Finding Blue

Climate Smart Agriculture for Natural Indigo Batik Production in Indonesia

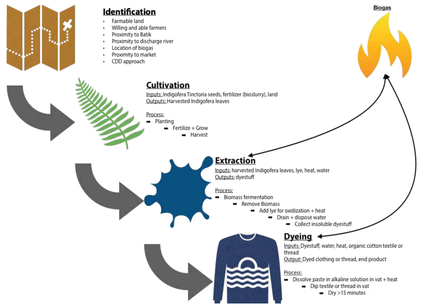
Ivan Bobashev - UC Berkeley - Masters of Development Practice - October 2018

Introduction

Bali based Sustainability and Resilience Company (su-re.co) was interested in exploring natural indigo dyes as a mechanism for climate change resilience. Localizing and mainstreaming natural indigo dye has a number of well defined environmental, economic, and social benefits. Synthetic indigo is ubiquitous in the textile industry in Indonesia. Use and discharge of synthetic is very toxic and contaminates many water sources in Java. There are currently very few sources of natural indigo, despite a long tradition of dyeing. Naturally dyed textiles are more lucrative than synthetics in today's environmentally conscious climate.

Ciwaringin Batik is a collective of traditional batik craftspeople in Java. In the past 10 years, the increase in demand for natural indigo batik has allowed many to return from factory and migrant work to work with their families and community. Currently, craftspeople use dye from a university in Yogyakarta (UGM). The dye is expensive, and although dubbed "natural", its origins are not transparent. Thus, the team was tasked with assessing the feasibility of growing and extracting indigo locally. Given the heat demand of batik decoration, and biowaste from extraction, there is opportunity for biogas to to replace LPG.
The youth group of the village is eager to develop the project, but cannot provide the resources. The local forestry agency, Perhutani, has agreed to lease a plot of land for a pilot project. However, the exact location and site characteristics are unknown to anyone besides the forestry agency.

The Indonesian archipelago is highly exposed to climate change, and Ciwaringin is no exception. Therefore, any intervention with an agricultural component must carefully consider changes in climate patters before introducing a species for cultivation.



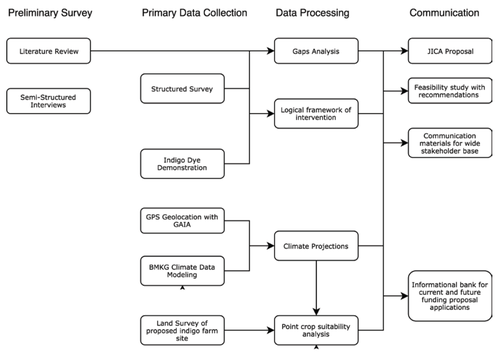
Objectives

- Accurately geolocate potential land grant for pilot indigo project

- Assess feasibility of farm-to-textile system in Ciwaringin and potential application of biogas

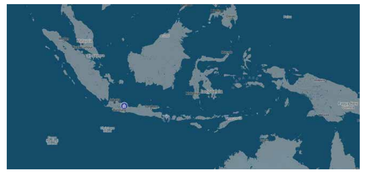
- Identify the most appropriate indigo crop choice under Climate Smart Agriculture principles

Methodology



Results

Geolocation



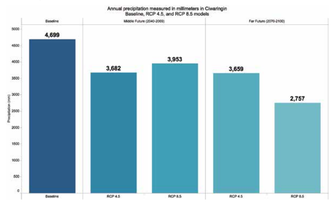
Country: Indonesia
Province: West Java
District: Cirebon
Subdistrict: Ciwaringin
Village: Ciwaringin

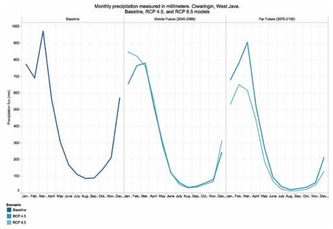
Lat: -6.72726
Lon: 108.38117
Elevation: 227 m

Point data for the proposed grow site was collected through available GIS data in GAIA as well as models developed by Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG). Climate projections were based on downscaled Representative Concentration Pathway (RCP) models, collected and run by BMKG at 20km resolution.
These models provide monthly results for precipitation, minimum temperature, and maximum temperature.
The reported models consider only baseline, medium-term, and far future trends.

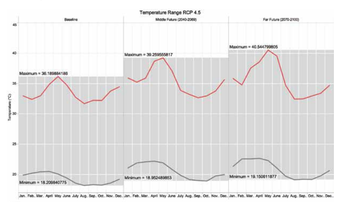
Climate Projections

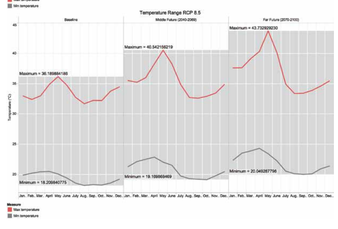
Precipitation





Temperature





RCP 4.5: *represents an optimistic scenario where commitments to mitigate GHGs are met and emissions peak in 2040*

RCP 8.5: *worst-case scenario in which GHG emissions grow unchecked*

Crop Suitability

	Species	Common Names	Altitude range (m)	Plant Height (cm)	Temperature (C)	Annual Rainfall Range (mm)	Shade Tolerance
	***Strobilanthes cusia (Nees) Kuntze,*** *Acanthaceae*	Assam Indigo, Chinese Rain Bell, Strobilanthes Flaccidifolius	100-2000	50-150	P: 27.3 - 25.4	T: 2841 *Prefers moist soil; trouble survivng dry season	Partial sunlight Grows best under canopy
	***Indigofera tinctoria*** *Fabaceae / Leguminosae*	True Indigo	0-1600	100	P:22-28 T: 7-32	P: 1,300-1,700 T: 640-3,000	Full sun
	***Indigofera arrecta*** *Fabaceae / Leguminosae*	Java Indigo, Bengal Indigo, Natal Indigo	200-2700	30-300	P: 22-30 T: 16-36	Prefers moist soil; can tolerate up to 2 months of waterlogging	Full sun, intolerant of shade

Recommendations

Strobilanthes cusia is found to be highly suitable with annual rainfall and soil quality being the only gaps in need of further clarification. Indigofera tinctoria is found to be moderately suitable with access to sun and annual rainfall being the main areas of concern. Finally, Indigofera arrecta is found to be marginally suitable with altitude, annual rainfall and sun access falling outside of the suitability range.

A pilot incorporating both Strobilanthes cusia and Indigofera tinctoria into an agroforestry system with the teak plantation is recommended.
Planting Indigofera tinctoria at the beginning of cultivation would allow it the full sun it needs while teak crops are still small, while building soil quality by fixing nitrogen. Indigofera tinctoria is also the variety Ciwaringin in most familiar with processing into dyestuffs so it would eliminate an extra level of training at the beginning stages and save resources for later stages.
During this process cultivators could be trained in Strobilanthes cusia care until the teak plants are mature enough that Indigofera tinctoria can no longer flourish.
Given the newly abundant shade, Strobilanthes cusia could be introduced into the agroforestry system and intercropped with teak.

Discussion with all of the relevant stakeholders including partners, farmers, batik craftspeople, and local forestry department informed a strategy for a way forward with the Ciwaringin Batik farm-to-textile project.
Implementation of the project can be broken down into 3 stages:

<u>Stage 1</u>
Obtain land use license from department of forestry
Cultivate 1st rotation of I. Tinctoria
Market analysis in Bali; establishment of su-re.colors
Time Frame: First 2 years of operation beginning ASAP

<u>Stage 2</u>
Build dye extraction lab
Dye quality feedback loop with batik makers
The resulting indigo dye must be a suitable substitute to the current supply from UGM
Sustainability audit by su-re.co
Time Frame: Beginning in mid 2019, assuming a sufficient crop of indigo produced

<u>Stage 3</u>
Introduction of biogas digester
Biomass waste from extraction lab input, creating heat source for batik
Bioslurry from digester used as fertilizer for Strobilanthes crop
Time Frame: Start in 2020, assuming success of Stage 2

Acknowledgements

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A special thanks to the Thread of Life team, Rumi Takama, and everyone else who helped us along the way.
Without the strong and meaningful partnerships involved in this project, there would be little chance of it emerging out of academic ruminations and into action.
I look forward to seeing what is in store for Ciwaringin Batik and su-re.colors!
Finally, a special thank you to George Scharffenberger, the MDP staff, and USAID for the preparation and resources. Without you none of this would be possible.

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