HEAVY RAIN AND SEA LEVEL RISE
Indonesian Farmers between Climate Change Adaptation and Climate Protection

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CRAIIP- Climate resilient investigation and innovation project

Source: www.naturalearthdata.com
Author: Martin Enzner, 2018
Mr Kustiwa Adinata
Project Manager
Country Program Indonesia

- Food security/sustainable smallholder agriculture and forestry Climate change adaptation
- Natural resources management and land rights
- Strengthening of Civil society
- Women empowerment
- Primary health care, Mother and child health, HIV-AIDS/Infectious diseases
Structure of presentation

- Our partners and funders
- Causes of climate change
- Impact of climate change for farmers in Indonesia
- Agro-ecology – the cure-all solution? Examples and challenges
- Organic farming
- Climate Field schools
- Cross-breeding and dissemination: Our key message in a short movie: Why climate-resilient agriculture matters for Indonesia?
Two main messages:
• Global temperature keeps rising
• CO2 concentration keeps rising
Leverage points to reduce agriculture's effect on climate, water quality, and water.

Source: Paul C. West et al. Science 2014;345:325-328
2. Climate Data Cilacap - **Temperature**

Temperatures in Cilacap

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**Increasing day and night time temperatures:**

- **Tmin** = +0.044 °C per year
- **Tmax** = +0.025 °C per year
- **Tmean** = +0.023 °C per year
Climate projections

Change of 'tasmax' in 'Cilacap, Indonesia' compared to 1970-1999

Source: Schöll (2018): ASA project; Projections of the annual temperature change (a) and precipitation change (b) relatively to the average of the basis period (1970-1999) according to 18 CMIP5 GCMs
• 2015-2017 In Cilacap and Pangandaran districts 322,476 hectares flooded, and harvest failure 77,792.
January 2018 : Flooding of rice fields
Impacts of climate change on rice and chili

**Rice**

- Reduced yields
  - 10% decrease of yield per +1°C (Peng et al. 2004)
  - > 35°C is critical (Wassmann et al. 2011)
  - Susceptible to water stress
  - High night time temperatures lead to sterility
  - Salinity reduces yield up to 50% (Zeng & Shanon 2000)

- Loss of paddi land
  - Rising sea: **waterlogging**, prolonged stagnant floods, seawater at coastlines, sustained submergence of the complete rice canopy

**Iron toxicity**
Increasing day time temperature but **not significant**
Decreasing night time temperature

Tmin = -0.072 °C per year
Tmax = +0.0087 °C per year
Trend in the number of days in a year with precipitation above 20mm for Pongtiku from 1998-2018

Source: Hollburg, Landwehr, Prayoga, Schöll 2019
Figure 6. Maps of landslide hazard 2014 (left) and prediction 2031 (right).

Vulnerabilities of chili farmers

- Increasing yields
  - +2°C temperature can increase yields (Sang Guy et al. 2018)

- Reduced yields
  - high temperature, chili matures fast
  - Day time temperature >34°C, night time temperature >21°C Abortion of floral buds (Erickson&Markhart 2002)
  - Higher temperature results in high number of abnormal fruits (calcium deficiency) (Sang Guy et al. 2018)
  - Excess soil moisture results in plant disease, nutrient leaching, reduced pesticide effectiveness (Akinbile&Yusoff 2011)
  - Increased occurrence of pests

Morphological characteristics of chili affected by climate change scenarios

Source: Sang Guy et al. 2018: 8

Farmers lack capacities to adapt; Along with land use changes and unsustainable agricultural practices.
Source: Sang Guy et al. 2018
Merging knowledge systems

„Many innovations are done by farmers‘ hands.“

„Before I do agriculture like a blind man, now I can see and understand.“

Farmer researcher from Pangandaran, West Java
Merging communities of practices – Part I

Agro-ecology & local wisdom

Farmer field school

On-farm trials
Merging communities of practices
Part I

Climate-friendly Farming

Climate Field Schools

On-farm trials

Adaptation techniques

Is this enough to influence climate policies?
Merging communities of practices

Climate-friendly Farming

- Appropriate technologies and innovations
- Climate Field Schools
- Problem-solving dialogue

Climate Field Lab

- Evidence-based advocacy
- Adaptation techniques

Increased adaptive capacity
FOUNDATION MODULE:
CLIMATE FIELD SCHOOL

DIRECTORATE OF FOOD CROP PROTECTION
DIRECTORATE GENERAL OF FOOD CROPS
MINISTRY OF FARMING
2013
- Climate Field School
- Farmer researcher
Research in Chili fields
36% leaders „on stage“
13%
7% are more „backstage“

67% in the middle of community

West Java: higher educated
Toraja: older than the average farmer
Strengthening Farmers’ Awareness Through Climate Field School (CFS)

- Andragogy (adult education) Approach
- Agrometeorological learning and local prediction
PROGRAM INOVASI DAN KAJIAN PERTANIAN YANG TAHAN IKLIM
(CRAIIP)

Uji Efektivitas Pupuk Hijau Azolla pinnata dan Sesbania rostrata
Pada Pertumbuhan dan Hasil Tanaman Padi Varietas Bangi, Cimera, Impal S1 dan Melang, yang Tahan Saltatias dan Ringan
Dilaksanakan di Desa Cigimeho Kec. Padahering Kab. Pangalengan
Adaptation Strategies

a. Floating Rice
b. System of Rice Intensification (SRI)
c. Stress-tolerant rice varieties
d. Green Manure
Appropriate Technology

- Soil Ecology health simple analysis/portable lab
- Biochar and organic pesticides
- Azolla for feeding fish and ducks
What can a farmer do if the fields are getting more and more saline?

Story of Farmer family van Wesemael

“Saline soil” = EC > 4 dS/m (Soil Science Society of America)
Here: 8 EC

Picture source: http://www.opdemariahoeve.nl/home
Sea cabbage (crambe maritima)

**Idea:** from white coast Dover

**Follow up:** Cooperation with University (analyse nutrients)

**Income:** Farmer family
- Price 120 €/kg (2 M IDR)
- $1500$ kg/season = 180,000€ or 2.9 billion IDR revenue

*Picture source: own 19.09.2018*
Sea cabbage production process

• 1st year: growing roots outside (550,000 roots)
• 2nd year: sprouts inside
• Harvest time: 8-11 AM
• 4 months, each day 12 kg

Picture source: https://www.gastropedia.nl/artikel/zeekool-crambe-maritima/
Saline Potatoes

- Smaller and harder than normal potatoes, yield lower
- Not salty!
- Sea Water is pumped from the sea and sprayed on potatoes

Picture source: own 19.09.2018
Zouttolerante aardappel binnen
Regionaal bod Proeftuin Zoet Water
Verslag van het volgen van aardappelrassen onder verschillende
zoutregimes gedurende 2 groeiseizoenen

Juni 2017
Auteurs:
Guus Heselmans (Meijer); Perry de Louw (Deltares); Corstiaan Kempenaar (Meijer); Edvard Ahlrichs (Deltares); Inez Terpstra (Meijer); Joost Delsman (Deltares), Stella Bari (Deltares);
Cheryl van Kempen (Deltares); Esther van Baaren (Deltares); Jean-Pierre van Wesemael (Saeftinge Zilt)
Healthy plant
“Climate Change is a real threat to us, even a matter of survival. With increasingly high attacks of pests and diseases, yields are declining. Our traditional weather rules aren’t reliable anymore, making it more difficult to determine the planting season for rice and other crops. Therefore, we are required to try new practices in order to adapt better. 

Pak Cristian David, desa Buntu Datu, picture source: own
Climate change matters for us, as it impacts agriculture negatively. The temperature is higher than 15 years ago. It becomes difficult to decide on the right time of land preparation, as the onset of the rainy season is unpredictable. There are more pests and diseases and also a higher resistance to pesticides. Lower yields, high chemical inputs and soil with low fertility and water holding capacity are common.

Pak Endi and Ibu Hera,, picture source: own
Economics of Organic Rice Farming + System of Rice Intensification (SRI)

- **Paddy Yield t/ha**: Conventional Rice Farming yields most. Organic Farming gets more profitable, as yields are building up and require less fertiliser.
- **Gross Margin Rp/ha**: Organic rice almost reaches conventional yield in third year.

**Prices 2018 (Rp/kg)**

<table>
<thead>
<tr>
<th></th>
<th>Conventional</th>
<th>Organic</th>
</tr>
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<tbody>
<tr>
<td>White rice</td>
<td>12,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Red rice</td>
<td>14,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Black rice</td>
<td>15,000</td>
<td>31,000</td>
</tr>
</tbody>
</table>

**Organic Rice Farming** is more profitable from second year onwards: Better prices + lower costs through organic fertilising (only labour costs).
Challenges Large gap between the skills of farmers (producers) to fulfill the requirements of buyers, both in terms of product types, quality and packaging.

Organic products most popular on local market: Rice, Vegetables, and Fruit Vegetables

Export products organic:
1. New Zealand and China: Snakefruit (sallaca)
2. Europe (Germany) and USA: Peanuts, Groundnut, Wild Peanuts, Cassava Chips (cassava, Sallaca, dragon fruit, jackfruit), spices, cinnamon, coconut, Rice (black, red), Brown sugar, Turmeric.
3. Canada: Nutmeg.
4. England: Powder (carob, maqui berry), Chia Seed, Quinoa Seed.
In order to further strengthen farmers’ capacity to adapt to climate change we would like to extend our network

- Promote organic products from smallholders in Indonesia in Indonesia and abroad: Farmer-smart Embassies and Asian fairs/events in Berlin and Europe
• IDEA 1: International Conference for farmer researchers à la Tropentag
• Idea 2: Farmer exhibitions in Indonesian universities with Fakultas Pertanian
Idea 3: (Farmer)-smart embassies and exhibitions
https://www.youtube.com/watch?v=-otnq4aMVkI

Azolla in West Java

https://www.youtube.com/watch?v=EoeB3cCQKKI
Projekt introductory video
My simple show CRAIIP
Thank You
Terima Kasih
Kurre Sumanga’