

## SMALL-SCALED OILSEED PROCESSING IN GERMANY

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**ABSTRACT:** Processing oilseed in small-scaled oil mills has become increasingly important in Germany. Due to this fact the Technologie- und Förderzentrum (TFZ, Technology and Support Centre) carried out a Germany-wide written survey among the operators of small-scaled oil mills in the middle of 2007. Results are, that in the past three years the number of oilseed production plants in Germany more than doubled. 585 small-scaled oil mills were known in the year 2007. In 2006 544 small-scaled oil mills produced 303,000 t of rapeseed oil as well as 586,000 t of press cake. The total amount of 889,000 t of processed rapeseed corresponds to approximately 16.7 % of the German rapeseed harvest in the year 2006 [3]. The expectations placed on the operation of a small-scaled oil mill were achieved to a lesser extent in 2007 than in the past because of changing regulatory and market conditions [7].

**Keywords:** Cold pressed vegetable oils, rapeseed oil, small-scaled oil milling.

### 1 INTRODUCTION AND GOAL

Already in 2004 German operators of oilseed production plants were questioned. This former survey showed the increasing number of small-scaled oil mills between 1999 and 2004 [4, 5]. Within these five years the number of oil mills rose from 79 to 219 [1, 4, 5].

Significantly increasing prices of fossil fuels cause a search for alternatives. Using rapeseed oil as fuel is one possibility. Fuels of renewable rapeseed show more advantages. They replace exhaustible raw materials, reduce CO<sub>2</sub>-emissions, contribute to climate protection and create a certain independence of the petroleum industry [6]. In Germany there is a fiscal advantage for agricultural consumers using biogenous fuels. Furthermore cold pressed rapeseed oil as edible oil becomes more and more popular.

Because of the aforementioned reasons the number of small-scaled oilseed production plants supposedly has increased again. There are neither data about flows of raw materials and products nor information about capacities or equipment of the increased number of oil mills. Consequently a new survey was conducted which was financed by the Union zur Förderung von Oel- und Proteinpflanzen e.V. (UFOP, Union for the Promotion of Oil and Protein Plants) located in Berlin, Germany.

The goal of the written survey was the ascertainment of current data on small-scaled oil milling in Germany. For this purpose information about technical equipment as well as the mass flows of the raw materials used and the products had to be gathered. In addition data regarding quality management, raw material and product prices as well as logistics and sales were collected. Moreover special features of the design of plants for the production of rapeseed oil fuel according to the preliminary standard DIN V 51605 [2] were intended to be determined.

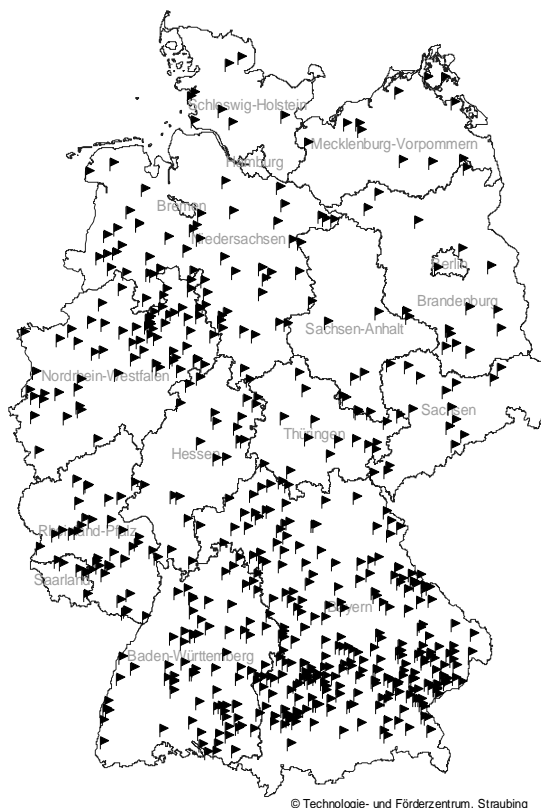
### 2 METHOD

The form of the survey in 2007 [7] followed the model of the one carried out in 2004 [4, 5]. 685 questionnaires were mailed to presumed operators of small-scaled oil mills. All oil mill operators who did not respond were phoned and asked for participation. During the phonecalls

also some information about the current situation of small-scaled oil production could be gathered. Based on the updated address data, a response quota of 34 % was reached.

### 3 RESULTS

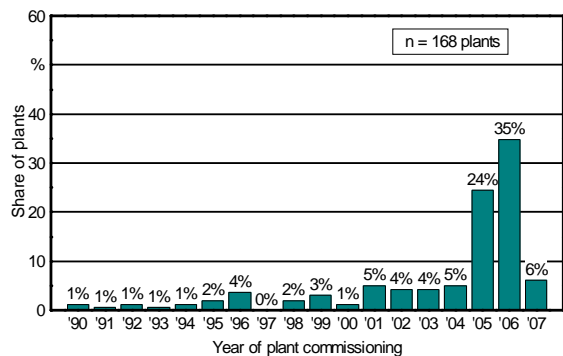
In Germany 585 small-scaled oil mills were operated in August 2007. The locations of the decentralised oil mills in Germany are shown in figure 1. The major share of plants (42 %) is located in Bayern (Bavaria).



**Figure 1:** Location of small-scaled oil mills in Germany (August 2007)

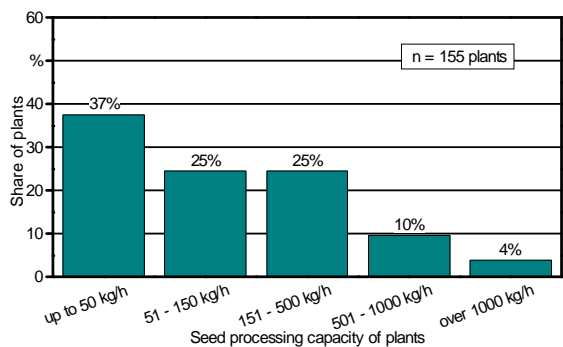
Figure 2 illustrates the percental share of plant commissioning from 1990 to 2007. More than 80 % of the

oil mills surveyed were built after 2001. Most plants were established in the years 2005 and 2006. The largest relative growth in the number of small-scaled oil mills was registered in Nordrhein-Westfalen (North-Rhine Westphalia) and Niedersachsen (Lower Saxony).



**Figure 2:** Year of plant commissioning (data until August 2007)

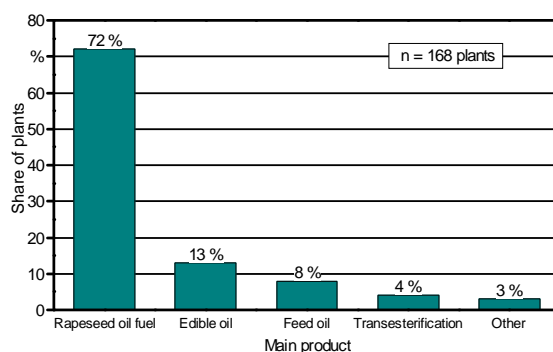
The average seed processing capacity of a German small-scaled plant is approximately at 375 kg per hour. The average capacity differs regionally. In south of Germany the average seed processing capacity is 185 kg/h, in Eastern Germany 280 kg/h and in the Northwest 800 kg/h. The share of the hourly seed processing capacity of all surveyed plants is demonstrated in figure 3.



**Figure 3:** Share of seed processing capacity of plants surveyed

In total, 544 small-scaled oil mills processed 889,000 t rapeseed in the year 2006. In 2007 the extrapolated theoretical seed processing capacity amounted to 1.7 million tons when 585 plants operate at capacity rating and at 330 pressing days per annum. This quantity of rapeseed would correspond to approximately 30 % of the German rapeseed harvest in the year 2007 [3].

The operators were also questioned what the emphasis of product range is. For 72 % of the oil mills their main product is rapeseed oil fuel. 13 % of the plants produce predominantly edible oil. The production of feed oil or oil for the transesterification were mentioned rarely (see figure 4).



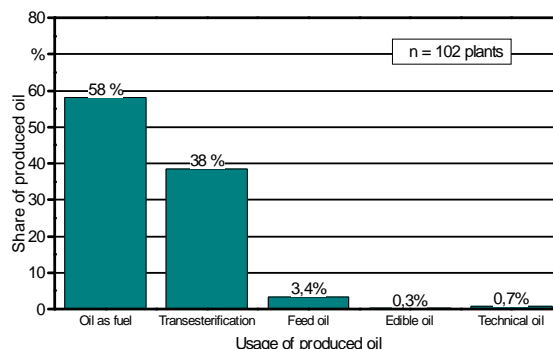
**Figure 4:** Share of the main products of plants

Table 1 shows the main product of oil mills depending on the date of plant commissioning. The share of rapeseed oil fuel producers starting operation before 2005 is 53 %, after that time the share is 83 %.

**Table I:** Main products subject to year of plant commissioning

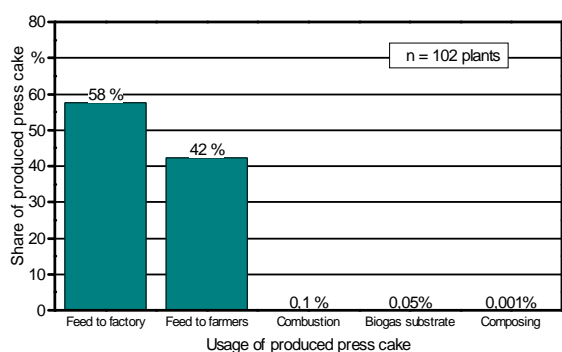
| Main product        | Plant commissioning     |                         |
|---------------------|-------------------------|-------------------------|
|                     | before 2005<br>(n = 57) | since 2005<br>(n = 107) |
| Rapeseed oil fuel   | 53 %                    | 83 %                    |
| Edible oil          | 30 %                    | 4 %                     |
| Feed oil            | 11 %                    | 7 %                     |
| Transesterification | 5 %                     | 4 %                     |
| Other               | 2 %                     | 3 %                     |

The distribution of the entire produced oil according to its utilisation is shown in Figure 5. In the year 2006 544 small-scaled oil mills produced 303,000 tons oil in Germany. 58 % of the produced oil were used as rapeseed oil fuel, while 38 % served as base oil for transesterification and 3,4 % as feed oil. 0,3 % were marketed as edible oil and 0,7 % were used for other purposes.



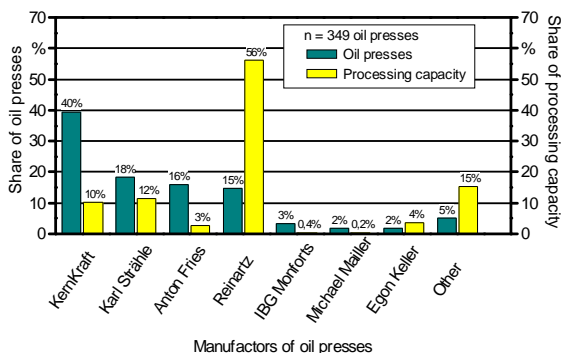
**Figure 5:** Usage of produced oil from small-scaled oil mills in 2006

In figure 6 the usage of produced press cake is demonstrated. Almost the total amount of the press cake is used as animal feed. 58 % of the entire production are delivered to animal feed producers and 42 % are sold directly to farmers. The combustion and the composing as well as the usage of press cake as biogas substrate play a minor role.



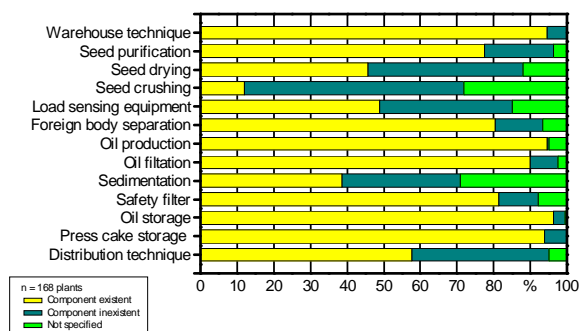
**Figure 6:** Usage of produced press cake from small-scaled oil mills in 2006

The equipment of small-scaled oil mills differs significantly between the installed plants. More than 90 % of the participating oil mills are equipped with agricultural warehouse technique, for example the possibility to store seeds. Components for purifying and drying the seed before processing are used in 77 and 46 percent of the plants respectively. In addition foreign body separation devices are by 80 % of the plants. Only 12 % of the oil mill operators crush the oilseed before processing oil. On average 2.1 presses are installed per plant, while over 50 % of the oil mills surveyed operate one single press. Figure 7 shows the percentage of different manufacturers of the oil presses and their share in the total processing capacity of small-scaled oil mills in Germany.



**Figure 7:** Share of oil presses from different manufacturers and their share of the total processing capacity

The oil purification mostly takes place by filtration (90 %). 39 % of the surveyed operators use sedimentation as additional or exclusive main purification systems. Over 80 % of the plants are equipped with a safety filter to reduce the contamination in the oil. Storage facilities for oil and press cake exist in most of the plants. They are available in 96 and 94 % of the surveyed oil mills respectively. 58 % of the operators dispose their products with distribution techniques, like filling stations or tank vehicles. A comprehensive overview of the technical plant units and equipment is given in figure 8.



**Figure 8:** Technical plant units and equipment

Small-scaled oilseed processing is reflected by regional seed purchasing and product sale. 8 % of the oil mill operators exclusively process oilseeds from their own production and use the entire press cake in their own farm. 11 % of the oil mills produce oil exclusively for their own usage.

A quality management system for at least one of the products of the oil mill is used by more than three quarters of the surveyed plants. 23 % of the plants are certified according to the QS system, and another 26 % of the operations are QS-certified for small producers of feed material. 12 % of the oil mills surveyed possess GMP+-standard (Good Manufacturing Practice) in which the HACCP-concept (Hazard Analysis and Critical Control Point) is integrated.

Regarding to future chances the expectations of the operators of small-scaled oil mills differ very much and show significant insecurity:

- The profit margins were often considered too small for the profitable operation of a small-scaled oil mill.
- The competitive pressure among oil mills is increasing.
- Increasing raw material prices and energy tax, introduced in 2006, cause high rapeseed oil prices. The largest part of the operators which produce rapeseed oil fuel regard sales chances as uncertain or pessimistic. They fear a sales collapse.
- In some cases operators of small-scaled oil mills are even considering the closure of the oil mill.
- However oil milling is still seen as one possibility to enhance the regional agricultural value added.

In table 2 the willingness of operators to build an oil mill again is shown. In 2007 49 % answered “yes” and 36 % answered “no”.

**Table II:** Willingness of operators to build an oil mill again in 2004 and 2007

|               | 2004<br>(n = 90) [4, 5] | 2007<br>(n = 168) |
|---------------|-------------------------|-------------------|
| Yes           | 49 %                    | 72 %              |
| No            | 17 %                    | 36 %              |
| Not specified | 11 %                    | 14 %              |

It is clear that the expectations placed on the operation of a small-scaled oil mill were met to a lesser extent in 2007 than in the past [7].

#### 4 OUTLOOK

- The taxation for rapeseed oil fuel needs to be adjusted to up to date market data based on the changed framework conditions and the profitability resulted.
- The benefit depends significantly on raw material prices and the prices of fossil fuels.
- More economical security could be obtained by diversification of products.
- Economic efficiency of rapeseed oil fuel is often given in the agricultural sector due to fiscal privilege, though because farms should be gained as primary customers.

#### 5 ANNOTATION

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#### 6 REFERENCES

- [1] BRENNDÖRFER, M. (1999): Ergebnisse einer bundesweiten Umfrage zum Stand dezentraler Ölsaatenverarbeitung. In: KURATORIUM FÜR TECHNIK UND BAUWESEN IN DER LANDWIRTSCHAFT E.V. (Hrsg.): Dezentrale Ölsaatenverarbeitung, Münster-Hittrup: Landwirtschaftsverlag GmbH, S. 91-99, ISBN 3-7843-2101-1.
- [2] DEUTSCHES INSTITUT FÜR NORMUNG E.V. (2006): (Vornorm) DIN V 51605. Kraftstoffe für pflanzenöлтаugliche Motoren – Rapsölkraftstoff – Anforderungen und Prüfverfahren. Berlin: Beuth Verlag GmbH
- [3] SCHENCK, W. VON (2007): Rapssaat bleibt gefragt! In: UNION ZUR FÖRDERUNG VON OEL- UND PROTEINPFLANZEN E.V. (Hrsg.): UFOP-Information Winterrapsaussaats 2007. Berlin, 8 Seiten.
- [4] STOTZ, K.; REMMELE, E. (2005): Daten und Fakten zur dezentralen Ölgewinnung in Deutschland. Berichte aus dem TFZ, Nr. 3. Straubing: Technologie- und Förderezentrum im Kompetenzzentrum für Nachwachsende Rohstoffe, 53 Seiten, ISSN 1614-1008.
- [5] STOTZ, K.; REMMELE, E. (2005): Processing of Oilseed in dencentralised Oil Mills in Germany. Results of a Survey. In: SJUNNESSON, L.; CARRASCO, J. E.; HELM, P.; GRASSI, A. (Hrsg.): Biomass for Energy, Industry and Climate Protection, 14th European Biomass Conference, 17-21 October 2005, Paris, France. Florence: ETA Renewable Energy, Florence, S. 1060-1063, ISBN 88-89407-07-7
- [6] THUNEKE, K.; REMMELE, E. (2005): State and Prospects of the Production and Use of Rapeseedoil Fuel in Germany. In: SJUNNESSON, L.; CARRASCO, J. E.; HELM, P.; GRASSI, A. (Hrsg.): Biomass for Energy, Industry and Climate Protection, 14th European Biomass Conference, 17-21 October 2005, Paris, France. Florence: ETA-Renewable Energies, S. 1679-1682, ISBN 88-89407-07-7
- [7] UHL, A.; HAAS, R.; REMMELE, E. (2007): Befragung von Betreibern dezentraler Ölsaatenverarbeitungsanlagen. Im Auftrag der Union zur Förderung von Oel- und Proteinpflanzen e. V. Berichte aus dem TFZ, Nr. 15. Straubing: Technologie- und Förderzentrum im Kompetenzzentrum für Nachwachsende Rohstoffe, 68 Seiten, ISSN 1614-1008