

Sustainable Intensification: who's keen and who isn't.

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Sustainable Intensification (SI)

Implicit understanding that it entails an increase in agricultural production while minimizing/reversing damage to the environment, e.g.

“... the application of technology that can increase food production from existing farm land, places less pressure on the environment and does not undermine the capacity to continue producing food in the future” (*Garnett et al., 2013*).

or

“Provide pathways out of hunger and poverty for smallholder families through sustainably intensified farming systems that **sufficiently** improve food, nutrition, and **income** security, particularly for women and children, and conserve or enhance the natural resource base.” (*Program Purpose, USAID AfricaRISING, Feed the Future Program*).

What is sustainable intensification? Views from experts

Brian Petersen, Sieglinde Snapp

Land Use Policy 46 (2015) 1–10

abstract One of the grand challenges facing society today is how to feed a growing global population while at the same time minimizing the impact on the environment. Recent initiatives by the United States Agency for International Development and the United Nations suggest “sustainable intensification” as the most appropriate means to use land in order to increase food supplies while protecting biodiversity and eco system processes. However, it remains unclear what sustainable intensification entails and what it means to those working on this grand challenge. This study draws from 30 interviews with agricultural experts to assess their perceptions of sustainable intensification.

Results show that the term is not uniformly understood and the majority of respondents do not see it as a significant departure from current agricultural practices. Concerns included the vague nature of the term ‘sustainable’ and insufficient attention to relying on biological processes to support environmentally friendly production systems. These findings suggest that the term sustainable intensification needs to be defined and used carefully in terms of land use programs and policies. The paper concludes by exploring ‘ecological intensification’ as an alternative concept proposed to guide the management of agricultural systems.

(Sustainable) Intensification is based on two assumptions:

- a) The key limiting factor for a rural household's income/wellbeing is the productivity of its farm, thus investing in additional inputs leads to higher returns and poverty alleviation.
- b) Rural households that do farm are willing to allocate time/money (and possibly take on more risk) towards investing in their farming – **they want to try to intensify.**

(Sustainable) Intensification (SI)

Some questions:

- 1. Can rural households intensify their agricultural enterprises by adopting improved technology?**
- 2. How much can they intensify?**
- 3. Do the benefits from intensification constitute a sufficient incentive for rural households to invest?**

Question 1.

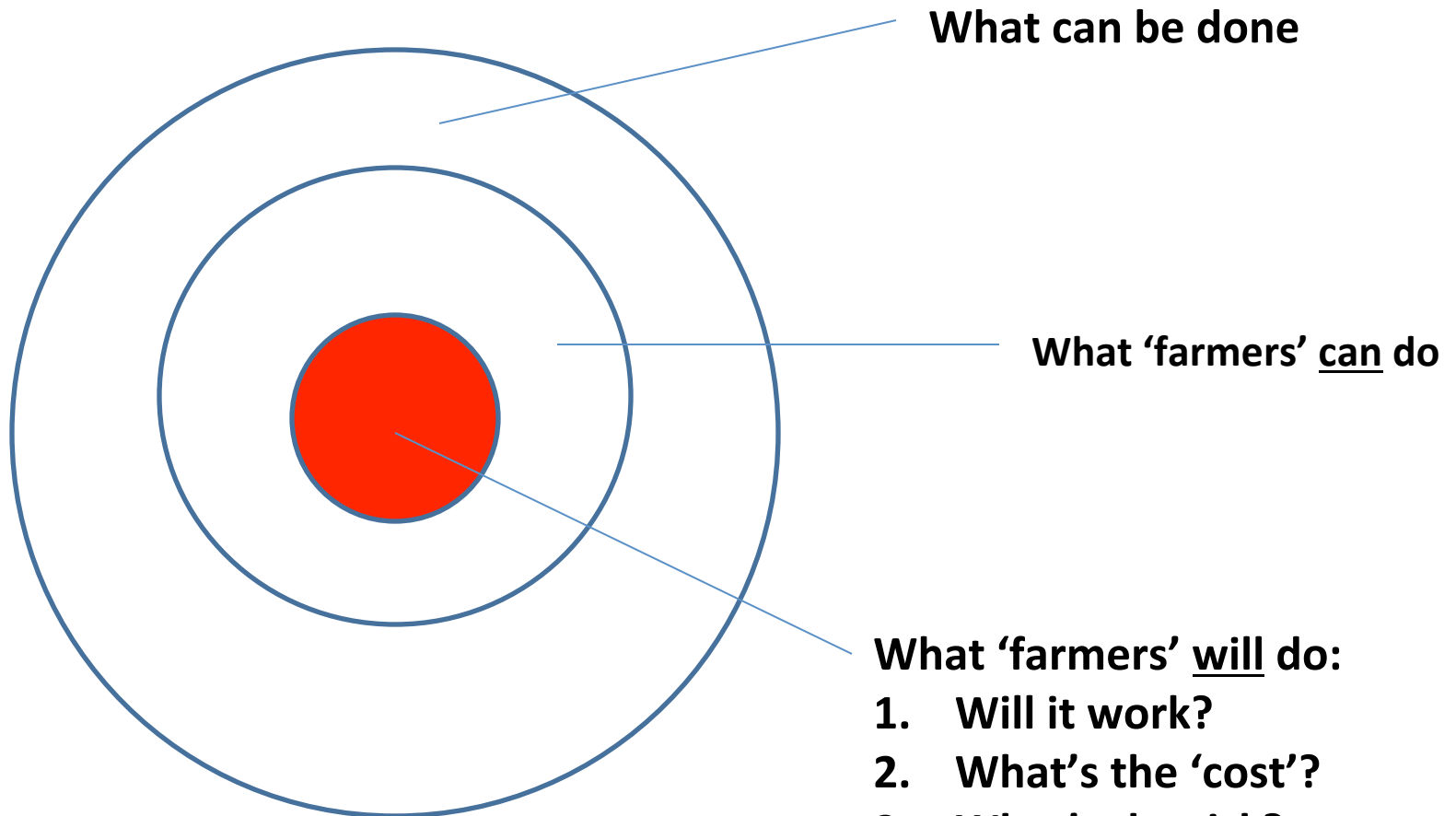
Can rural households intensify their agricultural enterprises by adopting improved technology?

Answer:

Yes, of course. Many effective technologies are available.

If appropriate technologies are **adopted** and **implemented properly** and they prove to be **cost-effective**, some benefits will result.

NRM technologies



What can be done

What 'farmers' can do

What 'farmers' will do:

- 1. Will it work?**
- 2. What's the 'cost'?**
- 3. What's the risk?**
- 4. Is it worth my while?**
- 5. Is it my best option?**

Question 2:

How much can rural households intensify?

Answer:

It depends.

Improved technologies increase Yield per Hectare. Lowder et al., (2014) report that most of the world's farms are very small, with around 475 million (84 %) smaller than 2 hectares. Of these, more than 410 million farms are less than 1 hectare in size.

Increased yield is not achieved without additional costs (inputs, labor, interest on credit, etc.). It is the **net** return on investment that rural HHs consider when deciding whether or not to make additional investments ('intensify') in agriculture.

While improved technologies have the potential to increase substantially the net value per hectare, the fact that most rural households don't have much land means that the absolute value of increased production per HH (or per person) is small and may not necessarily represent much of an incentive for adoption.

We can quantify the benefits accruing to any household from increased net return by calculating the Intensification Benefit Index.

Households can be characterized in terms of how they would benefit if net returns to land were to increase (by whatever means) according to the following relationship (Harris and Orr, 2014, *Agricultural Systems*):

$$\text{Mean } ^1\text{PDI [$/person/day]} = \frac{\text{Farm size [ha]} \times \text{Net Return [$/ha/year]}}{365 \times \text{Household Size}}$$

¹Personal Daily Income

The Intensification Benefit Index (IBI)

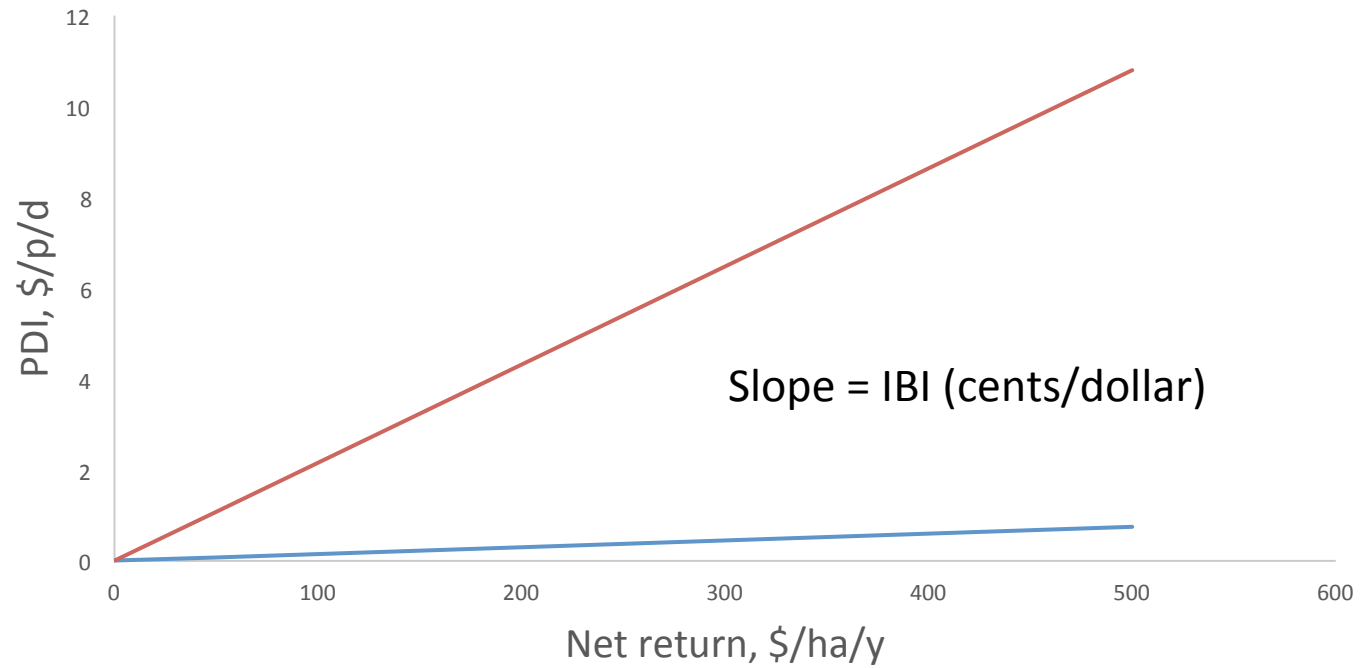
For any rural household,

the ratio of Personal Daily Income to net return per hectare per year is the Intensification Benefit Index and has units of **cents** (*per person per day*) **per dollar** (*per hectare per year*).

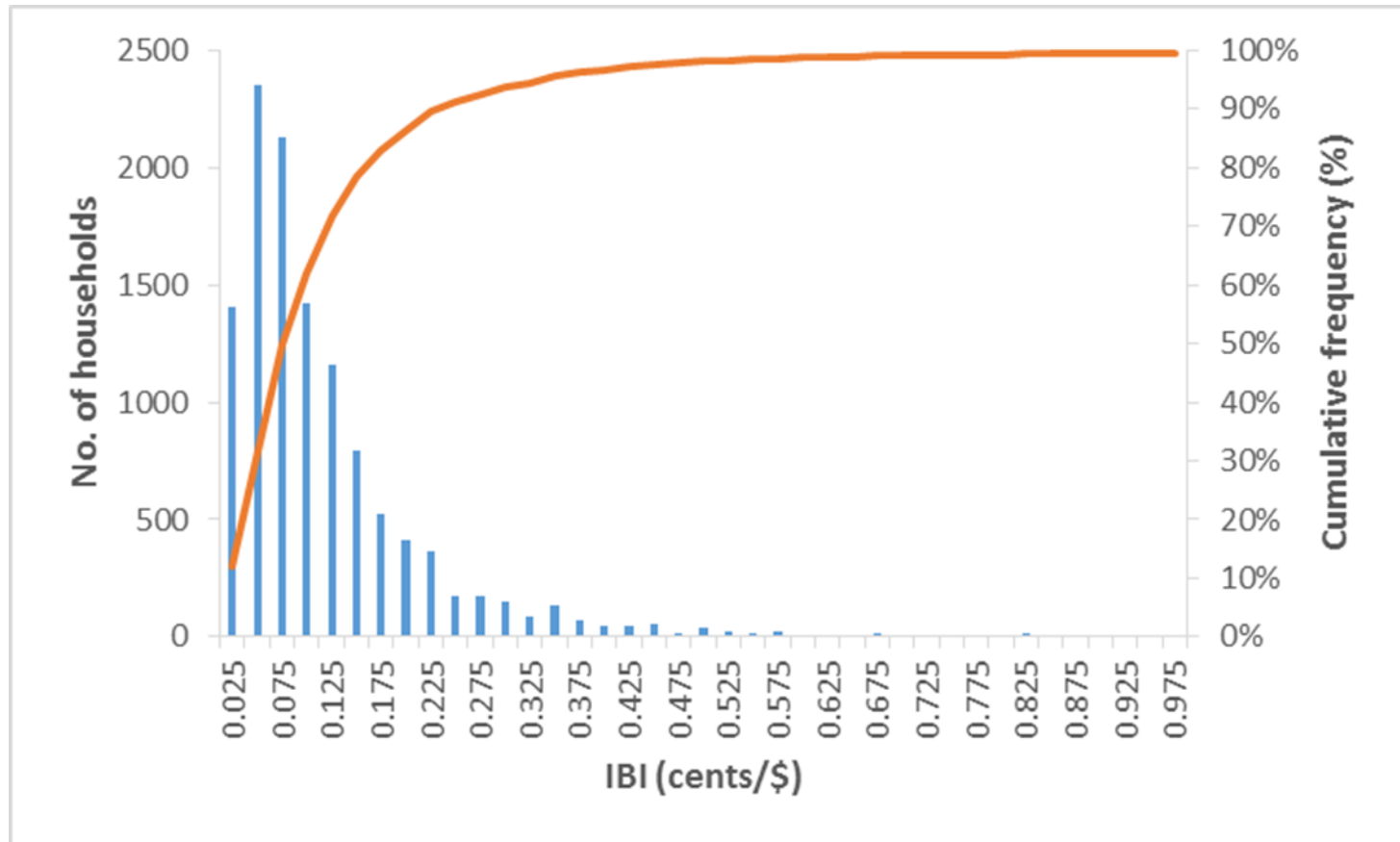
It is the rate at which PDI increases if net return per hectare increases, i.e. if Intensification 'happens'.

Note: IBI gives no information about whether or not intensification is **possible** or **likely**.

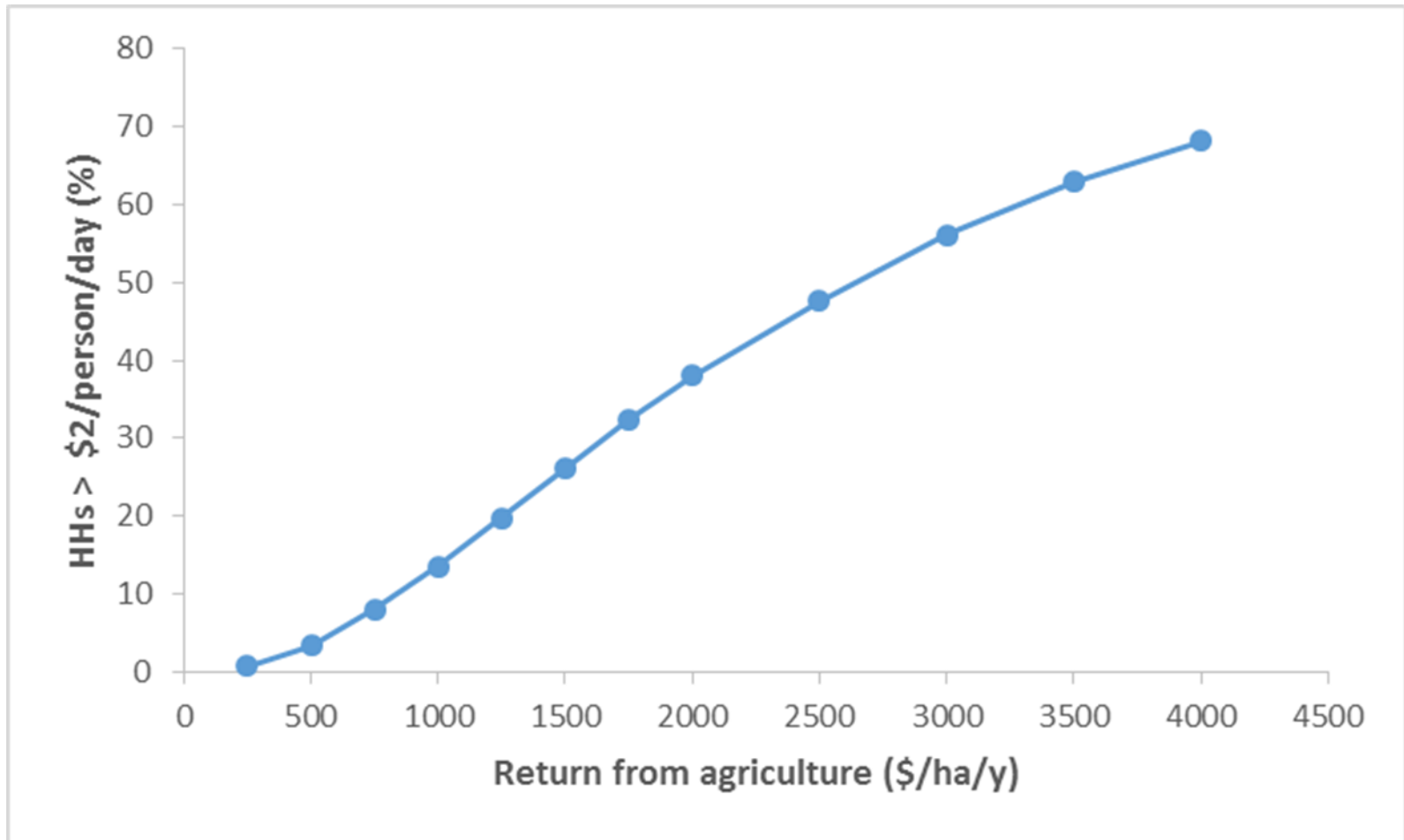
Intensification Benefit Index



**Frequency distribution of household Intensity Benefit Indices. N = 11,789 households.
(from 15 countries in SSA)**



The percentage of households whose members would exceed a PDI value of \$2/person/day as a function of returns from agriculture (\$/ha/year). N = 11,789.



Personal Daily Income (PDI, \$/person/day) for three sites in southern Africa calculated from net crop- and livestock income. Mean net return (\$/ha/y) from agriculture in survey: Changara, \$78; Nkayi, \$83, Mzimba, \$424. N = 160 households for each site.

**A. Changara,
Mozambique**

Mean PDI (\$/p/d)	0.40
SD	0.93
Median PDI (\$/p/d)	0.08
% HHs > \$2/p/d	3.1

B. Nkayi, Zimbabwe

Mean PDI (\$/p/d)	0.20
SD	0.21
Median PDI (\$/p/d)	0.14
% HHs > \$2/p/d	0

C. Mzimba, Malawi

Mean PDI (\$/p/d)	0.40
SD	0.42
Median PDI (\$/p/d)	0.29
% HHs > \$2/p/d	1.3

Question 3:

Do the benefits from intensification constitute a sufficient incentive for rural households to invest?

Answer:

We don't know.

We don't even have much information on the net value of improved technologies when implemented long term on a **whole-farm** basis.

Even large % increases in value on small farms will be small in absolute terms. They may be enough to persuade households to adopt or they may not. Changes in household behavior will depend on goals, attitudes, circumstances, livelihood strategies and other 'soft' characteristics.

We know very little about what criteria rural households use to make decisions about investments (time, money, effort, etc.).

Classical methods of research into adoption need to be augmented by methods from fields such as behavioural economics, marketing, psychology, communication and other fields that target the understanding of human behaviour.

World Development Report 2015: Mind, Society, and Behavior.

<http://www.worldbank.org/en/publication/wdr2015>

Conclusions (1)

- ❑ Given the **small farm sizes** that are characteristic of resource-poor rural households, **absolute values** of income will remain small for the majority of smallholders even if there is widespread adoption of improved technologies – i.e. **intensification**.
- ❑ The potential for **impact** from agricultural intensification depends on HH characteristics as well as agro-ecological potential and the conclusions can be counter-intuitive. For instance, some communities in high potential areas will **never** be able to benefit much from agricultural intensification. This should be taken into account when **targeting** interventions.
- ❑ The small benefits per HH from agriculture on small farms should be taken into account when approaching HHs to adopt new technologies – **other livelihood options** may be more attractive, particularly when **risk** is factored in. New technologies must compete for investment not only with the farmers' existing agricultural practices but with other economic options.
- ❑ Those attempting to impose technological or policy solutions should recognise that these will always require changes in behaviour by individual households within the landscape and just because a solution is '**effective**' does not mean that it is '**attractive**', particularly to resource-poor households.

Conclusions (2)

- ❑ We, as technology developers and promoters, are keen that farmers should intensify their agriculture, using the technologies that we know to be effective, for two reasons:
 - We recognize the global dimensions of the problems faced in feeding a rapidly growing population without degrading our resource base.
 - We have invested huge amounts of our time, intellectual effort and money in developing those technologies.
- ❑ For many, perhaps most, smallholder rural households the benefits on offer may be too small to induce them to adopt those technologies. Under such circumstances, and particularly where agriculture itself must compete with other economic options, households might not be quite so keen to intensify.