



Mission report: ICCRI East Java Indonesia

Philip Aguilar and Laurent Berthiot

13th to 22nd of June 2011

11/07/2011

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1. Context of this mission

The aims of this mission were:

- to take part to the ICCRI Coffee Meeting in Jember Indonesia,
- to meet the ICCRI researchers to present the Cirad activities around coffee traceability and characterization, focusing on the tools used,
- to discuss and plan the activities for the new Indonesian coffee project (areas to be studied, sampling, data to be gathered to create a database on Indonesians coffee)
- to meet students able to work on the project in the frame of a thesis.



Map of Java Island

2. Schedule of the mission

- 13/06/2011:
Travel Montpellier - Paris CDG - Singapore.
- 14/06/2011:
Travel Singapore - Surabaya - Jember.
- 15/06/2011
Coffee Field Meeting at Kaliwining ICCRI Station (Jember).
- 16/06/2011
Coffee Field Meeting at Andung Sari station of the ICCRI (two hours from Jember); dinner with ICCRI researchers.
- 17/06/2011
Meet with ICCRI's management; Presentation from Cirad; Discussion on research cooperation.
- 18/06/2011
Roasting and coffee cupping.
- 20/06/2011
Discussion on research cooperation; visit of the laboratories; meeting with Teghu Iman Santoso, young researcher applicant for a thesis in the frame of the project.
- 21/06/2011
Travel Jember - Surabaya - Singapore
- 22/06/2011
Travel Singapore - Paris CDG – Montpellier

3. Main points of the mission

3.1 Coffee Field meeting at ICCRI Kaliwining Station (Jember)

After the opening ceremony, the 300 participants visited the research plots (with different workshops on somatic embryogenesis, bio fertilizers, coffee borer entrapment...) and of the post-harvest treatment unit (for coffee and cocoa). A cupping session was organized with international cuppers for the selection of the best 2011 Indonesian coffees (Robusta and Arabica). During the afternoon, many stakeholders exposed their point of view on the coffee chain, the producers about the results of the last harvest, roasters and buyers what they were waiting from growers of Indonesia. Philip Aguilar exposed shortly the Cirad institution, the UMR Qualisud and the relationship between Cirad and ICCRI, former and future collaborations with ICCRI.



Opening speech by
Dr. Teghu Wahyudi,
ICCRI's Director (Photo Aguilar)



Cupping session (Photo Aguilar)



Embryoogenesis workshop (Photos Aguilar)



Coffee processing (Photo Aguilar)



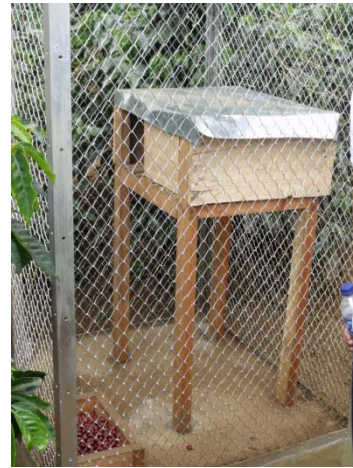
Coffee borer entrapment (Hypotan®) (Photo Aguilar)

3.2 Coffee Field Meeting at ICCRI Andungsari Station

The participants visited the research station created in 1994, extending on 110 ha. The plots are devoted to genetic improvement (with agronomic trials to compare the new varieties created by ICCRI). A part of the station is devoted to the “Kopi Luwak” (Coffee Civette). This station is conducted in an integrated way with a sustainable aim (production of bio fertilizer from compost to value the by-products).



Coffee plots (Photo Aguilar)



Cage for coffee Luwak production (Photo Aguilar)

The afternoon was dedicated to a free exchange between the coffee producers and the ICCRI researchers represented by Dr. Wiryadiputra, Dr. Soetanto, Dr. Mawardi and Dr. Yusianto.



(Photo Aguilar)

At the end of the meeting, Philip Aguilar was asked by Dr Soetanto to give his feelings about the meeting and the relationship between the producers and the researchers.

3.3 Presentation and discussion on research cooperation

A meeting has been organized at the ICCRI Jember station with the managers of the coffee research. Tony Marsh, coffee consultant for SCAA (Specialty Coffee American Association) was invited to attend our presentation. After an introduction by the Dr Surip Mawardi, we presented in the form of Power Point (annex 1) the three methods for the characterization and the traceability of coffee: Sensory analysis, NIRS & PCR-DGGE, methods to be used for the new project. We explained that, combining these three methods is the way to build a large database permitting to identify with a high level of precision the origin and the traceability of a sample.

After the presentation, some questions were asked:

- Is there an impact of the variety on the micro flora and the detection by PCR?
- Is there an impact of the micro flora on the aroma?

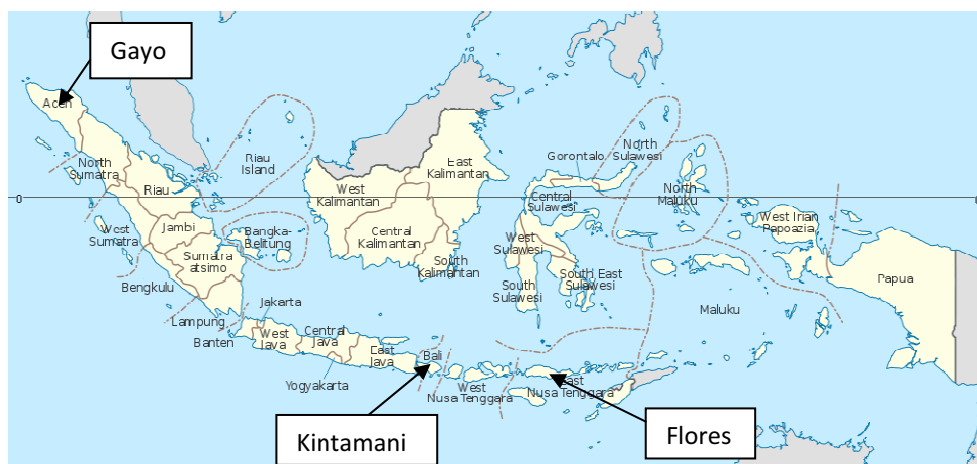
Then we had a discussion about the project. First we asked about the material they have to realize the analysis (NIRS and PCR-DGGE). For the NIRS, they actually don't have NIRS equipment; they can use a FT-NIRS (we have to check with Fabrice Davrieux if it's possible to use this for the project). If necessary, ICCRI will examine the possibility to invest in new equipment. For the PCR-DGGE, they have the knowledge, the equipment for the PCR but not for the DGGE. We suggested that Noel Durand and Fabrice Davrieux come to Jember as soon as possible to settle this equipment problem. About the sensory analysis, ICCRI uses the SCAA methodology for cupping. They have a database but not useful for our project. ICCRI would like to introduce Cirad methodology for cupping of coffee in order to do inter laboratory tests.

For the project we decided that the sensory analysis will be realized at ICCRI and Cirad. Then we can combine all the results to get a strong database and the statistical analysis will be more accurate.

Then we discussed about the sampling methodology.

Indonesia is a vast country with different environmental situations. ICCRI would like to investigate in 10 different areas to cover the whole country. It has been decided to begin with the three areas with

a Geographical Indication (Kintamani [Bali], Flores [Lesser Sunda Islands], Gayo [North Sumatra]). (see the detail of sampling in the minutes of meeting appendix 2).



The three areas of sampling

NB: Arabica coffee in these areas is wet processed and sun dried. Trials are running with the method of wet hulling: first, sun drying during 24 hours, then hulling and final sun drying. It seems that this method gives a stronger aroma.

Then we listed the data needed to perform the statistical analysis, listed the researchers involved in the project and discussed about the operational budget (appendix 2).

3.4 Meeting with ICCRI Director

We have been received by the ICCRI Director, Dr. Teghu Wahyudi for a short talk about the cooperation between Cirad and ICCRI and about the new project in the process of elaboration.

3.5 Roasting and cupping

On the 18th of June, Dr. Surip Mawardi and DR. Yusianto proposed to cup some typical Indonesian coffee (Andungsari, Luwak, Gayo, etc). Tony Marsh attended this cupping session; he wanted to add in the cupping session four coffees from a post harvest project he realized last year. For this cupping, the SCAA method was used (SCAA score paper on appendix 3). This cupping method is widely used in many producing countries. It is well adapted for marketing but it takes a long time (5 cups per coffee to be tested) and not precise enough for a scientific purpose. ICCRI (Dr. Surip Mawardi) wants to invite Laurent Berthiot for a mission in September to organize a training cupping session with the Cirad method.



Preparing the cupping session (Photo Aguilar)



Dr. Surip Mawardi cupping (Photo Aguilar)

On the 20th, a new cupping session of three coffees (*Robusta*, *Arabica* and *Liberica*) was organized after roasting the samples.

3.6 Visit of the laboratories

On the 20th, we visited the laboratories (soil chemistry, agronomy, breeding, entomology and phytopathology, somatic embryogenesis ...).

Even if the laboratories seem to be poorly furnished, the scientific equipment is recent and quite complete. Aside the ICCRI scientist and researchers, many university students work in the laboratories.

3.7 Pre selection of a young scientist

On the 20th, we met one of the two students selected by Dr Surip Mawardi and Dr Misnawi, Teghu Iman Santoso, back from a mission in Switzerland (GI seminary). This young man is agronomist, scientist in the ICCRI for one year. Although he seems to be interested by the coffee project, he has a very limited experience in the laboratory works (chemistry) and the knowledge in statistics are low. Back to Montpellier, we had a Skype conversation with Niken Puspita Sari on the 24th. She is a soil scientist with an experience in chemistry and knowledge in statistics with the use of different statistic software like SPSS. She seems to be more dynamic and with a large adaptation ability to a different cultural environment.

Conclusion

This mission permitted to reinforce the relations between Cirad and ICCRI. The aims of the mission (attending the Coffee Field Meeting and discussing the technical aspects of the new coffee project) are achieved. This mission must be completed by missions of Noël Durand and Fabrice Davrieux. A new budget has to be settled up in collaboration with the French Embassy in Indonesia.

Appendix 1

Presentation of Cirad activities (power point)

CHARACTERIZATION OF A COFFEE, TERROIR AND TRACEABILITY



Philip Aguilar
Laurent Berthiot
Fabrice Davrieux
Didier Montet

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laurent.berthiot@cirad.fr
fabrice.davrieux@cirad.fr
didier.montet@cirad.fr

CONTENTS

- Sensory analysis** philip.aguilar@cirad.fr; laurent.berthiot@cirad.fr
 - Definition
 - Implementation
 - Exemples
- Near Infra Red Spectroscopy, NIRS** fabrice.davrieux@cirad.fr
 - Definition
 - Implementation
 - Exemples
- PCR-DGGE (Polymerase Chain Reaction-Denaturing Gradient Gel Electrophoresis)** didier.montet@cirad.fr
 - Definition
 - Implementation
 - Exemples

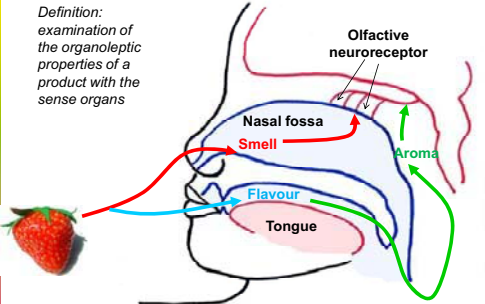
NON EXHAUSTIVE LIST OF THE STANDARDS USED TO ACHIEVE SENSORY ANALYSIS

International standards:

- Standard ISO 13299: Methodology. General guidance for establishing a sensory profile
- Standard ISO 8589: General guidance for the design of test rooms
- Standard ISO 5492: Vocabulary
- Standard ISO 6668: Green coffee: Preparation of samples for use in sensory analysis
- Standard ISO 8586 : General guidance for the selection, training and monitoring of assessors ...

SENSORIAL ANALYSIS

Definition: examination of the organoleptic properties of a product with the sense organs




VOCABULARY / DESCRIPTORS

Fondamental attributes:

- Body
- Acidity
- Bitterness
- Astringency

Qualities et defaults

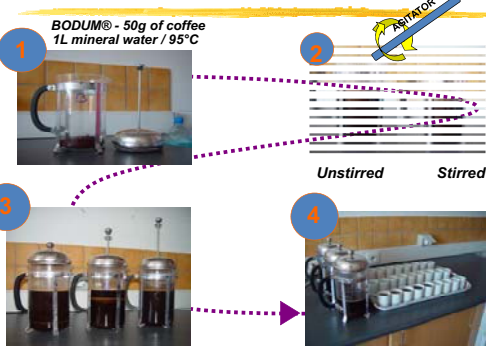
- Sour
- Fruity
- Harsh
- Greeny
- Earthy
- Metallic
- Phenolic
- Riosh
- Burned
- Stinky



Coffee aroma wheel

PREPARING THE COFFEE FOR A TEST

**BODUM® - 50g of coffee
1L mineral water / 95°C**



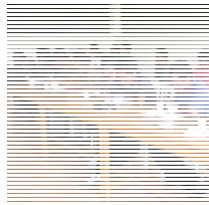
1. Weighing coffee
2. Pouring water
3. Leave to infuse for 5 mn then filter
4. Coffees ready to be Served

Unstirred Stirred

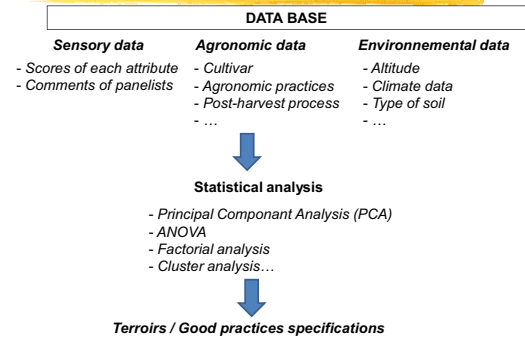
The short-listing of panelists is based on the identification and the perception threshold for basic tastes

Selection is based first and foremost on availability and motivation. Participants presenting ageusia and anosmia will be excluded.

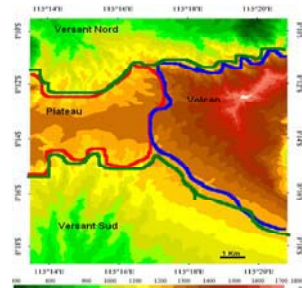
The panel must be composed of 8 to 12 people. This panel is selected and trained with different tests based on the international standard ISO 8586. The cuppers are able to identify and quantify the differences between the products.



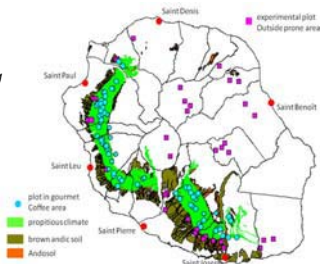
Training on coffee attributes



Delimiting homogeneous zones according to the sensory characteristics



Delimiting zones according to :
- sensory characteristics,
- altitude,
- type of soil.

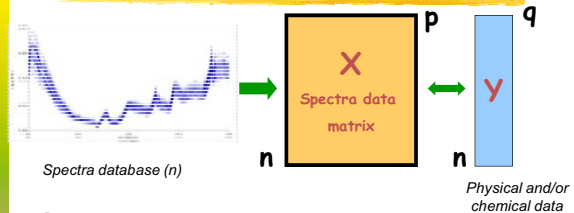


NIRS is the measurement of near infrared light **absorption** (wavelength and intensity) by a sample.

The technique is based on the vibrational properties of molecules and their interactions with light.

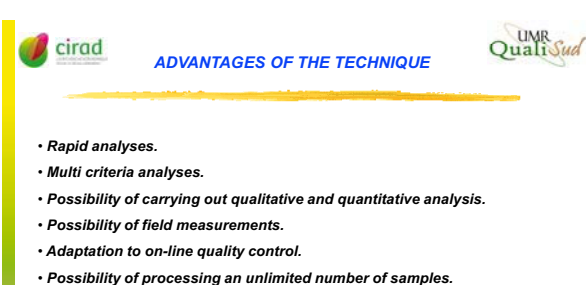
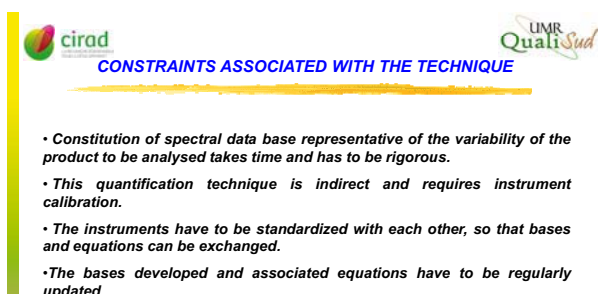
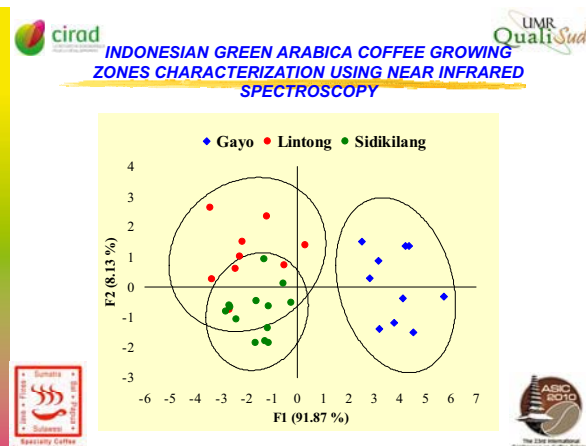
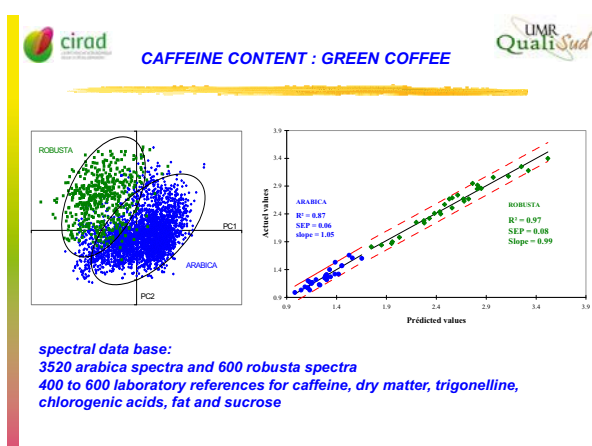
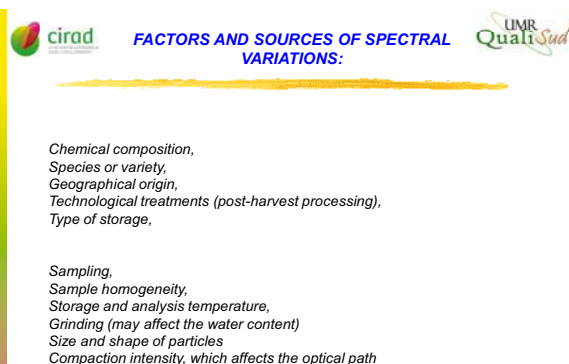
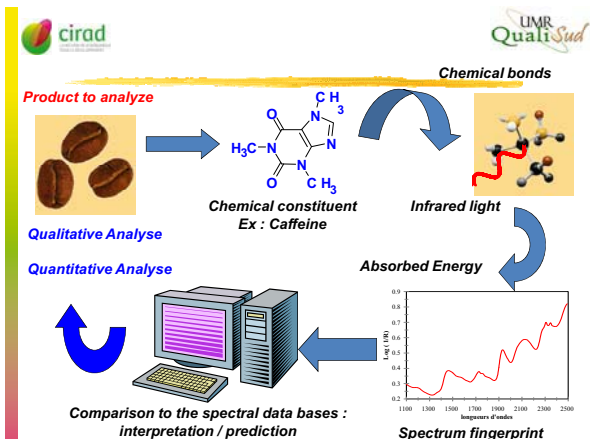
Controlling product quality

From raw material to end-product



$$\hat{Y} = b_0 + b_1X_1 + \dots + b_iX_i + b_pX_p$$

The prediction equation linking absorption values and reference values is of the multilinear type. It expresses constituent contents as a function of absorbance at certain wavelengths.

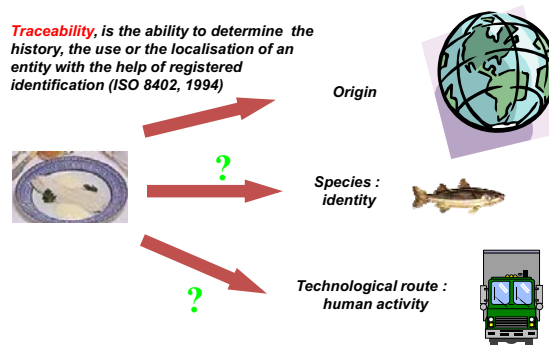


POLYMERASE CHAIN REACTION- DENATURING GRADIENT GEL ELECTROPHORESIS (PCR-DGGE)



OBJECTIVES

Traceability, is the ability to determine the history, the use or the localisation of an entity with the help of registered identification (ISO 8402, 1994)



DETERMINATION OF ORIGIN

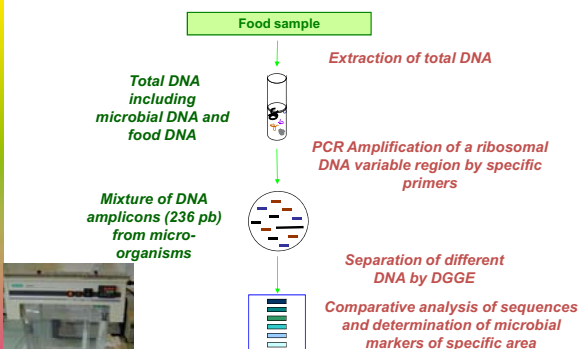
Idea : The environment has an effect on the micro-elements present on/in the fish



Micro-organisms
Algae
Insects
Chemical residues
Heavy metals
Isotopes ...

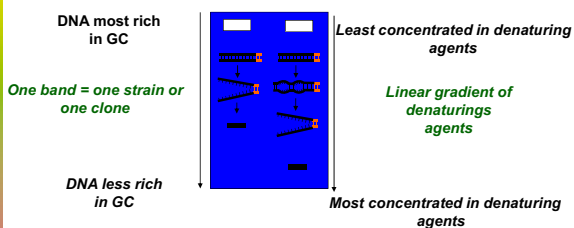


PCR-DGGE METHOD

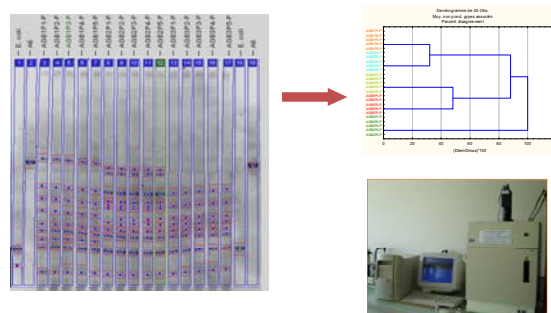


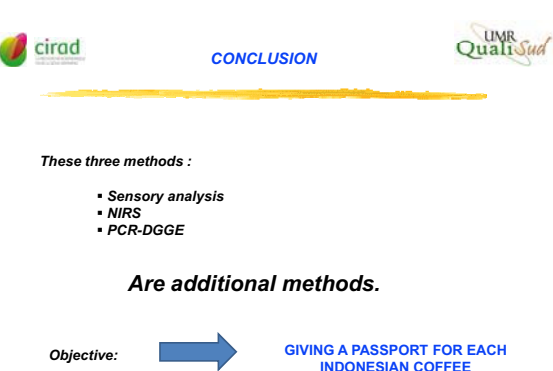
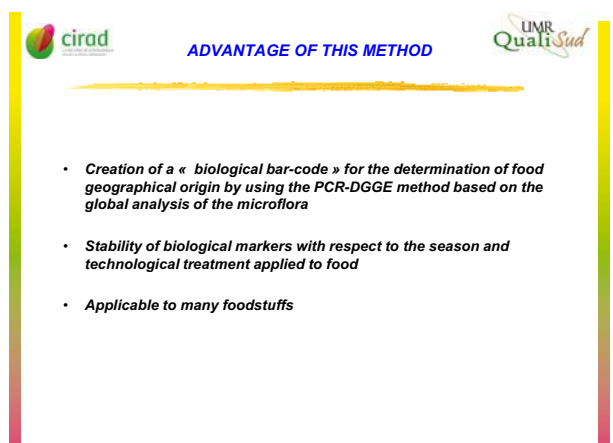
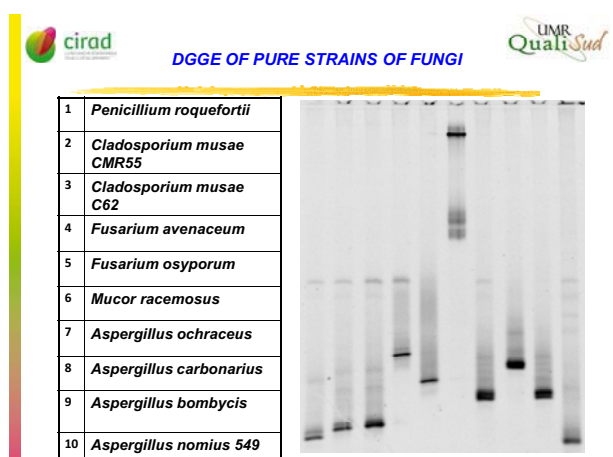
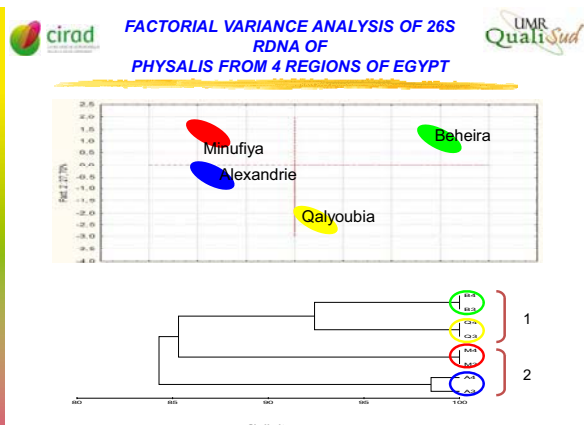
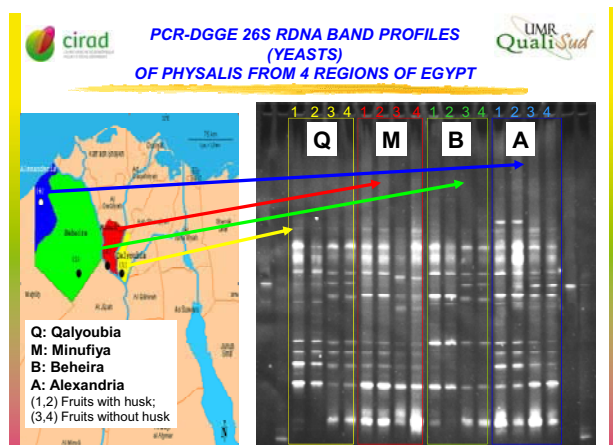
DGGE

Double strand DNA of the same size
from PCR



GEL ANALYSIS BY IMAGEQUANT AND STATISTICA





Appendix 2

JOINT PROJECT BETWEEN ICCRI-CIRAD QUALITY CHARACTERIZATION AND TRACEABILITY OF INDONESIAN ARABICA COFFEE IN INDONESIA

Minutes of Meeting Jember, June 17th, 2011

Attendants

- | | |
|-----------------------------|------------------------------------|
| 1. Laurent Berthiot (CiRAD) | 5. Misnawi (ICCRI) |
| 2. Philipe Aguilar (CIRAD) | 6. Niken Puspita Sari (JCCRI) |
| 3. Cahya Ismayadi (ICCRI) | 7. Ariza Budi Tunjung Sari (ICCRI) |
| 4. Surip Mawardi (ICCRI) | |

1. Presentation of project detail and goal by Mr. Berthiot and Mr. Aguilar audienced by ICCRI staffs.
2. Discussion by smaller team, concerning research methodology, as below:

SAMPIING METHODOLOGY

A. AREA OF SAMPLING

1. Flores Bajawa
2. Java (Estate/PTP/ICCRI)
3. Java Preanger Coffee (smallholders)
4. Toraja
5. Kalosi
6. Kintamani
7. Gayo
8. Lintong
9. Baliem Valley
10. Mangkurajo Bengkulu

B. TIME OF SAMPLING

1. First year (90 samples):
 - Focusing on GI area or around GI area (Kintamani, Flores, Gayo).
 - At the beginning, middle and at the end of harvest time.
 - 10 samples from each area.
2. Second year (100 samples):
 - One stage of harvesting time (middle harvest). Note: for north Sumatra and Aceh the samples including major and minor harvest session.
 - More areas including all area mentioned above.
3. Third year (100 samples)
 - Similar to the second year.

C. ENVIRONMENT DATA REQUIRED

1. Elevation and Latitude (GPS)
2. Light intensity (luxmeter)
3. Rainfall and rain days
4. Temperature (minimum, maximum, mean)
5. Wind velocity
6. Type of soil (compounds and texture)

D. AGRONOMIC DATA REQUIRED

1. Variety (one or two dominant)
2. Shade trees (yes/no, shading percentage)
3. Age of plantation
4. Use of fertilizer (organic/synthetic, dose, frequency)
5. Present of cover crops
6. Use of pesticides
7. Monoculture/mixed crop
8. Pruning
9. Date of harvest

E. POST HARVEST HANDLING

1. Processing methodology (pulping, hulling, fermentation, drying)
2. Delay between harvest and pulping
3. Time and method of fermentation
4. Wet/dry hulling
5. Mean of drying time. Note: for Sumatra drying time is before and after hulling.
6. For analysis the beans must be at commercial quality.
7. Quality grade according to SNI

F. QUANTITY OF SAMPLES: 2 kg of green coffee packed in aluminium foil

G. QUALITY PARAMETERS

1. NIRS
2. Sensory evaluation
3. Chemical Analysis (caffeine, trigonelline, acid organic, sugar, fat content, moisture content, GC profile for selected samples for the third year)
4. PCR-DGGE

H. MEMBER OF GROUP

1. Cahya Ismayadi
2. Surip Mawardi
3. Misnawi
4. Teguh Iman Santoso
5. Ariza Budi Tunjung Sari
6. Niken Puspita Sari
7. Fabrice Davrieux
8. Philip Aguilar
9. Laurent Berthiot
10. Didier Montet
11. Noel Durand
12. Gilles Saint-Martin
13. Renaud Boulanger

POINT FOR DISCUSSION AND FOLLOW UP

1. EQUIPMENT

The discussion should concern for who will be in charge of funding and purchasing NIRs instrument, ICCRI or CIRAD?

2. OPERATIONAL BUDGET (need to revise current proposal)

Due to the distance and challenges in collecting samples, sampling cost should be considered as follows:

- Sumatra, Aceh, Toraja, Flores: EU 1000/area/sampling time.
- Java and Bali: EU 500/area/sampling time
- Those costs have not included delivery cost, which will vary depending on quantity and distance.

Team also discussed laboratory fee and propose revision, regarding cost of analysis such NIRs (EU 50/sample), chemical analysis (EU 180/sample), sensory evaluation (EU 100/sample) and PCR DGGE (EU 250/sample).

3. STUDENT

As mentioned in project description, a PhD student or an ICCRI scientist will be selected and associated to the implementation of this joint program.

ICCRI propose two names of scientist, as candidates:

- Mr. Teguh Iman Santoso (Agronomist)
- Ms. Niken Puspita Sari (Soil scientist)

The students are required to set certain topic related to this project.

Appendix 3

Specialty Coffee Association of America Coffee Cupping Form



Qualitative	100 - Good	120 - Very Good	140 - Excellent	160 - Outstanding
4.75	7.25	8.75	9.25	9.75
4.50	7.50	8.50	9.50	9.75

Name: _____

Date: _____

Sample #	Burst Level in sample	Score Fragrance/Aroma	Score Flavor	Score Aftertaste	Score Body	Score Uniformity	Score Clean Cup	Score Overall	Total Score
Notes: _____									
Final Score									

Sample #	Burst Level in sample	Score Fragrance/Aroma	Score Flavor	Score Aftertaste	Score Body	Score Uniformity	Score Clean Cup	Score Overall	Total Score
Notes: _____									
Final Score									

Sample #	Burst Level in sample	Score Fragrance/Aroma	Score Flavor	Score Aftertaste	Score Body	Score Uniformity	Score Clean Cup	Score Overall	Total Score
Notes: _____									
Final Score									

June 2003