

A time-series analysis of Alpine and Saanen goat milk productivity trends in Taiwan

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Session name: Session 8: Adaptation, resilience and agroecological transition in small ruminants and camelids.

Session date: May 25, 2023

Session time: 4:00 PM



Dairy goat in Taiwan and Milk recording system

- x A total of **190 farms** with sum of **35,595 heads** including of **21,598** milking goats, 930 bucks and 13,067 young female goats on the year end of 2022 in Taiwan.
- x Annual production of **13,000 tons** of raw milk in 2022 gradually decreased from the production peak of 32,920 tons from 435 farms with sum of 67,817 heads in 1997.
- x Major dairy breeds were **70% of Alpine, 28% of Saanen,** and others.

Introduction

This study **aims** to:

- ◆ Quantify historical **trends and seasonal** patterns of goat milk and milk component production in Taiwan.
- ◆ Describe the overall pattern for **future applications** in order to **make managerial decisions**.



Material and methods

Animals and dataset

- ◆ Lactation records with following variables: **milk yield** (kg/goat for a whole lactation), **fat** percentage (%), **protein** percentage and **yield** (kg/goat for a whole lactation), **lactose** percentage and **yield** (kg/goat per lactation), **lactation** starting date, **parity**, **location**, and lactation length (d) across an **5-year** period.

Material and methods

Time-series data decomposition

- ◆ The data were decomposed into trend, season, and. Additive time-series data consisted of trend, season, and irregular (error) components, and the model is given as follows:

$$y_t = T_t + S_t + I_t$$

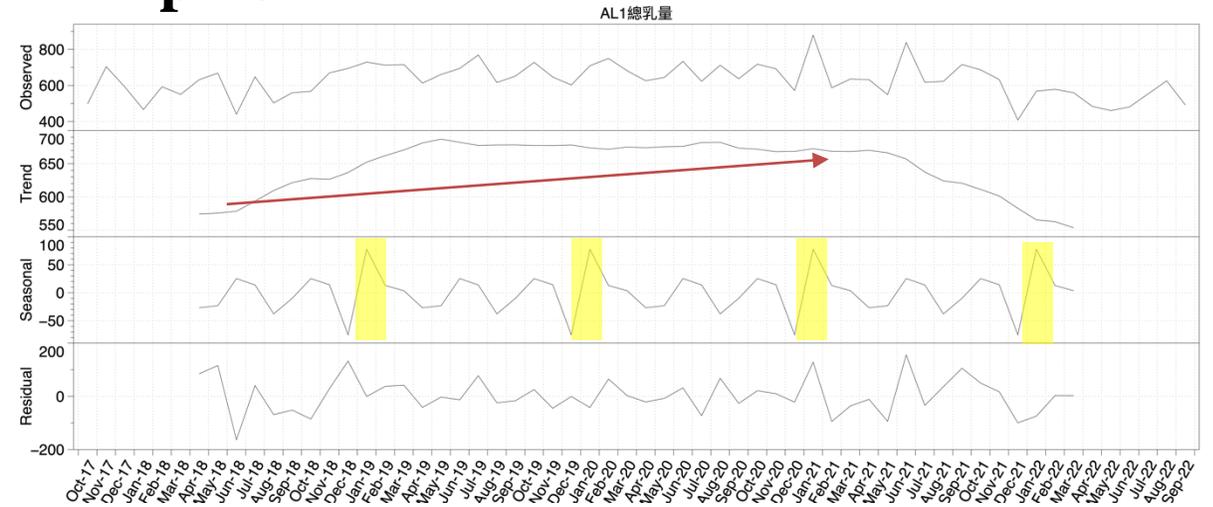
- ◆ y_t is the milk production value at time t , T_t is the trend cycle component at time t , S_t is the seasonal component at time t , and I_t is the irregular (remainder) component at time t .

Results and discussion

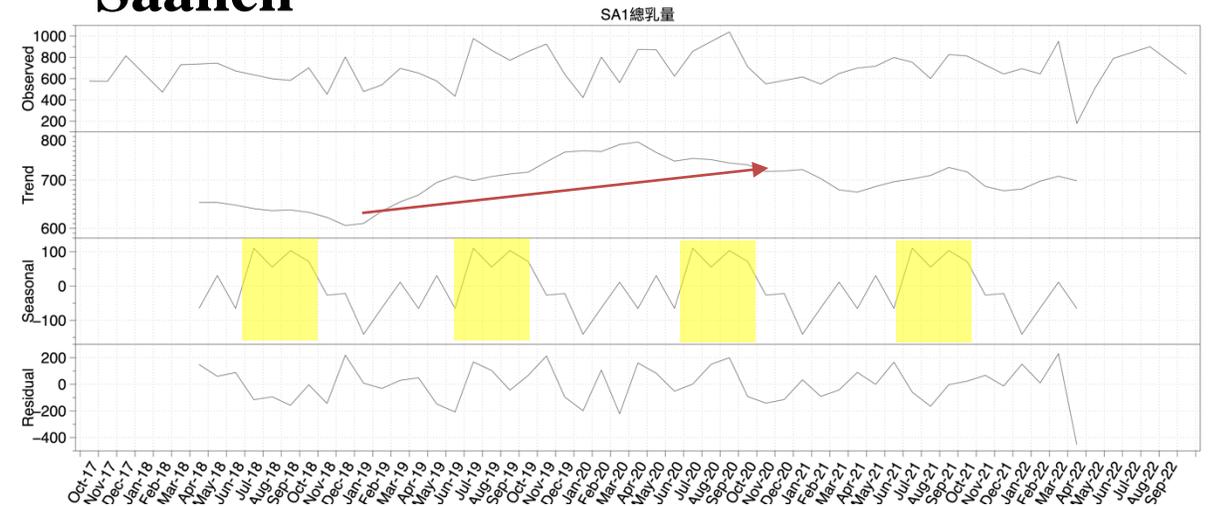
Milk yield per lactation

- ◆ Both Alpine and Saanen goat had a consistently increasing trend in milk production over the period 2018–2019 and reached its plateau.
- ◆ Seasonal pattern was clearly shown, with the predominant peak in milk production per lactation occurring in Alpine goat kidding in spring and Saanen goat kidding in summer.

Alpine



Saanen



Results and discussion

Milk yield per lactation

- ◆ The higher milk yield in spring kidders was likely driven by the longer photoperiod during mid lactation.
- ◆ December kidding would result in peak production in March when the photoperiod gradually increased, whereas November kidding would result in peak production in February when the photoperiod is reduced to nearly minimum.
- ◆ Goats that kidded in winter reached peak lactation earlier and slowly reduced daily yield in the subsequent months. Conversely, goats that kidded in early spring reached peak lactation much later.

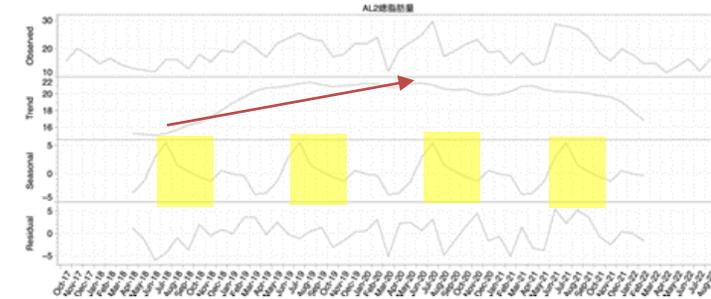


Results and discussion

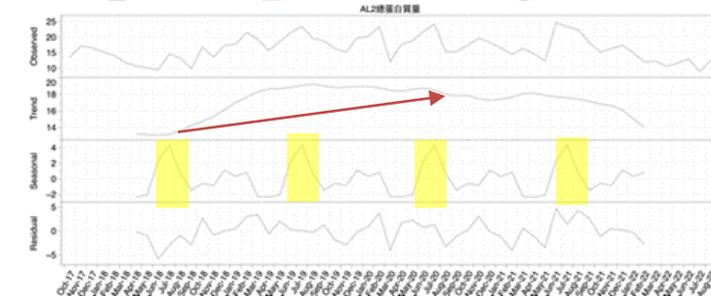
Fat, protein, and lactose yield per lactation

- ◆ For fat, protein, and lactose yield, a consistently increasing trend in Alpine and Saanen goat milk could be observed over the period 2018–2020, when it reached its plateau in 2020 and gradually decreased since late 2021.
- ◆ The overall trend for fat content is increasing since 2018, but protein, and lactose content were also increased since 2018 to 2019 and then and stabilized since then.

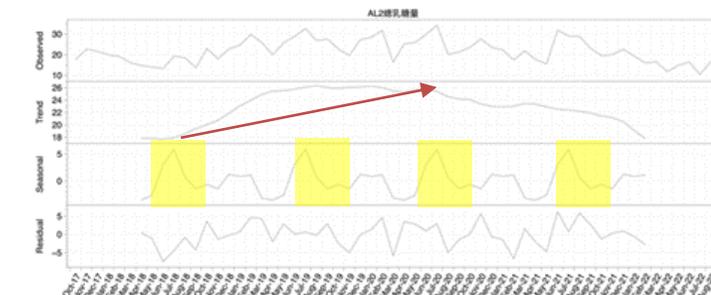
Alpine: **fat** kg/lactation



Alpine: **protein** kg/lactation



Alpine: **lactose** kg/lactation

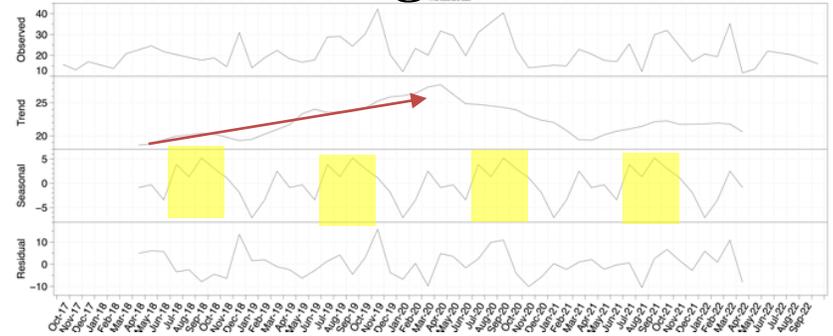


Results and discussion

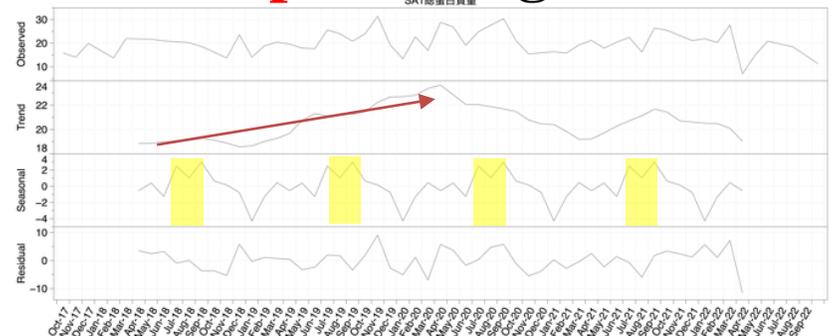
Fat, protein, and lactose yield per lactation

- ◆ Milk from spring kidders had a higher fat, protein, and lactose lactation yield than autumn kidders.
- ◆ This suggested that the decline in total milk solids yield during winter lactation was, to some extent, a synchronization effect of the decreased milk yield with decreasing photoperiod.

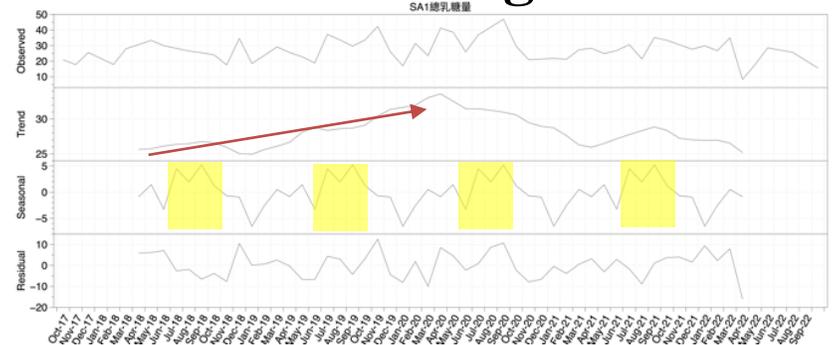
Saanen: **fat** kg/lactation



Saanen: **protein** kg/lactation



Saanen: **lactose** kg/lactation



Conclusion

Industry Implications

- ◆ The results could be used for advising management decisions according to farm and breed productivity goals. Dairy goat farmers in Taiwan are aiming to continue increasing milk production over the next 5 year.
- ◆ Month of kidding had a considerable effect on lactation curves of dairy goats in Taiwan, indicating that light manipulation, a cost-effective and straightforward method could accelerate increments in the national herd productivity.
- ◆ Trend and seasonal patterns can be utilized in Taiwan goat milk industry to forecast milk, milk component, and component production by specific breeds of goats.



Thank you

