

# Increasing Sustainability in the German Bakery Trade - Using Forecasting Order Optimization Software to Reduce Bakery Returns and Improve Sales Performance

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**Background:** In LOWINFOOD 14 technological tools and devices as well as organizational and managerial solutions to the food waste problem are deployed and implemented. Fruits & vegetables, bakery products and fish value chains are selected as settings to apply the innovations as these perishable foods are particularly concerned by the issue of food waste. Looking at the bakery sector, 1.7 of the 4.5 million tonnes of bread and bakery products produced annually in Germany are wasted, of which 36 percent are caused by returns of articles not sold in the stores<sup>1</sup>. Returns are accepted by bakeries in order to always offer their customers an attractive product range and thus to be able to counteract lost sales opportunities. On the other hand, returns cause high costs, which results in potential savings in energy or material costs for the bakeries through their reduction. At the same time, bakeries can make a positive contribution to sustainability by decreasing returns. The software FoodTracks<sup>2</sup> starts at this point. FoodTracks is an intelligent demand planning software targeted to optimize ordering processes in bakeries by providing insights into orders and sales. The challenge many bakeries face is that ordering decisions are made on-site at individual sales stores without taking all relevant circumstances into account. This can lead to a high rate of returns or early sellouts. FoodTracks uses the data provided by the bakeries on past sales figures and derives order suggestions for the stores.

<sup>1</sup>Schmidt, T.G., Baumgardt, S., Blumenthal, A. et al., 2019. Wege zur Reduzierung von Lebensmittelabfällen - Pathways to reduce food waste (REFOWAS): Maßnahmen, Bewertungsrahmen und Analysewerkzeuge sowie zukunftsfähige Ansätze für einen nachhaltigen Umgang mit Lebensmitteln unter Einbindung sozio-ökologischer Innovationen. Volume 1, Thünen Report, No. 73.1, Johann Heinrich von Thünen-Institut, Braunschweig, p. 113. doi: 10.3220/REP1569247044000.

<sup>2</sup><https://www.foodtracks.de/>

## Approach

1. **Implementing** FoodTracks software in three Germany bakeries with 15, 12, and 8 sales stores respectively
2. **Cleaning and merging** of data available from ERP-systems of bakeries (number of pieces delivered, sold, depreciated, and returned; prices; weights per item) for baseline (B → 7-14 months before) and demonstration phase (D → 10-15 months while using FoodTracks software)
3. **Gathering** missing data (weights based on literature or similar items, prices based on similar items)
4. **Assigning** one of the five categories bread, rolls, pastries, cake and snacks to all items sold in the bakeries
5. **Aggregating data** from daily entries per item per sales store for each bakery into monthly data per category for each bakery
6. **Analysing** data by calculating comparable key parameters and carrying out hypothesis tests (two-sided t-test for unpaired two samples) to prove statistical significance of changes
  - *Quantity returned per unit of turnover value, QRTV (in g/EUR):*

$$QRTV = \sum_{i=1}^d m_{r,i} / tv_i / d$$

- *Rate of returned items,  $r_q$  (in %):*

$$r_q = \sum_{i=1}^d m_{r,i} / (m_{p,i} - m_{d,i}) / d$$

m = quantity of monthly returned (r), produced (p), depreciated (d) bakery items (in g)

tv = turnover value of sold items (in EUR, incl. VAT)

i = number of month per phase (i=1 to d, d indicates total number of months included per phase)

**Outlook** - A prerequisite for the use of forecasting software is the provision of historical sales data. Regardless of whether the ordering of articles in a bakery is done centrally or decentral in the sales stores, forecasts are all the better the more reliable the data on which they are based. Correct entry of sales and returns figures is crucial. It is therefore important to sensitise employees in the bakeries to this topic. Best practice examples help convince managers to use forecasting software and should therefore be made available to them. The data obtained also provides the basis for analyzing the software's potential environmental and economic impact. This analysis is also planned in LOWINFOOD.

## Results

	Category	QRTV			$r_q$		
		QRTV <sub>B</sub> (SD) (in g/EUR)	QRTV <sub>D</sub> (SD) (in g/EUR)	Change / Significance (p < 5%)	$r_{q,B}$ (SD) (in %)	$r_{q,D}$ (SD) (in %)	Change / Significance (p < 0.05)
Bakery 1	Bread	39.5 (+/-12.4)	18.4 (+/-3.3)	✓	11.0 (+/-1.5)	8.6 (+/-1.4)	✓
	Rolls	16.8 (+/-4.0)	17.2 (+/-19.7)	✗	12.5 (+/-2.6)	19.7 (+/-1.9)	✗
	Pastries	12.0 (+/-5.9)	10.1 (+/-1.9)	✗	10.5 (+/-1.0)	9.4 (+/-3.8)	✗
	Cake	21.5 (+/-10.8)	8.5 (+/-1.8)	✓	11.2 (+/-1.6)	9.1 (+/-1.7)	✓
	Snacks	14.9 (+/-2.9)	15.3 (+/-2.9)	✗	69.3 (+/-20.4)	18.5 (+/-4.3)	✓
	<b>Total</b>	<b>20.9 (+/-12.4)</b>	<b>14.0 (+/-9.5)</b>	<b>✓ - 33%</b>	<b>22.9 (+/-25.1)</b>	<b>13.1 (+/-9.9)</b>	<b>✓ - 43%</b>
Bakery 2	Bread	99.7 (+/-34.5)	83.0 (+/-16.6)	✗	34.7 (+/-10.1)	32.4 (+/-5.3)	✗
	Rolls	29.5 (+/-5.9)	21.7 (+/-3.1)	✓	22.2 (+/-3.3)	18.8 (+/-2.1)	✓
	Pastries	17.7 (+/- 4.4)	21.4 (+/-4.9)	✓	22.3 (+/-4.2)	18.2 (+/-3.6)	✓
	Cake	145.0 (+/-52.6)	29.4 (+/-7.8)	✓	25.1 (+/-6.4)	19.1 (+/-4.4)	✓
	Snacks	2.9 (+/-1.5)	5.3 (+/-1.3)	✓	12.3 (+/-3.6)	13.8 (+/-2.8)	✗
	<b>Total</b>	<b>59.0 (+/-61.3)</b>	<b>32.2 (28.1)</b>	<b>✓ - 45%</b>	<b>23.3 (+/-9.4)</b>	<b>20.5 (+/-7.3)</b>	<b>✓ - 12%</b>
Bakery 3	Bread	49.2 (+/-5.3)	30.8 (+/-4.6)	✓	16.7 (+/-1.6)	12.0 (+/-1.6)	✓
	Rolls	14.4 (+/-1.4)	9.4 (+/-0.8)	✓	9.0 (+/-0.9)	7.0 (+/-0.5)	✓
	Pastries	7.5 (+/-1.9)	4.8 (+/-1.1)	✓	11.7 (+/-2.7)	9.0 (+/-2.0)	✓
	Cake	4.8 (+/-1.6)	4.2 (+/-1.5)	✗	6.6 (+/-2.2)	6.2 (+/-1.9)	✗
	Snacks	17.2 (+/-3.2)	10.7 (+/-1.6)	✓	13.6 (+/-2.4)	10.2 (+/-1.0)	✓
	<b>Total</b>	<b>18.6 (+/-16.3)</b>	<b>12.0 (+/-10.1)</b>	<b>✓ - 35%</b>	<b>11.5 (+/-4.1)</b>	<b>8.9 (+/-2.6)</b>	<b>✓ - 23%</b>

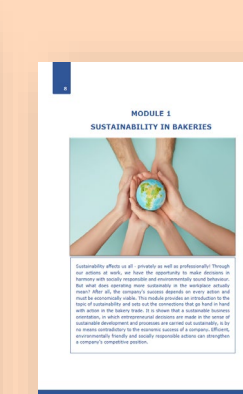
Table 1: Quantity returned per unit of turnover value (QRTV) and rate of returned items ( $r_q$ ) per bakery and per product category (SD = standard deviation) (✓ = reduction significant, ✓ increase significant, ✗ = change not significant)

## Discussion

In total all bakeries showed significant improvements in reducing QRTV and  $r_q$ . The categorial analysis revealed that QRTV is highest for bread for all entities with a max. value of 99.7 grams per EUR of sales reached in this category. Overall, bakery 3 performed best in QRTV and return rate. This bakery is the one that has best maintained its data so that predictions for future sales figures could be made most reliably. In addition, the management of this bakery was convinced of the effectiveness of the software and accepted the suggested sales figures most frequently.

Workbook: Reducing returned bakery products and promoting sustainability - Preparing employees in bakeries for the use of digital forecasting tools

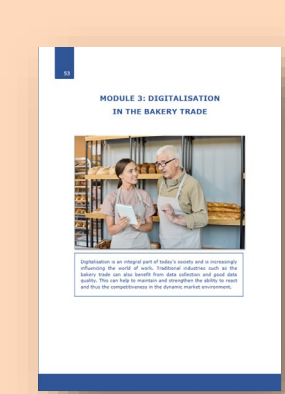
This workbook prepares bakery staff for the use of digital tools and establishes the link to the topic of sustainability.



**Module 1**  
Sustainability  
in the bakery  
trade



**Module 2**  
Merchandise  
management in the  
bakery and its  
contribution to  
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