The Role of Coordination and Cooperation for Bt-maize cultivation in Brandenburg, Germany

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***Abstract*— Since 2006, several varieties of transgenic Bt-maize are approved for commercial cultivation in Germany. The German regulatory framework for growing these crops comprises ex-ante regulations as well as ex-post liability rules to protect conventional and organic farming from possible negative side effects of transgenic plants and to ensure co-existence. Public regulation is also suspected to impose additional costs to those farmers who intend to plant Bt-maize. We address the question how Bt-maize growing farmers perceive the additional costs of regulation and whether coordination or cooperation takes place in order to diminish these costs. In 2006, we carried out a case study in the Oderbruch region (Brandenburg, Germany) comprising eight Bt-maize growing farmers and six adjacent neighbours. The predominantly large farms chose intra-farm coordination to manage the construction of buffer zones within their own fields and to avoid the planting of Bt-maize close to their neighbours. Inter-farm coordination or cooperation with adjacent farmers was not regarded necessary to achieve co-existence.**

Keywords— **Coordination, Cooperation, Bt-maize**

I. INTRODUCTION

Regulations concerning the cultivation of GM crops are embedded in the German Genetic Engineering Act (GenTG) [1] which dates back to 1990. The first partial amendment of the GenTG in 2004 included the establishment of a public site register (§16a, GenTG) and the compliance with Good Agricultural Practice (GAP) (§16b, GenTG) as forms of ex-ante regulation. Furthermore, ex-post liability rules were defined in §36a, GenTG. Further amendment is currently under way.

The public site register is provided by the Federal Office of Consumer Protection and Food Safety (BVL) and gives detailed information on the planting of GM crops in order to monitor possible environmental and health effects [2]. It is divided into a public part, which is freely accessible via the internet and displays information on the exact field location and the type of crop grown, and a non-public part which comprises personal data of the GM-planting farmer. For reasons of data privacy, information from this part is only given upon request and only to neighbouring farmers or other persons with legitimate interests. Cultivation of GM crops must be registered 90 days in advance to planting (§16a GenTG).

Another element is the compliance with the general code of GAP (§16b GenTG). The GM farmer is obliged to meet general safety arrangements, for instance minimum distances to neighbouring fields, the use of different varieties, or pollen barriers to prevent damage to third parties. However, the GenTG lacks concrete specification of minimum distance requirements that are sufficient to keep outcrossing below the EU-wide labelling threshold of 0.9% for adventitious and technical inevitable GM traces in food and feed. In 2006, German GM farmers had to rely on recommendations from GM seed companies which recommended buffer zones of 20 m to keep outcrossing below the labelling threshold [3].

In the case of ex-post liability, Bt-maize growing farmers in a region are jointly and severally liable for damages caused by, e.g., cross-pollination (§32 GenTG). Furthermore, GM farmers are strictly liable, i.e., even if they have met all requirements of the GAP, they are not exempt from third party liability claims.

From the legal framework of ex-ante regulations and ex-post liability additional costs can arise to the farmer who decides to grow GM crops:

1) Administration and publication costs

The cultivation of Bt-maize must be announced in the national public site register of the BVL. This can cause direct costs such as the act of registration itself as well as indirect costs for instance related to free

data availability through the internet which already led to a number of GM-field destructions.

2) Damage prevention and co-existence measure costs

In order to avoid possible damage, e.g., through gene outcrossing, the farmer is obliged to meet the standards of GAP. Apart from direct additional costs arising from the establishment of isolation distances or buffer zones also indirect costs must be taken into consideration like the search for suitable co-existence measures which were not specified in the German law.

3) Damage and liability costs

Even if a farmer meets the requirements of the code of GAP s/he is still jointly and severally as well as strictly liable for possible damages. The damage and liability costs depend on a) the expected damage, b) the probability of damage occurrence, and c) the probability that the farmer is actually held liable for the damage. Apart from theses direct costs, also possible costs arising from lawsuits have to be taken into consideration [4].

II. FORMS OF COORDINATION AND COOPERATION

According to the legal framework in Germany the GM-farmer carries the burden of ensuring co-existence exclusively. However, we argue that both the GM-farmer and his non-GM neighbours could contribute to co-existence by coordination or cooperation. Coordination can take place within a single farm (intra-farm coordination) or among two adjacent farmers (inter-farm coordination). For intra-farm coordination, a GM-farmer can arrange his own fields to keep maximum distances to his neighbours, adjust field size to reduce the risk of outcrossing or keep isolation distances. Inter-farm coordination involves the GM-farmer as well as the non-GM neighbour. The GM-farmer can inform his neighbour on his intention to grow GM-maize and the exact location of the GM-field. Both farmers can agree on planting different varieties or adjusting their cultivation plans in order to prevent short distances between GM- and non-GM maize fields.

Cooperation itself can be defined as a special form of inter-farm coordination. Beckmann and Schleyer (2007) [5] observe three new forms agricultural cooperation as a result of the approval of transgenic varieties for commercial cultivation in the EU: (1) the development of so-called GMO free zones, (2) the creation of potential GMO-zones or (3) cooperation for co-existence.

In the case of cooperation for co-existence, adjacent farmers can cooperate for co-existence by changing fields to keep safe distances.

In a region with GM farms as well as conventional or organic farms co-existence can cause additional costs. We argue that cooperation between neighbouring farmers becomes the more beneficial the higher the costs of on-farm co-existence measures are perceived and whether cooperation can reduce the costs of ex-ante regulation and ex-post liability significantly. One still has to keep in mind that also coordination and cooperation themselves are a new source of additional costs since agreements have to be made, monitored, and enforced.

III. CASE STUDY

As the case study region we chose the Oderbruch Region in the eastern part of the German federal state of Brandenburg because in this area infestation rates with the European Corn Borer (*Ostrinia nubilalis* HÜBNER) are high [6] and Bt-maize has already been adopted by several farmers to control the pest. In 2006, we carried out a full-sample case study in the Brandenburg district of Märkisch-Oderland by interviewing all eight Bt-maize growing farmers in the region with a standardized questionnaire comprising questions relating to on-farm Bt-maize cultivation, the perception of ex-ante regulation and ex-post liability as well as to coordination and cooperation.

IV. RESULTS

A. Administration and publication costs due to public site register

In the first place, a registration in the public site register is an additional time-consuming activity. At least three months in advance, the farmer has to decide where to plant Bt-maize and the other crops. Once registered, he can only plant Bt-maize on the areas he initially intended for this purpose. The interview

results reflect these additional costs since half of the Bt-maize growing farmers regarded the registration as "cost-intensive". Registration is also accompanied by the publication of farm-related and personal data which can be obtained upon request. Seven out of eight farmers reported personal disadvantages because of this publication. Five GM farmers became a direct target of anti-GM campaigns, such as field destructions and other hostilities.

B. Damage prevention, co-existence measures and their costs

For the planting seasons 2006 and 2007, the GenTG (dated 17th March 2006) lacked concrete measures for co-existence with respect to GAP and only seed companies provided recommendations on co-existence management. Every GM farmer kept at least a 20 m buffer zone around the Bt-maize stands as suggested by Monsanto Agrar Deutschland GmbH. The majority of the farmers were even willing to keep buffer zones up to 100 m and beyond. Interestingly enough, seven out of eight GM farmers linked no or only negligible costs to the establishment of buffer zones. Only one farmer described the additional costs as high.

C. Liability rules and risk of damage

The ex-post liability rules did not have any prominent influence on the farmer's decision to grow Bt-maize. The GM farmers were able to reduce the risk of gene outcrossing and, thus, economic damage to their neighbours by spatial allocation of the Bt-maize fields. Most of the GM farmers planned to expand Bt-maize cultivation in the next years regardless of a change of the liability rules. On the contrary, three of the six neighbours stated not to have grown Bt-maize due to the remaining uncertainty as to the liability in case of damage.

D. Coordination and cooperation between neighbours

Neighbouring farmers have incentives to coordinate if this reduces the costs of co-existence, ranging from relatively easy intra-farm coordination where no external actors are involved to inter-farm coordination and cooperation where the GM-farmer closely interacts with his neighbours or even downstream enterprises. According to our definition, intra-farm coordination consists of three general components: 1) field allocation, 2) field size and 3) isolation distances. Regarding the first two measures the GM farmer can decide freely on whether to adopt them or not whereas the last option is already prescribed by German law even if legally defined safety distances are still lacking. In our case study we observed that all farmers willingly kept distance requirements mainly in the form of buffer zones. In some cases, farmers also made use of field allocation to ensure even wider safety distances to organically farming neighbours.

Inter-farm coordination always directly involves the adjacent farmers. We define four components of inter-farm coordination: 1) information of neighbours, 2) adjustment of cultivation plans, 3) use of different (maize) varieties and finally 4) cooperation. Cooperation itself can be divided into three subgroups as suggested by Beckmann and Schleyer (2007) [5]: Cooperation can take place either in the form of a GMO-free zone, a GMO-zone or cooperation for co-existence as for instance the exchange of plots to ensure safety requirements. In most cases, the GM-farmer informed at least directly affected neighbours about his intention to plant Bt-maize and about the location of the field. This took place on a semi-official basis since in 2006 the GenTG did not require notification of neighbours. In our case study we did neither observe the adjustment of cultivation plans nor the use of different varieties. We argue that inter-farm coordination is not generally necessary for the adjustment of cultivation plans. In northern Germany, maize can not be drilled until late spring because of the soil temperature. At that time, winter grain (wheat, barley, rye, and rape seed) has already germinated. As soon as the GM farmer has to make his registration in the cadastre he already notices which crop has been sown next to his Bt-maize stand. Thus, he can coordinate his planting without contacting his neighbours. The adjustment of varieties seems to be only a theoretical solution for co-existence. First of all, it is accompanied with additional costs, ranging from 46 to 201 €/ha according to Messean et al. (2006) [7]. In Germany, only five different varieties of MON810 are approved for commercial cultivation. Two of them are medium early varieties (DKC 3421 YG and PR 39V17) and three are late maturing varieties (Kuratus,

PR 38F71 and PR 39F56) [8]. From this, we conclude that a GM farmer can only vary the flowering time within these two groups since no early maturing varieties are yet available on the market. This provides little scope for inter-farm coordination. Otherwise, the non-GM neighbour could make use of the different varieties of conventional maize and adjust his varieties for the sake of co-existence. None of the farmers we interviewed seriously took this form of co-existence into consideration.

V. CONCLUSION

The results from our case study lead us to the overall conclusion that under the given circumstances in Brandenburg, GM-farmers tend to prefer intra-farms coordination rather than inter-farm coordination or even cooperation. This is mainly due to the agricultural structure of this region which is dominated by large farms with a still low percentage of GM-maize. These farms can easily guarantee co-existence by intra-farm field coordination.

Still, coordination and cooperation is very likely to gain more importance in the future. All GM farmers interviewed planned to expand their GM-maize production area. In the long run, this probably will render intra-farm coordination more expensive. Our analysis was carried out under the regulative framework of the GenTG from 2006. As stated above, the Act did neither define specific distance requirements in the course of Good Agricultural Practice, nor was there the duty to inform the non-GM neighbour nor could a GM farmer and his neighbour decide on modifying distance requirements by private agreements. At the beginning of 2008, the German Genetic Engineering Act was again amended and the new act now envisions detailed rules of co-existence management for the first time. This includes the duty of the GM farmer to inform neighbouring farmers on planned GM cultivation and minimum distance requirements for Bt-maize are set at 150 m to conventional farms and 300 m to organic farms. These requirements can though be relaxed by private agreement which can thus be an incentive for inter-farm coordination in the future.

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