MAPPING COCOA PRODUCTIVITY IN GHANA, INDONESIA AND CÔTE D'IVOIRE



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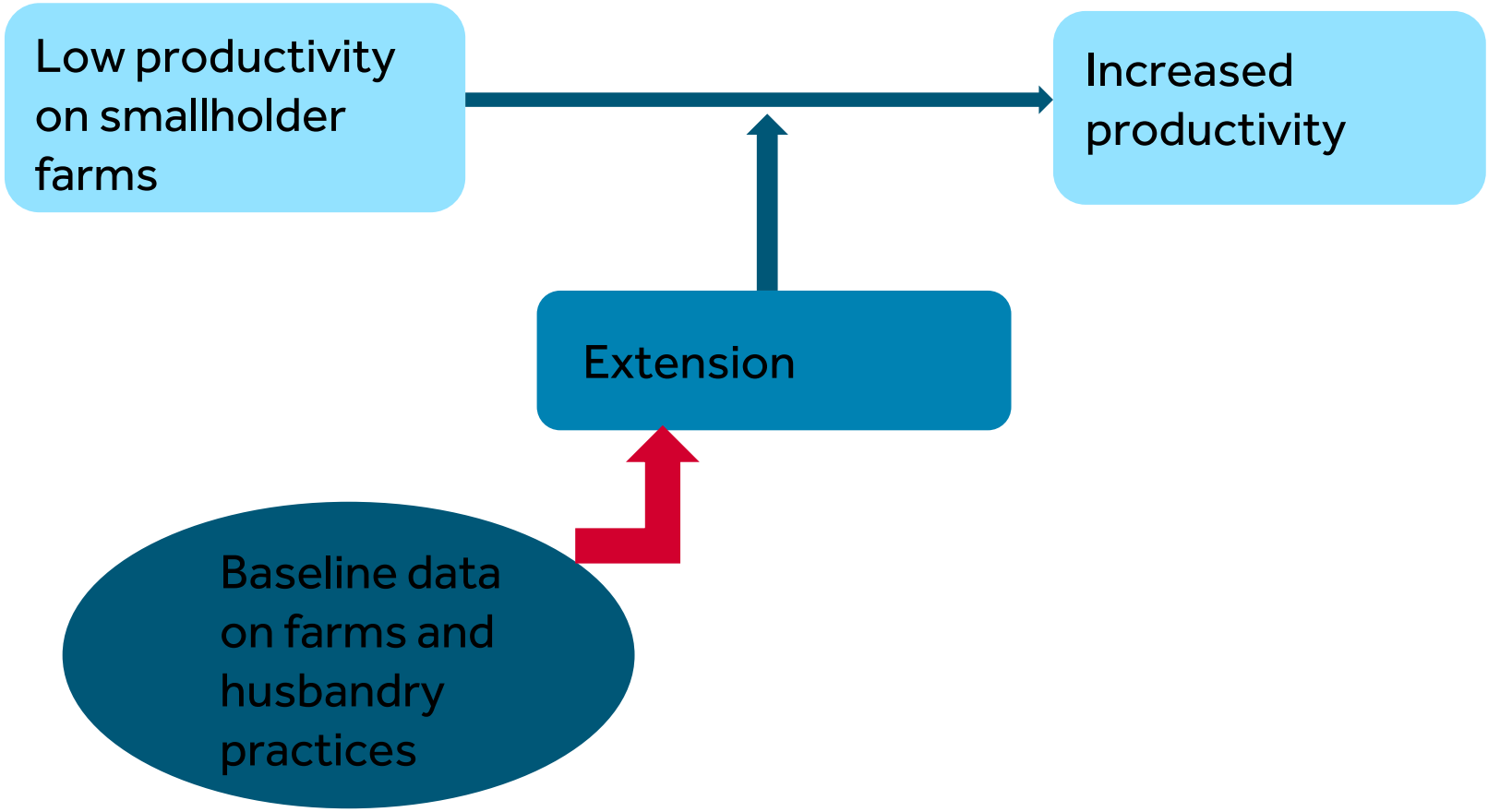
MAPPING COCOA PRODUCTIVITY PROJECT: BACKGROUND



PROJECT AIMS

- To quantify the variability in the physical characteristics of smallholder cocoa farms (in terms of size, planting density, shade trees present and soil parameters)
- To assess farming practices in place and challenges faced by farmers
- To assess the extent of yield variation between farms and to gain a better understanding of factors underlying this variation.

FARM SELECTION

- Ghana:- 4 Regions: Western, Brong Ahafo, Ashanti and Eastern Regions
- Indonesia:- Western Sumatra, Lampung, West Sulawesi, Central Sulawesi, South-East Sulawesi, South Sulawesi, East Java and West Papua
- Côte d'Ivoire: Abengourou-Kotobi, Gagnoa-Divo, Soubré and Guiglo

Location of farms in Indonesia.

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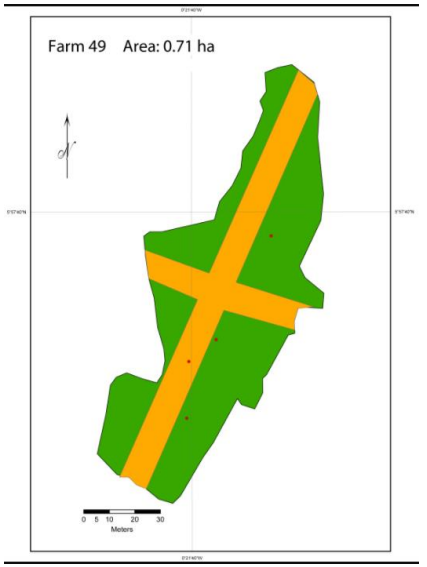
METHODOLOGY

- Baseline data on each farm: Farm size (GPS), cocoa tree density and shade trees present, soil samples (Ghana and Indonesia)
- Farmer interviews: included background information on the farmers; characteristics of the farms; agronomic practices in place
- Productivity assessments on tagged trees every six weeks (number of pods in different size classes, losses to diseases)



RESULTS

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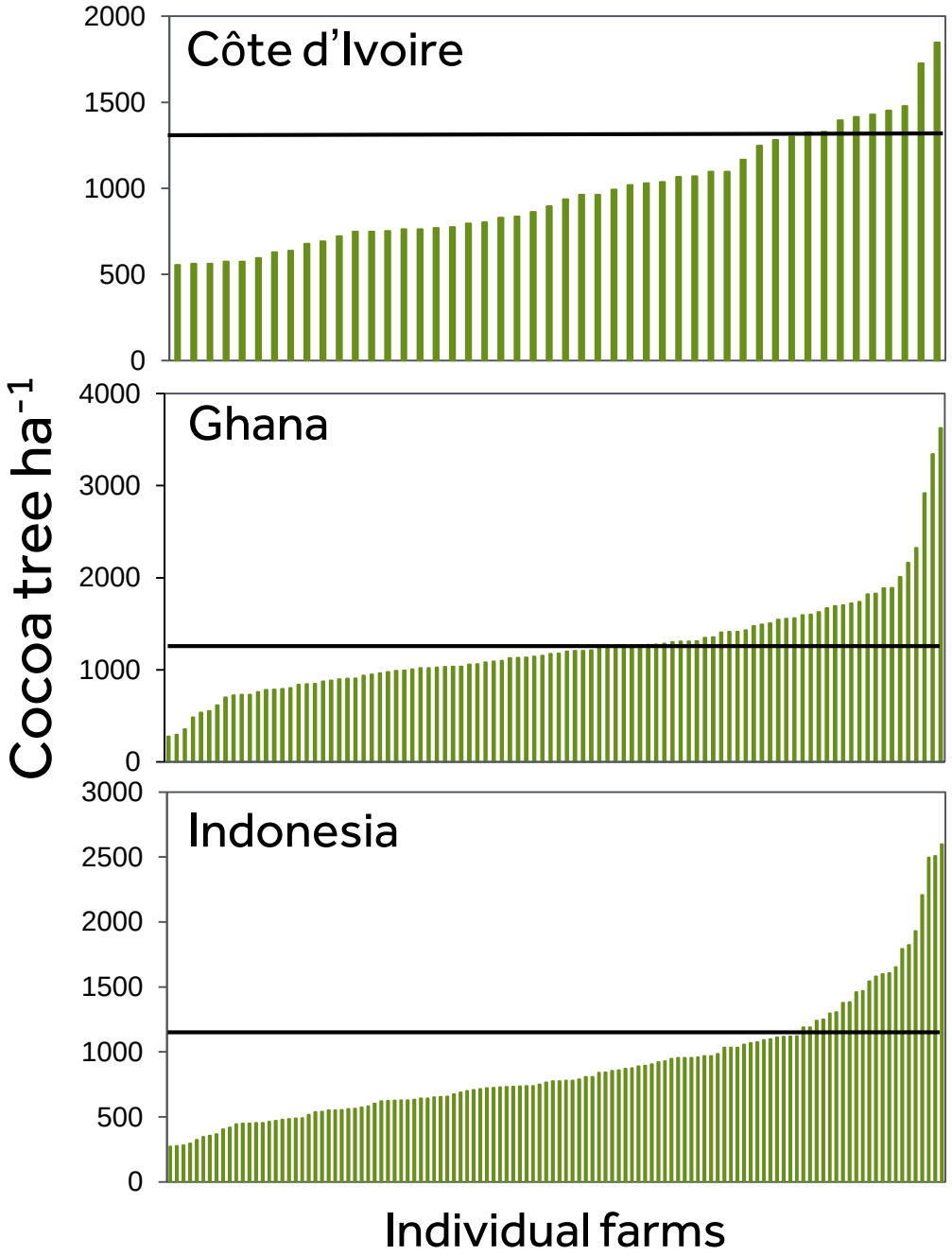
Characteristic	Ghana	Côte d'Ivoire	Indonesia
Farm size (ha) (mean,[median] and range)	2.17 [1.55] (0.26 to 11.6)	2.80 [2.21] 0.44 to 14.8)	0.70, [0.63] (0.11 to 3.2)
Farm Age (years) (mean and range)	17.5 (1 to 52)	24 (4 to 56)	15 (2 to 34)
Proportion of farms owner-operated	58%	69%	96%
Cocoa density (tree ha^{-1}) (mean and range)	1244 (276 to 3626)	975 (556 to 1848)	888 (272 to 2598)
Regular planting	Very few	None	Most
Planting material	100% seed derived	100% seed derived	Mixture of seed-derived and clonal material



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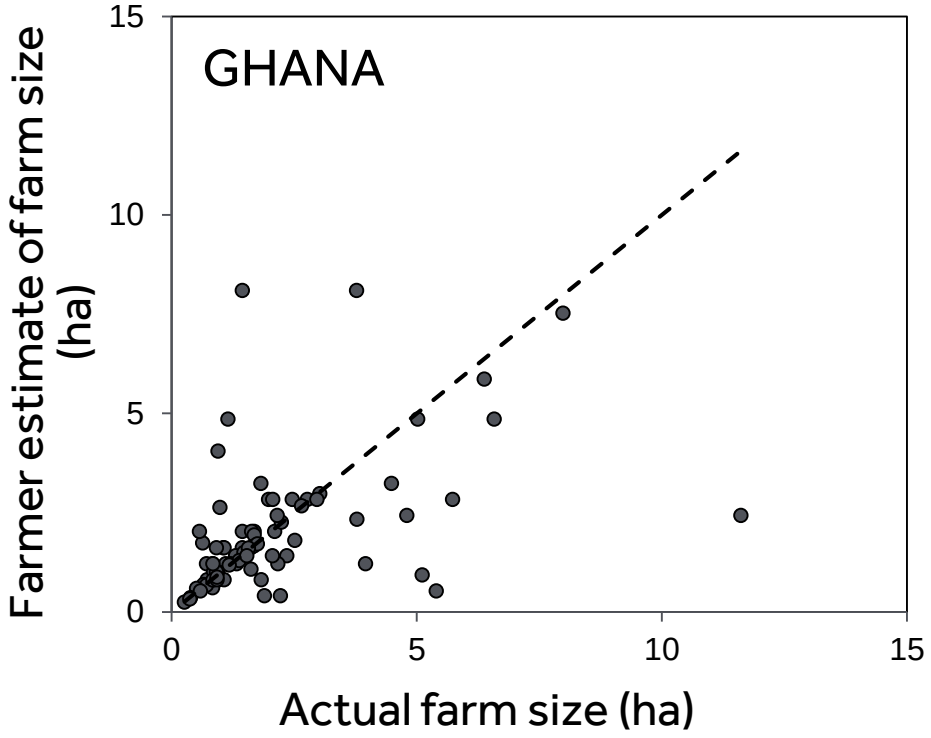
- Considerable deviation from recommended planting densities in each country

Horizontal line is recommended density



- Some farmers had a poor perception of farm size
- This can lead to incorrect quantities of fertilisers/ agrochemicals being applied
- Provision of farm size data important part of extension activity

SOIL CHARACTERISTICS

Proportion of farms that fell into the recommended soil macronutrient thresholds for cocoa as proposed by Snoek *et al*. (2016). "Gh"= Ghana, "Ind"=Indonesia

Parameter	Unit	Lower threshold (L.T)	Upper threshold (U.T.)	Farms below L.T. (%)		Farms above U.T. (%)		Farms within range (%)	
				Gh	Ind	Gh	Ind	Gh	Ind
pH		5.1	7.0	16.7	40.8	3.1	0.8	80.2	58.3
C	%	1.7	3.2	72.9	57.5	0	0	27.1	100
N	%	0.2	0.4	83.3	60.0	0	10.8	16.7	29.2
P	$mg\ kg^{-1}$	12.0	25.0	39.6	**	21.9	**	38.5	**
K	$cmol_c\ kg^{-1}$	0.2	1.2	0	0.8	0	3.3	100.0	95.8
Mg	$cmol_c\ kg^{-1}$	0.9	4.0	32.3	10.0	3.1	27.5	64.6	62.5

- High amounts of carbon and nitrogen were observed in more recently established areas such as Western Sumatra in Indonesia and the North-Western Region in Ghana

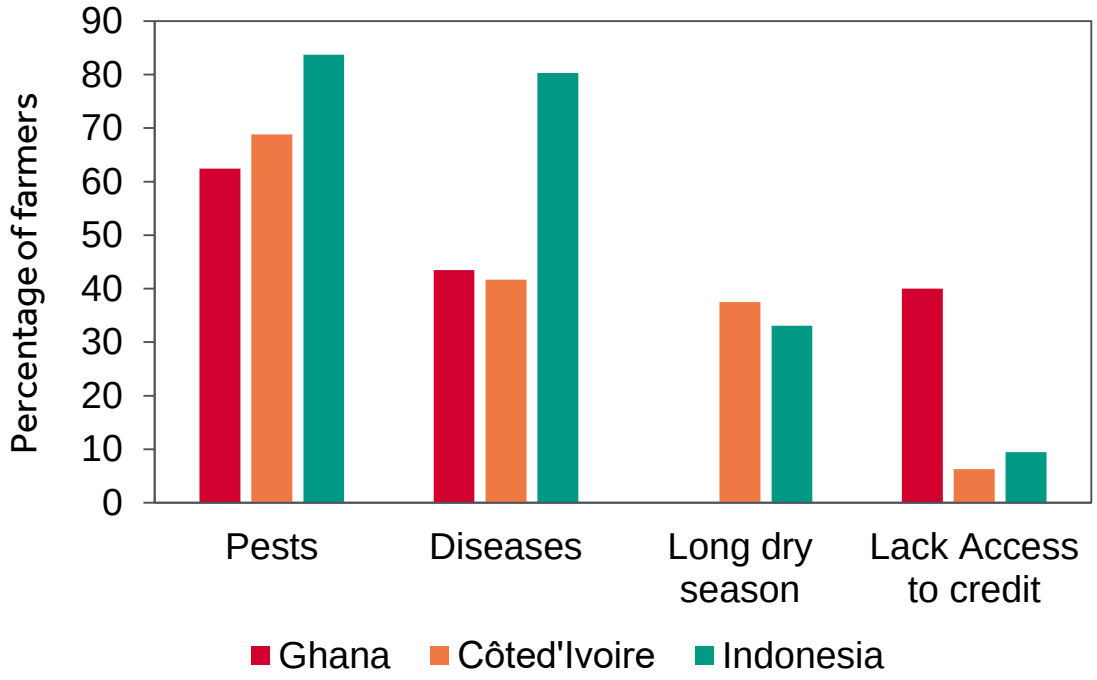
PLANTING MATERIALS

- Only 8.4% and 45% of farmers in Côte d'Ivoire and Ghana, respectively, stated that they obtained seed from recommended seed gardens.

Source of planting materials in Côte d'Ivoire

Sources of planting materials	Percentage of farmers
Neighbour/ relatives farm	45.8%
Don't know	43.8%
Own farm	12.5%
ANADER (Extension service)	4.2%
CNRA (Research organisation)	2.1%
Cooperative	2.1%

CHALLENGES FACED BY FARMERS



- Pests and diseases most commonly cited problems in all three countries
- Some country specific problems- e.g. access to labour and long wet season in Indonesia

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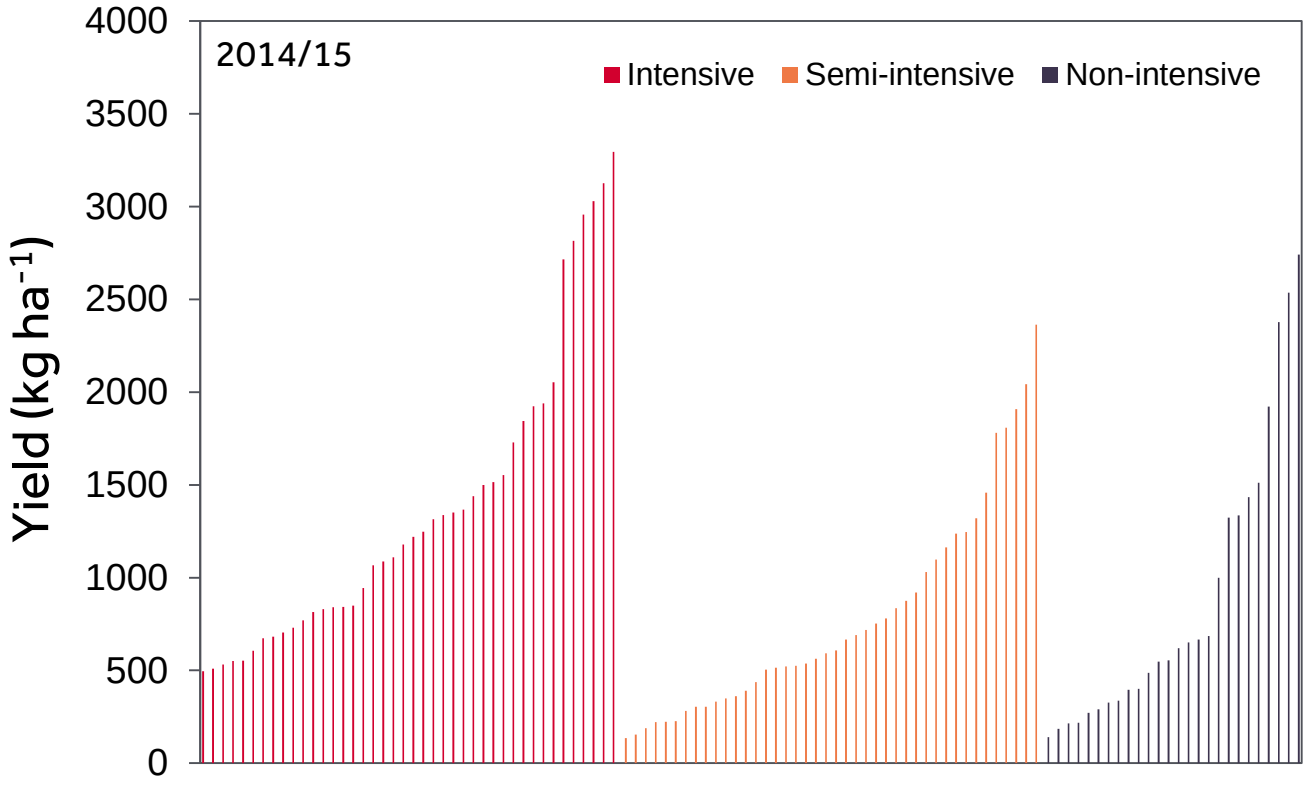
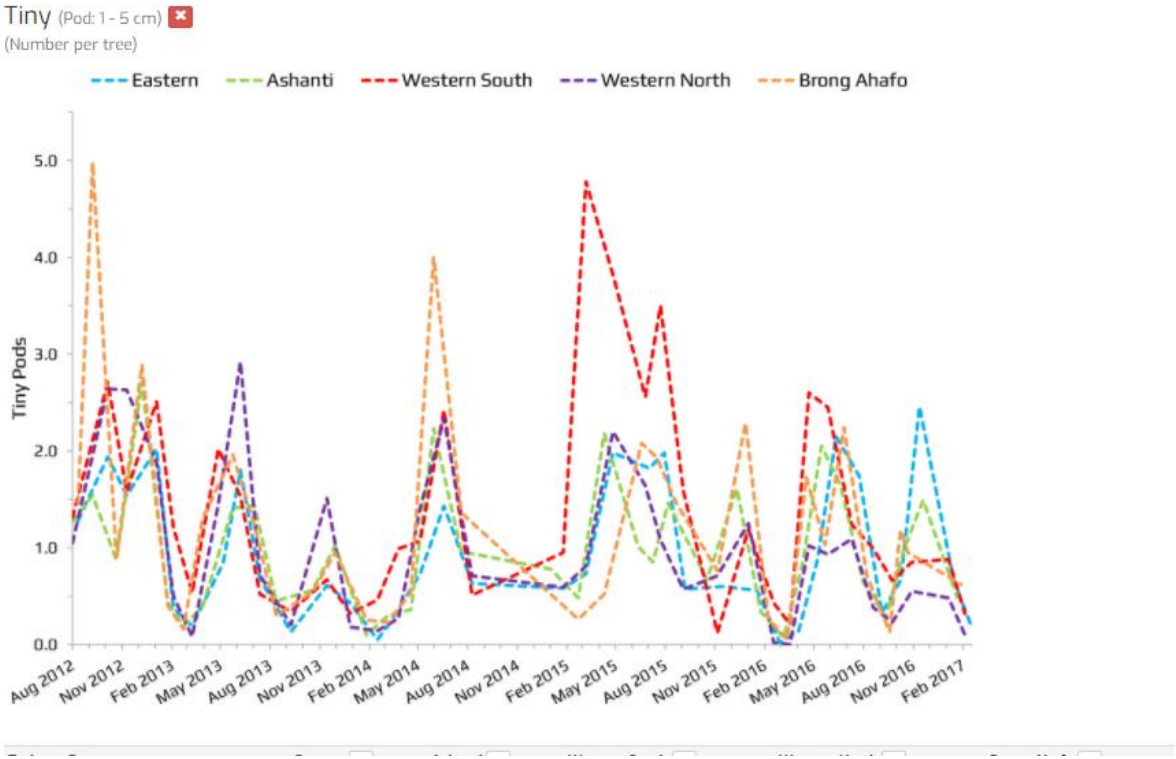
YIELD VARIATION BETWEEN FARMS

Country	Year	Number of farms	Mean yield (kg ha^{-1} yr^{-1})	Ratio of highest to lowest yielding farm
Côte d'Ivoire	2016	48	552	14
Ghana	2012/13	96	725	30
	2013/14	96	781	10
	2015	48	697	5
	2016	48	794	7
Indonesia	2014/15	120	1034	24
	2015/16	120	1229	137
	2016/17	120	1229	170



- In Indonesia farms classified as “Intensive” had higher average yields but large amount of variation observed within each category

Cropping Data



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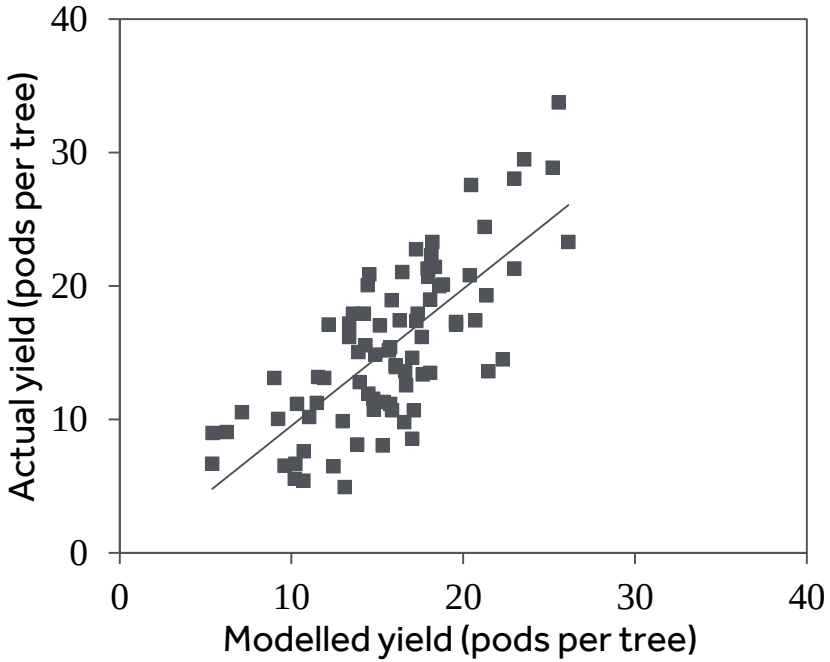
FACTORS UNDERLYING YIELD VARIATION BETWEEN FARMS

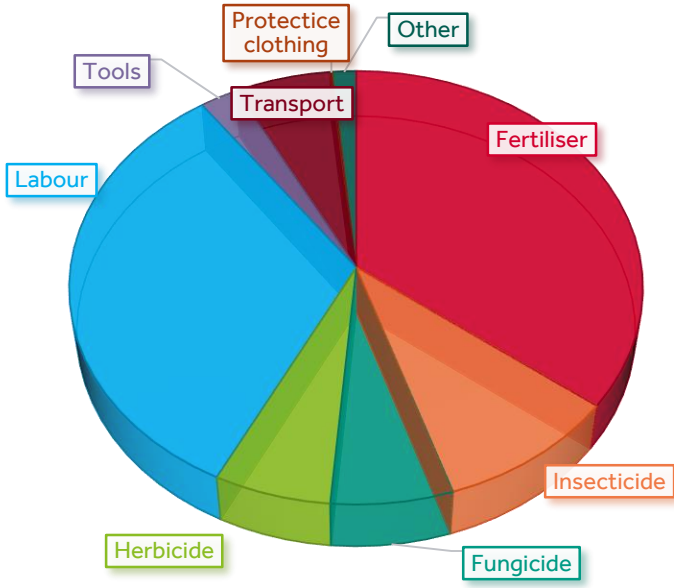
- Multiple regression approach used to examine factors underlying yield variation
- A number of common factors found to underlie yield variation
  - Fertiliser application
  - Spraying against blackpod
  - Planting density
- Soil phosphorus important in Ghana



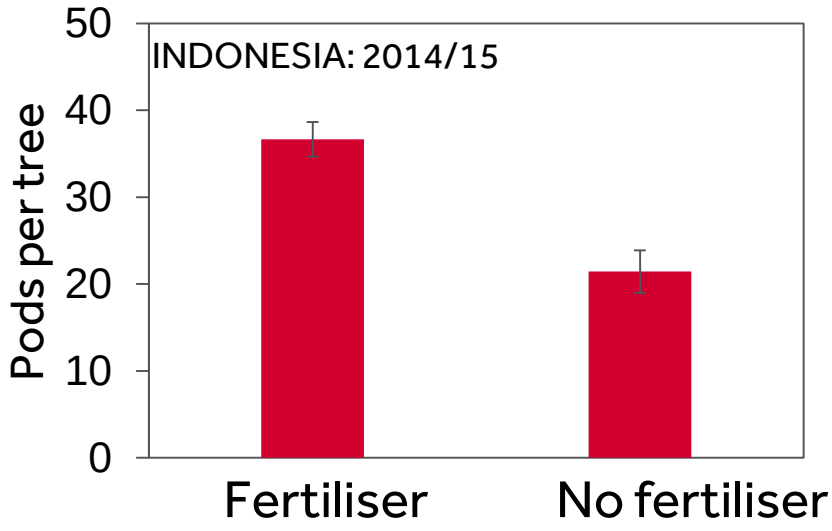
Model for GHANA 2012/13

FERTILISER ADDITION

- On average yields higher in Ghana and Indonesia when fertiliser applied
- Relationship not seen amongst sample in Côte d'Ivoire, although much fewer farmer applied fertiliser
- Geographical variation in soil properties illustrates the importance of localised fertiliser recommendations, particular given that fertiliser represented a high proportion of on-farm expenditure



On-farm expenditure in Indonesia



CONCLUSIONS

- The study illustrated a considerable amount of farm-to-farm yield variation
- Key factors that were associated with yield variation were planting density, fertiliser application and blackpod control
- Deviations from best practice were observed on many farms in each of the three top ranking cocoa-growing countries thus illustrating the great potential for on-farm yield improvement.

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