'Bad'.

Example:

CATEGORIES	INTENSITY	NOTES	QUALITY (0-10)	POINTS
<b>Defects</b>	0 1 2 3 4 5 [ ] [ ] [ ] [X] [ ] [ ]	dirt	1.5	x 2 = 3

If quality points are deducted, the taster should write the name of the specific defect in the notes section. If the sample is clean or free of defects, it should be scored as 'Excellent' in quality. To the right we offer some general categories of defects and some specific examples of common defects within those categories.

**Flavor** The taster need only evaluate the characteristics that are perceived, as not all can be found in every sample. The quality score is based on a combination of factors including the harmony, clarity and complexity of the flavors.

**Aftertaste** The residual flavor left in the mouth after the sample has dissolved completely.

**Taster's Points** The taster's general impression and subjective quality score for the sample.

**Comments** This space is for observations which are not noted elsewhere (for example: appearance, texture). The taster may also use Comments to prepare a summary of the evaluation and recommendations.

**Final Score** A cumulative total of all quality points. The highest possible final score is 100 points.

## Using the Scales

This form contains two types of scales. The purpose of the Intensity Scale is to develop a **flavor profile** of the samples, while the Quality Scale helps to identify the sample's **potential**. Remember that there is no direct relationship between intensity and quality, except in the case of Bitterness, Astringency and Defects. Half points are permitted when scoring on either scale.

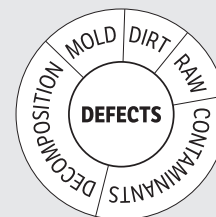
### INTENSITY SCALE

0	1	2	3	4	5
None/Not Detectable	Faint	Clearly Present	Moderate	Dominant	Extreme

### QUALITY SCALE

0	1	2	3	4	5	6	7	8	9	10
Terrible		Bad		Ordinary		Good		Excellent		

## Examples of Defects



**MOLD**  
musty, basement, mildew

**DIRT**  
mud, wet earth, dust

**RAW**  
vegetal, unripe, grassy, green

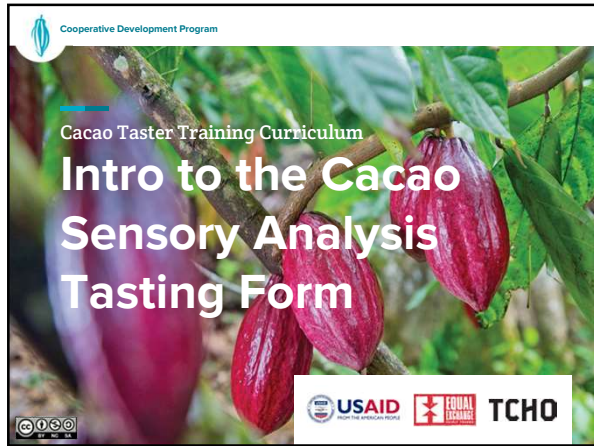
**CONTAMINANTS**  
plastic, chemical, smoke, metal, petrol

**DECOMPOSITION**  
hammy, meaty, rancid, putrid, compost

Note: Do not deduct points in defects for aroma, bitterness or astringency—these are evaluated in their respective categories.

TIP

A maximum evaluation time of 10 minutes per sample is recommended.




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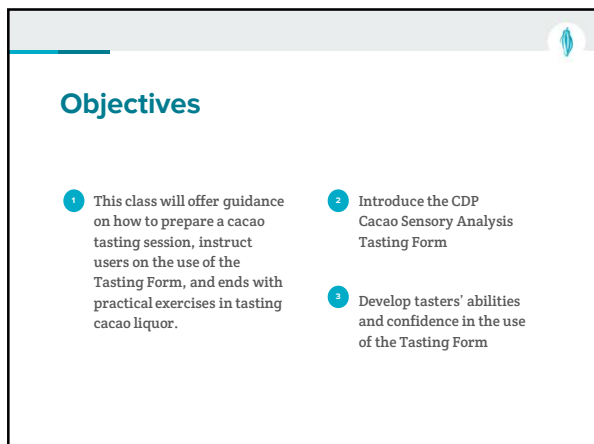
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## Tasting Methodologies

- What are you trying to achieve?
- What is a practical method for that purpose?

Methodologies:

- Raw Cacao (FCCI)
- Cocoa Liquor (CDP, Cacao of Excellence)
  - Liquid
  - Solid
- Chocolate (Private Companies)

*Sensory Standards Development*

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## Why Taste Liquor

- Creates feedback loop for the supply chain on quality
- Mimics chocolate processing & shows flavor potential
- Develops flavors through roasting and refining
- Creates a reference by blending beans together to make a representative sample
- Widely accepted form of sensory analysis
- Food safety

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## How to taste Liquor - Solid vs Liquid

<p style="text-align: center; color: #008080; font-weight: bold; margin-bottom: 10px;">Solid - tempered</p> <ul style="list-style-type: none"> <li>• Stable and can taste anywhere</li> <li>• Has the flavor release of chocolate with the melt contributing to the flavor appearance over time</li> <li>• Can accommodate a large group for tasting and be taken to the field without electricity</li> </ul>	<p style="text-align: center; color: #008080; font-weight: bold; margin-bottom: 10px;">Liquid - melted</p> <ul style="list-style-type: none"> <li>• Requires melting to a specific temperature for a specific amount of time</li> <li>• Internationally recognised standard with scientific data behind it</li> <li>• Has a faster flavor release</li> </ul>
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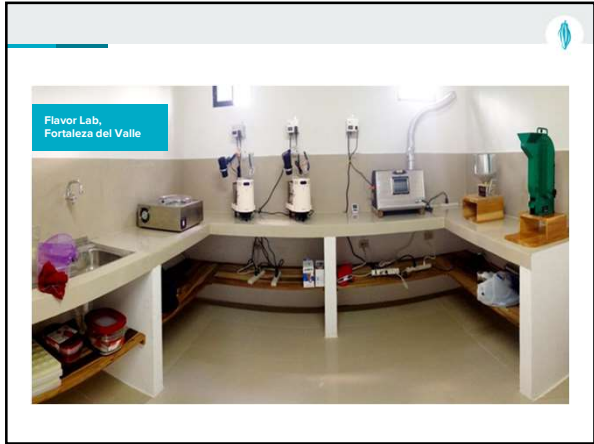
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### How to Prepare a Sample



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### Tasting Panels

- Size
- Selection:
  - aptitude + availability
  - power + applicability
- Schedule: daily/biweekly, weekly
- Functions: commercial, educational



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### How to Prepare for a Tasting



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## Alignment and Calibration

- Challenging - takes time and training
- Reference samples are needed for positive and negative attributes
- Regional differences in cacao flavor- language, sensory references unknown in other places are issues
- Use of cloud based systems like Cropster & Skype for real time feedback among groups & to compare results can be helpful

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## Developing a common language of taste



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### Tasting for Sensory Analysis

Aroma- smell each sample in the cup and write your comments

Tasting- place chocolate liquor in your mouth, masticate/chew the sample and let the chocolate liquor melt in your mouth

Use your spittoon

Silence/no talking

No cell phones or distractions

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### Descriptive Analysis Exercise - 15 minutes

- To practice descriptive analysis, one should use all of the vocabulary possible from one's sensorial memory to complete the analysis thoroughly.
- For example, if the taster perceives a citrus flavor, is it possible to refine the description to lime, or grapefruit, or orange, or tangerine?
- Exercise:** describe what you perceive in a free-flow manner:
  - Aroma
  - Flavor

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### Intensity Exercise

**INTENSITY SCALE**

0	1	2	3	4	5
None/Not Detectable	Faint	Clearly Present	Moderate	Dominant	Extreme

What is intensity?

- Attributes are graded on a scale of 0 (absent) to 5 (extreme)
- Acidity- what is it?
- Which of these two chocolate liquor samples is more intense in acidity?
  - Grade the intensity of acidity for each sample

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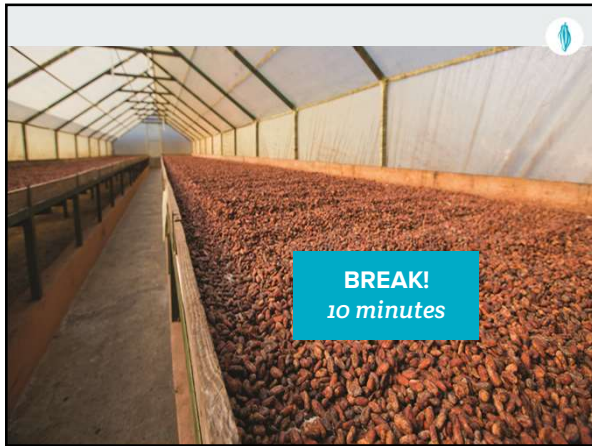
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**The Tasting Form is a tool that allows us to evaluate a sample of cacao with the objectives of:**

- Improving post-harvest practices
- Defining the use of the sample that is being tested
- Creating a sensory profile of the sample
- Gauging the quality of the sample

ATTRIBUTE	INTENSITY	NOTES	WEIGHT	POINTS
Aroma	1-5		10%	5%
Acidity	1-5		10%	5%
Bitterness	1-5		10%	5%
Astringency	1-5		10%	5%
Defects	1-5		10%	5%
Flavor	1-5		50%	25%
Aftertaste	1-5		10%	5%

**FINAL SCORE**

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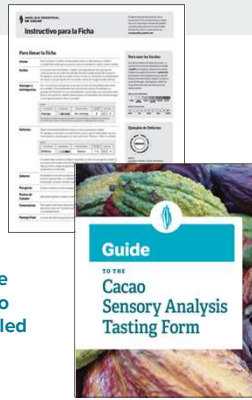
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The objective of the *Instructions* page on the back of the Tasting Form is to provide the user with a quick and easy guide.

The objective of the separate *Guide* is to provide more detailed information and various examples.




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The structure of the Tasting Form includes multiple methods of sensory analysis:

- Intensity scale
- Descriptive analysis
- Quality scale

**Using the Scales**

This form contains two types of scales. The purpose of the Intensity Scale is to develop a **flavor profile** of the samples, while the Quality Scale helps to identify the sample's **potential**. Remember that there is no direct relationship between intensity and quality, except in the case of Bitterness, Astringency and Defects. Half-points are permitted when scoring on either scale.




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**Intensity Scale**



- Helps to develop a flavor profile of the sample
- Attributes are graded on a scale of 0 (absent) to 5 (extreme)
- During the analysis, the intensity of any of the categories can vary and change. The taster can mark the scale with their initial impression and indicate with an arrow a change in the intensity
- For most sections of the form, intensity is NOT directly correlated to quality. Exceptions are clearly noted: Bitterness, Astringency and Defects.
- Half-points are permitted

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### Intensity Scale

- 0 = None, not detectable
- 1 = Faint, weak presence
- 2 = Clearly Present, not difficult to perceive
- 3 = Moderate, indicating a distinctive feature
- 4 = Dominant, this attribute may mask or overpower other characteristics of the sample
- 5 = Extreme, the presentation of this attribute is the most intense possible for cacao in the sensorial memory of the taster

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### Notes/Descriptive Analysis

- This is an opportunity on the Tasting Form to provide more detail than the numeric scores provide
- Think about your references and sensorial memory
- For example, if the taster perceives an acetic acid, is it possible to specify that the acetic acid is reminiscent of red wine vinegar, for example
- This skill is built over time

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### Quality Scale

- Helps to identify the sample's potential
- Attributes are graded on a scale of 0 (terrible) to 10 (excellent)
- During the analysis, the perception of quality of any of the categories can vary and change. The taster can mark the scale with their initial impression and indicate with an arrow a change in the quality
- Half-points are permitted

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## Aroma

A sensory perception based on one's olfactory senses, such as the sense of smell.

- Analyze before putting sample in mouth
- Aroma / Odor / Fragrance

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## Acidity

The organoleptic property produced by pure or mixed substances, that when tasted generate acid flavor like citrus. Acid is the elemental flavor caused by diluted aqueous solutions of acidic substances, such as citric acid or tartaric acid

The relation between intensity and quality varies depending on the perception and description of the types acids found during the tasting.

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## Acidity

### Acid References

- **Citric acid:** lime, orange, clementine, grapefruit, etc.
- **Malic acid:** apple
- **Tartaric acid:** grapes, tamarind
- **Acetic acid:** vinegar, sour
- **Lactic acid:** sour milk, yogurt
- **Butyric acid:** rancid butter, fatty foods, vomit
- **Nitric acid:** putrid meat



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## Bitterness and Astringency

There is an inverse relationship between the intensity of the bitterness and astringency and the quality score.

**INTENSITY**  
**0 to 2.5:** ≥ 5 in quality  
**2.5 to 5:** ≤ 5 in quality

- If the taster identifies a level of intensity between Absent with an intensity of 0, and Present with an intensity of 2-2.5, the quality rating might be Ordinary, Good or Excellent.
- If the taster identifies a level of intensity between Clearly Present with an intensity of 2.5-3, and Extreme with an intensity of 5, the quality rating might be Ordinary, Bad or Terrible.

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## Bitterness

An organoleptic property produced by pure or mixed substances, that when tasted generate a bitter flavor. Bitterness is the elemental flavor caused by dilute aqueous solutions of various substances, such as quinine or caffeine.

Bitterness References:

- Citrus peel and pitch
- Burnt coffee, caffeine
- Chicory, verbena
- Aspirin

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## Astringency

Astringency refers to the puckery or drying sensation created in the mouth and throat (primarily on the surface of the tongue).



Astringency References:

- Nut skins, seeds of certain fruits
- Unripe or under-ripe fruits, peels of fruits such as bananas or plantains
- Oversteeped tea, some red wines

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## Defects

This category is defined by the presence of defective flavors that are not characteristic of cacao, generally associated with a deteriorating condition or transformation affecting the product.



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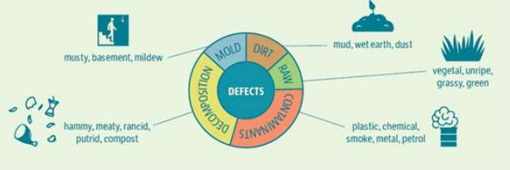
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## Defects

### DEFECTS REFERENCES



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## Steps to Analyze Defects

1. Inverse Relationship!
2. Any reduction in quality points should be defined in the notes. If the sample is clean or free of defects, the quality score is Excellent.
3. Remember that, in this case, flavors or textures related to the processing of the sample during roasting or grinding are not Defects!
4. Multiply the score by TWO.

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## Flavor

The impression caused by a food or another substance, which is determined primarily by chemical sensations detected via taste (the tongue) and smell (the retronasal cavity).

References:

**Cocoa/Cacao:** chocolate, fudge, brownie, cocoa powder, nibs

**Sweet:** candy, honey, cane sugar/panela, malt, molasses, brown sugar

**Nuts:** peanuts, almonds, pecans, pistachio, and others

**Fresh fruits:** apples, banana, melon, pineapple, cherry, grapes

**Dry fruits:** raisins, prunes, dried fig, dried cherry, dried peach

**Flowers:** roses, jasmine and others

**Spices:** cinnamon, cloves, basil, oregano, bay

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## Steps to Analyze Flavor

1. Perceived positive or neutral flavors, taking into account that negative flavors are evaluated mainly in Defects. The relationship between intensity and quality varies depending on the perception and description of the flavors found during the tasting.
2. Harmony, clarity, complexity.
3. Multiply the score by TWO.

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## Aftertaste

The residual flavors left in the mouth and on the palate, after the sample has dissolved completely.

1. When the sample has been completely ingested or/and has been exhaled, the taster analyzes residual flavors in the mouth.
2. Evaluate for approximately one minute.

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## Taster's Points

The taster's general impression and subjective quality score for the sample, taking into account all of the other categories of evaluation. In this category, the taster can rate the sample based on personal and professional perception of quality.

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## Comments

### STEPS FOR COMMENTS

1. This space is for observations which are not noted elsewhere (for example: appearance, texture).
2. Prepare a summary of the evaluation and recommendations.
3. Take note of any additional factors that have influenced the sensory analysis, such as environmental conditions and sample processing.

### EXAMPLE:

A very good quality sample with an aroma of roasted almonds and dried fruit flavors such as prunes that last through the aftertaste. The texture is a little grainy, I recommend processing the sample again.

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## Final Score

What does the score mean?



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## Cacao Tasting

Sample 729 in the whole form

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## Interpretation of Results

Logically, the higher the Final Score, the better the sample. Final scores can be used for decision making, such as:

- Create flavors profile and other sensorial characteristics
- Identify and correct processing defects
- Decide if the sample is accepted for buying or selling, or if it is rejected
- Establish a value or ranking in comparison with other samples
- Determine a purchase or sales price
- Determine winners of a contest
- Set a standard or make comparison with a standard

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## Cacao Tasting

Sample 364 - bitterness and astringency only

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**Calibration and Alignment**

After tasting, the leader of the tasting panel must collate all results in a single summary scoring sheet.

Let's do that and talk about it!

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**Cacao Tasting**  
Sample 103 in the whole form,  
followed by calibration and alignment

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**Questions?**

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## Physical Analysis

### Lesson Plan

The class will be a combination of presentation and hands-on activities in small groups. An overview of physical defects will be presented. Students will divide into small groups to perform an external analysis, learn to use the guillotine used in cut tests, sort and categorize cocoa beans into a quadrant used for sorting. Students will have the opportunity to discuss their findings with the other groups and consult the instructor about the defects they have analyzed. Finally, students will return to their small groups to perform another set of cut tests using pruning shears.

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### Class design and duration

2 hours

### Objectives

- Introduce participants to the methods used to sort and analyse cocoa beans to grade for quality
- Explain how to identify and categorize cocoa beans
- Develop skills to identify and categorize cocoa beans

### Materials

- Computer
- Projector
- Name tags
- Flip Chart and markers
- Pencils
- Guillotines, pruning shears and/or knives for cut tests
- Cocoa beans: 200 grams of cocoa beans for each group & defect examples
- Printed copies for each student: A) Defect Reference Guide B) Cocoa Bean Placemat C) Physical Analysis Form

### Link to Slide Presentation

<https://docs.google.com/presentation/d/1spue6ABQtA7NRgftl5fMekS-uL4Sktfyu8y1iRVwjto/edit?usp=sharing>

ACTIVITY	CONTENT	MATERIALS	TIME	RESPONSIBLE
<b>Introduction/room</b>	Welcome, presentation of content, objectives and methodology	Computer, Projector	2 minutes	Facilitator/Coordinator/Director
<b>Slide Presentation</b>	Quality overview and defect examples	Computer, Projector	25 minutes	Facilitator
<b>Small Group Activity</b>	External evaluation and cut test #1	guillotine (or pruning shears or knives), cocoa sample, defect quadrant, reference guide & calculation sheet	40 minutes	Facilitator + participants
<b>Class activity: all</b>	sharing, comparing & looking at examples	Defects organized by instructor in defect quadrant	15 minutes	Facilitator + participants
<b>Small Group Activity</b>	Cut test #2	(same as above) Pruning shears or knives, cocoa sample, defect quadrant, reference guide & calculation sheet	30 minutes	Facilitator + participants
<b>Participants questions</b>	Opportunity for participants to ask questions and exchange ideas		5 minutes	Facilitator + participants
<b>Exercise on cutting test</b>	Steps for physical analysis of cacao beans	Cacao beans, guillotine, scissors, razor, markers, forms, hydrometers, scales on grams	50 minutes	Facilitator + participants
<b>Conclusion and recommendations</b>	Participants' questions and opinions		10 minutes	Facilitator + participants

## Methodology

### Step 1: Slide Presentation

Refer to the presenter notes listed in each slide

### Step 2: Small Group Activity - 40 minutes

- A) The instructor will begin the exercise with a demonstration of how to use the guillotine for the cut test in a safe and effective manner (pruning shears and/or knives for the cut test can be substituted).
- B) Students will be divided into small groups of 3-4 students and provided with a labelled container of 100 cocoa beans. Each student will be provided with a printed copy of the Defect Reference Guide, Cocoa Bean Placemat, and Physical Analysis Form, however only one defect quadrant and calculation sheet will be used during the exercise in the small group. Using the Defect Placemat, students will begin with an external evaluation of the cacao beans and categorize the beans in their sample. Students will use the Defect Reference Guide to inform their analysis and they will record their findings in the Physical Analysis Form.
- C) Once the information is recorded for the external evaluation, students will then flip the defect quadrant placemat over to begin working on the cut test. Each group will have a guillotine (if this is not available, they can use pruning shears or knives for the cut test), place the beans in the guillotine from their sample and begin the cut test. Students will remove the beans from one side of the guillotine and categorize them in the Cocoa Bean Placemat by using the Defect Reference Guide. Results will then be recorded on the Physical Analysis Form.

### Step 3: Activity: Sharing, comparing and looking at examples - 15 minutes

- A) Students will rotate from station to station to look at how each group categorized and counted the defects they found in their cocoa sample. Students will also have the opportunity to look at actual cocoa defect examples that have been prepared by the instructor and organized on to the Cocoa Bean Placemat.

### Step 4: Small Group Activity

Students will return to their small groups and begin working on the 2nd cut test using pruning shears or knives. This process can be slow depending on the experience of the students with cut tests. Students will perform the test again and categorize one half of the cocoa beans in the Cocoa Bean Placemat by using the Defect Reference Guide. Results will then be recorded in the Physical Analysis Form.

### Step 5: Discussion

The facilitator will provide a space to debate and analyze the results.

## Appendices and Additional Material

Appendix A: Cocoa Sample Evaluation Summary - Student Practice Sheet

Appendix B\*: Cocoa Physical Analysis Placemat - External Evaluation

Appendix C\*: Physical Analysis Form - Cut Test

*\*Print on 11x17 paper or draw form on flipchart paper*

Additional Material: In the original slide presentation, beginning with slide “External Analysis” and ending with slide “Insect/Infested Beans”, there are currently 16 slides that can be printed out for students as a Defect Guide handout.

## Cocoa Sample Evaluation Summary- Student Practice Sheet

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### External Evaluation

Analysis for 100 beans	Number
Multiples	
Broken, umbilical, husk	
Flat	
Foreign Matter	
Sub-total	
Clean beans	
<b>External Evaluation Total</b>	

### Cut Test

	#1- 50 beans	#2 - 50 beans	Total
<b>Fermentation</b>			
Well Fermented			
Partially Fermented			
Not Fermented			
Violets			
Slatey			
Over Fermented			
<b>Defects</b>			
Mold			
Insect			
Germinated			

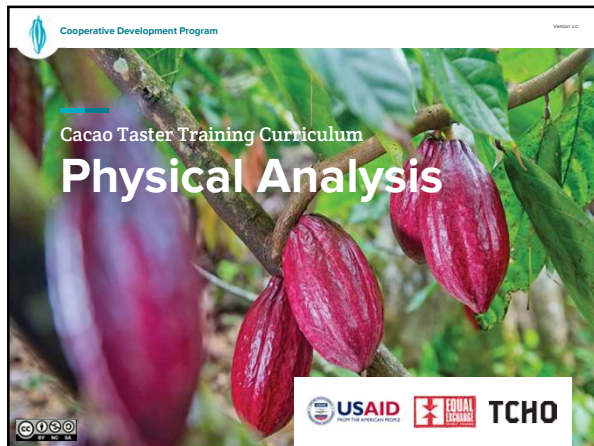


### Cocoa Physical Analysis Placemat - External Evaluation

External Evaluation	<i>Analysis for 100 beans</i>
Clusters/Multiples	
Broken, Split	
Flat	
Foreign Matter	
Insect damage	
Severely moldy	
Other	

### Physical Analysis Form - Cut Test

Cut Test	Fermentation
Well Fermented	
Partially Fermented	
Not Fermented	
Violets	
Slaty	
Over-fermented	
	<b>Defects</b>
Mold	
Insect	
Germinated	




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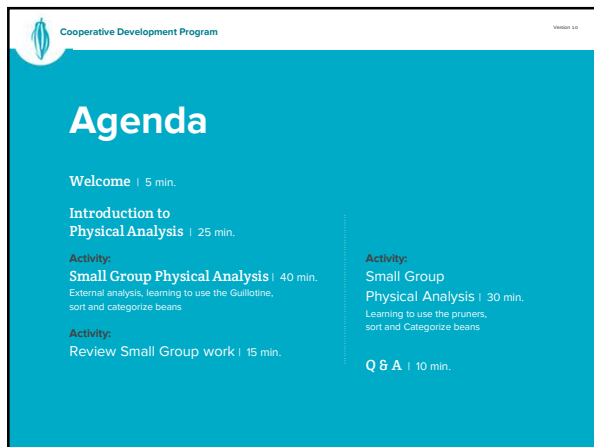
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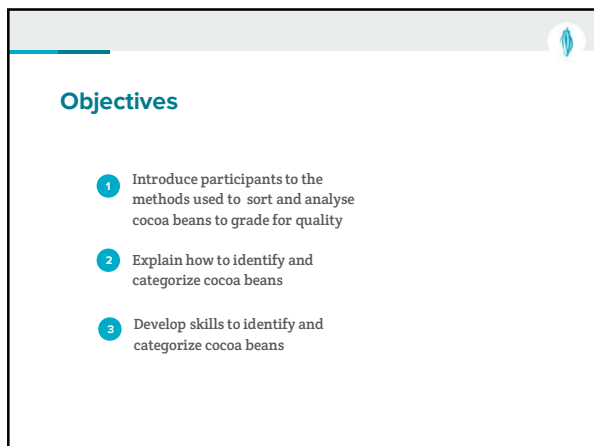
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## Who determines the quality of cocoa in a physical analysis?

Third Party Groups and Organizations:

- International Cocoa Standards: FCC, CMA & Cocoa Futures contracts
- Others interpretations include: Caobisco, Cocoa of Excellence, FCCI, CDP
- Internal cocoa quality standards by country:
  - i.e.: *Norma Técnica Peruana*
- Relationship between buyer and seller

There is no UNIVERSAL SYSTEM

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Table 5. Comparison of bean grade according to some existing standards (Beckett, 2009; End & Dand, 2015; US FDA, 2017).

Standard	Bean Grade / Description	Bean Count	Categories of Defects			Moisture (%)	Foreign Matter
			Mould (%)	Slaty (%)	Insect-Infested (%)		
ISO 2451	Grade 1		3	3	3		
	Grade 2	NSa,b	4	8	6	≤7.50b	0.75 %b
FCCc	good fermented		5d	5	5d		
	Fair fermented	100 per 100 gb	10d	10	10d	NSb	<1.50 %b,e
CMAAF	Ghana	1000 per kg	4g	10	4g	NS	NS
FDA	acceptable	NS	4	-	4	NS	≥10.00 mg/lb
ASEAN Stan 34	Extra Class		3	3	2.5		'Practically free of waste'
	Class 1		3	5	3		<2.00 %
	Class 2	NSb	4	8	5	≤7.50b	<2.50 %
The Coffee-Cocoa Board, Ivory Coast	Grade 1	NSb,j	NS	NS	NS	≤8.00b	≤1.00b
	Grade 2	NSb,j	NS	NS	NS	≤8.00b	≤1.00b

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## Why do you conduct a physical analysis?

- To evaluate the consistency of the cocoa sample
- Determine the quality of cocoa through physical inspection
- Identify trends and possible problems in lot
- Address and/or fix problem areas

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### Quality Control: Key Measurements

1. Draw a sample
2. Record Basic information
3. Test the moisture and pH level
4. Measure the bean size
5. Conduct an External and Internal Cocoa bean Evaluation
6. Calculate and Analyze your results

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### Sampling

How many bags should you sample?



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### Homogenization of the sample



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## Sample Label

<b>CERTIFICATION</b>	Orgánico-FLO	<b>ORGANIZATION</b>	CAC Cerro Verde
<b>N° LOT</b>	17/126	<b>LOCATION</b>	San Martín / Perú
<b>Date of Sampling</b>	10/29/2017	<b>CACAO VARIETY</b>	Trinitario
<b>KG in Lot</b>	25,024.0	<b>Sampling Place</b>	Almacén Central
<b>Bags</b>	Jute/64kg	<b>RESPONSIBLE</b>	Gustavo Palacios




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## Equipment/Materials




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## Genetic Types of Cacao

What do you look for and how do you measure it?




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## Analyzing the Beans

**Step 1**  
External Analysis


**Step 2**  
Cut Test

- Cut the beans longitudinally
- Record data in sample analysis form

Not Fermented




Defects




Mold      Insect

Broken/Cut      Flat


Partially Fermented




Well Fermented



Cluster



Germinated



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## External Analysis

Use a 100 bean sample




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## Broken/Split Beans

01 | Appearance

A cocoa bean of which a fragment is missing, the remaining part being more than half of a whole bean

02 | Possible Cause

Cut in the field while splitting pods or prolonged drying.




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### Flat Beans

01 | Appearance  
Bean which is too thin to be cut to give a complete surface of the cotyledons

02 | Possible Cause  
Lack of fertilizer or water




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### Bean Clusters/Multiples

01 | Appearance  
Two or more beans joined together which cannot easily be separated by using the finger and thumb of both hands

02 | Possible Cause  
From infected cocoa pods, beans are not mixed during fermentation or beans that are not mixed properly during the drying.




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### Germinated Bean

01 | Appearance  
The seed germ has pierced the shell as evidenced by the physical presence of the seed germ or by a hole in the shell following its detachment

02 | Possible Cause  
When the cocoa pod is over ripe or the seed germ is not killed in the first 72 hours of fermentation




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## Foreign Matter

### 01 | Appearance

Any substance other than cocoa beans



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External Evaluation	Analysis for 100 beans
Clusters/Multiples	
Broken, Split	
Flat	
Foreign Matter	

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## Cut Test



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**Well Fermented Beans**

**| Appearance**  
Beans with a well defined cotyledon, light brown to brownish, uniform color on the surface and bean interior.

**| Causes**  
Good fermentation and drying

**| Effect on Flavor**  
Aroma is clean and smells like cacao




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**Well Fermented Cacao**

**Light Brown**      **Brown**      **Dark Brown**




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**Partially Fermented Beans**

**| Appearance**  
Beans are brown (coffee) colored with violet; they have minimal ridges and are slightly compact

**| Causes**  
Insufficient fermentation or insufficient turning of the beans during fermentation

**| Effect on Flavor**  
Possible that acidity and bitterness are higher in concentration than those beans that are well fermented




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### Unfermented/Violet Beans

**| Appearance**  
Surface inside the beans does not have ridges, they are compact; they will have an intense violet color

**| Causes**  
Fermentation is interrupted or beans are dried quickly

**| Effect on Flavor**  
High acidity and astringency




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### Over-fermented Beans

**| Appearance**  
Very dark color, brown or black; many ridges and the texture is like a cork. The smell can be hammy, smoky or vinegary

**| Causes**  
Extended fermentation

**| Effect on Flavor**  
Hammy, smoky or vinegary




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### Slaty Beans

**| Appearance**  
Grayish black color, opaque, very compact no ridges/flat

**| Causes**  
Absence of fermentation

**| Effect on Flavor**  
Extremely bitter and astringent




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**Moldy Beans**

**| Appearance**  
 Grayish black color, opaque, very compact no ridges/flat

**| Causes**  
 Prolonged fermentation, slow or inadequate drying, storage under highly humid conditions  
*\*germinated or damaged beans are susceptible*

**| Effect on Flavor**  
 Possible soil, dirt or mold




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**Insect/Infested Beans**

**| Appearance**  
 Beans have holes or canals, larvae may be present

**| Causes**  
 Insect infestation in cocoa pods

**| Effect on Flavor**  
 Possible soil, dirt or mold




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**Small Group Activity**

40 minutes

**A | External Cocoa Bean Test**



**B | Cocoa Bean Cut Test**




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## Small Group Activity

30 minutes

Cocoa Bean Cut Test with Pruners



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