

A stepwise approach to achieve the best agronomic management practices and sustainable fertilizer use in West African cocoa production

Leonard Rusinamhodzi (IITA, Ghana), **Stefan Hauser** (IITA, Nigeria), **Ekatherina Vasquez Zambrano** (WUR, Netherlands), **Richard Asare** (IITA, Ghana), **Bernard Vanlauwe** (IITA, Kenya), **Ken Giller** (WUR, Netherlands)

Background

Smallholder farmers face severe resource limitations

Sub-optimal application of LMPs
(inability to purchase fertilizer)

Wide yield gaps



2022 International Symposium on Cocoa Research (ISCR), Montpellier, France

Background



The best returns to fertilizer applications are achieved when yield limiting factors such as pests and diseases are eliminated

What is the most sustainable approach to achieve best agronomic management practices (BAMPs) and enable resource constrained farmers to apply needed nutrients in cocoa?

How do we deal with susceptibility to climate variability and change?

Our baseline study.....




Up to 50% of farmers were not using fertilizer


Among those who used, they did not apply the recommended rates

Farmers were not achieving the best management (weeding, pruning, pest and disease control)

What is stepwise approach?



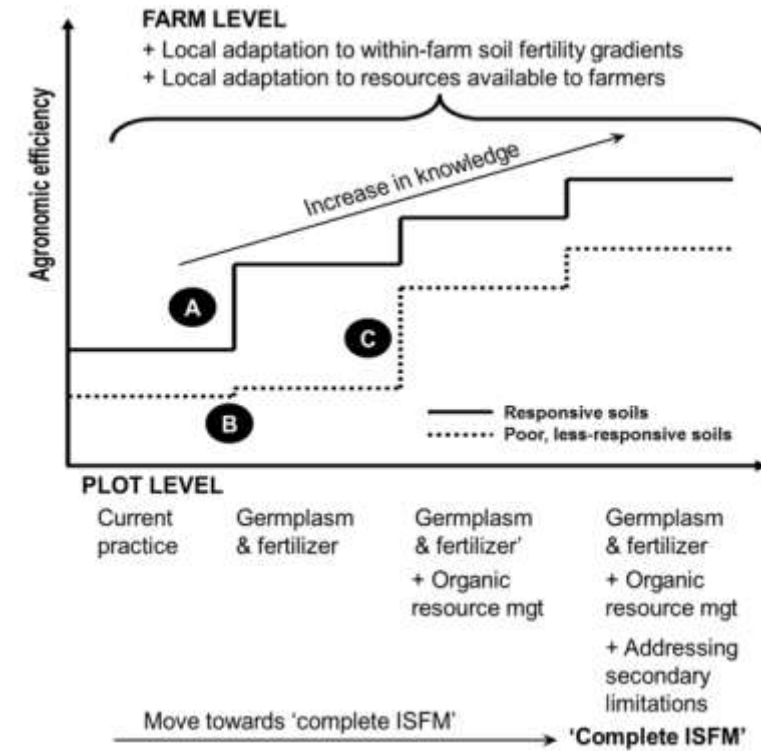
Stepwise approach breaks down the recommended best practices that many farmers cannot afford to implement at once:



Smaller, more affordable packages



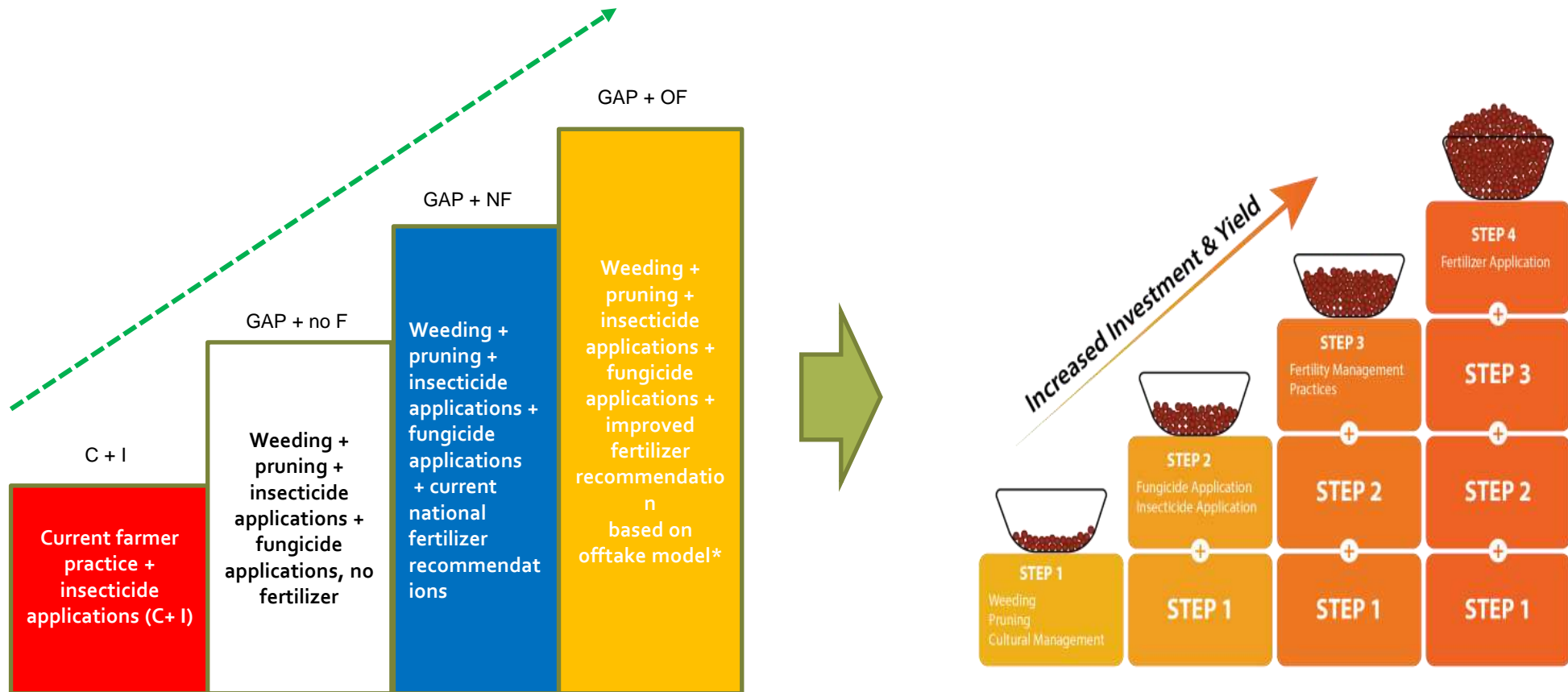
Can be implemented in phases to enhance adoption of agricultural technologies.



Vanlauwe *et al.* (2015)

2022 International Symposium on Cocoa Research (ISCR), Montpellier, France

A stepwise approach: on-farm trials

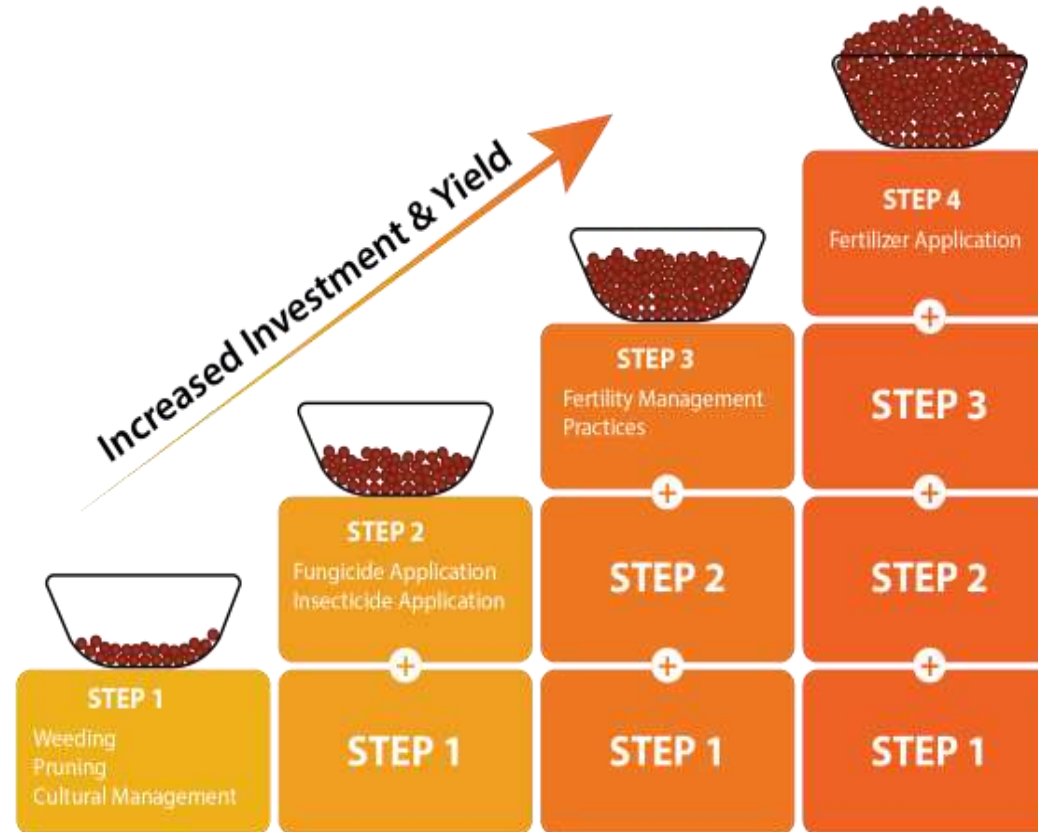


2022 International Symposium on Cocoa Research (ISCR), Montpellier, France

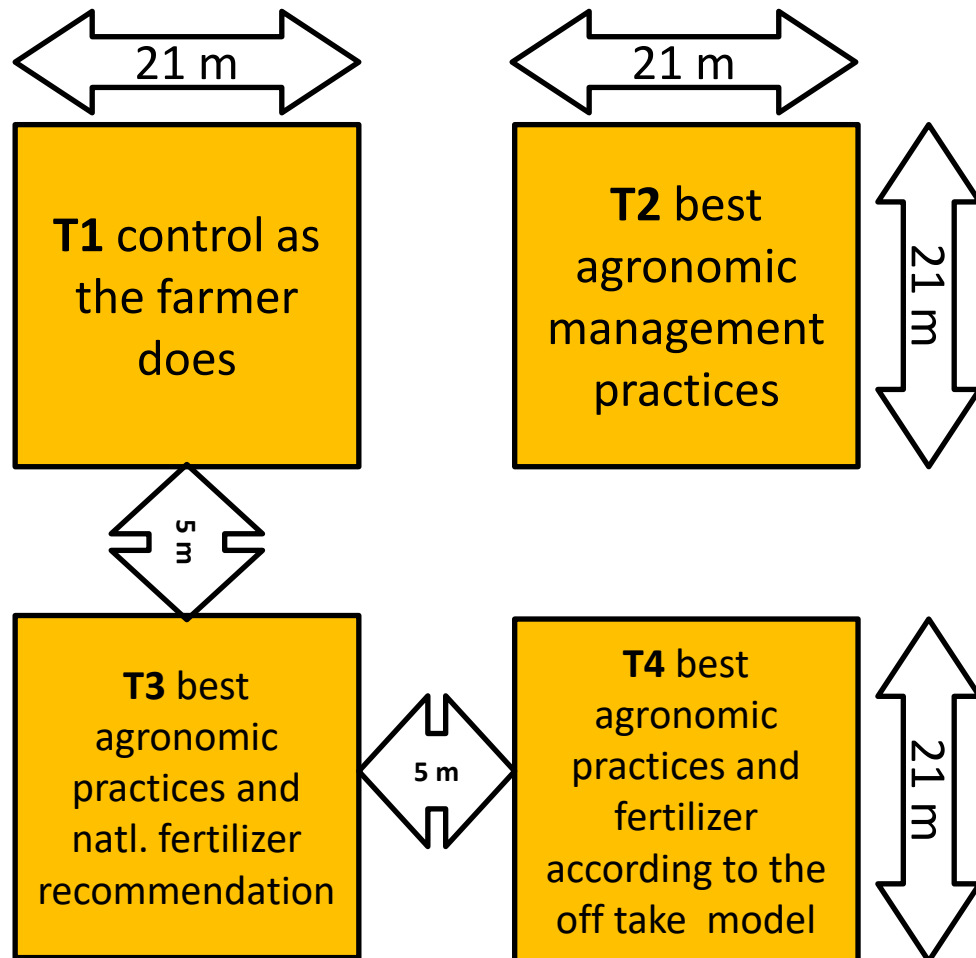


A stepwise approach – where is the starting point?

- Farm diversity largely driven by land and other resource limitations
- What are the investment needs and the outcome, and for whom?



Plot arrangement.....



- **An additive approach of four plots (T1-T4) representing increased intensities of management.**
- **Established on 389 cocoa plantations over two years (2020 and 2021)**
- **Cameroon, Cote d'Ivoire, Ghana, and Nigeria.**

Field design considerations



Restricted density, (950 - 1900) trees per hectare

Restricted age (8- 22) years, age of most trees in a plantation

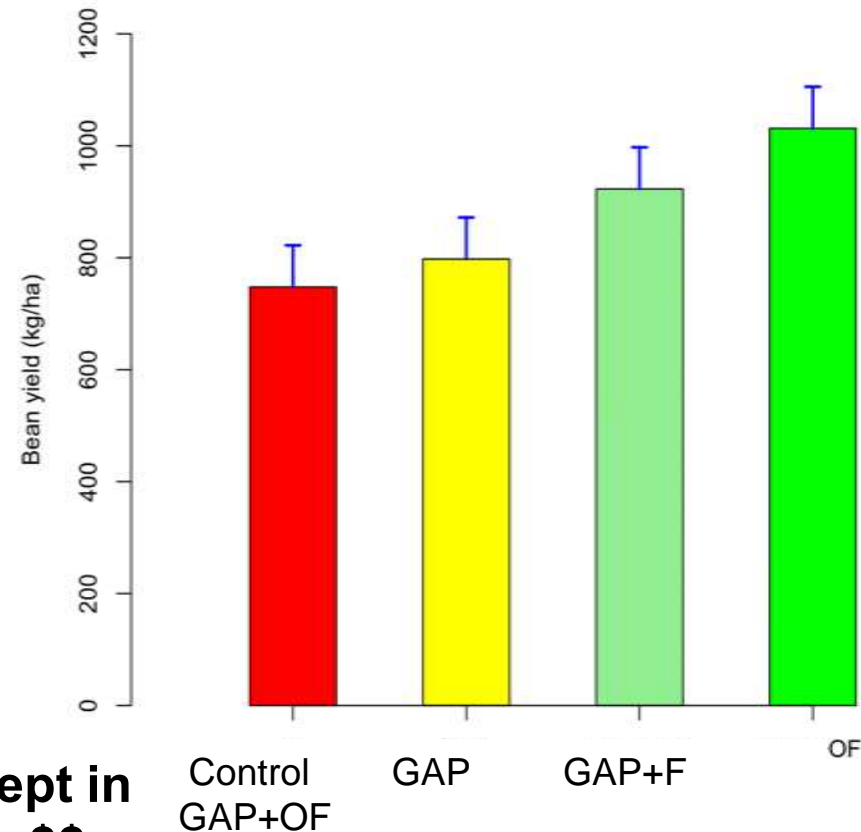
Shade level – was considered as a continuous variable

2022 International Symposium on Cocoa Research (ISCR), Montpellier, France

Preliminary results: On-farm validation Trials

- Best agronomic practices including structural pruning (T2) gave no significant increase in yields (702 kg/ha) above that of the T1 control (670 kg/ha)
- Application of fertilizer (T3 and T4) resulted in the largest yield increase above current farmer practice

Cocoa dry bean yield (kg/ha)



- **Preliminary results prove the "stepwise" concept in terms of yield benefits but work in progress on \$\$**

2022 International Symposium on Cocoa Research (ISCR), Montpellier, France

Development of decision support - Work in progress

Field trials



Analytics:

Spatial Crop + Economic models



Advisory apps/ field guides



2022 International Symposium on Cocoa Research (ISCR), Montpellier, France

Conclusions



- **There is need for judicious use of fertilizer (right quantity × correct formulation) in cocoa production systems of West Africa**
- **A stepwise approach may help to overcome the high demand on labour and capital**
- **Need to fully quantify the costs and returns of fertilizer user especially at farm level**

2022 International Symposium on Cocoa Research (ISCR), Montpellier, France

Thank you to all our partners!!

<p>Project Lead/Donor</p>	
<p>National Research Institutes</p>	
<p>Intl Research Centres</p>	
<p>Private partners</p>	



Thank you for listening!

Dr. Leonard Rusinamhodzi

L.Rusinamhodzi@cgiar.org

IITA, Accra, Ghana

2022 International Symposium on Cocoa Research (ISCR), Montpellier, France