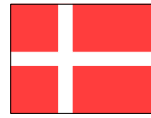


**Nordic Methods for documentation  
of packaging optimisation**



**Proposal for a  
Nordic method**




**– Part B -  
Benchmarking  
System**



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## REPORT OVERVIEW

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<b>Abstract:</b> This report is a working paper for the indicator-system (part B) of the Opti-pack project. The main objective for the part B of the Opti-pack project is to adapt the Norwegian national indicator system and the Swedish and the Norwegian shopping basket to common Nordic systems of indicators. The Norwegian systems have been developed by STØ on behalf of the Norwegian industry, which has financed these projects through the organisation SFA (Styringskomiteén for avfallsreduksjon i emballasjesektoren). The methods in this report will be discussed, reviewed and tested by the project members. This work will then be finalised with the issue of a final report by the end of the project period.		
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## **PREFACE**

Packaging waste has for a long time been one of the most focused problems in environmental politics, both nationally and internationally. On the European arena, the EU Packaging Directive from 1994 (62/ 94) has been an important basis, both for promoting increased recycling and recovery rates of packaging materials, as well as waste reduction related to packaging. Nationally, several countries have established agreements between environmental authorities and the packaging sector to follow up the requirements set in the Packaging Directive.

The Opti-pack project is a synergy project between the Nordic countries; Denmark, Finland, Iceland, Norway and Sweden, financed by the Nordic Industrial Fund, Centre for innovation and commercial development. The main objective in the project is to provide instruments for the industry for documentation of the requirements for packaging optimization set in the Packaging Directive. The project will finish their work within 01.10.2004.

This report is a working paper for the part B of the Opti-pack project. Østfold Research Foundation, STØ, has been pointed out as the responsible organisation for this part of the project. The main objective for the part B of the Opti-pack project is to adapt the Norwegian national indicator system and the Swedish and the Norwegian shopping basket to common Nordic systems of indicators. The Norwegian systems have been developed by STØ on behalf of the Norwegian industry, which has financed these projects through the organisation SFA (Styringskomiteén for avfallsreduksjon i emballasjesektoren). The methods in this report will be discussed, reviewed and tested by the project members. This work will then be finalised with the issue of a final report by the end of the project period.

According to the main project plan part B has the following steps:

### Step B.1: Preface

Spread the knowledge and educate the participants in the project

### Step B.2: Selection of products

The participating countries choose which products they want to study. It is also needed to find out which products that are the market leaders.

### Step B.3: Collect data

Each country collects data about the chosen products. The information is put into a common database.

### Step B.4: Generate results

The collected data are processed. The results will be presented as general indicators for package optimisation divided per country and for the Nordic countries totally.

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## **ABSTRACT**

This report is a working paper for the indicator-system (part B) of the Opti-pack project. The main objective for the part B of the Opti-pack project is to adapt the Norwegian national indicator system and the Swedish and the Norwegian shopping basket to common Nordic systems of indicators. The Norwegian systems have been developed by STØ on behalf of the Norwegian industry, which has financed these projects through the organisation SFA (Styringskomiteén for avfallsreduksjon i emballasjesektoren). The methods in this report will be discussed, reviewed and tested by the project members. This work will then be finalised with the issue of a final report by the end of the project period.

# 1 INTRODUCTION

This project report deals with development and application of indicator systems for packaging optimisation, on different levels in the business society. The main need for indicators is related to the compliance by individual companies and the national packaging sectors to the EU Packaging Directive (62/94), the EN standards from EN 13427:2000 to EN 13432:2000 and the CEN reports connected to these and the national regulations and covenants between governmental authorities and the packaging sector.

The working paper is based on experiences with methods developed in Norway concerning development in national packaging intensity (The Indicator Project; Hanssen et al 1998, 1999, Møller et al. 2001, 2002), and in Sweden and Norway concerning product related indicators (the "shopping basket" approach; Karlsson & Löfgren 1999, Johansson 2002). The purpose of the working paper is to give all participants in the Opti-pack project a common basis for carrying out national projects with development of indicators for packaging optimisation, to test the proposed methodology in practise. Based on these experiences, a revised methodology will be proposed as a basis for how companies representing packaging users and the whole packaging sector should report development in packaging optimisation.

We foresee a number of potential applications of indicators for packaging optimisation in the society, where only a few (I and II) are directly related to the requirements defined by the EU Packaging Directive and the CEN standards. Indicators are relevant for the following types of applications:

- I) Show compliance by the packaging sector with national regulations or covenants with authorities (eg. Norway §5.2 concerning packaging waste minimisation; Finland with a requirement to use 6% less packaging material in 2001 than in 1995).
- II) Show compliance with the CEN standards for packaging optimisation for specific products and producers (although there are not defined a need for indicators in the standard in the present version). The Shopping Basket approach might give the basis for average values for packaging groups that can be used to evaluate own packaging solutions.
- III) Benchmarking between companies within a given sector of packaging users
- IV) Comparisons of a given companies packaging efficiency over a longer time period
- V) Comparisons of new solutions in packaging design projects, with existing solutions in the same company, or with product group standards (see II)
- VI) Identification of areas in the packaging system that are contributing most to loss of packaging efficiency, and which are most relevant for improvement actions
- VII) Communication with customers, e.g. showing how good new product solutions are compared to existing solutions.

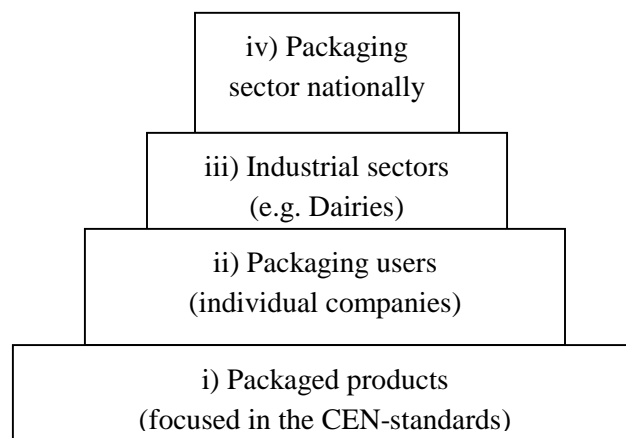
In the development of indicator systems for packaging optimisation, it is important to give companies the full list of potential applications, both those that are important to comply with the regulations, but also applications that might help companies with packaging improvement and cost reduction.

## 2 INDICATOR APPROACHES

The different applications for indicators that are presented in chapter 1, rely on an indicator system that covers four different levels of indicators:

- i) The product level or product group level (Shopping basket approach)
- ii) The company level (individual packaging users)
- iii) The sector level (groups of packaging using companies; e.g. the dairy sector)
- iv) The national level (The packaging indicator approach).

The relationship between the different approaches is shown in Figure 1. In general, the four different approaches in the system represents higher levels of aggregation of data, where level ii) gives input to level iii) and further on.



**Figure 1** Levels for packaging optimisation indicators

It should be noted that the complexity in data gathering and interpretation of results increase significantly from level i) to level iv). When trying to develop indicators for the whole packaging sector in a country, it is necessary to focus on much simpler indicators, than when a project is oriented towards products or single companies. This is the main reason for using very simple mass-based indicators for packaging efficiency in the Norwegian Indicator project.

The relationships between the different types of indicators and the types of applications are shown in the following matrix:



Level of aggregation Type of application	Level i) product level	Level ii) company level	Level iii) industrial sector level	Level iv) national sector level
<b>I Compliance by packaging sector</b>			<b>x</b>	<b>X</b>
<b>II Compliance with CEN standard</b>	<b>X</b>			
<b>III Benchmarking between companies</b>		<b>X</b>	<b>X</b>	
<b>IV Comparison over time for same comp.</b>		<b>X</b>		
<b>V Compare new and existing solution</b>	<b>X</b>			
<b>VI Identify areas for improvement</b>	<b>X</b>			
<b>VII Communication with customers</b>	<b>X</b>	<b>X</b>		

X: Important relationship

x: Secondary relationship

## 2.1 NATIONAL INDICATORS

The Norwegian Indicator project has been developed by Østfold Research Foundation (STØ) on behalf of and financed by the Norwegian industry (SfA) in order to follow development in material efficiency and waste minimization in the packaging sector. The indicator system is based on an Eco-Efficiency approach, with measurements of packaging consumption per 1000 NOK turnover in companies adjusted for changing in the total consumer price index.

A total of about 40 companies from 15 sectors of packers and fillers have participated with data over 4 years (1998-2001), whereas two companies have been followed over a period of 7 years (1995-2001). In addition two product groups (juice and lemonade) have been followed within a large share of the Norwegian market in the period 1995-2001.

## 2.2 PRODUCT RELATED INDICATORS

The Norwegian project called "Handlekurven" (the shopping basket) will give more detailed indicators than the national indicators. This system has also been developed by Østfold Research Foundation (STØ) on behalf of and financed by the Norwegian industry (SfA). STØ has modelled the Norwegian project after the Swedish project "Varukorgen". Packforsk performs the Swedish project. The pre-project to "Varukorgen" was finished in 1999 (Karlsson & Löfgren), and the report from the main project was finalised in May 2002 (Johansson). The issue of the first report from the Norwegian project "Handlekurven" is scheduled to late autumn 2002 (Rubach et al).

### **2.2.1 The Swedish Shopping Basket system**

The selection of packages studied in the Swedish “Varukorgen” is intended to mirror out the most common everyday commodities. The entire packaging system has been studied, i.e. consumer, shop and transport packages. The projects ambition has been to show the development for single packages and no weighting as to consumption has been made. For each selected product the market leader has been identified through information from the trade and its package has been studied. Information about the package comes from an enquiry to the filler of the package. The results are presented as a description of today’s package as compared to the one from previous years. Any changes are identified and described. For the single package the following key figures are given:

- Packaging weight
- Relation between packaging weight and product weight
- Packaging material
- Filling degree

The filler’s reason for making the changes are also given.

Total results are also presented. Key figures given for the entire basket are:

- Number of changed packages per packaging level
- Total packaging weight
- Distribution between packaging weight and product weight
- Filling degree
- Weight distribution on different kind of materials.

### **2.2.2 The Norwegian Shopping Basket system**

The Norwegian “Handlekurven” differs from the Swedish approach in several ways. The objective to “Handlekurven” is to measure the use of packaging materials and the distribution efficiency for 1000 kg of the product ready for consume. With this approach one wish to see how good different packaging solutions is to minimize the loss of product through the value chain. This is one of the most important duties for the packaging. Also the distribution efficiency in respect to filling degree in all parts of the packaging is investigated.

The 25 economic most important product groups in Norway have been identified. In each product groups the top 3 market leaders with respect to turnover has been identified. In each product group also the fastest growing brand has been identified. The analyses will give an overall picture of:

- The average packaging and distribution efficiency for the product group with respect to 1000 kg ready to consume
- For each product their part of a weighted average of the total turnover for the product group are used. In this way the effect of any changes in the market can be found.
- Differences between the market leaders and the fastest growing brand.

The key figures are shown for each product group. These key figures are given as a weighed average and maximum and minimum values. It is also possible to for instance look at the difference between the fastest growing products in relation to market leaders.

In the Norwegian “Handlekurv” it is not possible to see any figures for single products. This is because the producers/suppliers of the products demand totally confidentially about their own products.

### 3 THEORETICAL BASIS

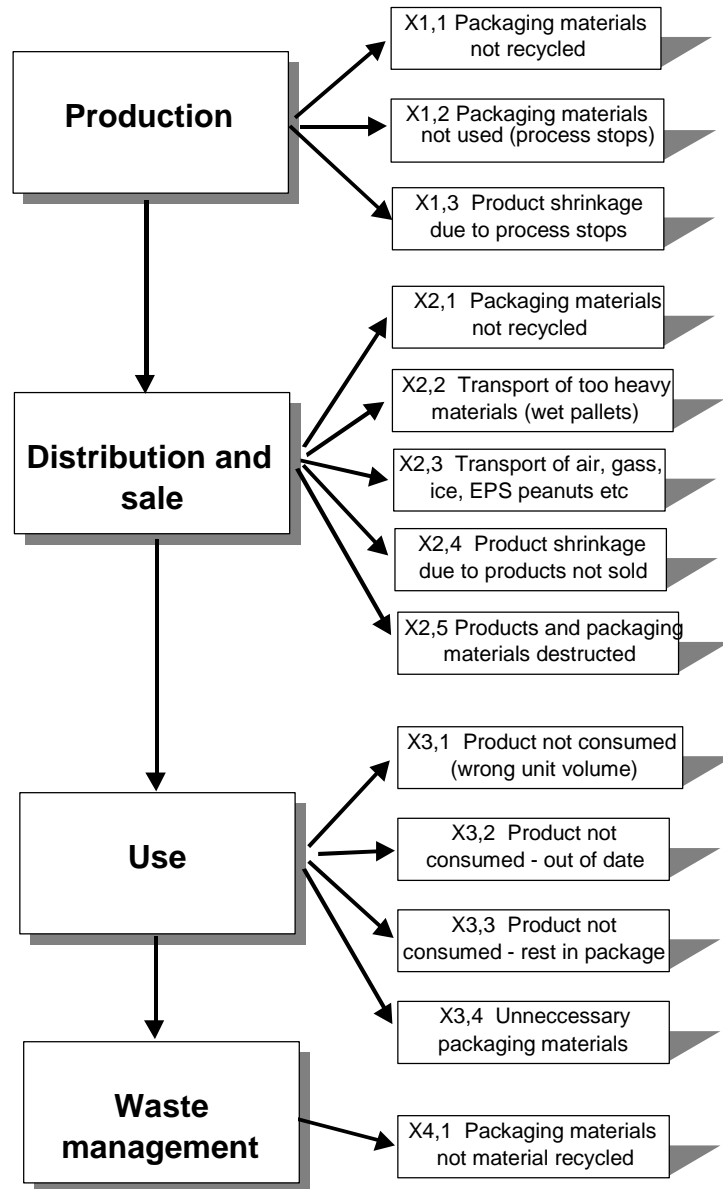
The basis for the indicator system that has been developed, is a model for packaging optimisation that focuses on the following four strategies:

- A. Optimise packaging to minimise all types of product loss in the value chain, from production to consumption
- B. Optimise packaging to maximise amount of materials that are recycled after use, and amount of recycled materials in the packaging (within restrictions defined in health and safety standards and regulations)
- C. Optimise packaging to minimise the loss of efficient volume in transport and storage, i.e. gas, air, utility materials etc.
- D. Optimise packaging to minimise the total mass of packaging materials in the packaging system.

In most national regulations and policies, and in the original EU Directive, it is first of all strategy D that has been focused. That means that projects have been focused on minimising the size and volume of packaging or on the thickness of packaging materials.

In our approach, we define strategy A as the most important optimisation strategy for all types of packaging systems, whereas the rank of the three other strategies might change from one packaging system to another. To optimise packaging beyond the strategy of shrinkage, good indicators for packaging evaluation is necessary. The shopping basket concept is a methodology to develop such types of indicators.

We have also defined a model for packaging optimisation through the value chain of packaging that consider these strategies in a comprehensive way. The model is shown in Figure 2, where the loss of packaging efficiency in each part of the value chain is considered.



**Figure 2 Model for loss of packaging efficiency through the value chain**

## 4 METHODOLOGY

### 4.1 NATIONAL INDICATORS

This indicator system will give some key figures for the development in material efficiency and use of material.

Possible indicators are:

- Material efficiency development for the whole sample of companies
- Development in gross and net material efficiency for four material types (fiber, plastic, glass, metal)
- Development of total packaging material efficiency in different industrial sectors
- Development in packaging efficiency in specific companies over a certain period of time

To be able to perform these analyses it is necessary to collect data for used materials for packaging per economic unit (NOK; SEK; FIM; DKK; ISK) from a number of selected companies in each country.

For the Norwegian indicator system three equations for material efficiency indicators have been developed, one for the company level (Formula 1), one for the industrial sector level (Formula 2) and one for the level of all packaging-using companies (Formula 3). All the Formulae are presented in Appendix A.

The basis for the indicators was the users of packaging products (fillers and manufacturers), as this part of the value chain is (more or less) responsible for selection of packaging solutions (Hanssen et al. 1998). In addition, three large grocery sectors were also included, but only with retailer and distribution packaging. Separate indicators have been developed for each of the four main packaging materials (plastic, fiber, glass and metal), and for the two main categories of packaging types (consumer packaging and retail/distribution packaging). These indicators have been developed as weighted average indicators according to the total turnover of each company and sector.

To get a representative picture on the consumption of packaging in Norway, a total of 15 different business sectors were chosen based on the economic production statistics from Central Bureau of Statistics in Norway. Those 15 sectors represent a total production value of about 260 billion Norwegian kroner annually (1999 figures; equals about 32,5 billions EURO). Within each sector, a number of companies were invited to participate in the study by delivering data, mainly large and medium sized companies. In total, 80 companies have been asked to participate in the study. Over the years 1998-2001, 41 companies have given data for their packaging efficiency, representing a total of 20 % of the total gross product of the 15 sectors. However, only 18 companies have participated with data for the whole period. All economic

data have been adjusted for changes in the total consumer price index value in Norway.

Some important assumptions for the indicator model is that

- Packaging consumption in a given year is equal to the mass of packaging purchased in the same year, i.e. it is assumed that no differences in storage levels occur
- Packaging with several different types of material fractions (complex packaging materials) has been categorized as the material type with the highest mass share
- Packaging solutions have been optimized by each company according to the need for protection of the goods to be distributed, so as there are no differences in loss of products due to bad function of the packaging.

To complement the study from the period 1998-2000, two large Norwegian Food producing companies were asked to contribute with data back to 1995. The main reason for this was to see whether companies would show more significant reductions in their packaging efficiency if a longer time period was taken into account. The indicators and data sets for those two companies were the same as for the rest of the companies participating in the study.

In addition, to get a more comprehensive picture for the whole Norwegian market, two product groups were selected to show both the influence of changes in individual packaging solutions by companies, and changes in the market share of different products. The distribution of fruit juice and lemonade were chosen as examples, mainly for reasons that data were easily available for those two product groups in Norway. For both product groups, only consumer packaging has been included in the study, as there would have been much more difficulty to get figures for the whole packaging system. As other studies have shown that consumer packaging is the most important part of those two systems (Hanssen et al. 2000), it is assumed that the results will be rather representative for the packaging systems in total.

General data sheets have been developed for data collection, and all data have been analysed by Excel spreadsheet, without any tests of significance.

#### **4.1.1 To work with the national indicator system**

It is proposed that the national indicator system is tested out in the Nordic countries through the Opti-pack project.

A proposal for this work is the following:

- Select the 3 most important branches that uses packaging in each country. Alternatively the 3 most important branches the Nordic countries as a total can be selected.
- Find the 5 most important companies in each branch in each country.

- These 15 companies are contacted and asked to fill out a data sheet for their own company. A proposal for a possible data sheets is found in Appendix B (in Norwegian).
- The collected data are processed and analysed.
- The chosen indicators for each country and for the Nordic countries as a total are being made.

## 4.2 SHOPPING BASKET

The shopping basket contains a selection of the most common household products. The product groups are selected based on the highest turnover in either economic unit or total units sold. Companies who prepare trade statistics like AC Nielsen can pick out these product groups. The system is then based on the product ranked as number 1, 2, 3 and the fastest growing product in each product group.



**Figure 3** Some examples of possible products

The consumer package is the unit we buy in the supermarket. The retailer packaging is the unit which transport, contains and protects the consumer package. In Norway approximately 40% of the retailer packaging are being use to expose the product in the shop. This means that the retailer packaging are put directly on the shelf in the shop. Figure 4 shows an example from Norway.

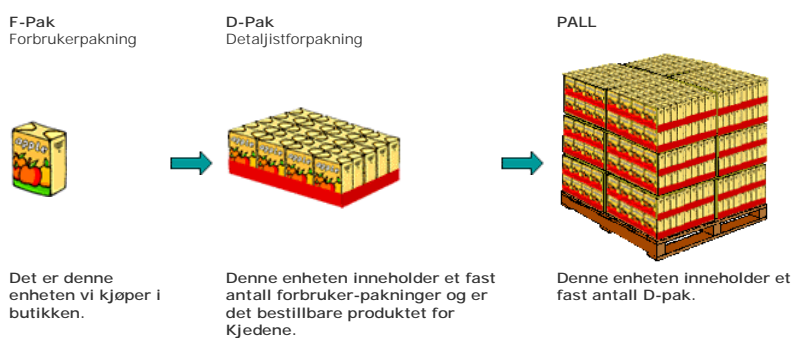




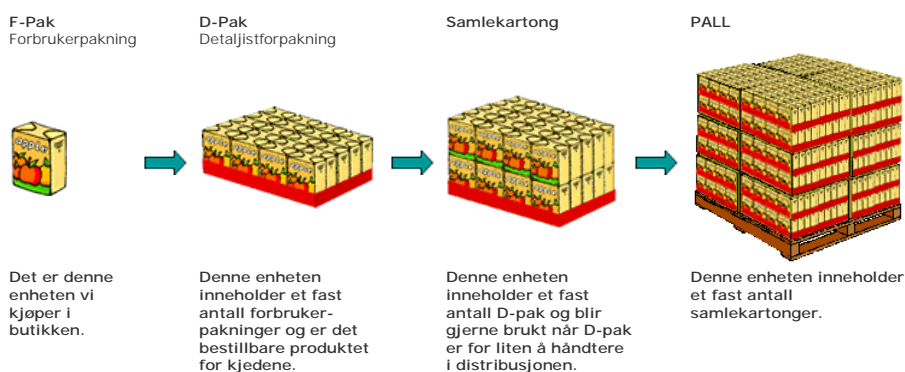
**Figure 4** An example of a combined retailer packaging used to expose the product. (Picture from [www.norpapp.no](http://www.norpapp.no))

In Norway the packaging structure to EAN Norge (European Article Numbering Norge) has been used. Figure 5 shows how this packaging system is defined.

#### Konsumentprodukt:



#### Konsumentprodukt med samlekartong:



**Figure 5** Packaging system. (Picture from [www.eanreg.no](http://www.eanreg.no))

The main objective is to measure the use of packaging and to get an overview of the distribution efficiency related to 1000 kg product consumed.

The producers or suppliers of the market leaders in each product group are being contacted and asked to submit information about the selected products and the packaging system (consumer, retailer and transport packaging) for these products. The data sheet, which is submitted to these suppliers, should be in the same format in all Nordic countries.

The information from the producers/suppliers are then analysed, and the results are presented as weighed average key figures for each product group. In this way information about each single product in the product group is kept confidential.

The results in the years to come can then be compared to the results from previous years. Changes will be identified and described as good as possible taken the confidentiality matter into consideration.

Possible indicators can be:

- Relation between packaging weight and the product weight
- Loss of product (kg)/1000 kg product ready to consume
- The weight of the packaging system for 1000 kg product ready to consume
- The weight of each part of the packaging system (consumer, retailer and transport packaging) for 1000 kg product ready to consume
- Gross and net material consumption divided into material groups (fibres, plastic, glass, metal, wood etc) for 1000 kg product ready to consume
- Number of units to reach 1000 kg product ready to consume
- Filling degree in consumer, shop and transport packaging in percentage of theoretical volume
- Transport efficiency in ton km/1000 kg product ready to consume

Over time, these indicators can tell us more in detail how work with packaging optimisation is heading.

#### **4.2.1 To work with the shopping basket system**

The shopping basket system shall be tested out in the Nordic countries through the Opti-pack project.

A proposal for this work is the following:

- Pick out the 5 most important household product group in each country. Alternatively the 5 most important household product group in the Nordic countries as a total can be picked out. This can be done by for instance ACNielsen.
- Find the 3 market leaders and the fastest growing product in each product group.

- The producers/suppliers of these 20 products are contacted and they are asked to fill out a data sheet for their own product. Alternatively it is possible to do these measurements in cooperation with a supermarket and/or a retailer. A proposal for a possible data sheets is found in Appendix C (in Norwegian).
- The collected data are processed and analysed.
- The chosen indicators for each country and for the Nordic countries as a total are being made.

## 5 EXPERIENCES

### 5.1 NATIONAL INDICATORS

The national indicator system has been in use in Norway since 1998. The indicator system is based on an Eco-Efficiency approach, with measurements of packaging consumption per 1000 NOK turnover in companies adjusted for changing in the total consumer price index. A total of about 40 companies from 15 sectors of packers and fillers have participated with data over three years (1998-2001) (Figure 6 & Figure 7), whereas two companies (Figure 8) have been followed over a period of 6 years (1995-2001). In addition two product groups (juice (Figure 10) and lemonade (Figure 9)) have been followed within a large share of the Norwegian market in the period 1995-2001.

The results show minor changes in the total packaging sector over the four last years, with a reduction in intensity of consumer packaging and a parallel increase in intensity of retail and transport packaging.

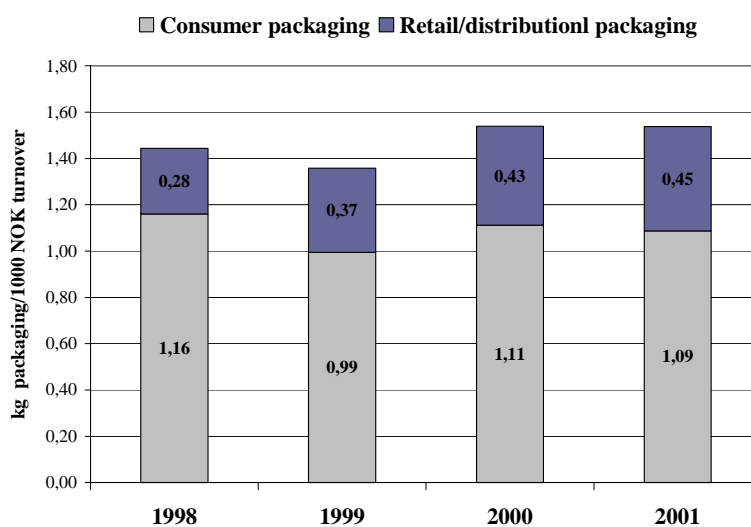
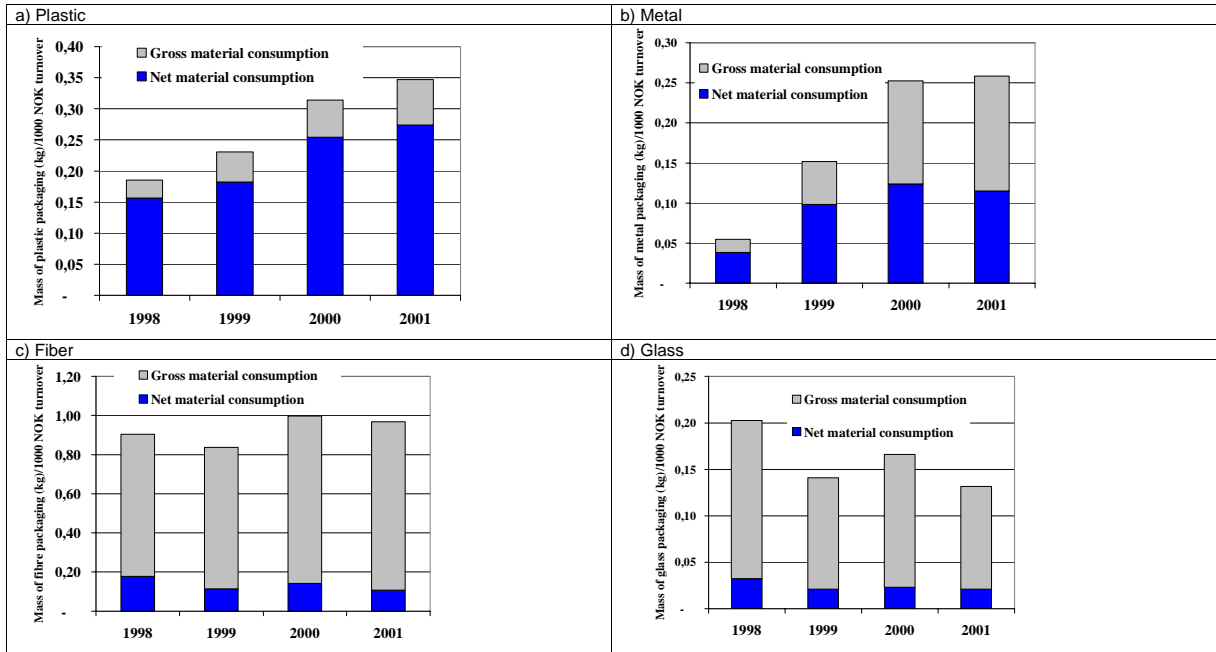
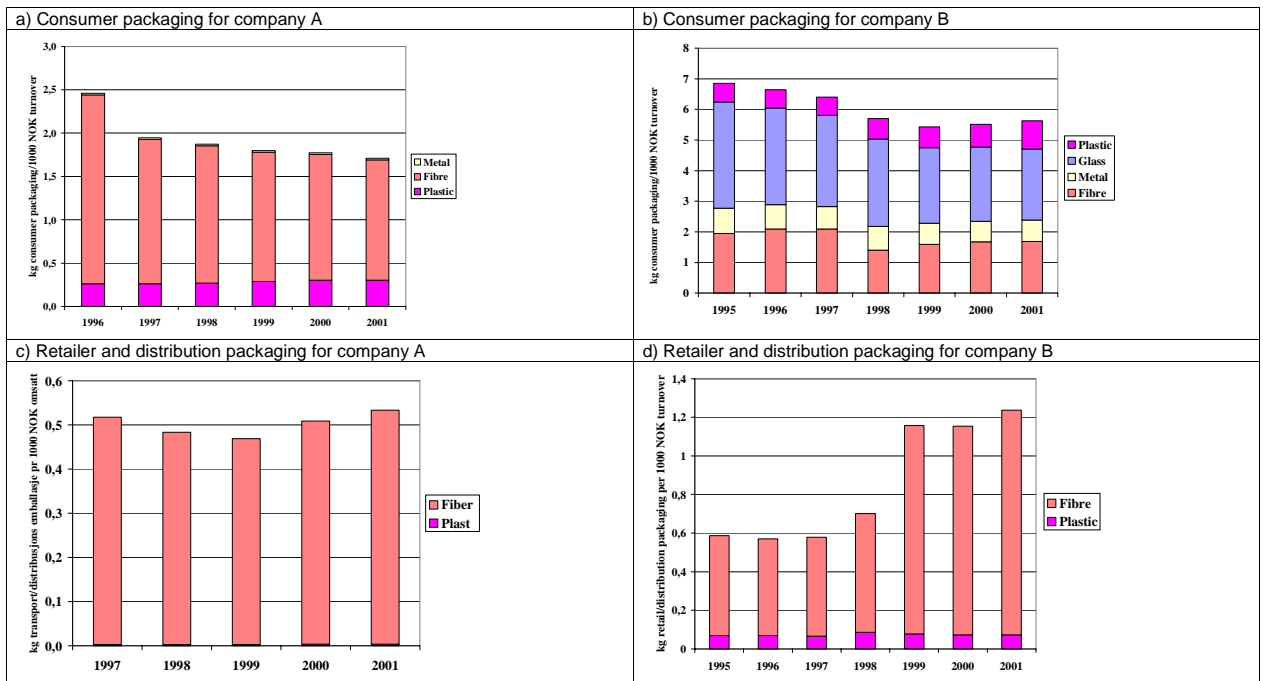


Figure 6 Material efficiency development for the whole sample of companies

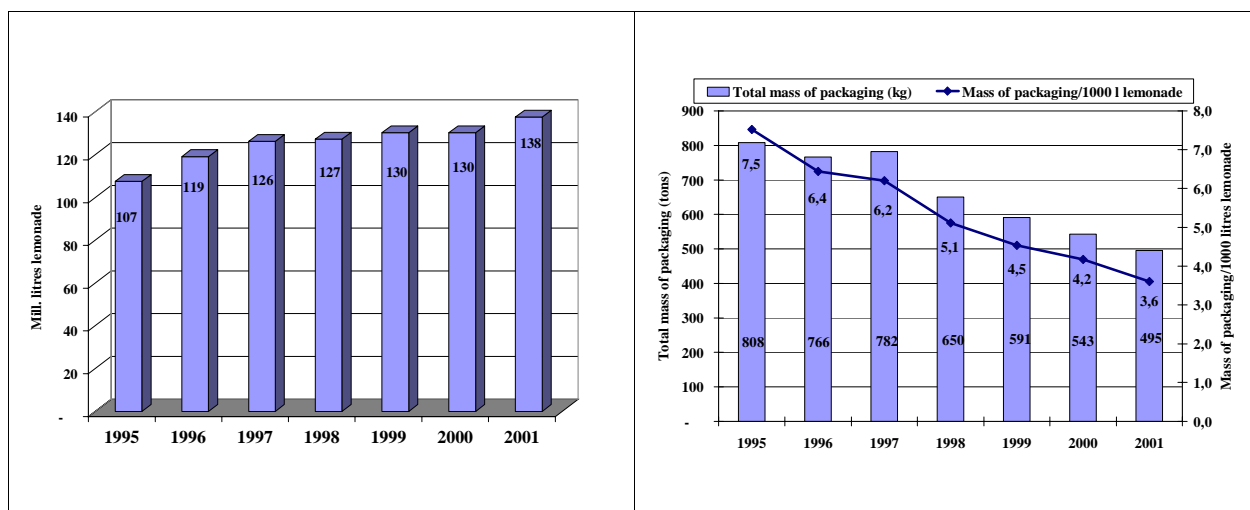


**Figure 7 Indicators for gross and net consumption of packaging materials per 1000 NOK turnover for four types of materials 1997-2001**

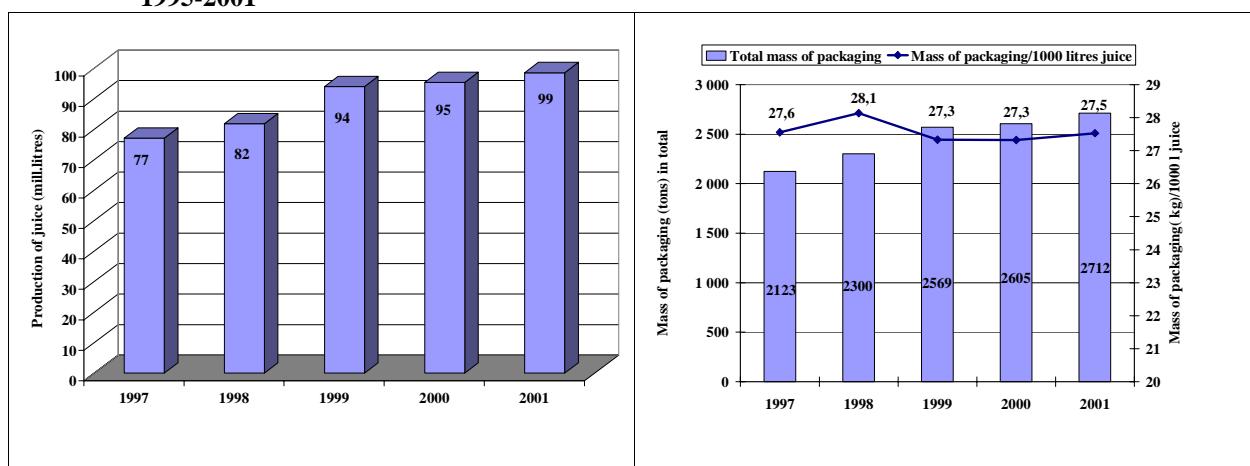
However, there seems to have been achieved significant efficiency gains in the two companies in the period 1995-98 (Figure 8), and also in distribution of concentrated lemonade (Figure 9).



**Figure 8 Indicators for packaging efficiency in two large Norwegian food producing companies 1995 (1996) - 2001**



**Figure 9** Development in consumption of ready mixed lemonade and packaging efficiency 1995-2001



**Figure 10** Consumption of juice in Norway and material efficiency for juice distribution 1997-2001

More results from the national indicator project and bigger pictures of the figures in this chapter are found in Appendix D.

## 5.2 THE SHOPPING BASKET

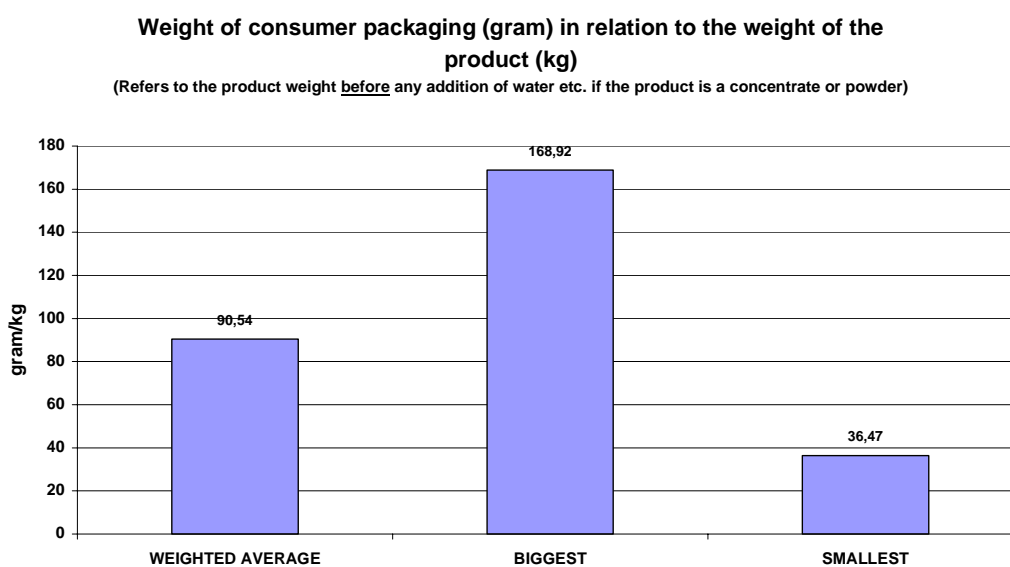
### 5.2.1 Some examples

We will here present some examples of indicators for one of the product groups in the Norwegian shopping basket. The results are mainly presented as a weighed average of the total turnover in this group. This is to reassure confidentiality for the single products in the product group.

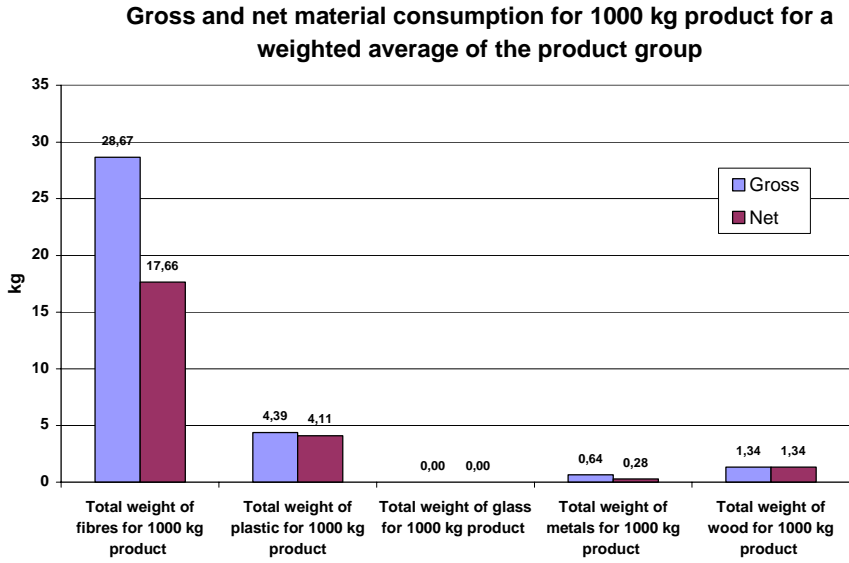
It is essential for the quality of the performed analyses that the total product shrinkage through the distribution chain for each single product is found. This figure will tell a lot about how effective the packaging is to transport the product to the consumer. However, it has been very difficult to find data on shrinkage related to single products. This is one of the key issues that we will focus much more in the years to come.

Ideally, one should also investigate how much of the product the consumers throw away and why they do that. This will give a good indication on whether the package has a well-adjusted size or not. This has only been done for a few products in the Norwegian shopping basket this year.

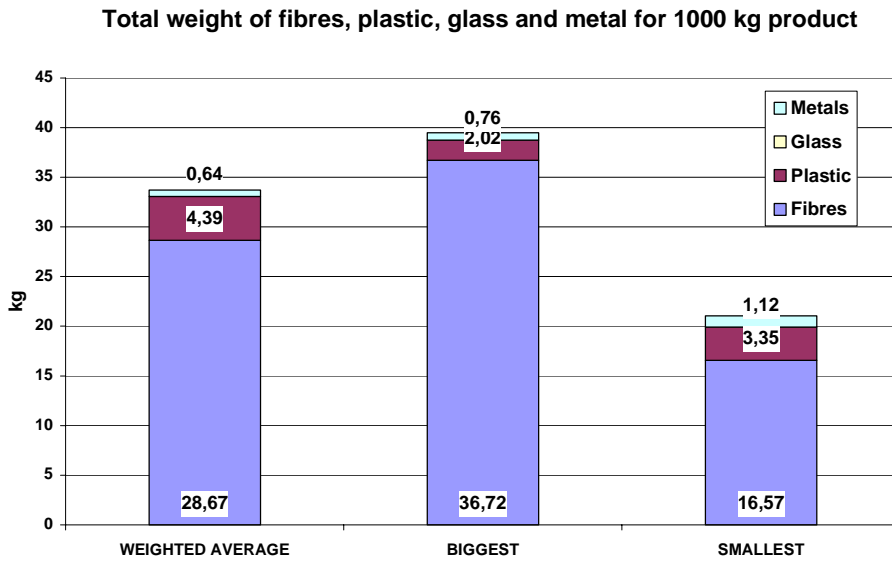
Figure 11 up to Figure 15 shows some of the possible results one can get from the Norwegian shopping basket approach.



**Figure 11** Weight of consumer packaging in relation to the weight of the product



**Figure 12** Gross and net material consumption



**Figure 13** Total weight of fibres, plastic, glass and metals



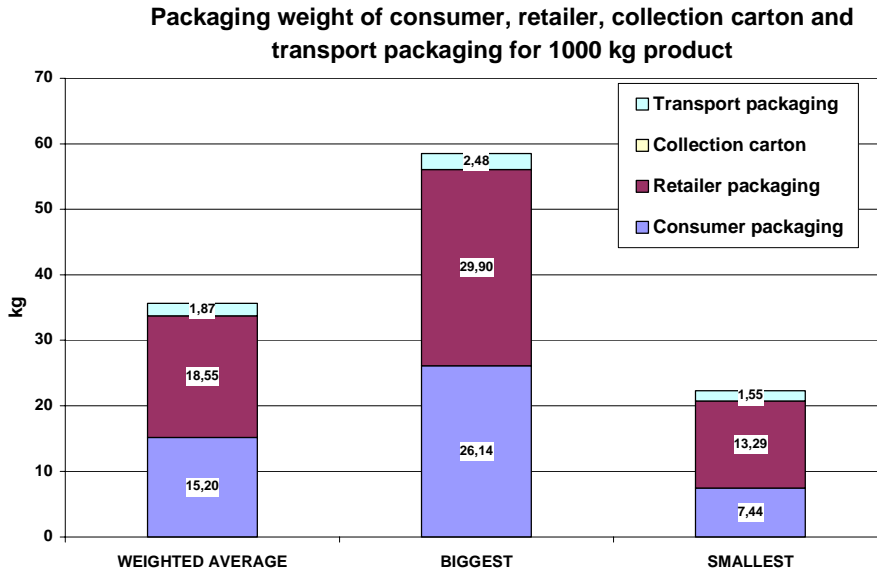


Figure 14 Packaging weight for consumer, retailer, collection carton and transport packaging.

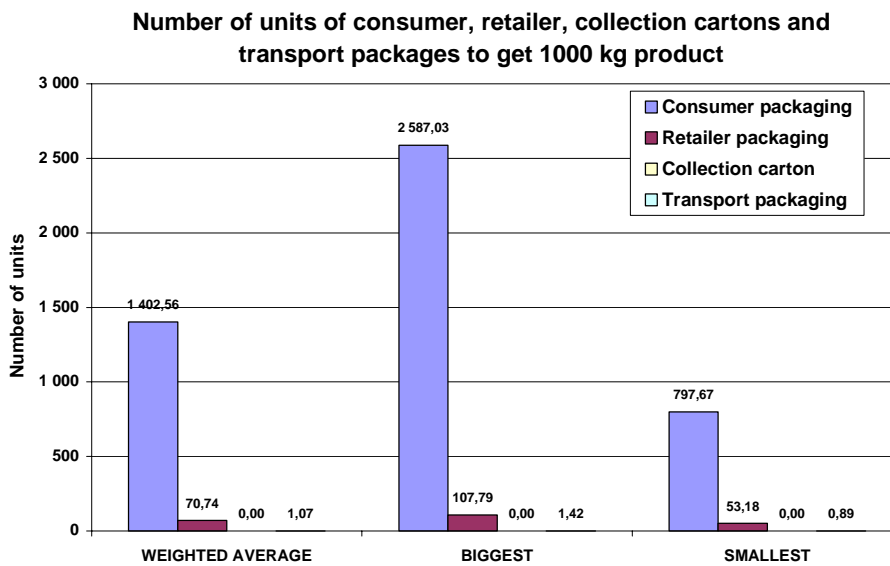
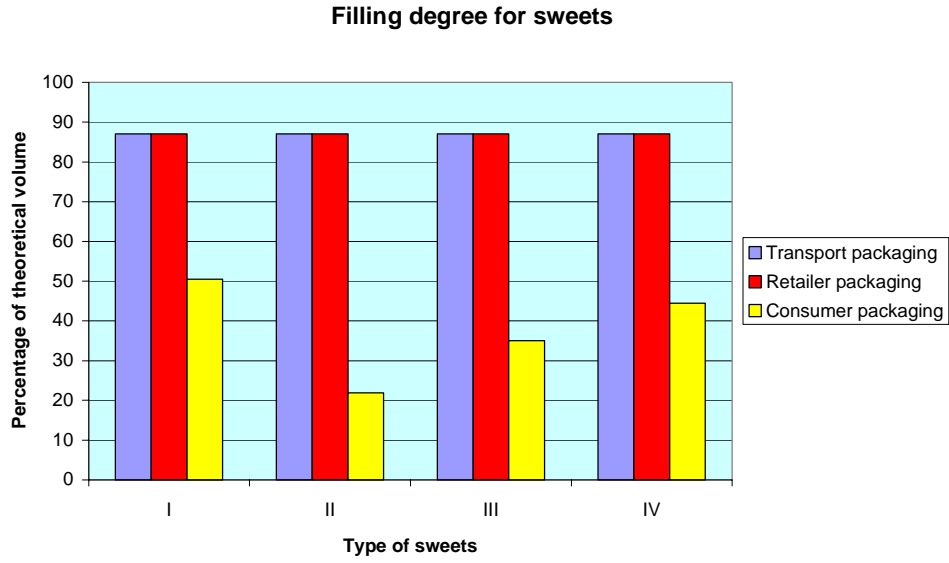


Figure 15 Number of units of consumer, retailer, collection cartons and transport packages that are needed to get 1000 kg of product ready for consume.



**Figure 16** Filling degree in consumer, retailer and transport packaging in percentage of theoretical volume.

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## APPENDIX A Formulas

### National indicators:

#### Equations for total material efficiency

I. In each company in year j :  $ME_{i,j,k} = \sum_{i=1}^4 \frac{X_{i,j,k}}{t_{j,k}}$

II. In each sector of ( $l=n_1-n_2$ ) companies in year j:

$$ME_{i,j,l} = \sum_{i=1}^4 \sum_{k=n_1}^{n_2} \frac{X_{i,j,k}}{t_{j,k}} \cdot \frac{t_{j,k}}{T_{j,l}}$$

III In the total business sector in year j:  $ME_{total} = \sum_{i=1}^4 \sum_{k=1}^n \frac{X_{i,j,k}}{t_{j,k}} \cdot \frac{t_{j,k}}{T_{total}}$

where

- $x_{i,j,k}$  is the mass of packaging material i, used in year j, in company k
- $t_{j,k}$  is the turnover in year j in company k
- $T_{j,l}$  is the turnover in year j in sector l, where sector l is the subsample of companies  $n_1 \dots n_2$  in the total sample n of companies
- $T_{total}$  is the total turnover in year j in all sectors in the sample

### Shopping Basket:

Necessary amount of product in order to get 1000 kg ready for consume:

$$\frac{1000}{\frac{Weight_{prod}}{\left(1 - \left(\frac{\sum \%_{loss}}{100}\right)\right)}} = 1000$$

Theoretical filling degree of transport packaging in percentage:

$((Width * Depth * Height * number \text{ of retailer packages or collection cartons} / (120cm * 80cm * (120cm - 15cm))) * 1000$



# APPENDIX C Datasheet shopping basket

Produkt:		Skriv inn eventuelle endringer av
Leverandør:		
Kontaktperson:		
Adresse:		
Postnummer:		
Telefon:		
Telefon direkte:		
Telefaks:		
E-post:		

Oppgi produktets omløpshastighet		NB! Alle data skal være knyttet til den type emballasje produktet t
----------------------------------	--	---

	F-pak	D-pak	Eventuell samlekartong
<p>Gi en kort beskrivelse av bestanddelene til produktets emballasje* :</p> <p>*For hver emballasjetype bør det så langt mulig kvantifiseres andel av hvert materiale i hver emballasjetype. Så langt mulig bør type og typebetegnelse for hver emballasjetype og hvert materialslag spesifiseres. Der det av ulike årsaker er umulig å spesifisere materialslag i sammensatte emballasjer, bør den samlede emballasje henføres til det materialslag som er det dominerende.</p>			
Oppgi andel fiber i % av total vekt av emballasjen *			
Oppgi andel plast i % av total vekt av emballasjen *			
Oppgi andel glass i % av total vekt av emballasjen *			
Oppgi andel metall i % av total vekt av emballasjen *			
Er emballasjen gjenvinnbar?			
Oppgi utvendig bredde i cm med 1 desimal			
Oppgi utvendig dybde i cm med 1 desimal			
Oppgi utvendig høyde i cm med 1 desimal			
Oppgi nettovekt av produkt uten emballasje i gram			
Oppgi vekten av KUN emballasjen i gram			
Hvis emballasjen har flere bestanddeler, oppgi vekt på hver del (for eksempel vekt av pall, vekt av vikleplast og vekt av mellomlag)			
Oppgi innervolum av F-pak i ml			
Oppgi fyllingsvolumet av produktet i liter/dm <sup>3</sup>			
Oppgi produktets egenvekt (hvis det er oppgitt fyllingsvolum)			
Hva er blandingsforholdet for produktet? (Ved konsentrat/pulver)			
Hvor mange ganger blir emballasjen/pallen antatt ombrukt?			
Oppgi antall F-pak i D-pak			
Oppgi antall F-pak i bredde på D-pak			
Oppgi antall F-pak i dybde på D-pak			
Oppgi antall F-pak i høyde på D-pak			
Oppgi antall D-pak i samlekartong			
Oppgi antall D-pak i bredde i samlekartong			
Oppgi antall D-pak i dybde i samlekartong			
Oppgi antall D-pak i høyde i samlekartong			
Oppgi antall D-pak evt. samlekartong i pall			
Oppgi antall D-pak evt. samlekartong per lag på pall			
Oppgi antall lag av D-pak evt. samlekartong på pall			
Oppgi stablevekt på pall i kg			
Oppgi prosent fyllingsgrad av optimalt volum			

**SPØRSMÅL TIL SVINN:**

Oppgi antatt/målt svinn pga svakheter ved emballasje i % av omsetning	
Oppgi estimert/målt svinn pga utgått holdbarhet i % av omsetning	
Oppgi anslått/beregnet svinn pga rest i F-pak i % av fyllingsvekt	

**ENDRINGER:**

Har det skjedd endringer på emballasjesystemet siden i fjor?	
Hvilken del av emballasjen er endret?	
Spesifiser hva som har skjedd (gi data på den gamle løsningen kontra den nye)	
Hvorfor ble det gjort endringer?	

## APPENDIX D Presentation of results from the Norwegian national indicator project

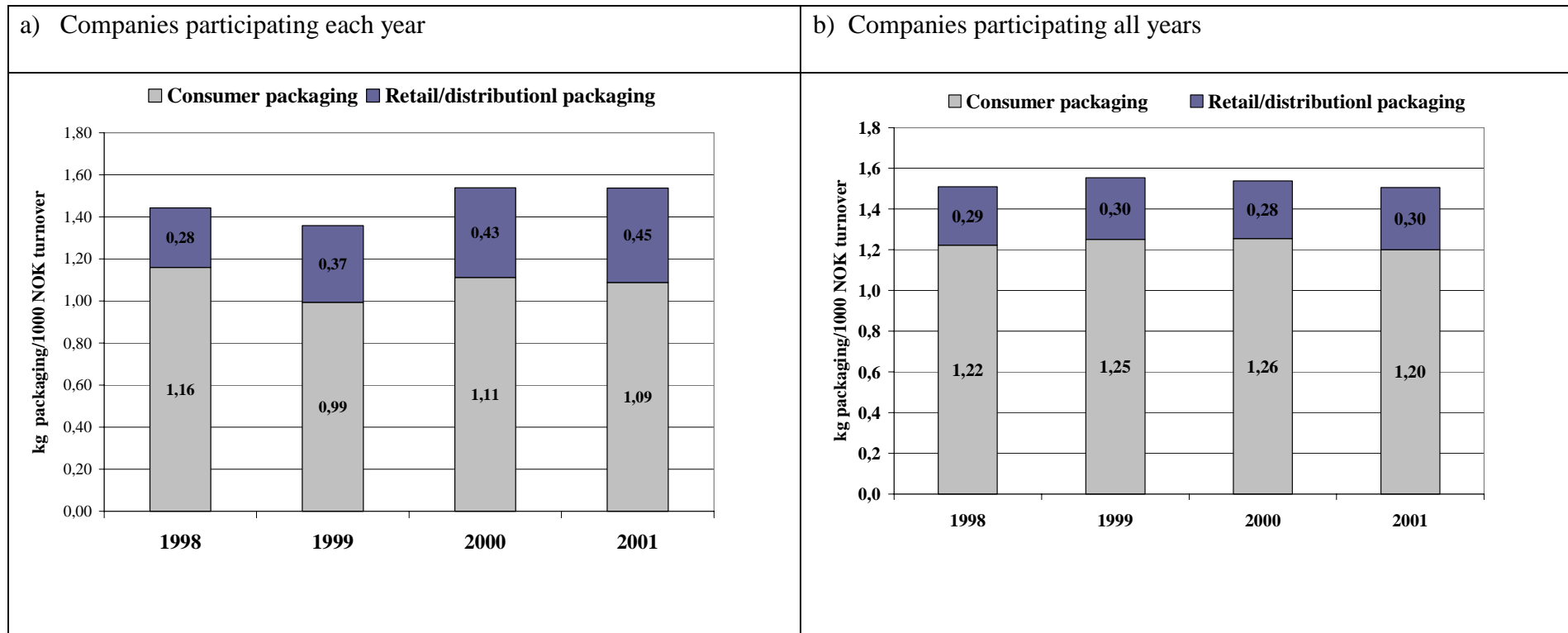


Figure 17 Aggregated indicators for gross consumption of consumer packaging and retailer/distribution packaging in the Norwegian business sector 1998-2001.

a) Plastic

b) Metal



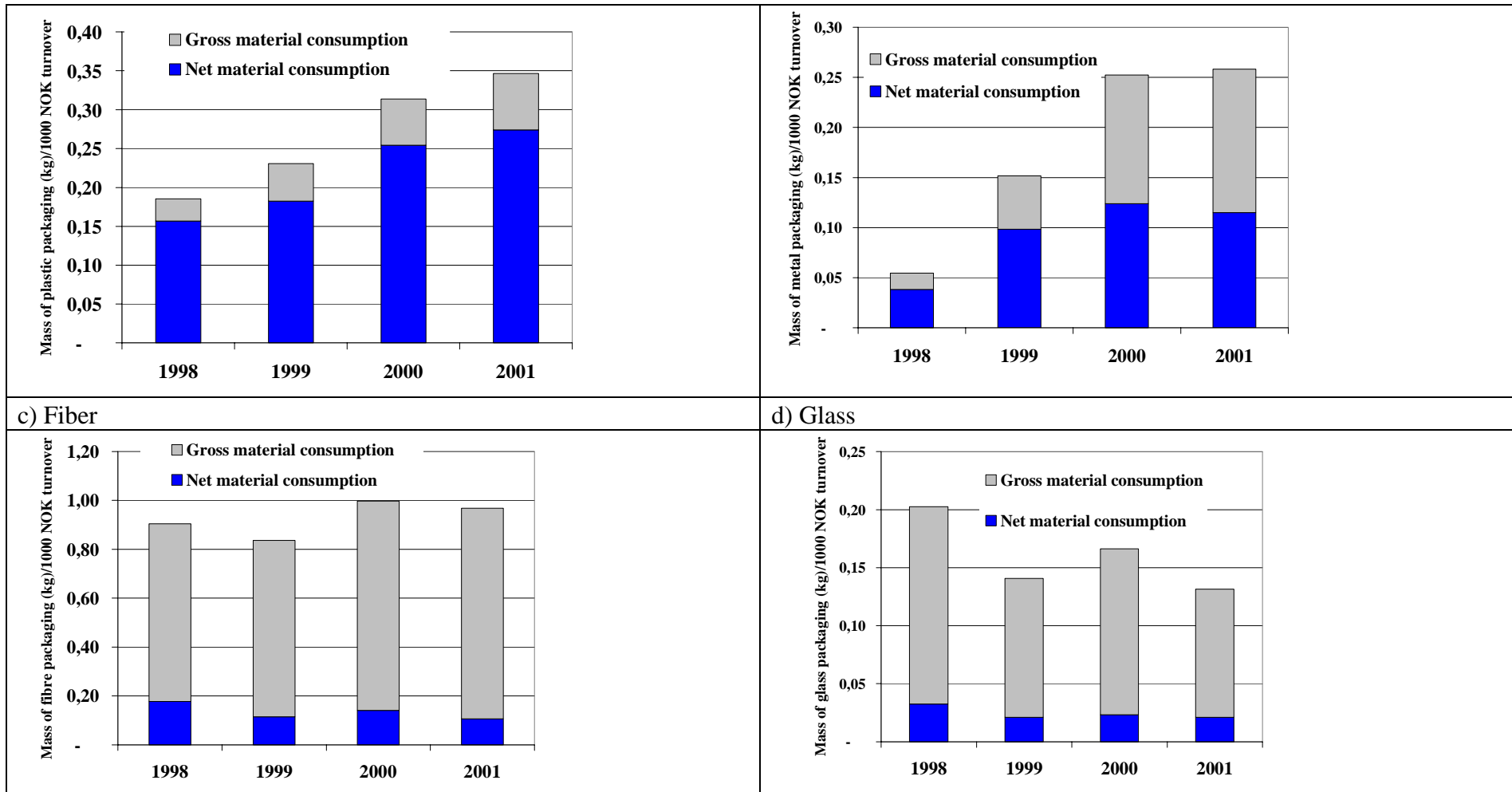


Figure 18 indicators for gross and net consumption of packaging materials per 1000 NOK turnover for four types of materials 1997-2001

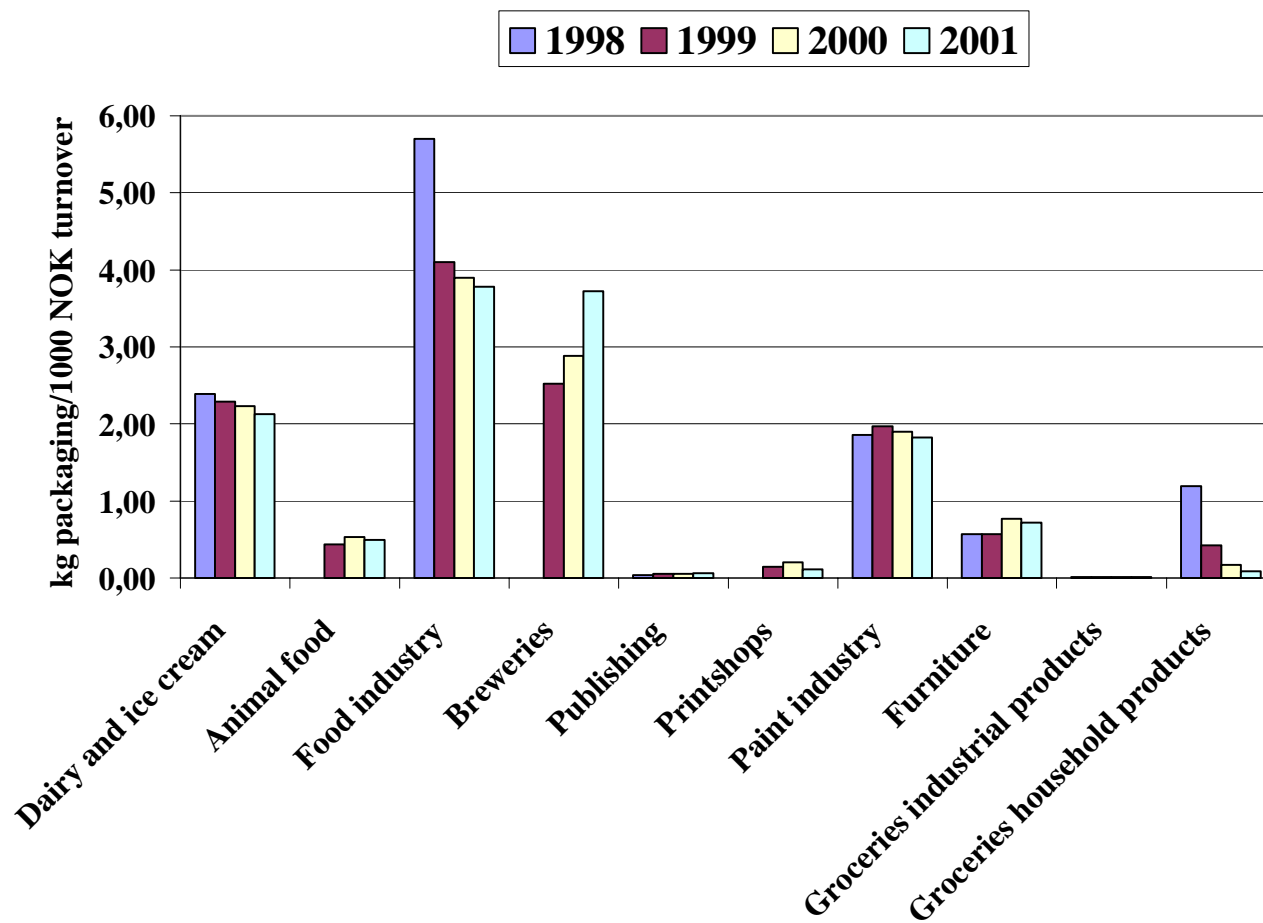


Figure 19 Aggregated indicators for gross consumption of consumer packaging and retailer/distribution packaging in industrial sectors 1998-2001.

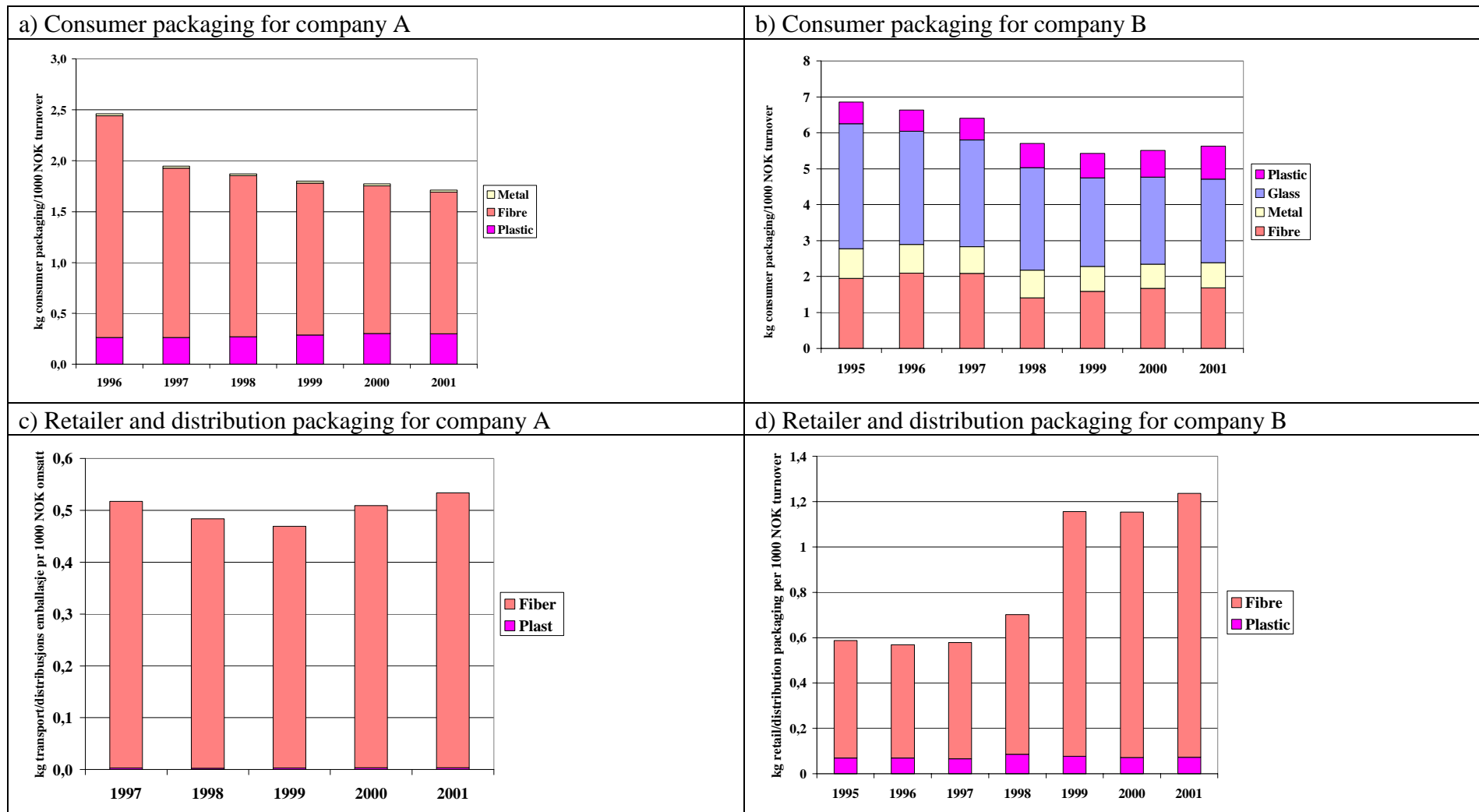


Figure 20 Indicators for packaging efficiency in two large Norwegian food producing companies 1995 (1996) - 2001

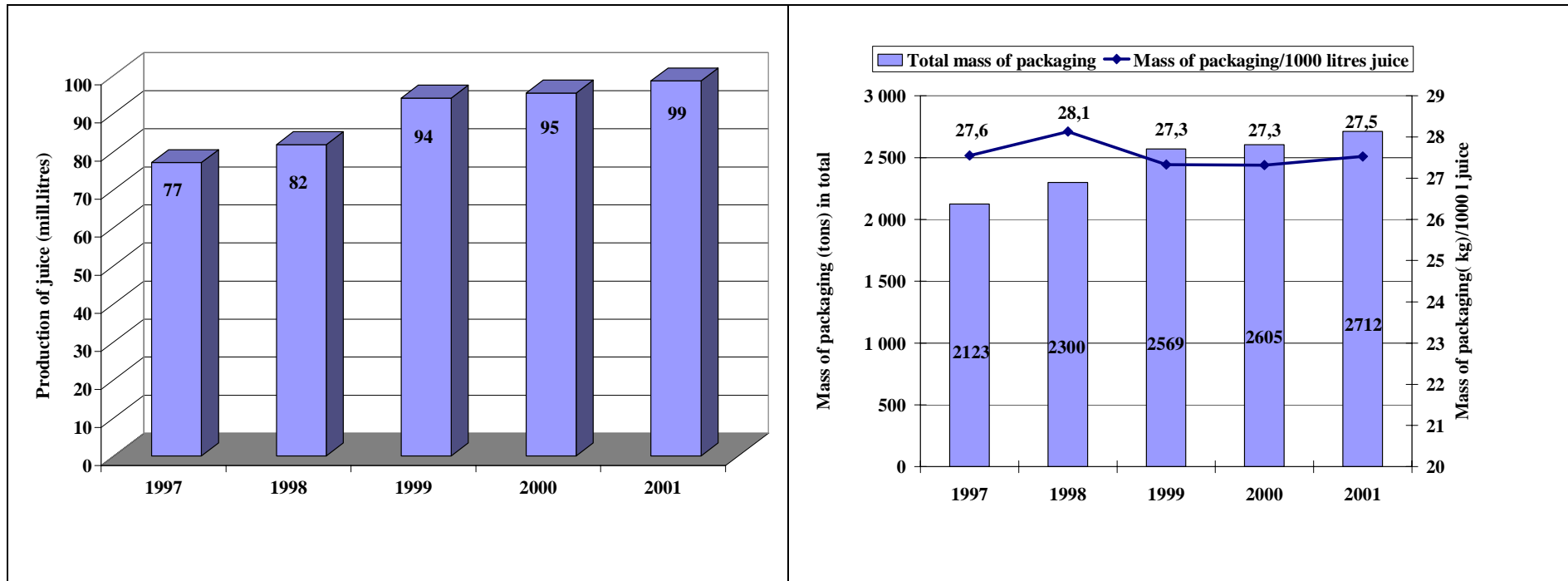


Figure 21 Consumption of juice in Norway and material efficiency for juice distribution 1997-2001

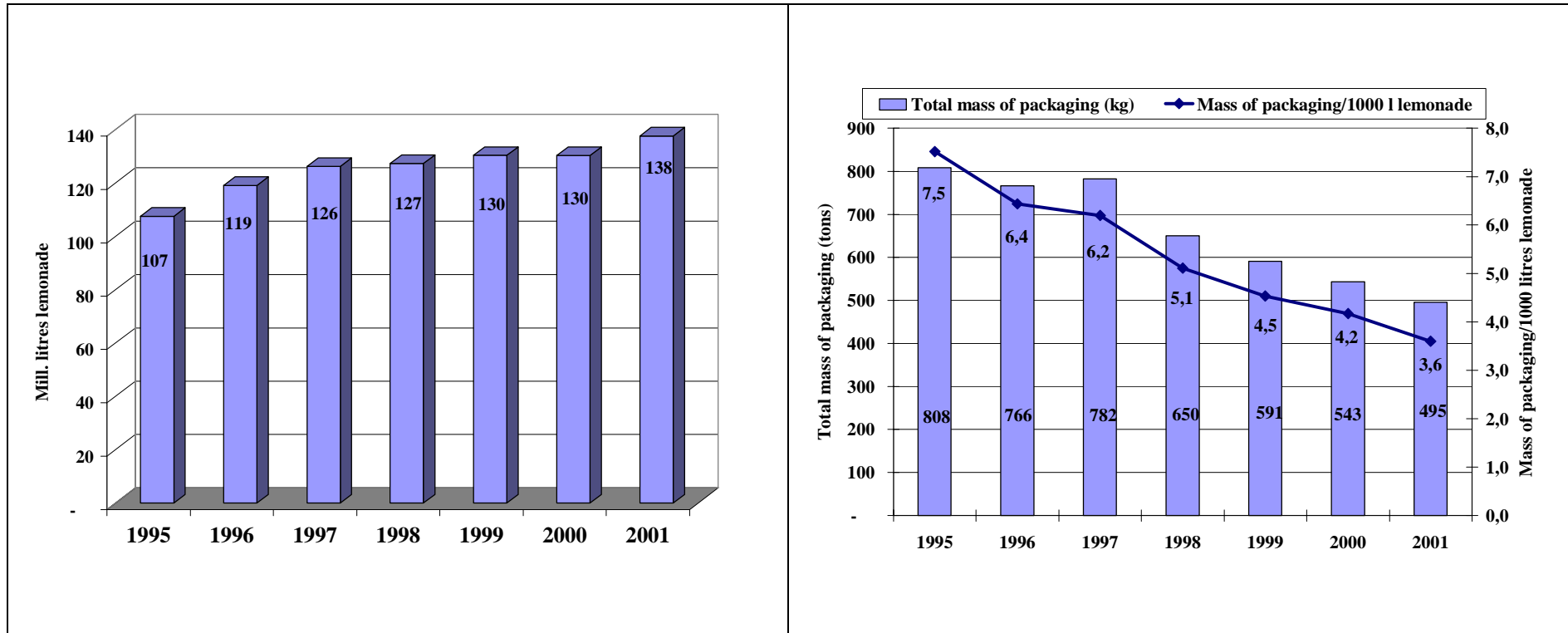


Figure 22 Consumption of lemonade in Norway and material efficiency for lemonade distribution 1995-2001

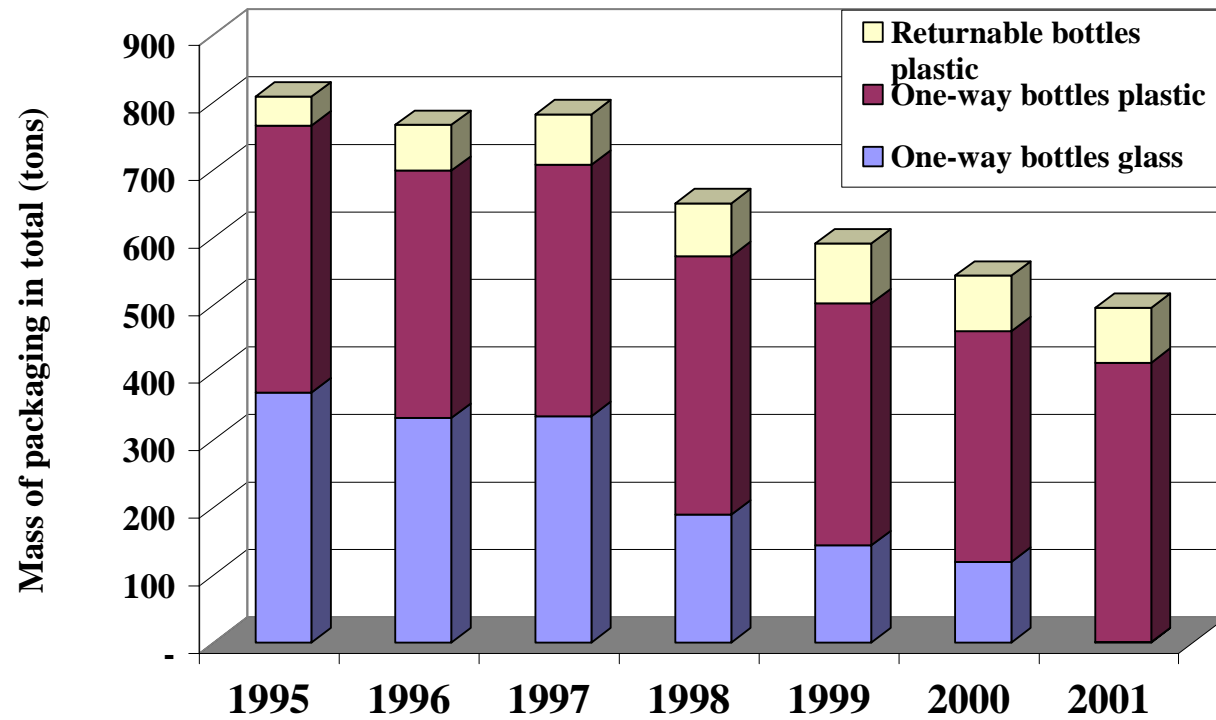


Figure 23 Development in different packaging materials in distribution of lemonade in Norway 1995-2001