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# Livestock Yield Gaps

To what extent can livestock productivity be improved?



## September 2018 - Fact Check 8

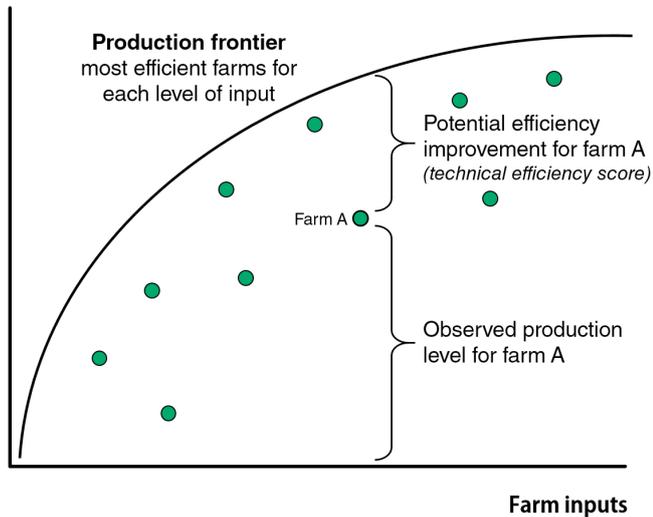
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Variation in productivity among farmers, both within and between defined production systems, suggests there is potential for productivity improvement, also known as closing the yield gap). Yield gaps define the difference between actual and potential yields (a maximum achievable production with best management practices); however, yield gap analyses can, and have been, applied to livestock systems<sup>1-4</sup>.

In low and middle incomes countries (LMICs) access to resources is often limited, so it may be impossible to attain maximum technically achievable yields. More realistic expectations are set using relative yield gaps between actual and attainable yields, given locally available resources<sup>3, 5</sup>. Furthermore, variation between different production systems can be caused by differences in environment, technology, or management decisions and processes; to what extent each of these has an influence and how controllable they are will influence the quantification of attainable yields<sup>1, 6</sup>.

### How can we quantify yield gaps?

To estimate the magnitude of livestock yield gaps within a location, a simple benchmarking method can be used. Using data usually gathered through surveys, the average farm performance is compared to the best performing farms (e.g. top 10% producers)<sup>2,4</sup>. This can inform what is feasible if average farms were to adopt the practices of their high performing neighbours<sup>6</sup>. Another approach is to construct production frontiers for the farm population. The frontier (or curve) represents the most efficient farms in the population, considering all inputs and outputs, thus describing the maximum level of output achievable by farms in a population. Given their existing inputs, each farm is given a technical efficiency score based on the gap between their current and attainable productivity. These can be averaged to give an illustration of the population yield gap<sup>1, 4</sup>(Figure 1).



**Figure 1.** Simplified example production frontier with suggested potential for efficiency improvement for an individual farm.

### The usefulness of system models

Livestock keepers in LMICs are unlikely to change their practices based on the promise of increased production alone; livestock are often multi-functional and can fulfil various objectives, including risk mitigation or displays of status<sup>7</sup>. System modelling, such as that carried out in the LiveGAPS project<sup>8</sup>, is particularly useful in taking the production improvements suggested by yield gap analysis and demonstrating how these are likely to impact the broad household system. Notably, interventions that produce the greatest increase in production do not always lead to the greatest increase in household profit. For instance, market access was also identified as an important component to accompany increase in production<sup>1,4,6,9</sup>.

### The benefit of combined interventions

Modelling suggests that the greatest increases to livestock system productivity will occur when interventions (e.g. improved livestock nutrition and animal health, as well as the use of improved cross-breeds) are applied in combination<sup>4,9</sup>. This is supported by examples of both past successful and failed efforts to improve livestock systems in LMICs. For instance, attempts at livestock genetic improvement which do not include accompanying management changes (improved feeding and health), were observed to have little success<sup>10</sup>. Whilst there is evidence of success, breed improvements that have also been accompanied by appropriate support and access to resources, were more likely to realise production potentials<sup>11-13</sup>.

### Yield gaps for decision making

The limitations of modelling studies and the complexity of LMIC livestock systems must always be kept in mind. However, it is valuable to understand the factors limiting livestock productivity in order to define and prioritise appropriate investment of resources to reach maximum positive impact. Funders should recognise the value of combined interventions to effectively support livestock production improvements.

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This research was supported by the Supporting Evidence Based Interventions project, University of Edinburgh (grant number R83537).

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### References

- 1 Henderson et al. 2016
- 2 Cortez-Arriola et al. 2014
- 3 van Linden et al. 2015
- 4 Mayberry et al. 2017
- 5 Tittonell et al. 2013
- 6 Herrero et al. 2016
- 7 Salmon et al. 2018
- 8 CSIRO, 2018
- 9 Mayberry, 2018
- 10 Kosgey & Okeyo, 2007
- 11 Thorpe et al. 2000
- 12 Peacock et al., 2011
- 13 Rege et al., 2011

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