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| Contributed paper prepared for presentation at the 5th Symposium on Agri-Tech Economics for Sustainable Futures19-20 September 2022, Harper Adams University, Newport, U.K.*Copyright 2022 by Authors names. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.* |

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# Abstract

Provide an abstract - 300 words maximum.

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# Introduction

Contributed Papers should be no more than 6,000 words in length (excludes tables, figures and labels, but includes references), with full papers to be provided to the Global Institute for Agri-Tech Economics by the specified due date to ensure sufficient time is available for editing and review.

Extended Abstracts should be no more than 3 pages in total (excluding the title page).

# Methods

If you are presenting equations, you must use the Equation Editor functionality of Word to ensure they are properly presented in the proceedings. For example, from Holland and Behrendt (2021)… as follows:

$NPVa=NPV\left[\frac{i\left(1+i\right)^{n}}{\left(1+i\right)^{n}-1}\right]$ (1)

where *NPV* is the net present value (£ ha-1), *i* is the discount rate, and *n* is the total number of years that the *NPV* spans. *NPV* is the sum of discounted future cash flows, such that:

$NPV=\sum\_{j=1}^{n}\left(B\_{j}-C\_{j}\right)\left(\frac{1}{\left(1+i\right)^{j}}\right)$ (2)

where *Bj* is the cash inflow in the *j*th project year, and *Cj* is the cash outflow (including capital outlays on lime) in the *j*th project year.

# Results

Please insert Table labels above any presented table, and insert Figure labels below any images or figures presented (some examples are shown below). All Tables and Figures should be cross-referenced into the text.

Additional guidelines for charts:

1. If you present graphs with multiple lines, make sure the information is legible whether it is printed in grey scale or colour.
2. Do not include figure titles within charts.
3. Always include labels for the x and y axis with units of measurement if appropriate, and make sure they are easily readable and not obscured by data lines or bars.



**Figure 1: Sequential decision making. Adapted from Trebeck and Hardaker (1972).**

**Figure 1 – Wheat production cost in the UK for conventional equipment and autonomous equipment with different levels of human supervision time. Source: Lowenberg-DeBoer et al. (2021).**

**Table 1: Equipment times of the machinery sets for rectangular fields of 1 ha and 10 ha. Source: (A. K. M. Abdullah et al., 2021).**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Equipment** | **Width of the implement (m)\*\*** | **Overlap percentage\*\*** | **Field speed (km/hr)\*\*** | **Field Efficiency (%) \*\*\*** | **Area/hr** | **hr/ha** |
| ***1 ha Rectangular Field*** |
| HFH equipment set (38hp)\*: |
| Drill | 1.5 | 10% | 3.25 | 73% | 0.32 | 3.12 |
| Sprayer | 7 | 10% | 5 | 46% | 1.45 | 0.69 |
| Combine | 2 | 10% | 3.25 | 80% | 0.47 | 2.14 |
| Larger conventional set (296hp): |
| Drill | 6 | 10% | 5 | 24% | 0.65 | 1.54 |
| Sprayer | 36 | 10% | 10 | 23% | 7.45 | 0.13 |
| Combine | 7.5 | 10% | 3 | 32% | 0.65 | 1.54 |
| Small conventional set (150hp): |
| Drill | 3 | 10% | 5 | 46% | 0.62 | 1.61 |
| Sprayer | 24 | 10% | 10 | 32% | 6.91 | 0.14 |
| Combine | 4.5 | 10% | 3 | 45% | 0.55 | 1.83 |
| ***10 ha Rectangular Field*** |
| HFH equipment set (38hp): |
| Drill | 1.5 | 10% | 3.25 | 84% | 0.37 | 2.71 |
| Sprayer | 7 | 10% | 5 | 70% | 2.21 | 0.45 |
| Combine | 2 | 10% | 3.25 | 92% | 0.54 | 1.86 |
| Larger conventional set (296hp): |
| Drill | 6 | 10% | 5 | 82% | 2.21 | 0.45 |
| Sprayer | 36 | 10% | 10 | 49% | 15.88 | 0.06 |
| Combine | 7.5 | 10% | 3 | 82% | 1.66 | 0.60 |
| Small conventional set (150hp): |
| Drill | 3 | 10% | 5 | 83% | 1.12 | 0.89 |
| Sprayer | 24 | 10% | 10 | 45% | 9.72 | 0.10 |
| Combine | 4.5 | 10% | 3 | 86% | 1.04 | 0.96 |

**Note:** \* HFH equipment sets representing both 38hp conventional machine with human operator and 38hp autonomous swarm robotics. \*\*The machine specifications and overlap assumptions were collected from the HFH experience and Lowenberg-DeBoer et al. (2021). \*\*\* The authors developed algorithms to estimate the field efficiency of rectangular fields (for details of the estimation procedures and algorithms see the technical note in the supplementary material).

# Discussion

The Authors may choose to integrate the discussion with the presentation of the Results.

Conclusion

This section is optional. You may also include a section for Acknowledgements if appropriate.

# References

‘Harvard’ Referencing without numbering…

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