Vulnerability of structures of logistics in food trade[1]

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INTRODUCTION

It can be taken for granted that the structures of logistics in food trade can be damaged by troubles reaching a certain extent. Which kind of trouble can occur and which structures of logistics in trade, from the perspective of both the commodity flow and the information flow, are employed will be outlined. The study is a first attempt to a process oriented risk analysis in the food trade. It is based on interviews with logistic managers and tries to show effects of natural and man-made hazards on the food supply-chain.

BASIC ELEMENTS AND DEFINITIONS

Risk arises from the interaction of endangerment and vulnerability, the latter being described as the exposition and sensitivity of the goods (their "value"), the environment or the people[2]. Danger is caused on the one hand by extreme natural occurrences, which can be divided into three groups: extreme cosmic, geological and atmospherical occurrences, and on the other by occurrences of human origin. Examples for this are troubles or failures of the information, communication or traffic infrastructure, malfunctions of large technical facilities or attacks via the Internet. The probability of occurrence and the sectoral risk can be represented within a matrix, the extreme values of which are occurrences with a very high probability of occurrence and a low risk for the sector (e.g. failure of an IT network component) and occurrences with a very low probability of occurrence and a very high risk (evacuation of a conurbation).

In addition, risks arise from the sectoral dependency of the food trade. Beside the classic dependencies on the agriculture sector and the food industry (as producers) as well as on the transportation sector, today there are strong dependencies as regards energy supply, information and communication technology and the financial sector.

Security of supply of foodstuffs is a result of the continuity of food supply at the place of residence of the consumers under changing environmental conditions.

SCENARIOS

The scenarios of

- a power failure in a region,
- a freight transport trouble through the interruption of motorway stretches as well as
- a blockade of the IT infrastructure by denial-of-service attacks

and their impact on the population and the way how the population is affected were studied.

Selected impacts regarding food trade and population

A large-scale power failure affects both the population in the region and trading. As to the other scenarios, this is widely restricted to trading. The exception from this is the shortage of cash supply in case of a failure of the payment system, which is directly felt by the population. Consumer behaviour and product demand derive from the degree to and the way in which the population is affected. A power failure causes the demand for finished foodstuff that can be consumed cold to rise

while other products are not demanded. In trade, this is contrasted by the necessity for the quick disposal of perishable food that is not ready for consumption. In case of a failure of the IT networks the population's demand for food remains unchanged at first.

As regards food trade stocks, a power failure leads to a complete breakdown of the warehouse unless an emergency generator is available. In distribution systems with few central warehouses, a trouble in freight transport through the interruption of motorway stretches leads to considerable supply bottlenecks, while systems with several storage stages are less affected. The IT networks failure interrupts the information flow between the points of sale and the warehouses. This can be bridged by using couriers, provided there is a close network of warehouse sites.

In the points of sale, a power failure leads to the closing of the shop if there is no emergency generator available. Perishable food which needs to be kept cool can no longer be cooled, and selling in dark shops without electronic cash systems is nearly impossible. In case of a breakdown of the IT networks, selling continues on the basis of cash, but repeat orders via automatic systems are not possible. A great trouble affecting the traffic infrastructure leads, depending on the distance to the single warehouses, to considerable delays in the delivery of goods.

Impact on sectoral relations
The networking of economic sectors leads to further effects and supraregional dangers. A power supply breakdown is liable to encroach upon the supply of cash and the provision of cashless payment services in areas that are not affected by the power failure. In agriculture, a power failure can lead to considerable milk production troubles (milking and milk cooling), in the food industry it can cause loss of production. Together, the two factors can be the reason for long-term supply bottlenecks and a shortage of the products on offer, both effects being ascertainable regionally and supraregionally.

Importance of commodities stocks
The different impacts of the presented troubles can be bridged for a short time by means of commodities stocks. In this respect, the stocks with the consumer and in the branch are very important, but less significant in the warehouses.

EVALUATION OF THE INTERVIEW
8 trading enterprises, realizing together about 100 billion euros of turnover[3] in 2002, took part in the interview. One enterprise is equipped with emergency power supplies with a diesel generator in all branches; there are three enterprises which have this equipment at least in the large branches. By means of the emergency power, two of these enterprises can operate the branches including the cooling systems. The supply of the branches is done by central and/or regional warehouses in six enterprises. Two dealers also work with distribution centres without stockkeeping. With all those interviewed, there are commodities stocks in the supply chain. The stock of preserved food lasts between 7.5 and 30 days, that of fresh products between zero and ten. There is an excess coverage of the supply areas with three enterprises, and with three others at least partially. Six enterprises are able to compensate the loss of warehouses by supraregional supplies. Five can fall back on an emergency scheme in case of loss of several warehouses in one region. The critical value is regarded by two participants to be at a loss of 50 % of warehouses in one region, one says it is already at 25 %.

Storage technology is characterized by electricity-driven machines and devices. In warehouses for foodstuffs there are no lift trucks with combustion engines because they are not permitted. The complete control of the commodity flow in the warehouses is done by means of electronic devices.

Partially, the storage of goods is organized according to groups of goods in the racks; partially, the merchandise management system controls the storage by applying criteria of distance and access frequency. This makes a possible manual removal of goods from storage more difficult.

The enterprises delivered further information, e.g. on the positive outcome of a test of selling using manually operated cash boxes. All participants see no possibility of manual storage and removal from storage in the warehouses and distribution centres. A trouble of the extent assumed requires a complete stock-taking because a subsequent entry of the movement of goods is not possible. In connection with forecast systems for projecting the demand of goods, a time need of about one month is envisaged to remedy the faults. During this time, stockouts may arise in the branches.

CONCLUSIONS

For economic reasons society increases its risk by purchase decisions that are centered on the lowest price, as security of supply requires stocks close to the place of consumption, redundant systems as well as possibilities of doing work manually. These crisis preparation measures increase costs and lead to higher prices. The vertical integration of the supply chain leads to the further reduction of stocks while the exchange of information increases. About half of the interviewed enterprises have no printed lists indicating the purchase order quantities of the branches and can thus not realize a reliable delivery of goods in case of a longer power failure or IT breakdown. Nonetheless, the enterprises see the possibility of organizing food supply by means of fixed allocations to the branches. However, without electricity, the selling of goods remains the biggest problem as the branches rely on electric lighting. To maintain food supply by the dealers in serious crisis situations, accompanying state measures are necessary.

Recommendations for the preparation for large-scale crises are:

- Increasing the stocks in the branches.
- Drawing up lists with purchase order quantities of foodstuffs and non-alcoholic beverages of the branches in regular time intervals, archiving as paper copies.
- Drawing up emergency plans for different scenarios. Communication of these measures to the personnel.
- If an emergency plan provides for manually operated cash boxes or for the selling from freight vehicles, this should be practised.
- Equipping the branches with emergency generators or solar systems for power generation.
- Establishing general legal conditions for the distribution of food in situations where normal selling is not possible.

The talks made clear that issues pertaining to large-scale crisis situations have not been given much attention so far. However, there is need for information.

REFERENCES

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