Video Script: Adoption

Let's talk about the adoption profile, which is extremely crucial in the assessment of research options.

What do we actually mean by adoption? Adoption, in our case, means that small-scale banana producers select and start using a new technology, such as planting a new higher yielding or disease resistant variety or implementing a new pest management regime. How adoption develops over time can be illustrated graphically by an adoption curve. Economists use this curve to model the adoption process and estimate the benefits arising from adoption of a new technology. The total benefit of the new technology is computed by multiplying the effect (for example an increase in yield) with the size of the area in which the new technology is used, for every year considered in the assessment.

It is very common to assume an s-shaped adoption curve like the one shown here. The adoption process can be divided into four main phases. At first, when the new technology becomes available, only few banana farmers know about it which is why, initially, the new technology will only be used on a small share of the crop area. Adoption then speeds up as more and more farmers are exposed to the new technology and become aware of its benefits through observation of adopter's fields, communication among other farmers, or through extension services. Eventually adoption slows down as most potential users have been reached and fewer and fewer farmers remain in the target domain who have not yet adopted it. Finally, we expect to see dis-adoption – meaning farmers will stop using the technology after some time because a newer and better one has become available.

In order to estimate an adoption curve, we need three essential parameters. The first one is the so-called adoption ceiling which represents the maximum number or share of farmers who will adopt the new technology. This parameter determines the maximum crop area in which the new technology will be used. The adoption ceiling is this horizontal line in the graph. The second key parameter is the year when adoption starts after a certain period of research and product development. The third essential parameter is the time from first adoption until the adoption ceiling is reached. These parameters combined define the shape of the adoption curve.

Let's see what happens if we increase the adoption ceiling parameter. Imagine a new technology, for example, a new high yielding variety of a major cultivar. If planting material is easily available and inexpensive, many farmers will decide to try this new technology. In the graph, this can be illustrated by moving the adoption ceiling upward – we call this an upward shift of the adoption ceiling. If the year of first adoption is the same, the new adoption profile looks like this.

Now, what happens if we decrease the adoption ceiling? If, for example, the new technology is targeting a very specific problem such as cold tolerance of a crop, fewer farmers – for example only those in high altitude mountain areas will adopt the new technology. This results in a downward-shift of the adoption ceiling as illustrated in this graph. The associated adoption curve would then have this shape.

Let's have a look now at the year when maximum adoption is reached, which is illustrated by t_3 in this graph. What happens if we shorten the period of time from the first year of adoption until the year when maximum adoption is reached? For instance, let's assume that a country's agricultural extension system is strong and the new technology is widely promoted by extension workers through training sessions and extension materials. Hence, many farmers will know about the benefits of the new technology resulting in a fast uptake of the innovation. The adoption ceiling will then be reached much faster which is illustrated by the shift of t_3 to the left and this associated adoption curve.

The opposite might be true if a technology is very knowledge intensive and thus requires a lot of information and training, such as Integrated Pest Management. We would expect a slower adoption spread than for example for an improved variety.

Why is it actually important to disseminate a new technology to farmers as quickly as possible? Let's have a look at the graph again. The shaded area illustrates when the project with the original adoption profile would yield benefits. Inspecting the curve with the shorter time until the adoption ceiling has been reached demonstrates that benefits arise much faster which is displayed by the shaded area. The same is true for an adoption profile with the same period of time from the first year of adoption to the year when maximum adoption is reached but with an earlier onset of adoption.

Now, remember the process of discounting future benefits and costs that we introduced earlier. Benefits that arise in the present are worth more than benefits that arise in the future. Thus, a late and/or slow adoption results in lower benefits arising from the new technology compared to an early and/or quicker adoption even if the adoption ceiling is the same. This is why aiming for a quick and early adoption is relevant for the impact of the research project.

If we have estimates for the adoption parameters described before, we can estimate technology adoption by multiplying the refined target domain area with the respective adoption percentages for each year of the assessment in each country considered. These estimated adoption numbers are an important input to the Economic Surplus Model, which we will describe in the next video.

What is adoption?

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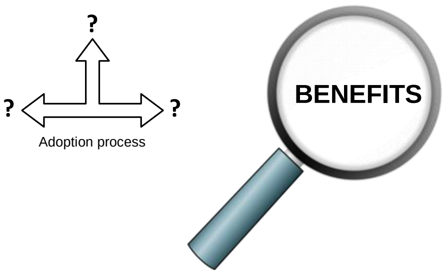

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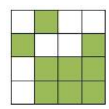
Total benefit of the new technology:

Effect (i.e. increase in yield) x Size of the area on which the technology is used



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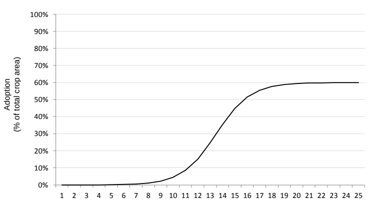

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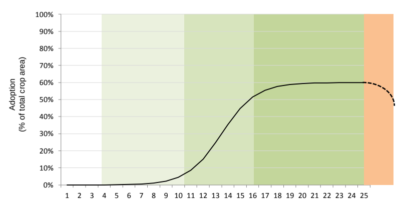

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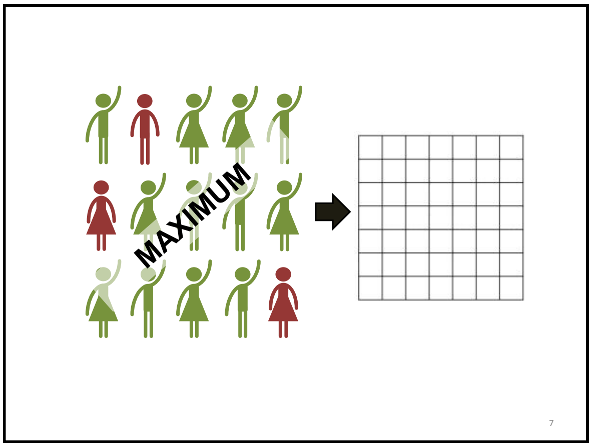
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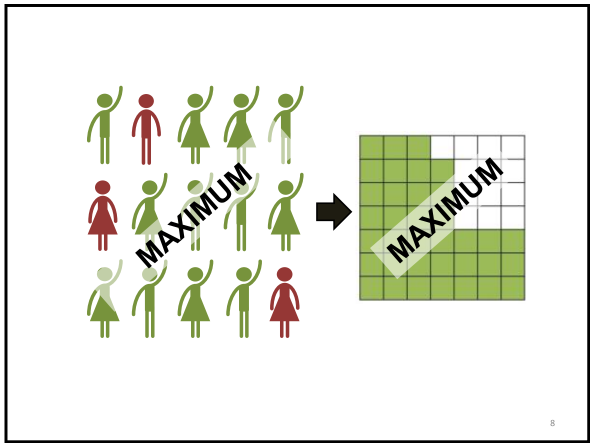
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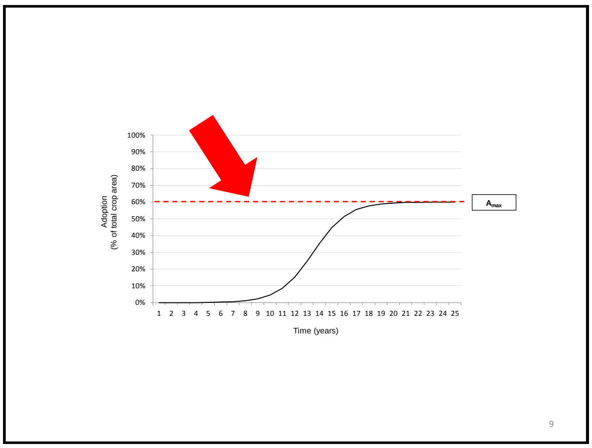
Adoption
(% of total crop area)
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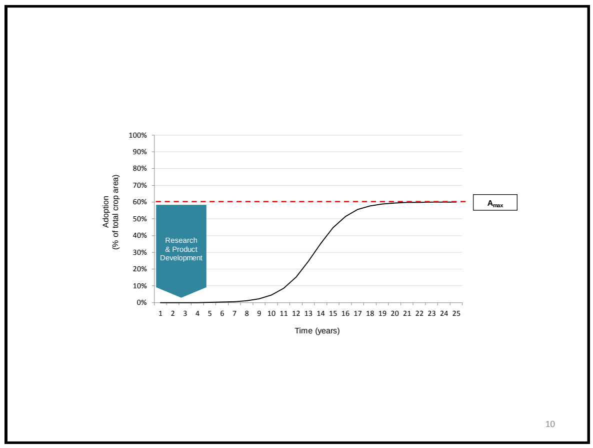
Time (years)
A_{max}
9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Time (years)
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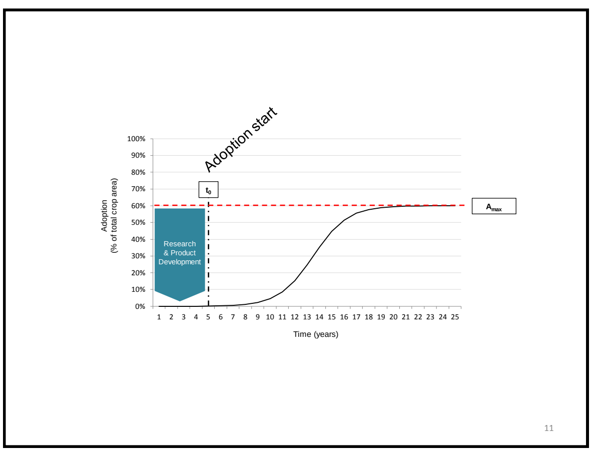
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Time (years)
A_{max}
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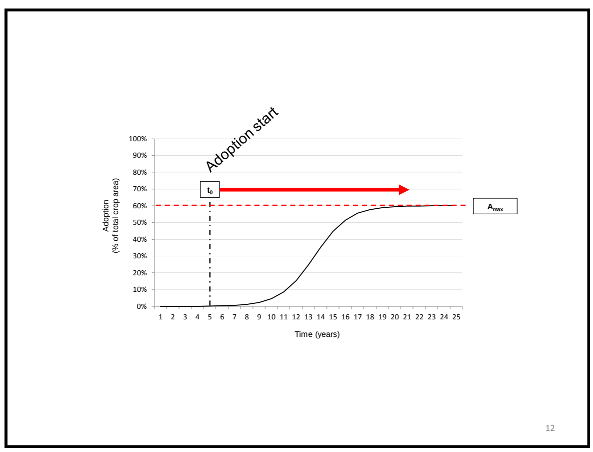
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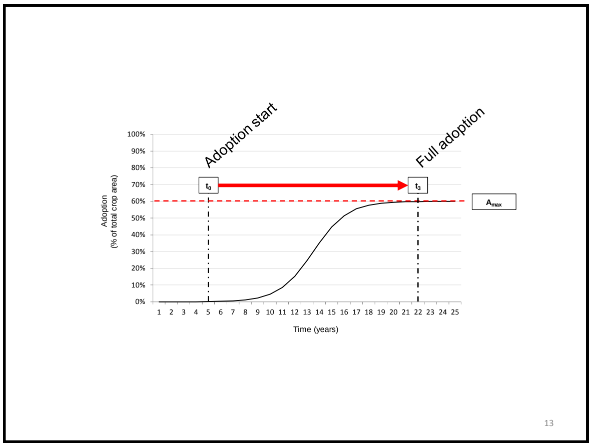
Time (years)
A_{max}
12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Time (years)
A max
13


CHANGES
Adoption
ceiling


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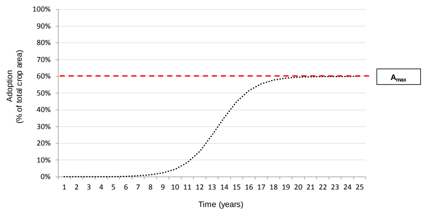
16


17


18

What happens if we **increase** the **adoption ceiling parameter**?



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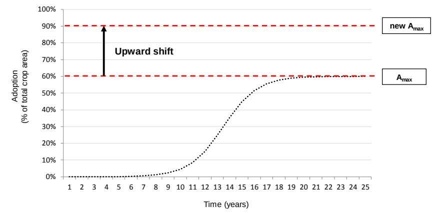
What happens if we **increase** the **adoption ceiling parameter**?



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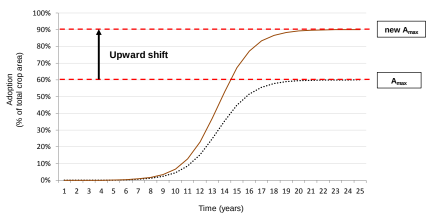

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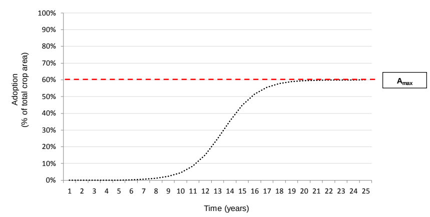
What happens if we **decrease** the **adoption ceiling parameter**?



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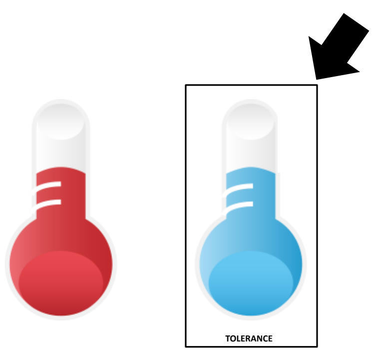

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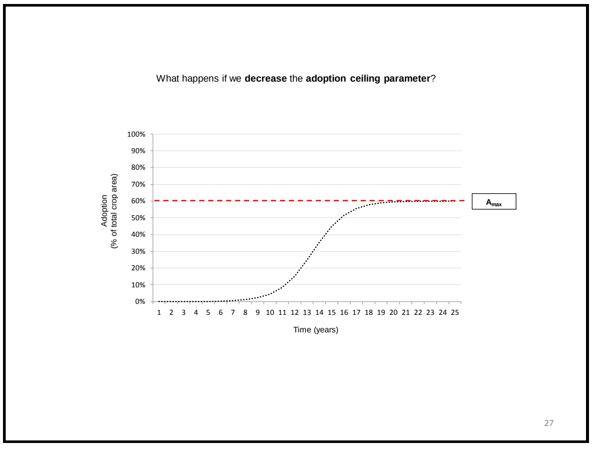
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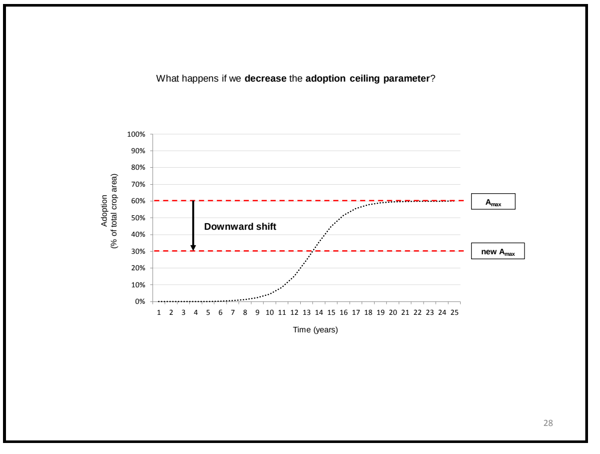
Time (years)
A_{max}
27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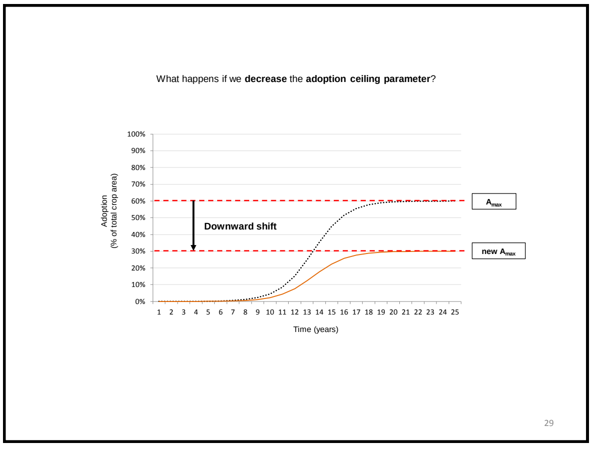
Time (years)
Downward shift
A_{max}
new A_{max}
28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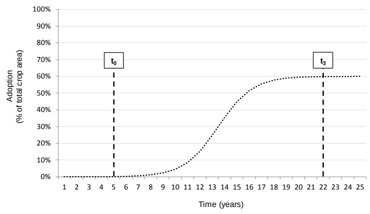
Time (years)
Downward shift
A_{max}
new A_{max}
29


CHANGES
Year when maximum adoption is reached

What happens if we **shorten** the **adoption period**?



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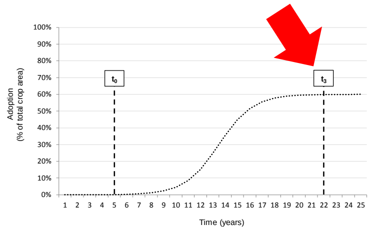
What happens if we **shorten** the **adoption period**?



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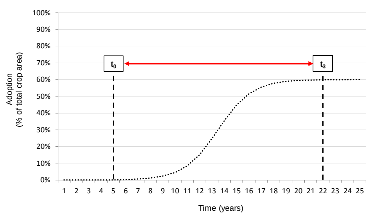

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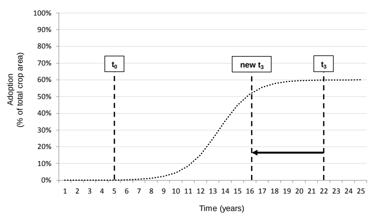

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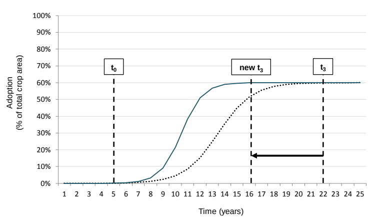

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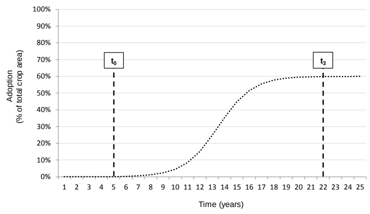
What happens if we **extend** the **adoption period**?



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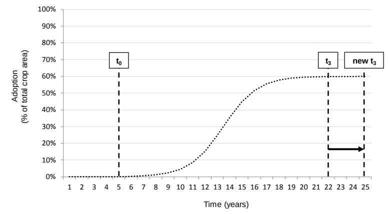

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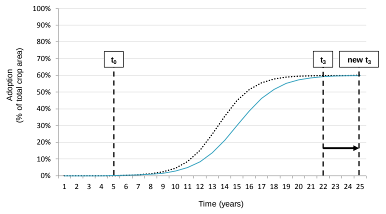

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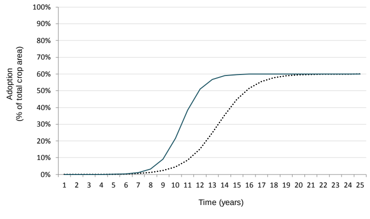
Why is it important to aim for a quick and early adoption?



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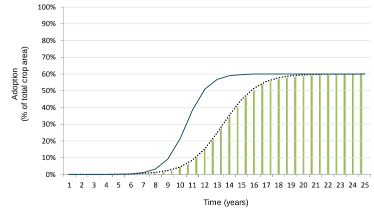

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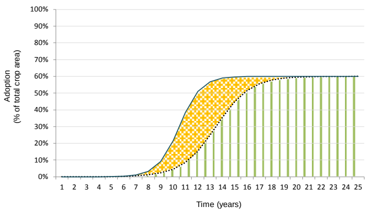

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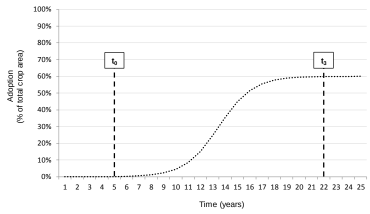

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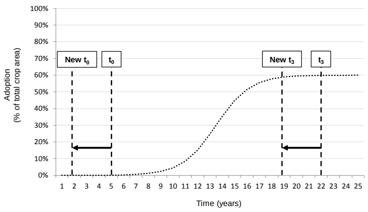

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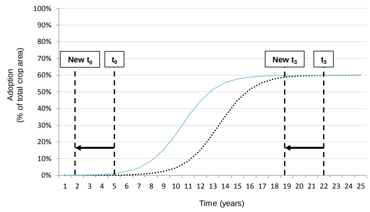

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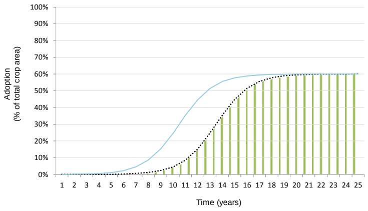

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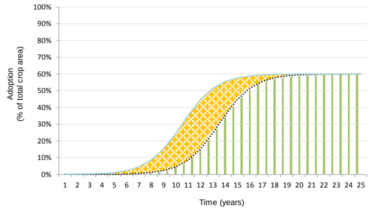

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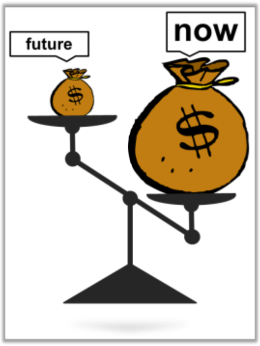

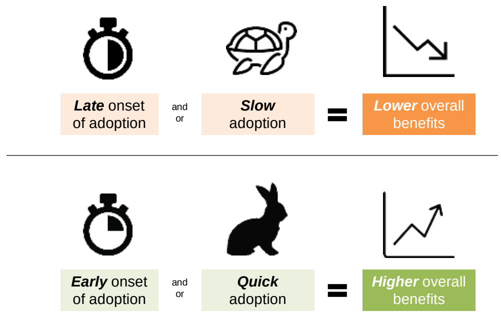

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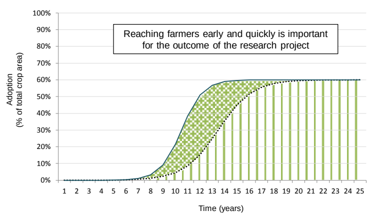

Estimates for adoption parameters

Estimates for adoption parameters

Technolog y adoption = Refined target domain area x Respective adoption percentages

Economic Surplus Model

Production and Narration (November 2016):
Diemuth Pemsl, Lars Scheerer, Veronica Mulligan, Charles Staver

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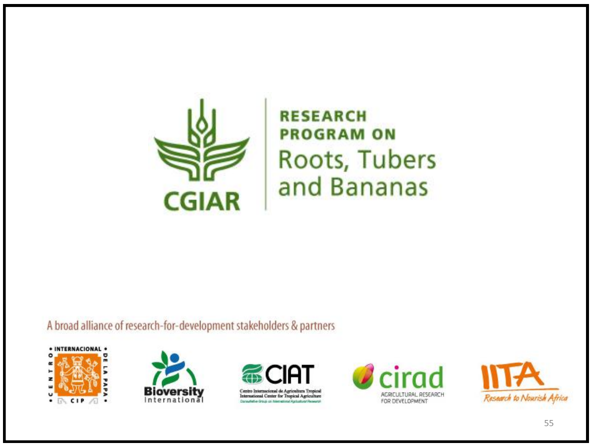
RESEARCH
PROGRAM ON
Roots, Tubers
and Bananas
A broad alliance of research-for-development stakeholders & partners
55