Feed Strategy Optimization for Milk Yield

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🐄 Project Objective:

To explore how different feed types and climate factors affect milk production, and develop a predictive model to support optimized feed strategies for dairy farms in New Zealand.

📊 Data Description:

- Simulated dataset covering 3 regions (Waikato, Canterbury, Southland)
- 36 months of data (Jan 2019 – Dec 2021)
- Features: Feed type, quantity, rainfall, temperature
- Target: Milk production in litres

🧠 Methodology:

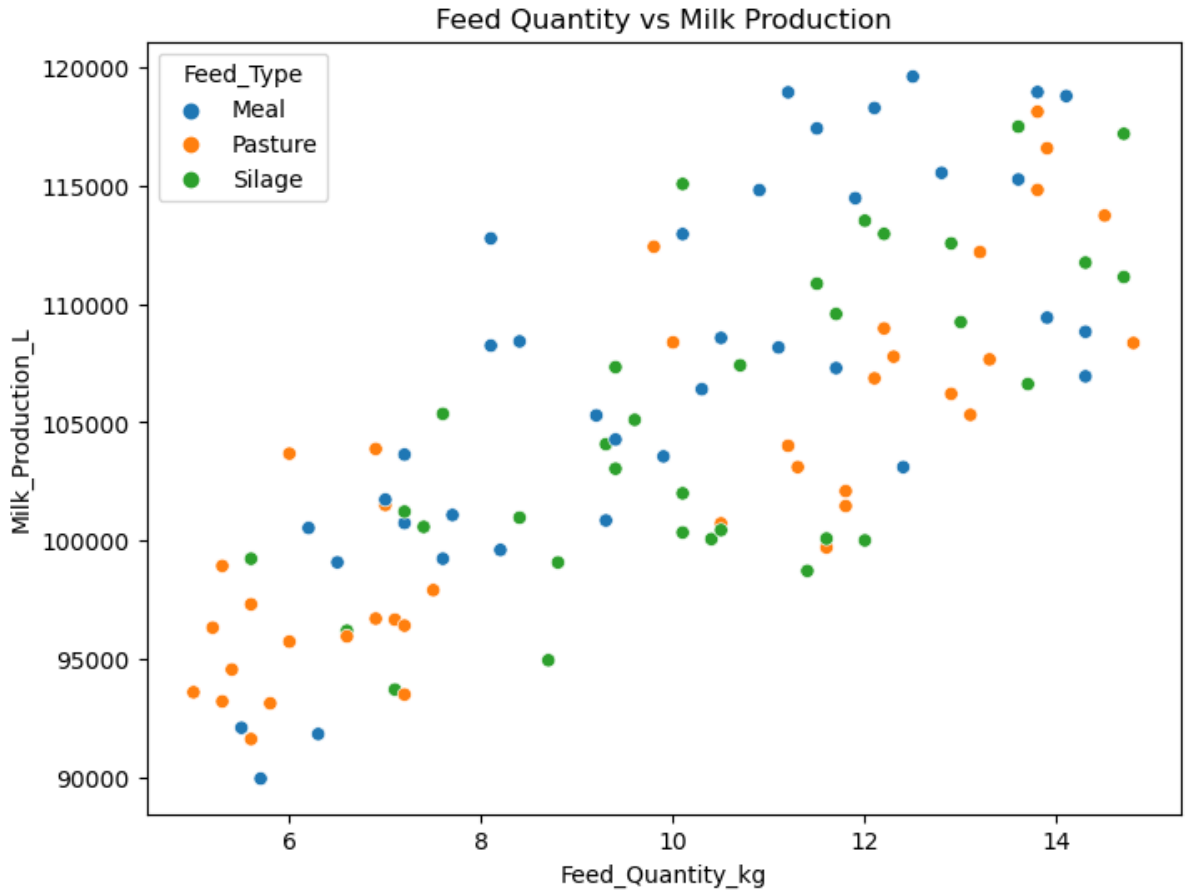
- Performed EDA and visualizations
- Feature engineering: Created interaction variables like Temp × FeedQty
- Encoded categorical variables
- Trained a Random Forest model to predict milk production
- Evaluated with RMSE and R^2 metrics

✅ Model Results:

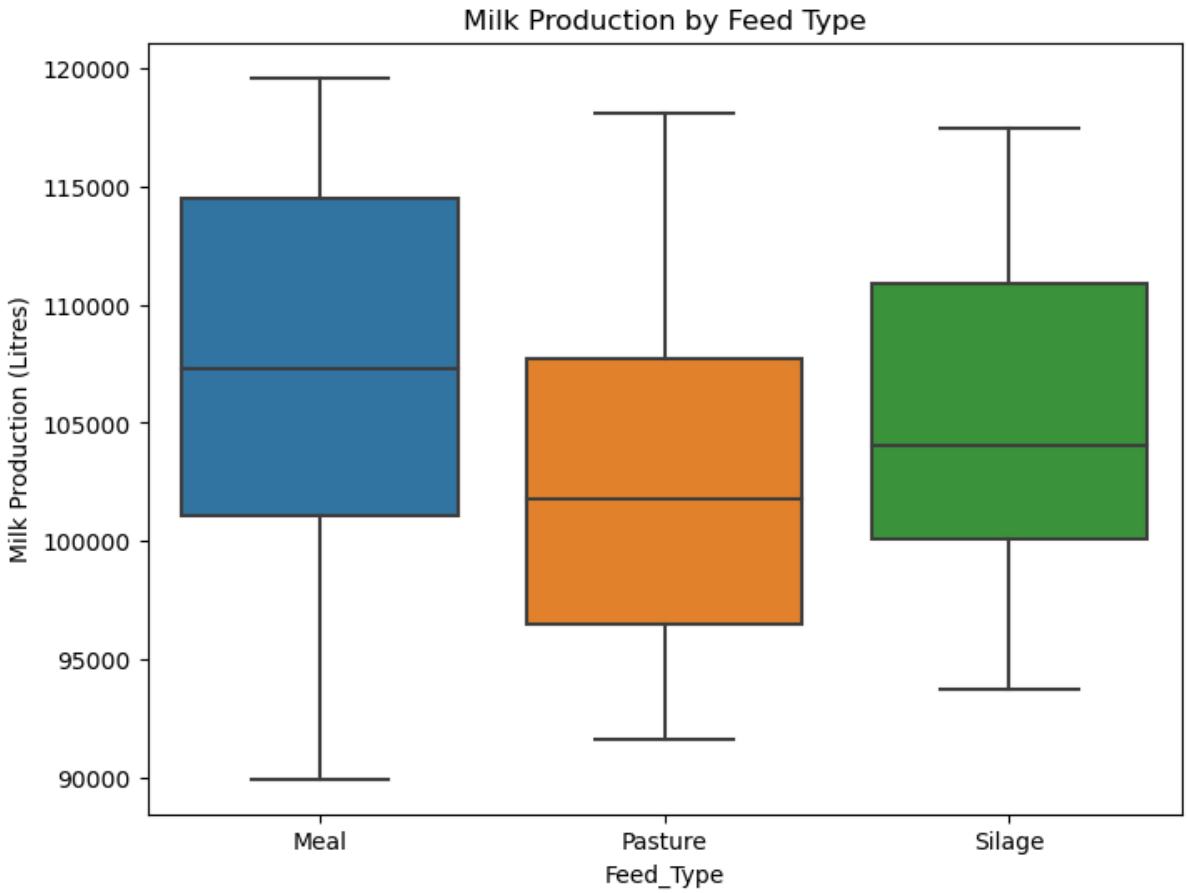
- **RMSE**: ~3524 litres
- **R^2 Score**: **0.68**

The model accurately captured trends in milk output based on feed strategy and weather conditions.

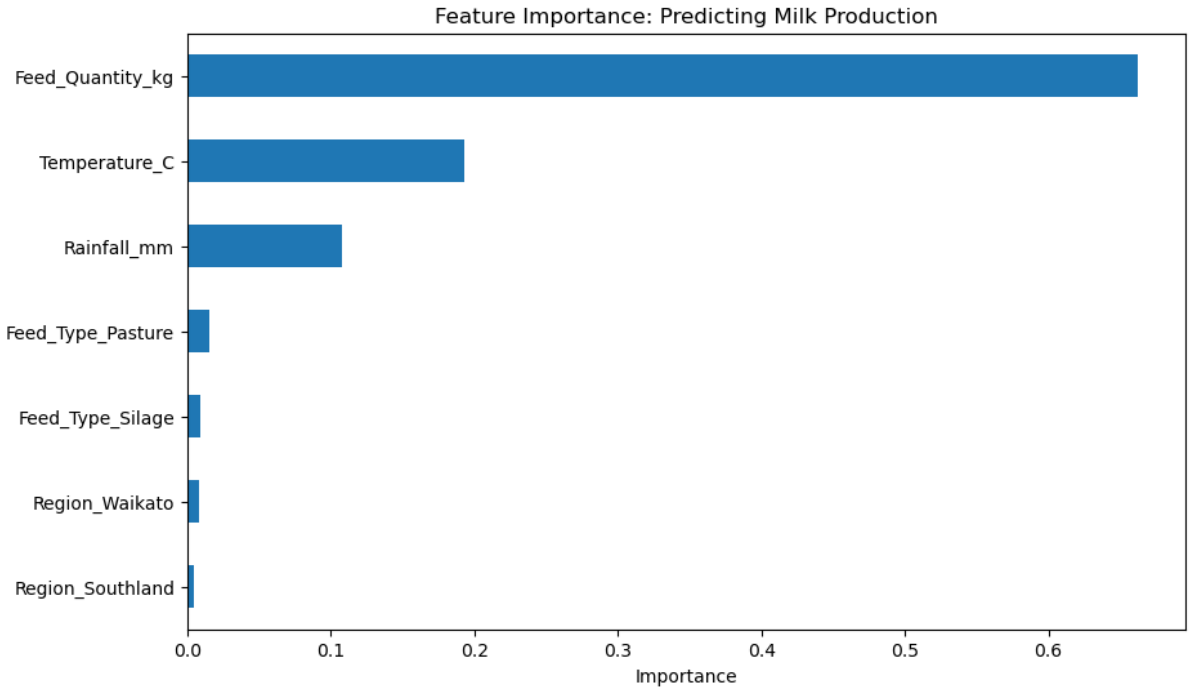
🎯 Visuals:



1. **Milk production vs. feed quantity** (scatter plot)



2. **Box plot of milk production** by feed type



3. **Feature importance** bar chart from Random Forest

🔍 Key Takeaways:

- **Higher feed quantity and moderate climate** led to better milk production.
- **Meal feed** outperformed silage and pasture.
- Feature importance analysis showed that feed quantity, temperature, and feed type were the strongest predictors.

📌 Conclusion:

This project demonstrates the power of machine learning in agricultural decision-making. By modeling the impact of feed strategies on milk yield, farmers can make informed decisions to improve productivity. The techniques applied here can be extended to real farm datasets for even more actionable insights.