Food and Agriculture Organization of the United Nations

GLOBAL SOIL PARTNERSHIP

International Training on Digital Soil Property Mapping and Information Delivery

Yogyakarta, Indonesia, 22-26 April 2019

Rationale

The increase of world population needs more food, feed, fuel, and fiber. Meanwhile, agricultural land is relatively constant and even tends to decrease. To feed people, both actions may be opted i.e. optimizing the existing agricultural land and opening new agricultural land. Every country has different reason to select the action.

Narrowing yield gap in the existing agricultural land become main efforts worldwide. Different farming system was developing with the target to make more efficient in agro-input for high production. The effort differs among agroecosystem being specific for each country. The technological formulation to determine agro-input including fertilizer need geoinformation on nutrient status of soil and its properties.

Soil properties can be mapped using different techniques, among others digital soil mapping that use previous soil map and data as well as take advantages of information and communication technology.

More over geoinformation delivery is of great importance. This can be done by adopting available technologies including web GIS and smartphone to deliver information timeless and spaceless.

Objective

- Explore recently available innovation in information delivery
- Build capacity to map soil property digitally
- Strengthen collaboration and networking on digital property mapping and information delivery

Outcome

- Documented innovative technologies in spatial information display and delivery.
- Increased awareness on the importance of information and communication technology in mapping soil properties
- Increased capability of 60 researcher and lectures to map soil digitally

- Shared experience and strengthened international collaboration in research and development of mapping soil properties digitally

Participants and Guest Speakers

This training will be attended by 60 participants and resource persons. Participants are researcher of Indonesian Assessment Institute of Agricultural Technology and Indonesian Center for Agricultural Land Resource Research and Development.

Guest speakers will present current status on the topics of soil data capturing using sensors, digital soil mapping, information system for spatial info delivery and platform and initiative for information sharing (Table 1).

Tabel 1. List of guest speaker

No	Name	Affiliation	Topic
1	Dr. Fadjry Djufri	General Director IAARD, Indonesia	National Policy on Agricultural Land Resource Information System
2	Prof. Dr. Dedi Nursyamsi, MAgr	Assistant of Minister for Infrastructure Ministry of Agriculture	Infrastructure of Database and Information System in the Ministry of Agriculture
3	Dr. Haris Syahbuddin, DEA	Acting Director ICALRD, Indonesia	Indonesian Land Resource Information System: current status and future direction
4	Prof. Dr. Budiman Minasny	Professor The University of Sydney, Australia	Digital soil mapping: current and future
5	Dr. Dominique Arrouays	INRA, France	Applying digital soil mapping technology in Global Soil Mapping and National Mapping in France
6	Dr. Viatkin Konstatyn	FAO, Italy	Global soil partnership: new era in soil information sharing
7	Dr. Pittayakon Limtong	LDD, Thailand	CESRA and Asian Soil Partnership: current and future
8	Dr. Kanika Singh	The University of Sydney, Australia	Proximal soil sensing in Papua New Guinea: lesson learnt
9	Dr. Husnain	Head ISRI, Indonesia	Soil sensor for fertilizer recommendation: Indonesian experience
10	Mr. Saefoel Bachri	IT Specialist ICALRD, Indonesia	Smartphone - based Soil Assessment: Indonesia experience

Budget

This training is fully supported financially by SMARTD of IAARD

Tentative Programme

21 April 2019: Participant arrival
22 April 2019: International Seminar
23 April 2019: Hand on training
27 April 2019: Participant departure

Day 1, 22 April 2019 OPENING AND PRESENTATION

TIME	TOPIC	PERSON IN CHARGE
08:00 - 09:00	REGISTRATION	Ms. Ika Mustika Sundari
09:00 – 10:00	WELCOME SPEECH *Acting Director of ICALRD* KEYNOTE SPEECH: National policy on agricultural land resource Information System *DG of IAARD* Photo session	Ms. Gries M. Fridani
10:00 – 10:30	COFFEE BREAK	
Global Overview on Mapping Approach and Data Management Moderator: Dr. Haris Syahbuddin, DEA (ICALRD)		
10:30 - 11:00	Infrastructure readiness of database and information system in the Ministry of Agriculture	Prof. Dr. Dedi Nursyamsi, MAgr *Assistant of Minister for Infrastructure, MOA*
11:00 - 11:30	Digital soil mapping and proximal soil sensing: current and future	Prof. Dr. Budiman Minasny *The University of Sydney, Australia*
11:30 - 12:00	Global soil partnership: new era in soil information sharing	Mr. Kostiantyn Viatkin Ms. Isabel Luotto *FAO, Rome, Italy*
12:00 – 13.00	LUNCH	
Regional and National Application Moderator: Prof. Dr. Dedi Nursyamsi, MAgr (Indonesian Ministry of Agriculture)		

13:00 – 13:30	Indonesian Land Resource Information System: Present Status and Future direction	Dr. Haris Syahbuddin *Acting Director* *ICALRD*
13:30 - 14:00	Applying digital soil mapping technology in Global Soil Mapping and National Mapping in France	Dr. Dominique Arrouays *INRA, France*
14:00 - 14:30	CESRA Thailand and Asian Soil Partnership: current and future	Dr. Pittayakon Limtong *LDD, Thailand*
Sensor-based Soil Data Capturing and Use Moderator: Dr. Yiyi Sulaeman (ICALRD)		
14:30 – 15:00	Soil sensor for fertilizer recommendation: Indonesian experience	Dr. Husnain *ISRI, Indonesia*
15:00 – 15:30	Proximal soil sensing in Papua New Guinea: lesson learnt	Dr. Kanika Singh *The University of Sydney, Australia*
15:30 – 16:00	Smartphone - based Soil Assessment: Indonesia experience	Mr. Saefoel Bachri *ICALRD, Indonesia*
Session Closing Acting Director, ICALRD		

Note: Gala Dinner, 18:30-21.00, All are invited

Day 1, 22 April 2019 HAND ON TRAINING

TIME	TOPIC	INSTRUCTORS
16:00 – 16:30	Training Introduction	Dr. Yiyi Sulaeman *ICALRD, Indonesia*
16:30 – 17:00	Software Installation	Mr. Kostiantyn Viatkin Ms. Isabel Luotto FAO

Day 2, 23 April 2019 – Introduction to Digital Soil Mapping in R

TIME	TOPIC	INSTRUCTORS
08:30 - 10:30	Introduction to Spatial Data, Basic Concepts, Data types, Handling of Spatial Data, Introduction to Digital Soil Mapping **Hands-on:** Spatial Data in QGIS	Ms. Isabel Luotto Mr. Kostiantyn Viatkin, FAO
10:30 - 11:00	COFFEE BREAK	
11:00 - 13:00	R Basics: Interface, Objects, Commands, Expressions, Assignments, **Hands-on:** R Basics	
13:00 - 14:00	LUNCH	
14:00 - 16:00	R: Data Types: Data Import and Export, R: Data Types: Vectors, Data Frames, Lists, **Hands-on:** R: Data Types	
16:00 – 16:30	COFFEE BREAK	
16:30 - 17:30	Con R: Data Types: Spatial Data, Projections, Basics Graphics with R **Hands-on:** R: Spatial Data	

Day 3, 24 April 2019 – Data Preparation for Digital Soil Mapping

Time	TOPIC	INSTRUCTORS
08:30 - 10:30	Soil Profile Data Preparation: Import, Explore, Merge Site and Layer Data **Hands-on:** Data Import and Exploration	Mr. Kostiantyn Viatkin, Ms. Isabel Luotto FAO
10:30 - 11:00	COFFEE BREAK	
11:00 - 13:00	Soil Profile Data Preparation: Exploratory Data Analysis; Detecting and Getting Rid of Outliers, NA Values; **Hands-on:** Data Cleaning	
13:00 - 14:00	LUNCH	

14:00 - 16:00	Pedotransfer functions; Soil Depth Estimates; Data Transformation; **Hands-on:** Data Transformation	
16:00 - 16:30	COFFEE BREAK	
16:30 - 17:30	Environmental Covariates; Preparing Final Table for Modelling; **Hands-on:** Selection of Covariates	

Day 4, 25 April 2019 – Soil Property Modelling and Mapping: Regression Kriging

Time	**TOPIC**	**INSTRUCTORS**
08:30 - 10:30	Theory of Linear Modelling, Stepwise Multiple Linear Regression	Mr. Kostiantyn Viatkin, Ms. Isabel Luotto FAO
10:30 - 11:00	COFFEE BREAK	
11:00 - 13:00	Stepwise Multiple Linear Regression **Hands-on:** Multiple Linear Regression	
13:00 - 14:00	LUNCH	
14:00 - 16:00	Theory of Spatial Interpolation (Kriging) **Hands-on**: Mapping with Regression Kriging	
16:00 - 16:30	COFFEE BREAK	
16:30 - 17:30	Uncertainty and Validation **Hands-on (con)**: Uncertainty and Validation	

Day 5, 26 April 2019 – Soil Property Modelling and Mapping: Random Forest

TIME	**TOPIC**	**INSTRUCTORS**
08:30 - 10:30	Theory of Machine Learning, Mapping Soil Properties with Random Forest	Ms. Isabel Luotto Mr. Kostiantyn Viatkin, FAO
10:30 - 11:00	COFFEE BREAK	
11:00 - 13:00	Mapping Soil Properties with Random Forest **Hands On**: Mapping with Random Forest	
13:00 - 14:00	LUNCH	
14:00 - 16:00	Map Quality Measures, Validation, Uncertainty; Comparison and Selection of the Final Map	
16:00 - 16:30	COFFEE BREAK	
16:30 - 17:30	Discussion, Questions, Summary of the Digital Soil Mapping Workflow.	

17:30 – 17.45	**CLOSING**	Dr. Yiyi Sulaeman

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