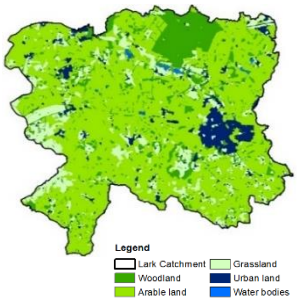
Using D-Risk to inform the feasibility of water sharing as a drought risk management tool at Lark catchment

Aggregated business profile

Location	The River Lark catchment in Eastern England
Main irrigated crops	Potato, Onion, Carrot, Parsnip, Sugar beet, Spring cereal
Irrigated area	2595 ha
Dominant soil type	Coarse and medium sands
Licensed abstraction	4742146 m^3/year
Storage capacity	2163150 m^3

Lark Abstractors Group - overview



The Lark Abstractors Group (LAG) is an organisation that represents agricultural irrigators in the Lark catchment. It is actively engaged to improve river flows in the River Lark and future drought resilience, supporting initiatives to enhance collaboration between farm businesses dependent on abstraction for high-value irrigated production. Nine farm businesses belonging to the LAG who had previously expressed an interest in water sharing were the focus of this study.

Managing irrigation abstraction and drought risks by water sharing at different spatial scales

The River Lark catchment is an intensively farmed lowland catchment in Eastern England and is a known hot-spot for irrigation intensity and recurrent abstraction pressures. D-Risk was used to assess how the potential benefits of water sharing to reduce water resources risks in agriculture are affected by drought severity and the spatial scale of water sharing agreements:

- Tributary groups (5): water sharing between businesses with water abstraction points along the same tributary or main channel reach;
- Sub-catchment groups (3): water sharing between businesses with abstraction points within common sub-catchments determined by the gauging station, and;
- Catchment group (1): water sharing between all businesses.

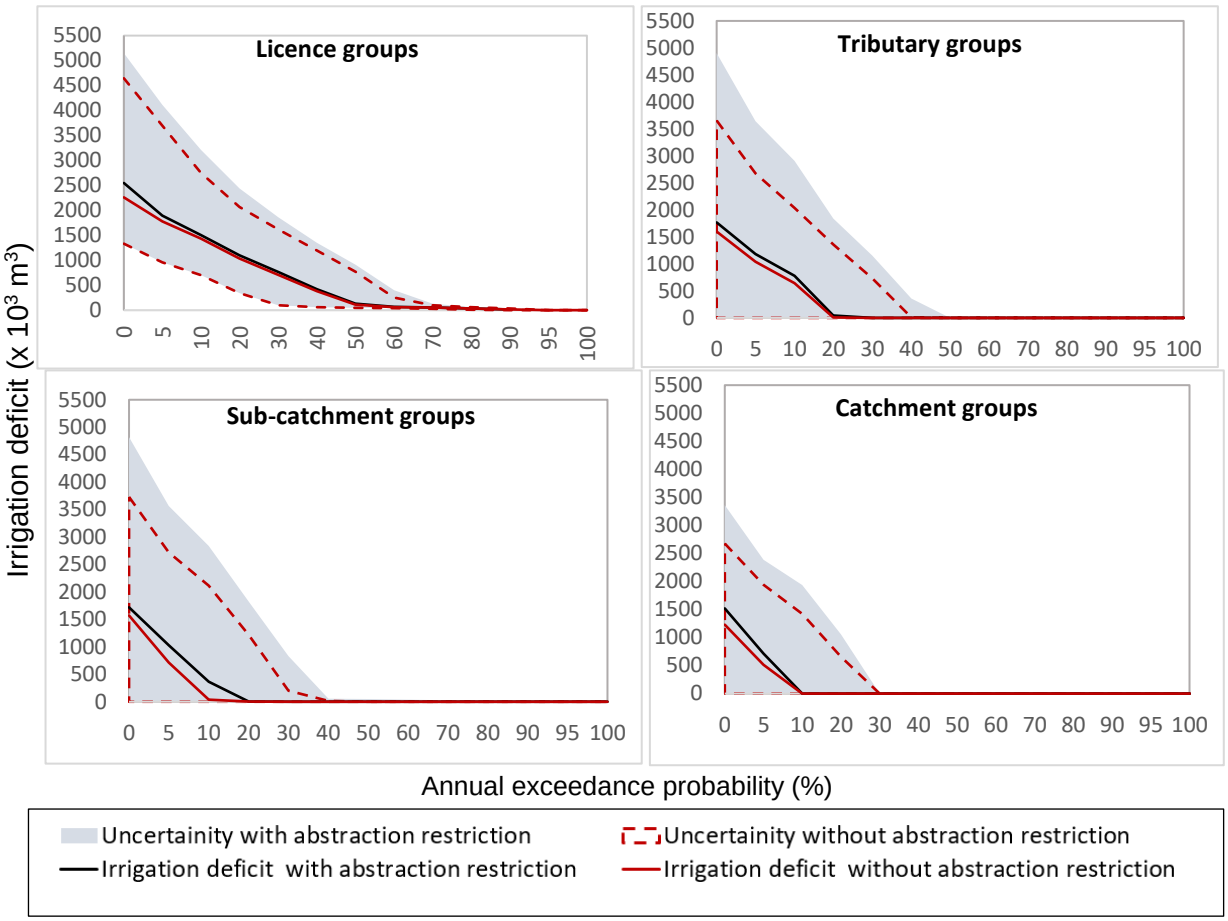
Results were compared with aggregated D-Risk results in which all businesses operate independently with no water sharing.

D-Risk – underpinning decisions with evidence

D-Risk uses a dataset of equally probable weather series to calculate multiple estimates of annual irrigation demand for the individual and aggregated farms, and its reliability considering abstraction licence limits and river flows. A monthly time-step water balance model is then used to assess how irrigation demands compare against the licensed abstraction. From this, it is possible to assess any annual irrigation deficit and changes in licensed abstraction 'headroom'.

Using D-Risk to assess the feasibility of water sharing as a drought risk management tool for irrigated agriculture

An irrigation deficit is assumed to be any proportion of demand that cannot be met by available supply, either due to annual or monthly licence limits and any abstraction restrictions. Licensed 'headroom' is defined as the proportion of licensed volume that is not used in any given year. It is calculated from the sum of all available licences (both direct and storage).



With no water sharing, the nine businesses have a combined annual irrigation deficit of around 1,000,000 m^3 in a design dry year (20th percentile probability of exceedance across the 100x30 simulated years). Around 65,000 m^3 of this deficit is caused by the simulated river flow-based restrictions on surface water abstraction. The benefits of water sharing in decreasing the annual probability or risk of an aggregate irrigation deficit (and uncertainty range) increases with increasing spatial scale. However, water sharing within the 5 tributary groups reduces the irrigation deficit with a 20th annual probability of exceedance from around 1,000,000 m^3 to only 47,000 m^3.

Using D-Risk to inform agribusiness decision-making

D-Risk provides valuable insights on the benefits of informal water sharing between local agricultural abstractors to address their desire to increase the efficiency of the current water allocation and therefore the economic benefit and associated increased productivity. It demonstrates that water sharing at any scale tends to reduce the exposure of businesses to the risk of an irrigation deficit, especially in drought years. Furthermore, the potential benefits of water sharing increase with the spatial scale. However, water sharing does not completely remove drought risk due to the combination of water resources management constraints that are embedded in the volumetric licence limits to ensure sustainable abstraction and drought management protections such as abstraction restrictions at low river flows.

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