

# The Whey to Beer

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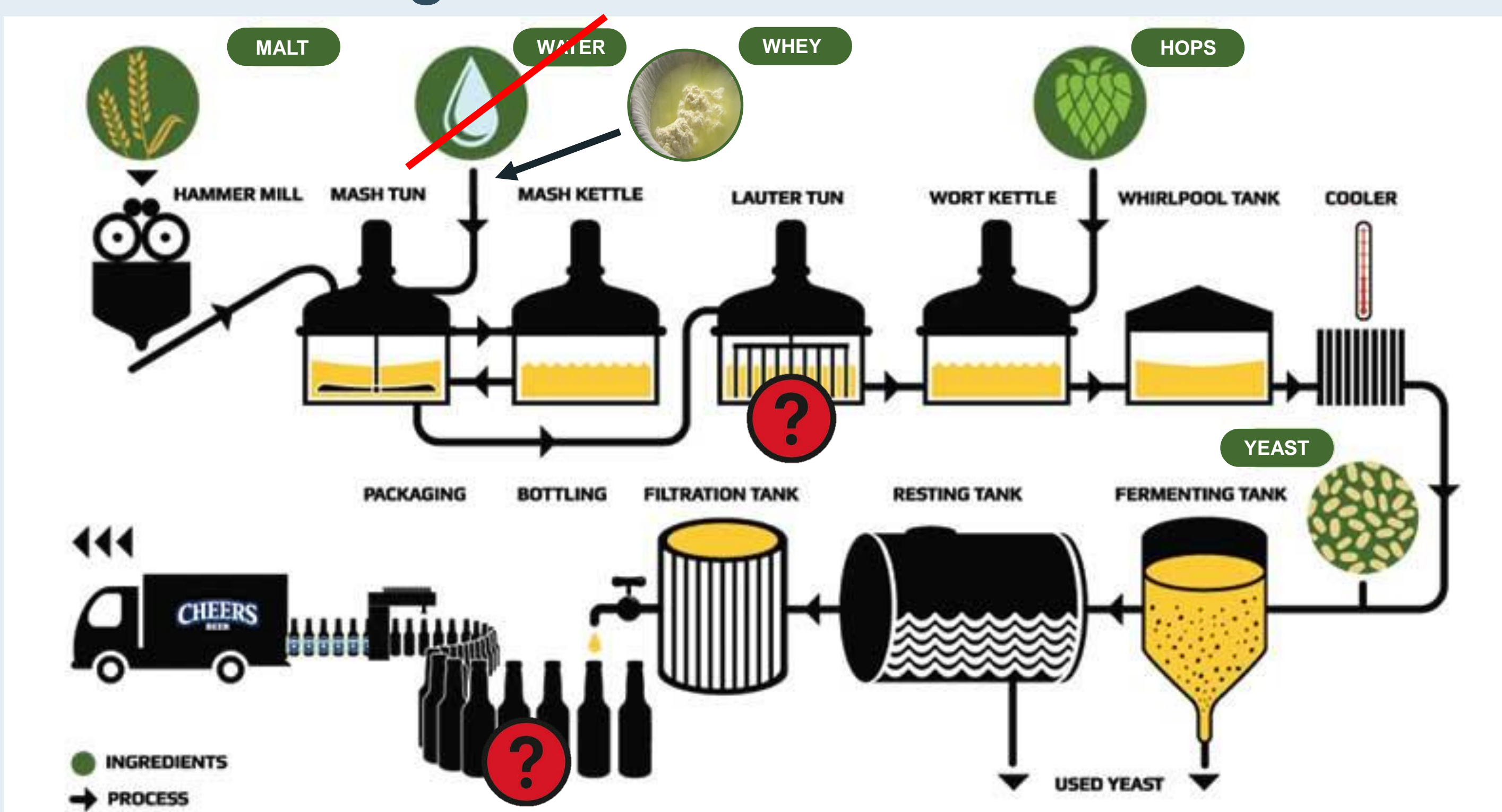
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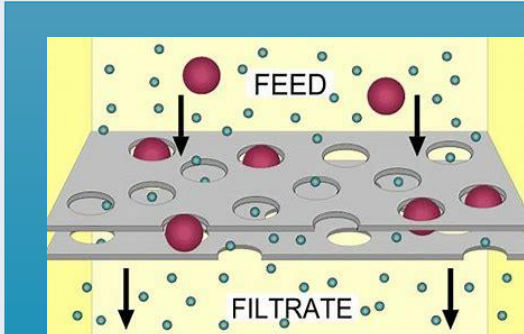


Whey is an often-overlooked byproduct formed during the production of dairy products such as cheese, yogurt, and curd (matten for pastry). This liquid is still nutrient-rich and contains valuable components, including lactose (30-60 g/L) and proteins (6-10 g/L). Despite generating significant whey volumes, most small dairy farmers lack effective valorisation strategies. To address this, the aim is to investigate if whey could replace the brewing water used in beer production, leading to water savings, but also whether it can act as an adjunct, with lactose as supplementary sugar in the mash, or as an added aroma or flavour.

## The Brewing Process



## Potential problems & Experimental Setup



Whey proteins might block the filter cake during wort filtration, resulting in increased lauter times



Whey proteins might create cloudiness in the beer, especially during ageing



Whey proteins might contribute to foam  
Whey fats might destroy the foam



Cheesy off-flavours ?  
Sweetness from lactose ?  
Ageing of beer ?

- Lab (0.5l) trials with whey as brewing water
- Follow-up of filtration



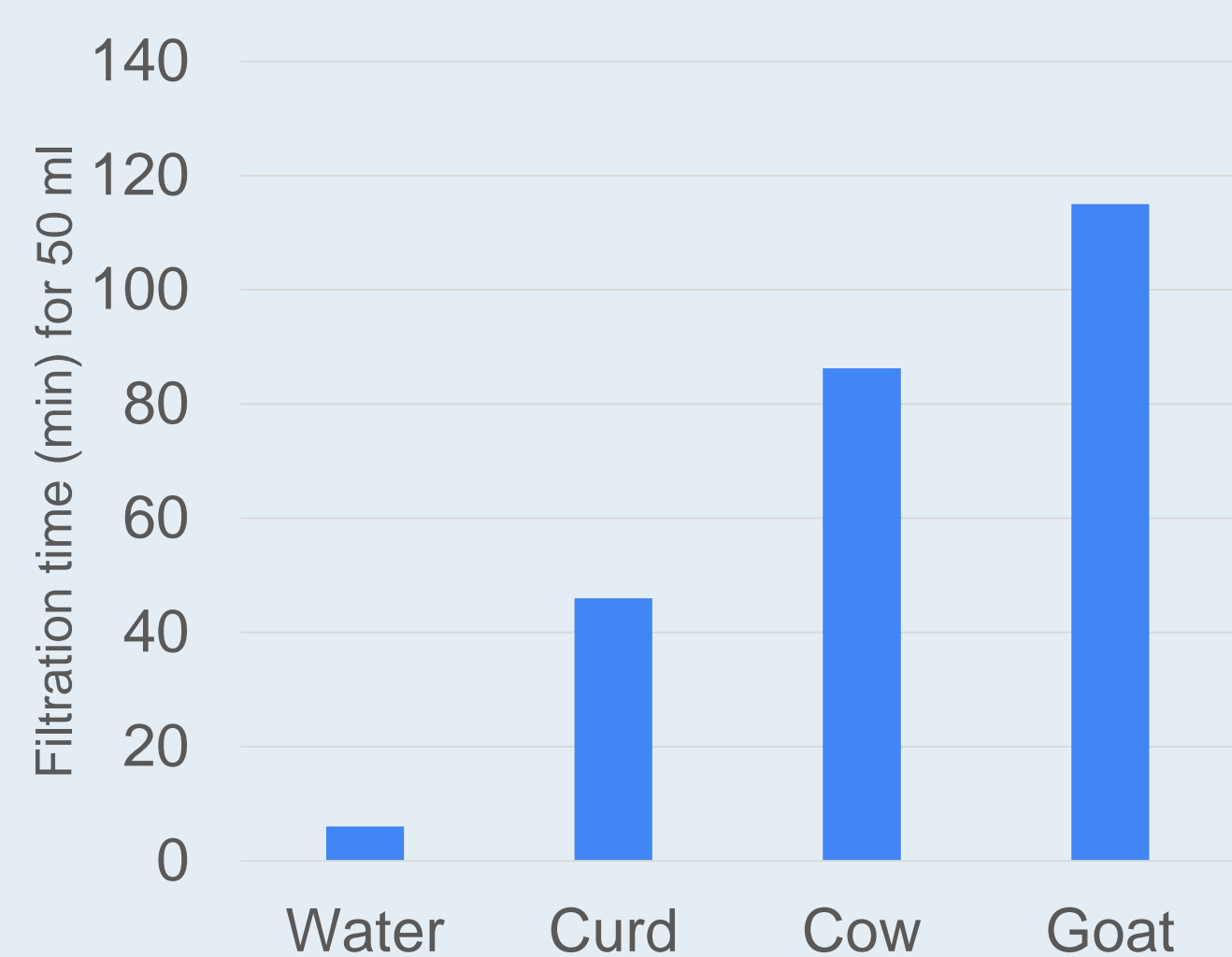
- Pilot trials (5 hl) with 100% whey as brewing water from curd – cheese production from cow or goat milk



- Effect of lactase, during brewing and fermentation, upon alcohol production
- Fermenting with 4 yeasts to create Pilsner (5%ABV), Blond (6%ABV), Stout (6%ABV) and Non-Alc Beer. With and without lactase addition during fermentation

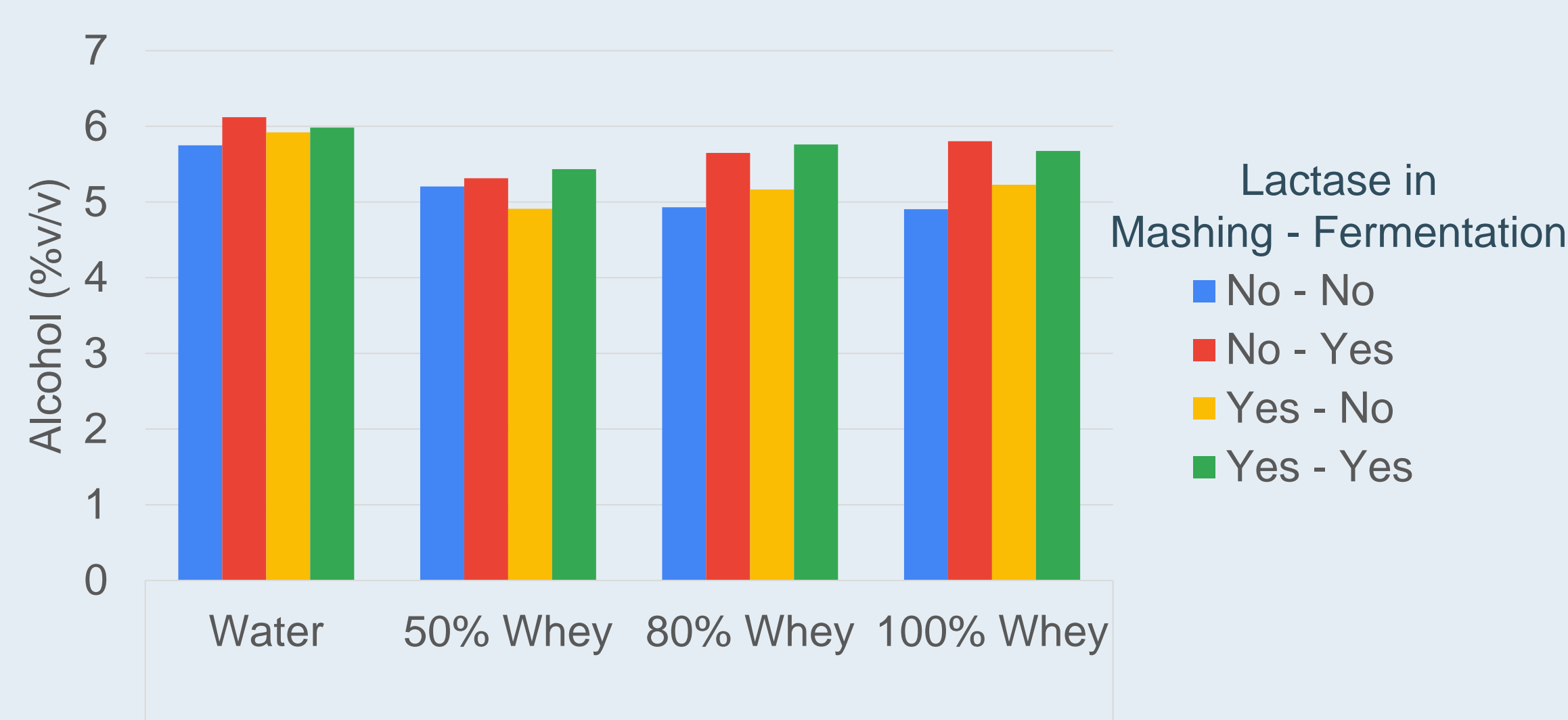
## Lab Trials

Wort filtration with 100% whey as brewing water



The use of whey as brewing water results in a decreased filterability. Whey from goat cheese production seems to have the lowest filterability compared to whey from cow milk. The whey after curd production (sour process) showed lowest impact. However, filtration time is more than double compared to the control.

Lactase addition during mashing or fermentation on alcohol production



The use of lactase during mashing seems to have a minimal effect on alcohol production. When using it during fermentation, more alcohol is produced by hydrolysing lactose into fermentable glucose and galactose (results not shown).

## Conclusion

It is possible to use whey as brewing water. Wort filtration is slower, with whey from goat milk being the worst. Beer brewed with whey of goat milk has high protein levels and low haze. However, it doesn't protect the foam. Curd whey showed highest potential for brewing (process and physico-chemical characteristics). No cheesy off flavours - lactose improves smoothness, fullness of beer, low to normal beer ageing.

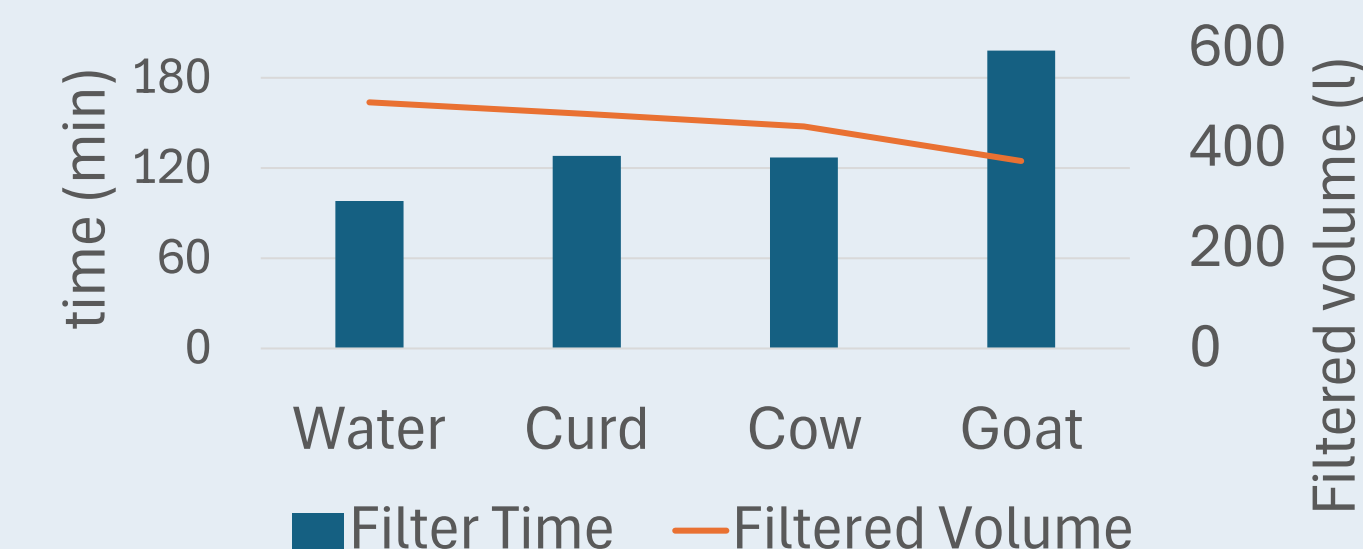
## Acknowledgements



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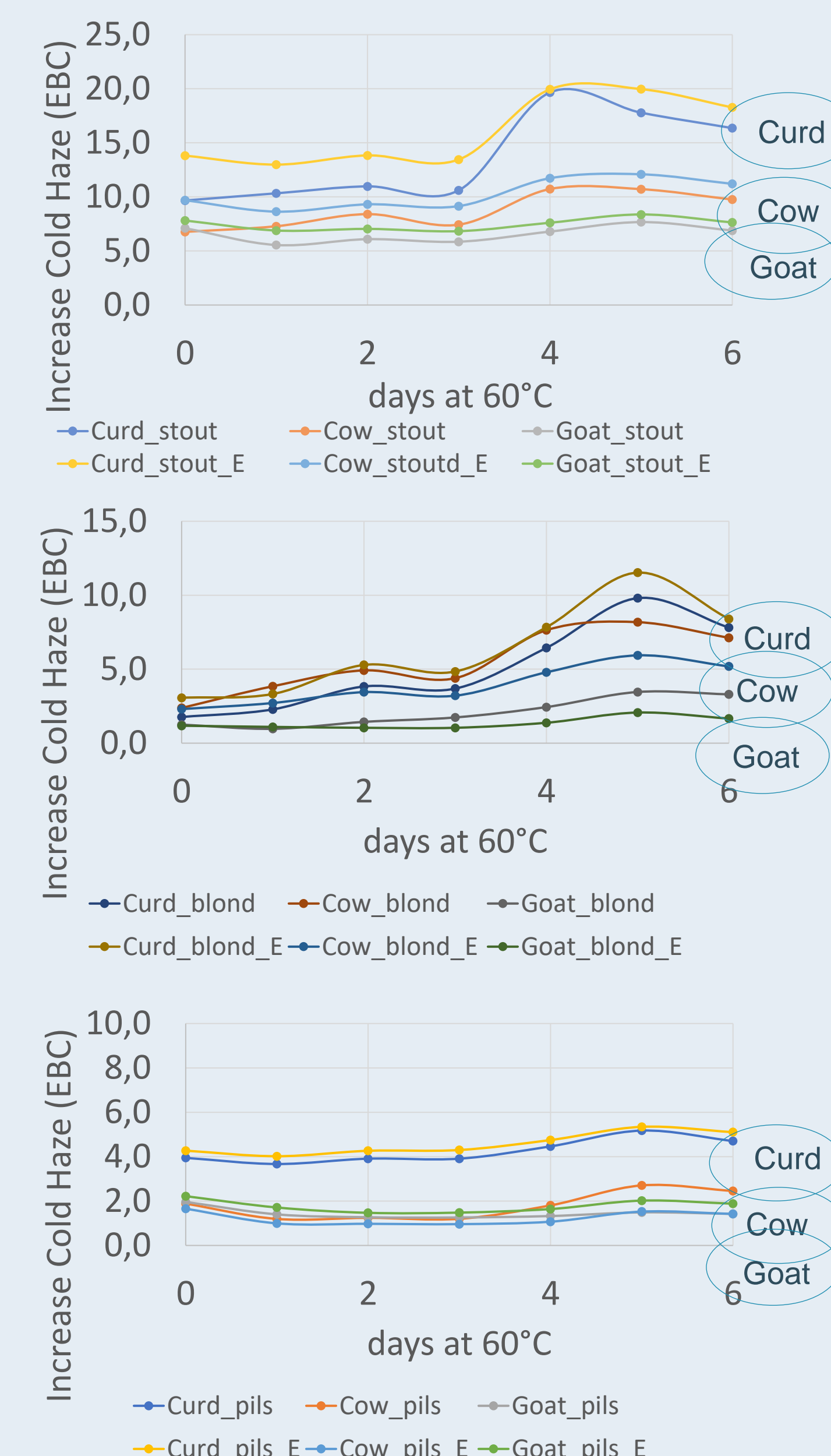
## Pilot Scale Trials

Wort filtration with Meura 2001 mash filter



Lab scale results confirmed at pilot scale: 'goat cheese whey': negative impact on wort filtration. Curd whey still results in 30% slower filtration performance.

Haze formation (forced ageing @ 60° C)



No cheesy (off)-flavours  
Residual lactose makes beer more malate  
Lactose in Non-Alcoholic beer improves fullness of beer  
Beers are ageing slow to normal

Curd whey has the lowest impact on foam stability. The foam of the blond beers are most sensitive when using whey from cow and goat milk. The roasted malt for stout showed bigger impact than the use of whey.

Protein levels of beer with goat milk whey is the highest whereas the haze formation during forced ageing is the lowest. Curd whey always showed higher haze in fresh and aged beer. The use of lactase during fermentation is supplier depending and not always efficient in alcohol formation. Production of beer below 0.5%ABV is difficult. Lactase cannot be used in NAB.