WASTE NOT

Food waste in Poland and perspectives of reducing the phenomenon by 2030.

Warsaw, 2021

The report is a part of the *Development of a food waste monitoring system and an effective program for rationalizing food losses and reducing food waste – PROM project*. The study is being implemented under the GOSPOSTRATEG strategic research & development program, financed by the National Center for Research and Development.

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Banki Żywności

PROGRAM RACJONALIZACJI I OGRANICZENIA MARNOTRAWSTWA ŻYWNOŚCI

Narodowe Centrum Badań i Rozwoju

Table of Contents

1

Results summary

The present report summarises a two-stage Delphi study which was commissioned by the Federation of Polish Food Banks and carried out by the 4CF Company. The research focused on the long-term (10-year) perspectives regarding the phenomenon of food wastage in Poland. The current scale of losses, according to latest analyses, has reached 5 million tons per year.

The term "Food waste" applies to all instances where raw foods and food products (intended for human consumption) are not being utilised in accordance with their original purpose, i.e. are not consumed by people. The term applies to all links of the food chain, including primary production, processing, distribution and household consumption. During the course of the present project, this definition was an important point of reference in determining the legal, technical and organisational solutions which could radically reduce the scale of food waste.

The key results of the study which served as the basis for the recommendations included in this report can be brought down to one key numerical variable and two sets of data.

23,4% this number reflects the Experts' low assessment of the likelihood that Poland will successfully implement the European Parliament's resolution of May 16, 2017 "on initiative on resource efficiency: reducing food waste, improving food safety" (2016/2223(INI)). The resolution obliges Member States to take measures aimed at halving food waste by 2030 (as compared to 2014). Such a low assessment stresses the need for the implementation of efficient solutions which will accelerate the reduction of food waste in Poland.

The first of the aforementioned sets of data – which are key from the decision-makers' point of view – is presented in the table below. It juxtaposes (in quantitative terms: thousands of tons) the forecast value of food waste in individual links of the value chain with the most optimistic scenario of food waste reduction. The table also provides the difference between these two values. It shows the potential for food waste reduction which depends on the decisive action of decision makers. According to the Experts who took part in the study, such a reduction of losses is a realistic goal for the present decade.

	Lowest possible level to which food waste could be reduced [in '000s tons]	Forecast level of food waste in Poland [in '000s tons]	Difference between the forecast and the lowest possible level
primary production	639.7	1020.6	37.32%
food processing	554.9	672.2	17.45%
transport	299.7	405.5	26.10%
trade	440.0	547.3	19.61%
catering industry	426.2	505.7	15.72%
households	1395.8	1853.2	24.68%

How to reach the optimistic goals? In the course of the study, the Experts assessed 17 possible solutions which have the potential to reduce food waste. A synthetic visualization of their evaluation can be found on page [X] of the present report. It shows the relative efficiency, timeframe and cost-effectiveness of implementation. However, not all solutions deserve equal attention and not all are equally prioritised.

In light of the obtained results, the solutions limiting food waste in Poland can be assigned priority based on two types of analyses.

The first is based on the assumption that we should focus on battling those areas of food waste which are responsible for the largest scale of wastage, i.e. households. The following actions were determined to be the most effective in this respect:

- Implementation of mass technological solutions for monitoring expiration dates (e.g. QR codes) as well as for sharing shopping lists or recipes;
- Strengthening the role of social organisations which distribute unsold food by increasing the effectiveness of their operations and by creating a network;
- Offering appropriately-sized portions to consumers;
- Introduction of education on food waste reduction to public schools and vocational education;
- Organising social campaigns to raise awareness about the need to reduce food waste.

The second analysis of the results (quotient ETM/%FW; priority was given to changes which resulted in higher values than the median for all solutions) allowed us to define top-priority solutions for individual stakeholders within the agri-food market. The results are presented in the table below.

European public administration	national public administration	food banks	business
1. Addition of further durable foods (e.g. groats, rice, pasta, etc.) to the list of products which do not require an expiration date.	**12.** Introduction of education on food waste reduction to public schools and vocational education.	**13.** Organising social campaigns to raise awareness about the need to reduce food waste.	**11.** Offering appropriately-sized portions to consumers.
	4. Mandatory donation of unsold food to social causes by farmers, food producers, distributors and the catering industry.	**9.** Strengthening the role of social organisations which distribute unsold food by increasing the effectiveness of their operations and by creating a network.	**3.** Implementation of mass technological solutions for monitoring expiration dates (e.g. QR codes) and for sharing shopping lists or recipes
	2. Introduction of markings specifying the expiration date and storage methods to the front of packages.		**6.** Creating opportunities for the sale of food that does not meet quality criteria, but is safe for consumers, e.g. "imperfect vegetables and fruit".

Does this mean that no other solutions exist and that other stakeholders, including consumers, have no role to play? Not at all. However, given limited resources, prioritisation helps to establish the most effective actions, those which can be implemented on a large scale in the shortest possible time. The Experts assessed that each of the above solutions has the potential to reduce food waste in Poland by over 13%. Although their joint implementation would not result in a simple summation of effects (assuming conservatively that the effectiveness of aggregated actions against food waste will increase logarithmically), each of them is a worthwhile goal.

2

Shortened description of methodology

The analysis is a part of the PROM project and its methodology is consistent with that of a Delphi study. It was commissioned by the Federation of Polish Food Banks and carried out by 4CF between February 21 and April 7, 2021.

The Delphi Method was developed in the United States in the 1950s and 60s by the RAND Corporation, a think-tank of the air force. It was designed for situation-assessment by decision-making and analytical military institutions and it is a key tool in strategic foresight and modern strategic management. It allows expert groups to reach unified conclusions on a given topic within a short time. The results of Delphi studies are relatively unaffected by psychological, rhetorical or sociological factors which usually have a negative effect on group discussion (e.g. expert panels), because experts are required to remain anonymous within the Delphi framework.

The high flexibility of the Delphi method renders it useful wherever expert consensus is needed, but it is primarily used in projects which aim to assess the possible paths of future developments. Thus, it is hardly surprising that the Delphi method was initially used in classified US Air Force projects to reach a consensus among senior officers, academics, civil experts and decision makers. Since then, it has proven its worth in thousands of civilian projects, in areas such as education, technological development, spatial planning, conservation of natural resources or regional development planning.

In its classic variant, the Delphi method is turn-based. In the first round, a group of experts is asked to evaluate a set of several statements (Delphi hypotheses) using a unified rating system. The experts who assign the highest and lowest scores are also asked to justify their choice and provide a brief explanation. In the second round, experts re-evaluate the same hypotheses, but this time, the organisers of the study provide the results of the previous round: each hypothesis is presented with an arithmetic

mean of the experts' ratings and the anonymized comments of participants. Having familiarised themselves with the new information, experts re-evaluate the Delphi hypotheses, which gives them the opportunity to verify and/or modify their previous answer. If the assessment of a hypothesis by a particular expert differs significantly from the arithmetic mean (the "working consensus"), the expert is informed about the fact and asked to justify their answer once more by providing a brief explanation which should include references to the comments of other participants. Depending on the available resources, the study may end after the second round or continue with further rounds until a satisfactory consensus is reached.

The following study was carried out with the employment of an online Delphi tool: the smart-delphi 4CF HalnyX platform. This solution is a departure from the turn-based methodology of traditional Delphi studies, in favour of a continuous online survey. Each time they visit the platform, experts are informed whether their rating differs significantly from the average. The comments and explanations of ratings resemble a mini-forum, where an anonymous discussion leads to a final consensus.

3

Research questions

The primary aim of the study was to obtain expert opinions on the following topics:

1. What will be the scale of food waste in Poland by 2030?

2. What will be the role of individual entities – business, national and European public administration, science, NGOs, consumers – in reducing food waste?

3. What will be the role of Food Banks in reducing food waste by 2030 and what will be the form of their participation in the process?

4. What resources will be needed to effectively reduce food waste by 2030?

5. What actions are necessary to effectively reduce food waste by 2030?

4

Structure of the study

The study consisted of two stages.

The first stage focused on assessing the scale of food waste in Poland in the year 2030. Experts were asked to evaluate:

- The likelihood that in 2030, the scale of food waste in Poland will be **under 3.5 million tonnes per year** (which would constitute a reduction by 30% compared to 2021)
- The likelihood that in 2030, the scale of food waste in Poland will be **under 2.5 million tonnes per year** (which would constitute a reduction by 50% compared to 2021)
- The lowest possible level of food waste which could be reached in Poland by 2030, with regard to individual links of the value chain (primary production, processing, transport, trade, the catering industry, households)
- The expected level of food waste in Poland in 2030, with regard to individual links of the value chain (primary production, processing, transport, trade, the catering industry, households)

The first stage of the study lasted three weeks and ended with a meeting where results were presented, thus providing a background for the second stage, which focused on the remaining research aims.

The second stage was devoted to assessing the potential and the cost of solutions which could reduce food waste. It also evaluated the role of specific entities in the implementation of changes. Two factors were selected for the evaluation of solutions:

- **Earliest Time to Mainstream (ETM)** – the shortest time required for a solution to become a permanent element of a future reality, to become popular
- Impact on reducing the phenomenon of **Food Waste (%FW)** – the potential reduction of food waste caused by a given solution, expressed in percentage points compared to the 2021 level of food waste

Basing the evaluation on the above factors provides a solid foundation for choosing the optimal strategy when it comes to food waste reduction. ETM indicates the necessary timeframe for a given strategy, and indirectly determines how difficult it is – regardless of the reasons – to disseminate it. %FW indicates the most effective solutions from the point of view of the Commissioner's primary objectives.

Furthermore, the Experts were asked to answer the following questions with regard to each of the proposed solutions:

? Which links of the food value chain does the solution affect the most?

1 primary production	3 transport	5 the catering industry
2 processing	4 trade	6 households

? What would be the approximate cost of implementing this solution?

1 Low	2 Medium	3 High

? Which sector/s will have a leading role in implementing this solution?

1 European public administration	**3** food banks	**6** science
2 national public administration	**4** business	**7** NGOs other than food banks
	5 consumers	

The Commissioner requested a study which would go beyond a dry list of numbers, but would provide entities willing to reduce food waste with optimal and accessible solutions. The three questions listed above contribute to the guide-like quality of the present publication, by supplementing objective factors with information addressed to specific recipients (placement within the value chain, available budget, sector with the greatest impact on the implementation of a given solution), and above all, by providing answers to research questions 2,3 and 4, which were defined by the Commissioner.

The second stage of the study also lasted three weeks.

! The participants had the opportunity to modify their answers and add comments at any time during the first and second stage. Selected comments are presented in the present report along with detailed descriptions of solutions.

5

The Experts

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Deputy Director at the Department of Processing and Agricultural Markets, Ministry of Agriculture and Rural Development.

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Professor of agriculture, former chair of the Department of Industrial and Food Microbiology at the University of Warmia and Mazury in Olsztyn, former Minister of Agriculture.

dr Andrzej Gantner

Vice-chairman of the board and general manager of the Polish Federation of Food Industry, Editor-in-chief of the "Food Lex" quarterly.

Karol Stec

Project Director at the Polish Organisation of Commerce and Distribution.

Mieczysław Augustyn

Member of the Sixth and Seventh Term of the Polish Senate. Chairman of the Piła Food Bank. 1990–2005 Director of a Welfare Home in Piła. Former member of the Piła City Council and its chairman from 2002 to 2005.

Elżbieta Szadzińska

Vice-President of the Consumer Federation. Member of the Council for Sustainable Use of Food of the Federation of Polish Food Banks.

prof. dr hab. Paweł Wojciechowski, prof. UW

Doctor of law. Lecturer at the Department of Agricultural Law and the Section of Food Law at the Faculty of Law and Administration of the University of Warsaw.

dr hab. Krystyna Rejman, prof. SGGW

Holder of a post-doctoral degree in management and quality sciences. Professor at the Warsaw University of Life Sciences, researcher at the Department of Food Market Research and Consumption.

Jagna Niedzielska

Cook, culinary advisor, lover and promoter of non-waste cooking. Author of the "Bez resztek" anti-food-waste book/guide.

Marek Borowski

President of the Board of the Federation of Polish Food Banks.

6

Results

1. FIRST STAGE

In the first stage of the study, the Experts were asked to assess the potential for food waste reduction in the country as a whole (questions 1 and 2) and in specific links of the food production value chain (questions 3 and 4).

The analyses of research teams at the Institute of Environmental Protection – National Research Institute and the Warsaw University of Life Sciences served as the point of reference with regard to the scale of food waste in Poland. Both institutions are involved in the implementation of the ground-breaking PROM project in Poland. Their research shows that nearly 4.84 million tons of food was wasted in Poland in 2020. The point of reference for the desired 2030 levels of food waste in Poland was the resolution of the European Parliament of May 16, 2017 "on initiative on resource efficiency: reducing food waste, improving food safety" (2016/2223(INI)), which obliges Member States to halve food waste by 2030 (compared to 2014).

The results of the study are presented below.

QUESTION 1. What is the likelihood that in 2030, the scale of food waste in Poland will be under 3.5 million tonnes per year?

a arithmetic mean of probability ratings: **71.1%**

b standard deviation: **12.9%**

W ocenie Ekspertów jest prawdopodobne, że do roku 2030 uda się ograniczyć marnotrawstwo żywności o przynajmniej 30 proc. To bardzo dobra, optymistyczna prognoza.

QUESTION 2. What is the likelihood that in 2030, the scale of food waste in Poland will be under 2.5 million tonnes per year?

a arithmetic mean of probability ratings: **23.4%**

b standard deviation: **5.1%**

The Experts were skeptical in their evaluation of the second statement. The mean of probability ratings indicates that food waste will likely not be reduced to under 2.5 million tonnes by 2030.

It is worth noting that the standard deviation is low, indicating that the Experts are in agreement on this issue.

QUESTION 3. The lowest possible 2030 level of food waste which could be reached in Poland in specific links of the agri-food value chain and in households.

In question 3, the Experts assessed the minimum (realistic, but desirable) scale of food waste in each link of the value chain in 2030. The amount was expressed in thousands of tonnes.

QUESTION 4. The expected scale of 2030 food waste in Poland in specific links of the agri-food value chain and in households.

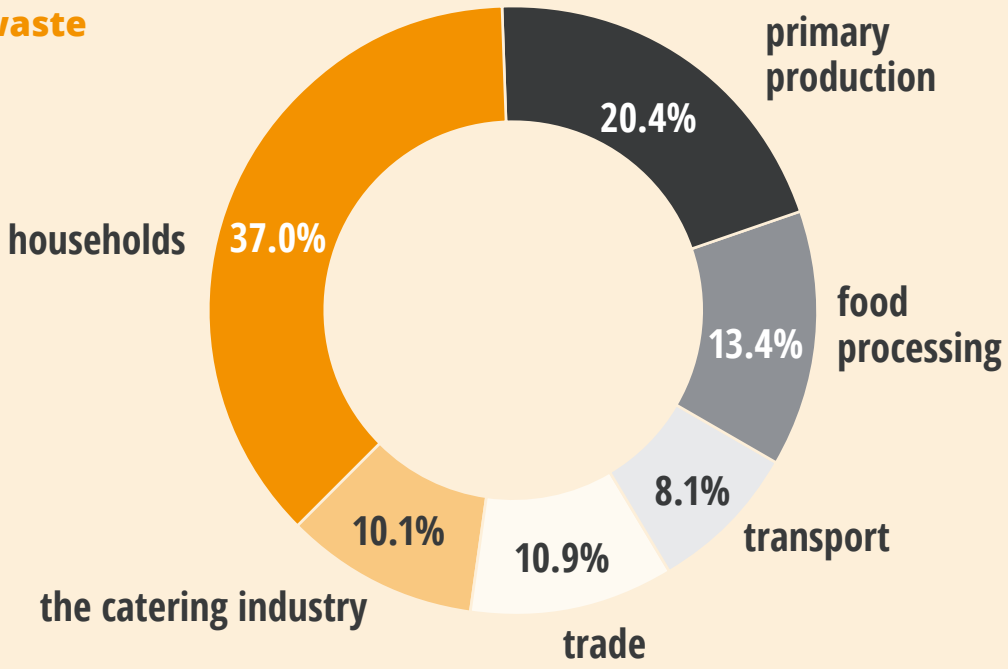
In question 4, the Experts were asked for a forecast of the most probable scale of food waste in specific links of the value chain in 2030, expressed in thousands of tonnes. The table below summarises the results and shows the mean values of answers provided by Experts to questions 3 and 4.

	Lowest possible level to which food waste could be reduced [in '000s tons]	Forecast level of food waste in Poland [in '000s tons]	Difference between the forecast and the lowest possible level
primary production	639.7	1020.6	37.32%
food processing	554.9	672.2	17.45%
transport	299.7	405.5	26.10%
trade	440.0	547.3	19.61%
the catering industry	426.2	505.7	15.72%
households	1395.8	185.2	24.68%

The chart below shows the percentage share of specific value chain links in the total forecast scale of food waste. The largest share are households and the smallest is transport.

GRAPH 1

Share of specific links of the value chain in 2030 food waste
Forecast levels

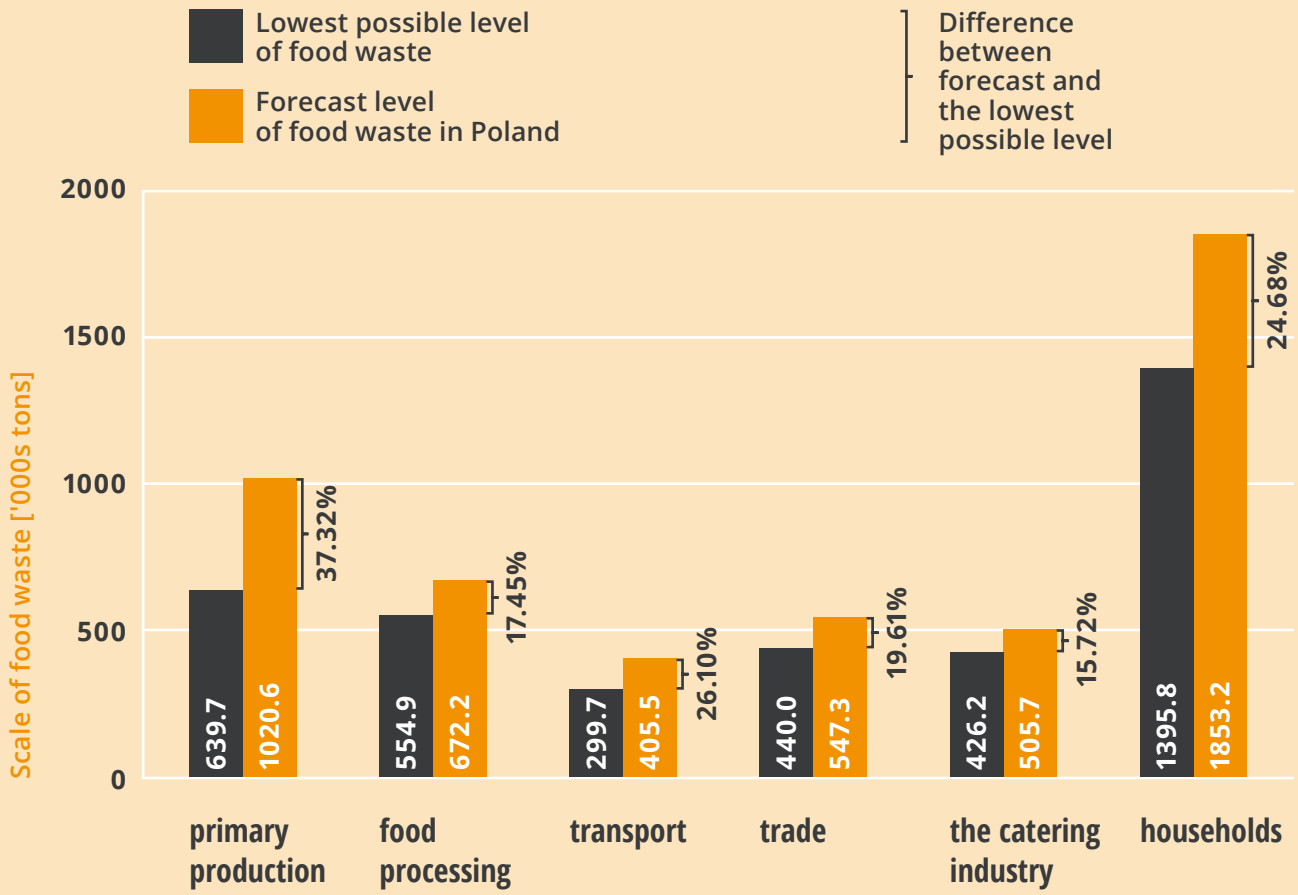


The graphs below show a comparison between the forecast scale of food waste (Question 3) and the minimum level which, according to Experts, could be reached in 2030 (Question 4). As can be seen at first glance, Experts have indicated that there is potential to reduce food waste in every link of the value chain (including households) if appropriate mitigation measures are taken. For ease of readability and to avoid fractions, the variable [mass] is shown in thousands of tons.

GRAPH 2

2030 scale of food waste in Poland

Possible minimal level vs forecast



It is worth noting that the differences between the values are not the same for specific links of the value chain. This phenomenon is illustrated in the chart below, where the red bar indicates the reyearsive difference (in percentage points) between the forecast and the realistic minimum. The highest difference of 37.32% occurs in primary production, while the lowest, 15.72%, in the catering industry. These differences may be the foundation for a third path which could lead to a reduction of food waste, different from the two paths discussed in the present report.

2. SECOND STAGE

The primary matrix

Presented below are the results of the second stage of the study which were obtained with the employment of the 4CF Matrix. The yearster is 4CF's unique tool which creates visual representations of foresight studies and provides deepened strategic analyses of the potential of future solutions.

How should it be read? The matrix consists of two axes: the Shortest Time to Mainstream (ETM) is marked on the horizontal axis and is expressed in years from 2021. ETM is the shortest time necessary for the dissemination of a given solution on the market. It is therefore not a forecast, but it might be too yearse to react once the ETM deadline has passed. The vertical axis shows food waste reduction potential, expressed in percentage points compared to 2021 (%FW).

The higher a solution is on the vertical axis, the higher it was rated by Experts in terms of the potential for food waste reduction. However, this assessment should be considered in the context of the horizontal axis, which shows how far we are from the implementation of a given solution.

The matrix has been divided into four quadrants which are an aid for evaluating solutions based on their distribution on the 4CF Matrix. The solutions shown in the green quadrants deserve particular attention as they

4CF MATRIX

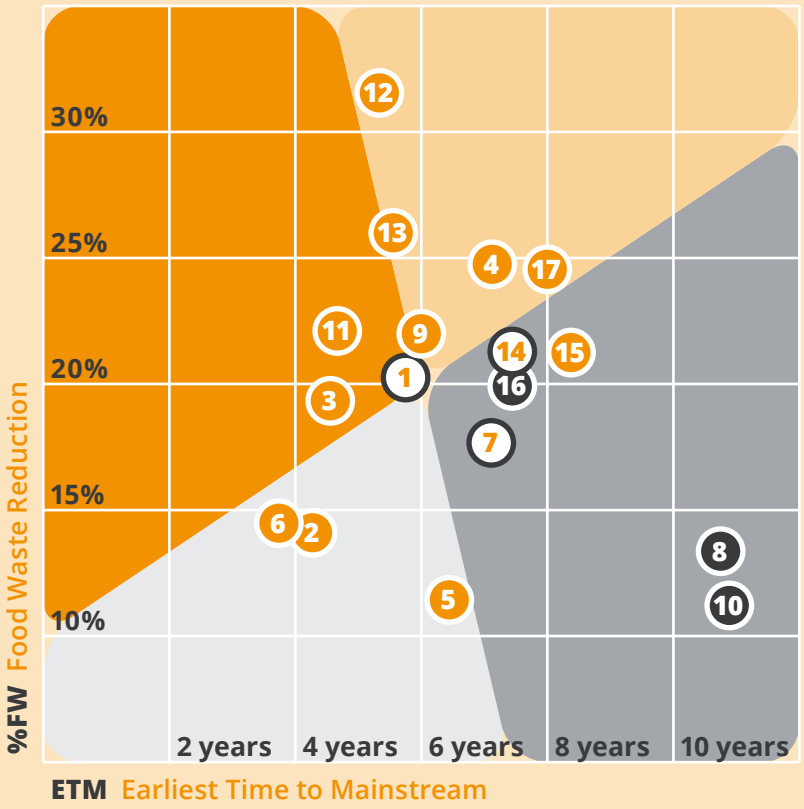
Solutions to the phenomenon of food waste

Estimated level of implementation costs

low medium high

Skuteczność rozwiązań

high low



1 Addition of further durable foods (e.g. groats, rice, pasta, etc.) to the list of products which do not require an expiration date.

2 Introduction of markings specifying the expiration date and storage methods to the front of packages.

3 Implementation of mass technological solutions for monitoring expiration dates (e.g. QR codes) as well as for sharing shopping lists or recipes.

4 Mandatory donation of unsold food to social causes by farmers, food producers, distributors and the catering industry.

5 Converting expired foods into bioenergy or compost.

6 Creating opportunities for the sale of food that does not meet quality criteria, but is safe for consumers, e.g. "imperfect fruit and vegetables".

7 Creation of high-barrier packaging to extend the shelf life of products.

8 Mass implementation of technologies for extending the shelf life of products (e.g. refrigerators which adjust humidity to the stored products).

9 Strengthening the role of social organisations which distribute unsold food by increasing the effectiveness of their operations and by creating a network.

10 Use of food waste as a raw material to create packaging, clothes and organic ingredients.

11 Offering appropriately-sized portions to consumers.

12 Introduction of education on food waste reduction to public schools and vocational education.

13 Organising social campaigns to raise awareness about the need to reduce food waste.

14 Optimised raw material purchases (production) and product purchases (distribution) with the use of automated ordering systems and an AI-controlled supply chain.

15 Addition of farming, production and the catering industry to the list of entities stated in the the Act on Counteracting Food Waste, which are required to donate unsold food and are subject to fees proportional to the amount of food wastage.

16 Tax-free donation of expired food to non-governmental organisations.

17 Changing the "best-before" and "use-by" terminology, so that consumers can clearly identify products with a short and long shelf-life.

are potentially the most effective ones in the short, medium and long term. Solutions in the yellow and red quadrants are potentially less attractive paths of development, or possibly even traps. Choosing and developing them could lead to an unfavorable allocation of limited financial resources.

The inclination of the quadrant axes is based on the assumption that when two solutions are equally effective but their ETM differs, the solution which could be implemented faster should receive a higher score. The angle of inclination of the quadrants' horizontal axis was determined arbitrarily based on the overall distribution of solutions.

The color of the circle around each solution indicates the estimated level of implementation costs. Low – light blue, medium – blue, high – dark blue.

The following pages contain an analysis of detailed results pertaining to specific solutions shown in the matrix.

ETM:
6 years

%FW: **20%**

Required financial outlays:
low

Links of the value chain affected by the solution:
trade,
the catering industry,
households

Sector with a leading role in implementation:
European and national public administration

1 Addition of further durable foods (e.g. groats, rice, pasta, etc.) to the list of products which do not require an expiration date.

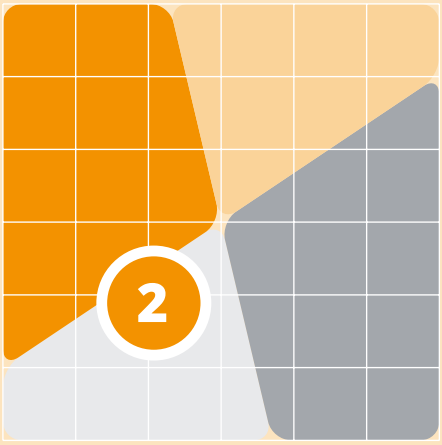
Currently, producers are not required to provide an expiration date on products such as: fresh fruit and vegetables, table salt, granulated sugar, vinegar, bakery and confectionery products, drinks with an alcohol content of or exceeding 10%. According to the Experts, expanding this list has a significant potential for reducing food waste, rated at the level of 20%. However, it should be noted that such a modification will most likely require legislative changes at the level of the European Union, which will significantly extend the time of implementation.

Expert Comments:

This solution would only be possible if it were introduced at EU level. The preparation of new legislation at the EU level may take approx. 2–3 years. If the modification were adopted in the form of a regulation, the time of implementation in Poland would be determined by its provisions. If the EU were to issue a directive, the expected time of implementation in Poland would be another 2–3 years. The required financial outlays would come down to the costs of changing the markings on packaging + possibly changing packaging with old inscriptions, if it would not be possible to use existing stocks.

> This solution would only be possible if the provisions of the EU regulation were changed. The time required for such a change to take place is approx. 3 years. The legislative process at the EU level is a long one, particularly when the "consent" of the EP is required (which would be the case in this instance). Implementing the new legislation at the national level would not be necessary, as the regulations of the EU Council and the EP are directly applicable. However, it would be important to educate and inform consumers about the safety of such products. It would take about 2 years for the information to effectively reach consumers.

> It is possible, but would require storage conditions to be specified very clearly. Pasta and groats cannot be stored indefinitely. Their packaging is also not indestructible. Poorly stored, they may, after some time, be subject to microbiological contamination (molds, fungi) or become colonized by insects.



ETM:
4 years

%FW: 14%

Required financial outlays:
medium

Links of the value chain affected by the solution:
trade,
the catering industry

Sector with a leading role in implementation:
national public administration,
food banks

2 Introduction of markings specifying the expiration date and storage methods to the front of packages.

One of the causes of food waste is poor storage. Storage conditions are usually specified on packaging in fine print, if at all. The introduction of a clear labeling system, such as pictograms on the front of packages which would inform consumers about the expiration date and recommended storage methods, can be implemented relatively quickly. However, the potential for reducing waste, compared to other solutions, is among the lowest.

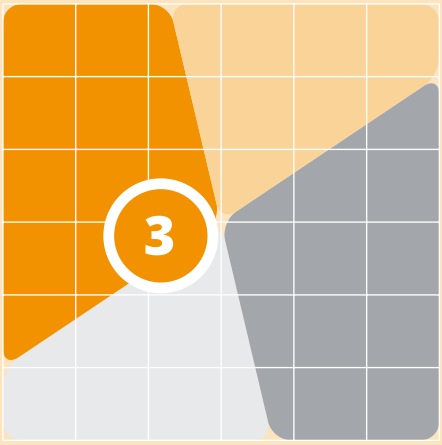
Expert Comments:

"Undoubtedly, such markings could contribute to changing the awareness of consumers and store staff. making them more sensitive to expiration dates. I believe that this solution could be included in an amendment to the Act on Counteracting Food Waste. Such a modification would take about 3 years (including implementation). Many entities would need to be involved, but the key would be to convince the public administration, i.e. decision-makers, including political decision-makers.

"From a legislative point of view, this solution is similar to proposal No. 1. However, it seems that it is not so much the placement of expiration dates that is important, but the confusingly similar wording of two types of information: the use-by-date and the best-before date.

Another issue is that storage conditions are sometimes difficult to implement. Information such as "Store in a dry, cool, ventilated and shaded place" (authentic inscription on a groats package) is not very helpful. It would be much more useful to learn what type of storage place the producer had in mind (at least one example).

> Undoubtedly, the placement of storage method pictograms on the front of packaging would contribute to the reduction of food waste at the household level. As for expiration dates, I have some doubts. Consumers are already aware of the need to check expiration dates. Will changing their placement bring about the expected results? It will certainly result in additional costs for packaging companies. The challenge is to introduce uniform terminology for expiration dates.



ETM:
5 years

%FW: **19%**

Required financial outlays:
medium

Links of the value chain affected by the solution:
food processing,
trade,
the catering industry,
households

Sector with a leading role in implementation:
business

3 Implementation of mass technological solutions for monitoring expiration dates (e.g. QR codes) as well as for sharing shopping lists or recipes.

QR codes – black and white squares which work somewhat similarly to bar codes – could become a more flexible and consumer-accessible way of indicating expiration dates. Other IoT (Internet of Things) technologies, such as NFC chips (used, e.g., in smartphones for contactless payments and in keyfobs which open electronic locks) would expand the functionality of packaging by enabling continuous monitoring of the shelf life of products or the exchange of recipes within the consumers community. Although the potential for reducing food waste is significant in this case (19%), the Experts indicate that the effective implementation of this solution might be difficult, as it would need to operate within a technological ecosystem.

Expert Comments:

Many of these solutions are already resent on the market, but they are not systemic. IoT (Internet of Things) offers many possibilities, including QR codes. Each refrigerator should be equipped with a list of products that require a cold chain, e.g. certain fruit and vegetables (pictograms), an automatic QR code scanner and an indicator light which would inform about the approaching expiration date.

4 Mandatory donation of unsold food to social causes by farmers, food producers, distributors and the catering industry.

ETM:
7 years

%FW: **25%**

Required financial outlays:
high

Links of the value chain affected by the solution:
primary production, food processing, trade, the catering industry

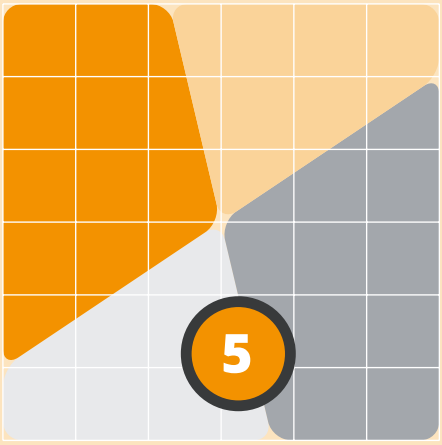
Sector with a leading role in implementation:
European and national public administration, food banks

This solution received one of the Experts' top ratings in terms of the potential to reduce food waste, but it requires significant legislative changes and high expenditures. Experts pointed out in their comments that this solution would be a legal basis for the reorganisation and development of a complex logistics system for the collection and distribution of unsold food. Hence, its implementation would require significant organisational effort.

Expert Comments:

"One could say that the idea is very noble. However, it should first be estimated how much food would actually be saved (daily, weekly, etc.), how much is necessary for those in need (and whether that amount might increase or decrease in the future). It should also be considered whether the existing system of "social assistance" (broadly understood) would be able to handle and distribute such amounts of food in time, avoiding spoilage on its way to those in need (or going bad shortly after having reached those in need). Furthermore, the costs of such distribution should be determined, as well as who would cover them. The entire process would have to be implemented in stages.

> The donation of unsold food to social assistance by farmers, food producers, distributors and the catering industry will ultimately place the food in households. It will simply transfer the problem from other links of the value chain to the final consumer. Unless part of the solution is to promote responsible consumer behaviors which would limit the "problem" on other levels, i.e. production, the reasonable handling of food by the catering industry (smaller portions, second helpings etc.), the use of products of "undesirable" shape.



ETM:
6 years

%FW: 11%

Required financial outlays:
medium

Links of the value chain affected by the solution:
primary production, food processing, trade, the catering industry, households

Sector with a leading role in implementation:
business

5 Converting expired foods into bioenergy or compost.

According to the Experts, this idea should be included in the set of undesirable and inadequate solutions, because expired food is, in fact, waste. It is not a question of semantics or lexical definitions, but a matter of simple logic: food is produced to satisfy people's hunger, not as an energy source or a raw material for fertilizer production. Moreover, there are concerns whether this solution would not be counterproductive. Rather than reducing food waste, it could perpetuate the phenomenon. Considering that the energy sector is of strategic importance for the national economy, making even a fraction of it dependent on the constant supply of "raw materials" (the expired food) might make food waste a permanent, necessary element of reality. The above doubts are reflected in the Expert's low rating of this solution: its potential to reduce food waste was estimated at a mere 11%.

Expert Comments:

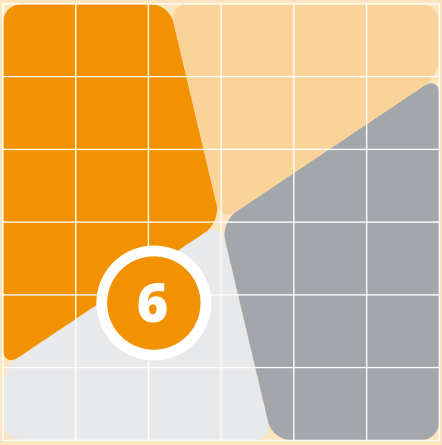
We return to the issue of defining food waste. If we understand it as it is defined for the purposes of this study ("The term 'food waste' applies to all instances where raw foods and food products (intended for human consumption) are not being utilised in accordance with their original purpose, i.e. are not consumed by people. The term applies to all links of the food chain, including primary production, processing, distribution and

household consumption."), then this solution does not prevent food from being wasted and becoming waste.

> In line with the waste hierarchy principles, processing expired/spoiled food and transforming it into bioenergy or compost is a highly desirable practice. The separate storage of food waste would generally only be problematic at the level of households. Expenditures may be required to create installations with sufficient capacity.

> Entrepreneurs might be interested in new waste treatment options if they are cheaper. Therefore, landfill fees could be increased, and – possibly – a new legal instrument could be introduced: a waste incineration fee. It would require in-depth analyses in order to avoid unwanted side-effects.

> Expired food is waste. The waste hierarchy includes: waste prevention, preparation for reuse, recycling, other recovery processes and disposal. The goal is circular waste management. Energy recovery and disposal are the least desirable options.



ETM:
4 years

%FW: 14%

Required financial outlays:
low

Links of the value chain affected by the solution:
primary production, food processing, trade, the catering industry, households

Sector with a leading role in implementation:
business

6 Creating opportunities for the sale of food that does not meet quality criteria, but is safe for consumers, e.g. "imperfect fruit and vegetables".

Already, some stores sell visually unattractive food at lower prices, but this practice is not widespread. In part, it is due to business principles such as the so-called 'cannibalizing': more expensive products being displaced in the consumer's basket by cheaper ones offered by the same producer. Another aspect is the consumers' cautious approach to "ugly" fruit and vegetables. We still primarily base our choices on visual criteria. The undoubted advantages of this solution include its virtually non-existent cost and the possibility of very quick implementation. Provided, of course, that consumers would be willing to change their preferences and reach for "crooked carrots" more eagerly.

Expert Comments:

Clearance sales are already taking place and gaining popularity. No special incentives are needed, it is a part of business. However, I do not think it probable that they will spread on a massive scale. I know from experience and contacts with many players on the market that too many sales and promotions kill 'first-class' sales.

> It seems that no external pressure or incentives are needed, the decision lies in the hands of business owners. The "direct" costs of this solution appear to be close to zero. There would, however, be "indirect" costs of introducing such a solution (for example, it could affect the sales of ‘full-value’ products).

> If consumers accept such imperfect products, so will trade and business. It is the consumer who ultimately makes the decisions about his/her purchases. This does not require the creation of new selling opportunities.

> The implementation of such a solution does not take time and costs little. The wording "creating opportunities'' implies that implementation would be voluntary. Therefore, the effectiveness would depend on the involvement of specific links of the value chain, in this case: primary production and trade. A potential barrier for the effectiveness of the idea would be the behaviors of consumers. On the one hand, we would offer them various simplifications (use-by dates on the front packages, QR codes, 'smart' refrigerators), and on the other – the stereotypical crooked carrots. We like simple, symmetrical carrots. The incentive to buy imperfect food would have to stem from a significantly lower price. It would need to differ from the original pricing by more than just a few percent – at least by 1/3. This, in turn, requires a change in the approach to bargain prices.

ETM:
7 years

%FW: 18%

Required financial outlays:
medium-high

Links of the value chain affected by the solution:
food processing, trade, households

Sector with a leading role in implementation:
business

7 Creation of high-barrier packaging to extend the shelf life of products.

The most common reason for tossing food into the rubbish bin in households is an exceeded expiration date. Could an extension of this deadline be a solution to the problem of food wastage? A longer expiration date could affect not only consumer behavior, but also the organisation of the entire logistics chain and the shelf life of a product. Improving the barrier properties of packaging seems a good compromise between the need to extend the shelf life of food and the growing trend to buy natural products, without preservatives. Unfortunately, this solution is among the most cost-intensive in the analyzed set, as it requires significant research and development. Two questions arise: first – will consumers be willing to buy more expensive but more durable products? Second – will high-barrier packaging be more environmentally friendly than current solutions?

Expert Comments:

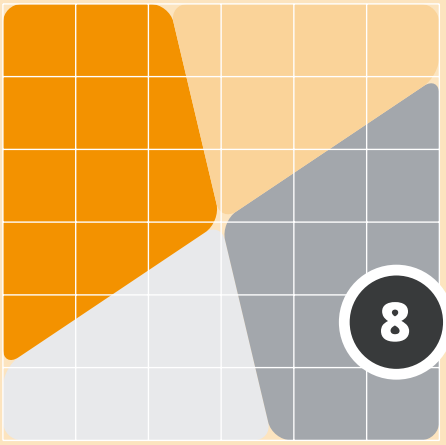
"High-barrier packaging which could extend the shelf-life of products will have to meet requirements such as a high degree of recyclability. At the

same time, the general trend (at least the one promoted by the media) is to reduce the use of plastics.

> The costs of research necessary for the production of packaging which would extend the shelf life of products are [currently] borne by businesses. Co-financing would need to be added to the existing programs – for business, scientific research and processing.

> There is a contradiction here between increasing the barrier properties and increasing the recyclability of packaging. This requires the development of completely new packaging materials.

> A cost-intensive solution that requires the financing of scientific research both in science institutions and in the business sphere. However, there is a conflict of interests between food processing companies and consumers, because of the possible increase in packaging prices and, consequently, food prices. The question of recyclability is also important.



ETM:
11 years

%FW: 13%

Required financial outlays:
high

Links of the value chain affected by the solution:
trade,
the catering industry,
households

Sector with a leading role in implementation:
business

8 Mass implementation of technologies for extending the shelf life of products (e.g. refrigerators which adjust humidity to the stored products).

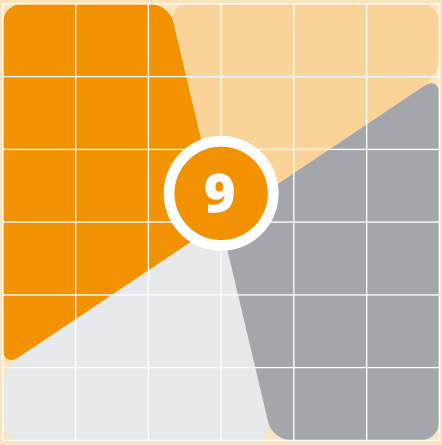
The implementation of packaging which would extend the shelf life of products can be problematic. Maybe it would be easier to approach the problem differently and to develop food storage devices – such as refrigerators – which could preserve food more effectively? Technologically speaking, such solutions already exist, but as the Experts point out, consumers may not be aware of their benefits, and may therefore not be eager to invest in such novelties. As a result, the costs of promoting a "smart refrigerator with humidity control" are too high for producers of household appliances (when compared to potential profits) to risk their mass introduction to the market. Such solutions can be implemented much faster in trade and the catering industry, where the cost and loss calculation is key to the success of a business. It would still, however, require significant investments.

Expert Comments:

"If the technological solutions are already available, it is probably a matter of time before they become popular. The question remains about the costs of such devices/technologies when compared to

old solutions. Switching to the new technologies is likely to take many years, as a faster replacement process could produce waste of another type in huge amounts. This would also be harmful for the environment and would go against a circular economy.

> The solution can be particularly useful in trade and the catering industry, where the purchase of new equipment would be motivated by a simple calculation of costs and losses. Its implementation in households, however, would require in-depth analyses of hidden/unconscious consumer needs. In households, the only requirement for refrigerators is functionality, unlike, for example, in the case of TV sets. Therefore, my rating of this solution is lower than the average rating of other Experts within the group.



ETM:
6 years

%FW: 22%

Required financial outlays:
medium

Links of the value chain affected by the solution:
primary production,
food processing,
trade,
the catering industry,
households

Sector with a leading role in implementation:
food banks

9 Strengthening the role of social organisations which distribute unsold food by increasing the effectiveness of their operations and by creating a network.

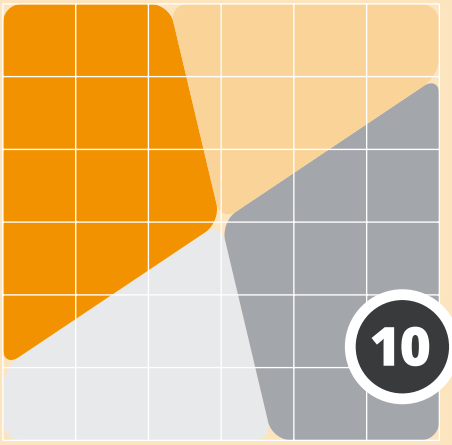
Places which waste food are scattered all over Poland. Grocery stores, discount stores, supermarkets, restaurants. To effectively manage such amounts of unsold food requires a good understanding of the local social environment and readiness to make quick decisions. Social organisations are much better prepared for such tasks than public administration. Strengthening their position would, according to the Experts, result in a reduction of food wastage by over 20%. Of course, developing a network of social organisations and improving their efficiency would require time and effort (ETM was estimated at 6 years), but today's food banks provide solid foundations for the development of a system for the social management of unsold food.

Expert Comments:

"This solution could be synergic with solution No. 4: "Mandatory donation of unsold food to social causes by farmers, food producers, distributors and the catering industry.

"Strengthening food banks is a definite and urgent necessity. The costs of maintaining four food bank networks amount to approx. PLN 700,000 per year for the

Greater Poland Voivodeship alone. Assuming that c. 50 such networks would be needed to cover the entire country, the necessary costs are relatively easy to estimate. Appropriate local and/or national government programs would need to become involved. The costs would be significant, but it should be noted that unsold food would need to be collected from several thousand locations, most days of the week, by thousands of organizations. However, the expense would be justified not only from an ecological and social perspective, but also economically. The value of the saved food would greatly exceed the costs of its collection.



ETM:
11 years

%FW: 11%

Required financial outlays:
high

Links of the value chain affected by the solution:
primary production,
food processing,
trade,
the catering industry,
households

Sector with a leading role in implementation:
science,
business

10 Use of food waste as a raw material to create packaging, clothes and organic ingredients.

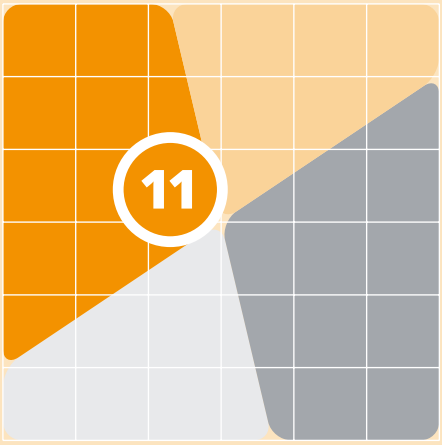
This solution raises similar questions to solution No. 5, which is reflected in its rating. However, when compared to the prospect of obtaining energy or compost from food, using it as a raw material for the production of packaging or clothes seems to require even greater financial outlays both for research purposes, product development processes, and for the modification of production processes (including new technological lines).

Expert Comments:

> In this case (...) food has already been wasted, so it is difficult to discuss the solution in the context of food waste reduction. That being said, seeking new ways of managing food waste is necessary, of course, especially if in the context of overproduction.

> New technologies: their development and implementation require significant expenses and commitment, both on the part of science and business. Redistributing food

just before it is "wasted" is possible, but over short distances. Uneaten food is waste (according to the definition) and should be managed in accordance with modern standards such as Closing the Loop (circular economy).



ETM:
5 years

%FW: 22%

Required financial outlays:
medium

Links of the value chain affected by the solution:
food processing,
trade,
the catering industry,
households

Sector with a leading role in implementation:
business

11 Offering appropriately-sized portions to consumers.

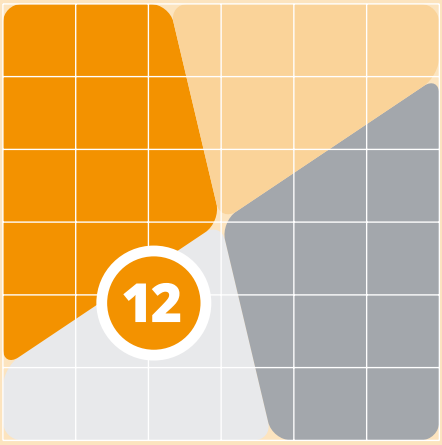
A study conducted in 2019 by the Warsaw University of Life Sciences as part of the PROM project shows that spoilage is the main cause of food wastage in Poland. The same research shows that as many as 61% of Polish consumers buy too much food, buy spontaneously and do not rely on shopping lists. One of the suggested solutions is for manufacturers to offer smaller portions of food. Such products (e.g. 100-gram portions of fruit sold as a healthy snack) are already present on the market, have gained recognition in the food industry in recent years and won prizes for innovation. Unfortunately single-serving packaging has its dark side: it generates more packaging waste. Such solutions are also more expensive than traditional alternatives, and it should be borne in mind that the price difference may increase dramatically with the tightening of pro-environmental regulations aimed at eliminating disposable plastic products (such changes have already affected the catering industry).

Expert Comments:

"The costs of implementing the solution will differ depending on the link of the food supply chain. For retail and gastronomy, the expenses will not be significant. The food processing industry would need greater financial outlays to implement such changes (new packaging, modification of packaging lines).

> Offering single-serving products is an expensive solution and does not eliminate the problem of food waste. It might limit the phenomenon, but at a significant cost on the part of the processing companies (packaging, technological lines) and trade (limited sales area, shelf space).

> One of the simpler solutions which can be implemented swiftly. It would require the greatest commitment on the part of the processing sector (in the convenience food offer).



12 Introduction of education on food waste reduction to public schools and vocational education.

ETM:
5 years

%FW: **32%**

Required financial outlays:
medium

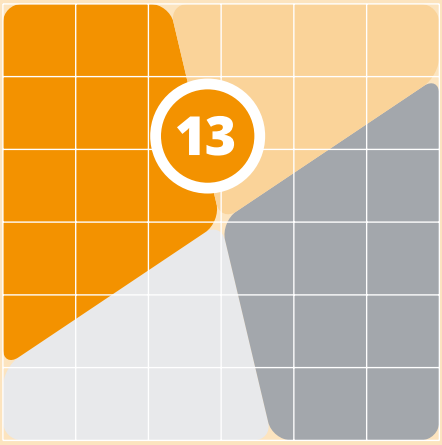
Links of the value chain affected by the solution:
primary production,
food processing,
transport,
trade,
the catering industry,
households

Sector with a leading role in implementation:
national public administration

A definite leader among the analysed solutions in terms of the potential to reduce food waste. According to the Experts, the introduction of broadly understood education on reducing food waste could reduce the phenomenon by up to 1/3. However, to achieve such results, the program would need to actually shape consumer behaviors of the young generation.

Expert Comments:

An absolutely necessary and urgently needed solution! It could be extended to include an even broader education on sustainable consumption and production (of food and other everyday household goods). Avoiding food wastage would be one of the key promoted principles.



13 Organising social campaigns to raise awareness about the need to reduce food waste.

ETM:
6 years

%FW: **26%**

Required financial outlays:
medium

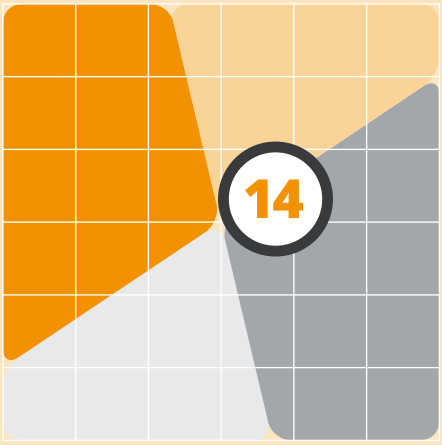
Links of the value chain affected by the solution:
primary production,
food processing,
transport,
trade,
the catering industry,
households

Sector with a leading role in implementation:
food banks

Although social campaigns are not an innovation, the Experts believe that they have a high potential for reducing food wastage. The main disadvantage of this solution, however, is the relatively long time it takes to determine whether a campaign was successful and whether it brought about the desired effects. Therefore, although the solution itself is not particularly expensive (the required financial resources were rated "medium"), a non-financial cost – time – may render this solution less attractive than the %FW rating would indicate.

Expert Comments:

"Social campaigns have an important role. They are already happening, although the process is time-consuming.



14 Optimised raw material purchases (production) and product purchases (distribution) with the use of automated ordering systems and an AI-controlled supply chain.

ETM:
7 years

%FW: 21%

Required financial outlays:
medium

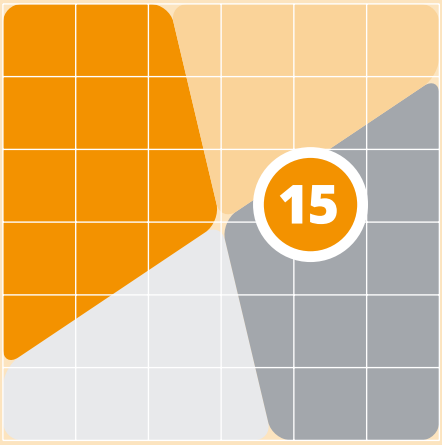
Links of the value chain affected by the solution:
primary production,
food processing,
transport,
trade,
the catering industry

Sector with a leading role in implementation:
business

As in solution No. 9, the goal is to increase the efficiency of logistics. In this case, however, focus is on the initial links of the value chain: business rather than consumers. AI-supported automation of purchase planning and supply chains could potentially reduce food waste, but above all, it could significantly reduce the costs and losses on the part of entrepreneurs. Systems which use simple artificial intelligence algorithms to support business planning are already present on the market. Their relatively high prices stand in the way of popularisation. Although the financial outlays may not seem particularly high on a national scale, such investments are typically financed with private funds. Individual enterprises may find it too difficult to bear the costs of implementing such systems. It should also be noted that purchasing an automated planning system is not enough to bring the expected results. It is necessary to adapt the company's operating culture to the system, which is often a greater challenge than stretching the investment budget to finance the purchase of a license.

Expert Comments:

none.



ETM:
8 years

%FW: 21%

Required financial outlays:
medium

Links of the value chain affected by the solution:
primary production, food processing, the catering industry

Sector with a leading role in implementation:
national public administration

15 Addition of farming, production and the catering industry to the list of entities stated in the the Act on Counteracting Food Waste, which are required to donate unsold food and are subject to fees proportional to the amount of food wastage.

A potentially attractive solution (with a %FW estimated at 21%), but there are many obstacles that might hinder its effective implementation, which is reflected in the high ETM rating. Experts pointed out that merely changing the regulations would not bring the desired results. An administrative system would have to be created to implement the changes, which would generate additional costs. As a result, the solution could become a "dead letter" and have an opposite effect to the expected one. In addition, such a change would require the involvement of the public administration, which in itself can be difficult, and could raise doubts as to the appropriate classification of certain products as “wasted”.

Expert Comments:

The development of good, thoroughly-consulted legal changes is a 3-year process. The inclusion of additional incentives in legislation may contribute to a significant

reduction of food waste. The financial outlays (compared to other proposals) would be relatively low.

> New legislation would need to be devised at the national level. In practice, the process of handing over/collecting products from farmers may prove difficult. It would entail additional labor costs being imposed on farmers.

> This is not a good idea. Nobody in their right mind would intentionally waste their source of profit. There would be a huge amount of paperwork, as well as significant reporting and control costs. How would someone be able to constantly control crops and how they are used? It would be a dead letter.

> I generally agree. The easiest part of this proposal is to extend this solution to industrial entities. As for the catering industry and farmers, legislation would require thorough rethinking and the inclusion of all possible exceptional events/circumstances. For example, how should we approach the problem of cherries left on trees due to a lack of seasonal workers?

ETM:
7 years

%FW: **20%**

Required financial outlays:
low

Links of the value chain affected by the solution:
food processing, trade

Sector with a leading role in implementation:
national public administration, food banks

16 Tax-free donation of expired food to non-governmental organisations.

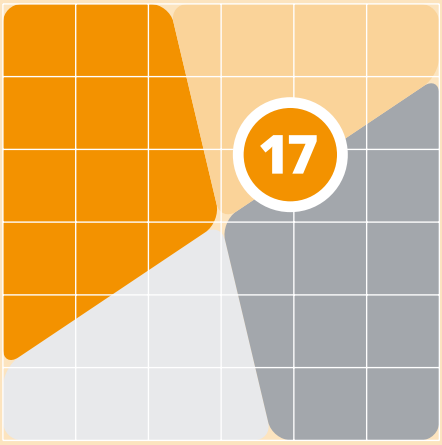
This is another solution which requires legislative changes and it is subject to similar implementation difficulties as other proposals in this category. The involvement of public administrations will be crucial in opening the possibility of tax-free donations of expired food. What distinguishes this solution from other initiatives in this category is that it does not require an additional administrative system. Therefore, the cost of implementation is low. The issue to be resolved is who would assume responsibility for products thus introduced into circulation. If it were the producer, the initiative could backfire: the risk of lawsuits and complaints would push producers to discard the expired products rather than donate them.

Expert Comments:

> This solution would require the “Act on Food Safety and Nutrition – Art. 52” to be amended. Foods with a ‘best before’ or 'use by' date cannot remain on the market beyond the specified deadline.

> Responsibility for an expired product thus reintroduced into circulation is problematic. The product may not be harmful, but there is no guarantee as to its quality. A dissatisfied consumer may blame the producer.

> The solution could be implemented, but would require additional legal provisions, especially at a national level. I am not aware whether it would also require changes in EU regulations (such a solution was introduced in Belgium a while ago).



ETM:
8 years

%FW: 25%

Required financial outlays:
medium

Links of the value chain affected by the solution:
food processing, trade, households

Sector with a leading role in implementation:
European public administration, food banks

17 Changing the "best-before" and "use-by" terminology, so that consumers can clearly identify products with a short and long shelf-life.

The last proposal is among the potentially most effective, but – at the same time – most difficult to implement, which is reflected in the high ETM. Experts pointed out that although the solution seems a simple matter of changing the graphic design of packaging, it should be noted that there are regulations which specify important health and safety information as well as its placement on the package. Therefore, this ostensibly simple modification would require legal changes at EU level, which would significantly extend the time necessary for implementation. On the other hand, the highly rated benefits of this solution suggest that the game is worth the candle.

Expert Comments:

"To implement this solution, it would be necessary to amend the regulation of the European Parliament and the EU Council. For several years now, the EU has been discussing a single labeling strategy for expiration dates.

"Simplified and easily legible labeling would enable consumers to improve

food management. However, the labelling could not be reduced to a single type of date for food safety reasons.

> The potential success of this solution is related to the implementation of proposal No. 1. If we discontinue providing expiration dates for durable food, it will become possible to consider a single labeling system for the remainder of products. However, a more consumer-friendly wording of the information could also be considered (in English, it sounds simpler).

7

Conclusions

The aim of the study was to obtain answers to five questions posed by the Commissioner and thus increase the efficiency of organisations which strive to reduce food waste in Poland. The answers provided by the study are presented below.

What will be the scale of food waste in Poland in 2030?

There is significant potential for reducing food waste in Poland to 3 million tonnes per year by 2030. Households can contribute the most to achieving this goal, followed by primary production. Together, these two entities account for over 57% of food waste.

What will be the role of individual entities – business, national and European public administration, science, NGOs, consumers – in reducing food waste?

Each of the solutions was assessed by the Experts in terms of the entities which would need to assume a leading role in implementation. The solutions are revisited below, with focus on this single aspect. The table shows which entities will play an important role in each case. Further information about their potential involvement is provided in the detailed descriptions of solutions.

Solution	Business	National public administration	Eu public administration	Science	NGOs	Consumers
Addition of further durable foods (e.g. groats, rice, pasta, etc.) to the list of products which do not require an expiration date.		X	X			X
Introduction of markings specifying the expiration date and storage methods to the front of packages.	X	X			X	X

Solution	Business	National public administration	Eu public administration	Science	NGOs	Consumers
Implementation of mass technological solutions for monitoring expiration dates.	X	X				
Mandatory donation of unsold food to social causes by farmers, food producers, distributors and the catering industry.		X			X	
Converting expired foods into bioenergy or compost.	X	X	X			
Creating opportunities for the sale of food that does not meet quality criteria, but is safe for consumers, e.g. "imperfect fruit and vegetables".	X		X			X
Creation of high-barrier packaging to extend the shelf life of products.	X		X	X		
Mass implementation of technologies for extending the shelf life of products.	X		X			
Strengthening the role of social organisations which distribute unsold food by increasing the effectiveness of their operations and by creating a network.		X			X	
Use of food waste as a raw material to create packaging, clothes and organic ingredients.	X			X		
Offering appropriately-sized portions to consumers.	X		X			X
Introduction of education on food waste reduction to public schools and vocational education.		X		X		
Organising social campaigns to raise awareness about the need to reduce food waste.		X			X	

Solution	Business	National public administration	Eu public administration	Science	NGOs	Consumers
Optimised raw material purchases (production) and product purchases (distribution) with the use of automated ordering systems and an AI-controlled supply chain.	x			x		
Addition of farming, production and the catering industry to the list of entities stated in the the Act on Counteracting Food Waste, which are required to donate unsold food and are subject to fees proportional to the amount of food wastage.		x	x		x	
Tax-free donation of expired food to non-governmental organisations.	x	x	x		x	
Changing the "best before" and "use by" terminology, so that consumers can clearly identify products with a short and long shelf-life.	x	x	x			

What will be the role of Food Banks in reducing food waste by 2030 and what will be the form of their participation in the process?

The main task for Food Banks in the present decade will be to increase the efficiency and scale of their operations by actively increasing the involvement of NGOs in the process of food waste reduction. Moreover, the Banks will have a significant role in the effective distribution of unsold food and in raising social awareness about reasonable food management.

What resources will be needed to effectively reduce food waste by 2030?

Each of the proposals was assessed by the Experts in terms of the necessary expenditures. The vast majority of solutions (11 of them) were classified as medium-cost. Three solutions were rated as low- or high-cost. It can therefore be concluded that the effective reduction of food waste by 2030 will require significant financial outlays, but they will not exceed the capabilities of the involved public and private entities. The beneficial changes which will result from the implementation of these solutions are financially and organisationally attainable over the next ten years.

What actions are necessary to effectively reduce food waste by 2030?

Firstly, we should focus on reducing food waste where wastage is most widespread: in households. The Experts concluded that the following solutions are the most promising in this respect:

- Implementation of mass technological solutions for monitoring expiration dates (e.g. QR codes) as well as for sharing shopping lists or recipes;
- Strengthening the role of social organisations which distribute unsold food by increasing the effectiveness of their operations and by creating a network;
- Offering appropriately-sized portions to consumers;
- Introduction of education on food waste reduction to public schools and vocational education;
- Organising social campaigns to raise awareness about the need to reduce food waste.

However, the proposals can also be assessed using a different criterion: prioritising solutions which could result in the greatest gain within the shortest time. A synthetic indicator can be employed for this purpose: P=ETM /%FW. Once the indicator is calculated for all solutions (max=6.4;

min=1; median=3.33), priority may be assigned to solutions with a P value greater than the median for all solutions. This strategy is a way to determine the most promising proposals from the perspective of individual stakeholders within the agri-food sector. The results are presented in the table below. Certain stakeholders – consumers, NGOs other than food banks and science – are not included in the table. The Experts believe that while these three groups would participate in implementing the solutions, their role would not be a leading one.

European public administration	national public administration	food banks	business
1. Addition of further durable foods (e.g. groats, rice, pasta, etc.) to the list of products which do not require an expiration date.	**12.** Introduction of education on food waste reduction to public schools and vocational education.	**13.** Organising social campaigns to raise awareness about the need to reduce food waste.	**11.** Offering appropriately-sized portions to consumers.
	4. Mandatory donation of unsold food to social causes by farmers, food producers, distributors and the catering industry.	**9.** Strengthening the role of social organisations which distribute unsold food by increasing the effectiveness of their operations and by creating a network.	**3.** Implementation of mass technological solutions for monitoring expiration dates (e.g. QR codes) and for sharing shopping lists or recipes
	2. Introduction of markings specifying the expiration date and storage methods to the front of packages.		**6.** Creating opportunities for the sale of food that does not meet quality criteria, but is safe for consumers, e.g. "imperfect vegetables and fruit".

8

Commissioner of the study

Federation of Polish Food Banks

The Federation of Polish Food Banks (FPFB) is a non-profit organisation. For over 20 years, FPFB has been fighting food waste and reducing malnutrition in Poland.

Every day, 31 Food Banks collect unsold, good-quality products from supermarkets (primarily fruit, vegetables, drinks, dairy, bread, occasionally meat). The supplies are used to support organisations such as eateries, nursing homes, community centers, night shelters, hospices, orphanages or support centers for single mothers. Many of these organisations would not be able to function without the aid provided by Food Banks. In 2018 alone, we donated 67,000 tons of food products. **We are also the only organisation in Poland which analyses the phenomenon of food waste and its scale.**

31
Food Banks

3,300
partner organisations

67,000
tons of food donated in 2018

1,600,000
people each year

204,670
children (under 18)

The effects of food wasting are harmful from a social, economic and ecological perspective. For many years, Food Banks have therefore been advocating to limit the phenomenon. To this end, they carry out educational campaigns which raise social awareness of the problem and its harmful consequences.

Since mid-2018, the Federation of Polish Food Banks has been a leader of the PROM project: a Program for the Rationalisation of Food Losses and Reduction of Food Waste. The aim is to develop a system for monitoring food waste, as well as for rationalising and reducing food losses. Research carried out as part of the project will be aimed i.a. at determining the actual scale of food waste at every stage of the food chain in Poland.

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4CF is a Polish company with global reach. Since 2007, we have been analysing future scenarios to help our clients make the best strategic decisions and to stay three steps ahead of their competition. With our aid, our customers surf the wave of change safely and take advantage of market changes more successfully than their competitors. We provide services to the public and private sectors, as well as to NGOs and international organisations.

Providing development-propelling insights into the future is a task we take very seriously. We are constantly developing advanced research methodology to stay at the global forefront of foresight. The 4CF HalnyX Delphi research platform is one of our flagship research tools.

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