

**Aus dem Institut für Marktanalyse und Agrarhandelspolitik**

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**Possible consequences of EU eastern enlargement in  
the domain of plant breeding and seed marketing**

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**AGRICULTURE IN THE EU,  
CENTRAL, EASTERN AND NORTHERN EUROPE**

*PERSPECTIVES FOR HARMONIZATION OF AGRICULTURAL AND FOOD POLICIES IN  
EU AND ASPIRANT- MEMBER COUNTRIES:*

**Possible consequences of EU eastern enlargement in the domain of plant  
breeding and seed marketing**

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**Abstract:**

Seeds in particular of self pollinating crops, have attributes of public goods so that in a market oriented system extensive legal regulations must be installed. In the EU this legal system consists of the Plant Variety Protection Act which grants exclusive property rights to new plant varieties. The Seed Trade Act is the other regulation protecting farmers from fraud through unobservable quality shortages. This is accomplished by extensive examination and control mechanisms. Besides this official prerequisites, the performance of the seed market is influenced by private contracts between the market participants. As a comparison shows, the performance oriented contract design in Denmark leads to better results than the inflexible standards oriented contracts in Germany.

**1. General aspects**

The integration of a nation into a confederation like the European Union requires not only an adjustment of basic legal acts, but also adjustments in the second and following levels of the national institutional framework. Consequently the public as well as private organizations concerned in the respective countries have to analyze, whether they must change their structure and activities.

The seed sector in this respect is a good example:

Firstly because a market oriented seed system needs a strong and detailed legal framework:

Seed is a typical confidence-good. Neither you can simple test the genetic potential nor the quality of the seed itself (purity, germination rate, etc.). Thus already in the early stage of plant breeding and seed marketing seed testing stations were established.

A quite stronger problem is the fact, that mainly the seed of self-pollinated crops like small grains but also rye and vegetatively multiplied potatoes can be re-used without quality losses by taking a part of the harvest for seeding; this is the so-called use of farm saved seed. Furthermore competing seed enterprises can insert the genetic information of varieties from other plant breeders in their own plant breeding process.

Thus, the following two attributes of public goods apply to seed grain:

1. A good, which everybody can use at no charge once it is made available to the market, has the characteristic of 'non-exclusivity'.
2. If the use of a good does not diminish its availability so that a use does not restrict the consumption, the good has the characteristic of 'non-rivalry'.

Generally these attributes in a privately oriented market system lead to an under-production of such goods, because the supplier cannot expect sufficient revenues since he cannot offer the good to an adequate price. Therefore, seed has significant public good properties, so that in a private oriented seed market exclusionary mechanisms must be applied. This is different from countries where plant breeding and seed production is organized in public institutions. But these would probably have to be changed after an EC-accession.

The second and more general reason to choose exemplary the seed sector is, because it is the most important input factor in all plant-based agricultural production systems and plant breeding gains increasing importance for an intensive agricultural production. The genetic potential of the plant determines the upper limit on yield and projections show, that in future in plant production other inputs like fertilizer, plant-protective-agents etc. will play a decreasing role or at least depend on the potential of new breeding varieties.

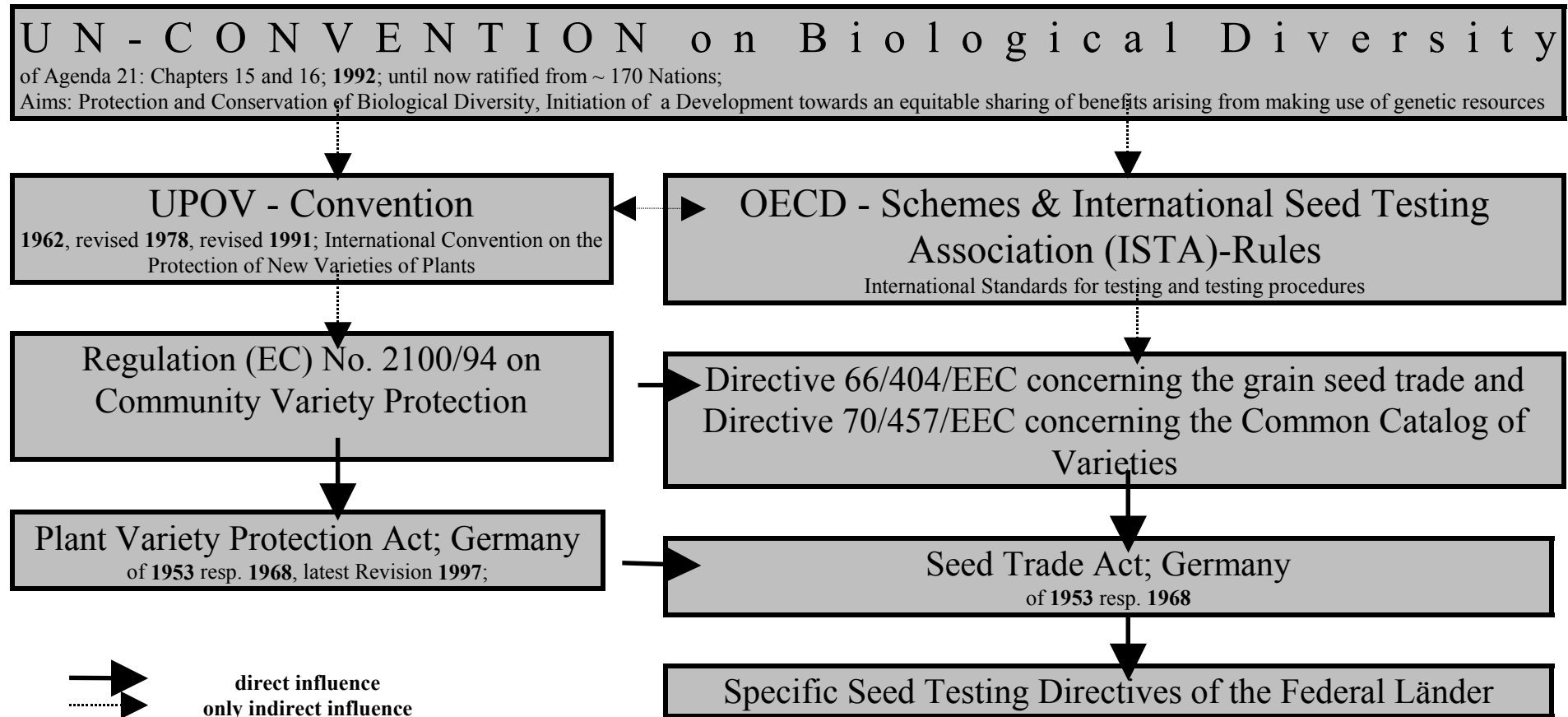
## **2. Legal framework**

Due to the characteristics of seed it is necessary to have an institutional framework which

- protects users as traders, and plant breeders against fraud through unobservable quality shortages relative to the seed and breeding variety

- creates transparency relative to the promised but unobservable characteristics of the breeding variety and seed
- protects the plant breeders against the abuse of their breeding efforts by competitors or farmers.

**Fig. 1: Legal (institutional) Framework of the Grain Seed Market (Germany)**



Source: Josef Efken

In the domain of agricultural plant breeding and seed trade exists a complex, detailed and hierarchical legal framework, which indicates that these activities have a long tradition (Fig. 1).

In a worldwide context there is the **UN-Convention on Biological Diversity** which resulted from the Agenda 21. Its aims are the protection and conservation of biological diversity by means of an initiation of a development towards an equitable sharing of benefits arising from making use of genetic resources.

However, until now the UN-Convention on Biological Diversity has no real importance yet for the industrialized countries concerning the grain seed markets.

The International Union for the Protection of New Varieties of Plants (UPOV) is an intergovernmental organization. It is based on the International Convention for the Protection of New Varieties of Plants. The main aim of the Convention is to promote the protection of the rights of the breeder in new plant varieties. So UPOV has for example produced a Model Law on Plant Variety Protection.

The International Seed Testing Association (ISTA) has introduced an ISTA seed lot certificate which jointly with the OECD-schemes guarantees that all tests have been made according to international rules. This is particularly important for the international seed trade, because with OECD-label and ISTA certificate there is no need of re-testing of the imported seed so that the seed trade has become simplified.

The EU-Seed Legislation is based upon the content of these international agreements and consequently is separated in a Plant Variety Protection Act and a Seed Trade Act:

The **Plant Variety Protection Act** protects the Plant Breeders Rights and promotes plant breeding.

The national Offices of Plant Varieties grant Variety Protection if the Variety is

- New
- Distinct from other Varieties
- Homogenous
- Stable
- Designated by suitable Denomination

Variety Protection is granted regularly for 25 years like for seed grain and for 30 years for a few species like for potatoes.

After successful trial the plant breeder can choose whether he likes to get protection only in a individual state or in the entire European Union; usually he decides for the latter one.

The plant breeder cannot preclude farmers from re-using farm saved seed of his protected varieties, but can collect a fee from them. Also he cannot preclude competitors from using his

protected varieties in their varietal Development Programs but if a variety ‘B’ of a competing seed enterprise originates in a variety ‘A’ with only a minor distinction from ‘A’ the Plant Breeder of Variety ‘A’ can collect a fee from this competitor.

Basically this regulation effects that all plant breeders have continuously access to the newest improved genetic resources, so that progress in plant breeding should be enhanced.

**Tab. 1: The variety and seed testing scheme in Germany**

(Official quality-management-system of plant breeding, seed multiplication and seed marketing)

Year	Federal Office of Plant Varieties	Certification Offices (in all of the 16 federal states of Germany)	Agricultural Advisory Boards (Regional agricult. Chambers/Off.)
	<b>Official Variety Examination</b>	<b>Official seed an seed production Examination</b>	<b>Private/semi-official Variety Examination</b>
1.	Usually simultaneous laboratory and field tests		
2.	of the variety for variety-protection and		
3.	variety -registration which lasting three years	Preliminary multiplication possible	At least three-year-lasting variety field-tests using
4.	Continuous	Yearly recurrent Certification Procedure and Examination of Certified Seed in Commerce	regional adapted plant production
5.	test of the ascertained		strategies to recommend the regionally best performing Varieties
6.	Variety characteristics	<b>Point of time for the conclusive evaluation of the variety for farmers</b>	

Source: Josef Efken

The **Seed Trade Act** has the aim to warrant the seed quality by legal regulation of seed production and trade mainly for the agricultural and horticultural species.

The main topic of the Seed Act is to make sure that agricultural seeds are admitted to trade only when officially permitted.

The Seed Trade Act provides two different procedures of licensing: On the one hand the award of a general license for trading the variety, on the other hand the award of a yearly certificate for the produced seed.

The applicant gets the general license (registration) if the variety is distinct, homogeneous and stable. In addition a variety of agricultural species must have a ‘value of cultivation and use’. This means that this variety must have an advantage of at least one important attribute over

the other varieties of the same species. So the newly bred variety guarantees a better economic return. In fact this is the most difficult hurdle of the registration procedure.

A result of this strong condition in the Seed Trade Act is that variety protection has little or no value, if the variety would not pass the examination of the Seed Trade Act.

Thus breeders normally first apply for registration and when they know that the variety will successfully pass they apply for variety protection.

Because both procedures are very similar the variety protection under the Plant Variety Protection Act and the registration under the Seed Trade Act both are carried out by the Federal Office of Plant Varieties to save money and mainly to save time (Tab. 1).

The license for trading a variety in one EU member country normally also allows the use of this variety in the other EU member countries. In Germany, for example, the license of the national Office of Plant Varieties corresponds to a superior quality label because the national tests of 'value of cultivation and use' recognize the typical climatic and soil conditions.

Seed certification means that certain minimum requirements of the most important seed quality characteristics are fulfilled. The certification procedure is divided into the field inspection and the examination of the prepared seed. In the field inspection the purity of the variety, the presence of other species and weeds, and the manifestation of disease are examined. The examination of the prepared seeds includes the mechanical fineness, the freeness from other crop seeds and weed seeds, the germinating power, moisture content and in certain species the fulfillment of special requirements.

When the seed is certified more or less 35% of the seed-lots (max. 25t) in commerce will be checked through official seed-controllers, whether the seed really corresponds to the prescribed minimum requirements.

An additional and very important service in Germany are the extensive field trials of the regional advisory boards. After a trial period of three years the advisory boards recommend the best performing varieties.

### **3 Practical experiences with the institutional framework**

There are considerable resources necessary to translate such an extensive institutional framework into action.

The Federal Office of Plant Varieties with more than 400 employees handles on average per year about 1000 Plant Protection applications and 900 Variety Registration applications, at which small Grain varieties have a share of less than 10%.

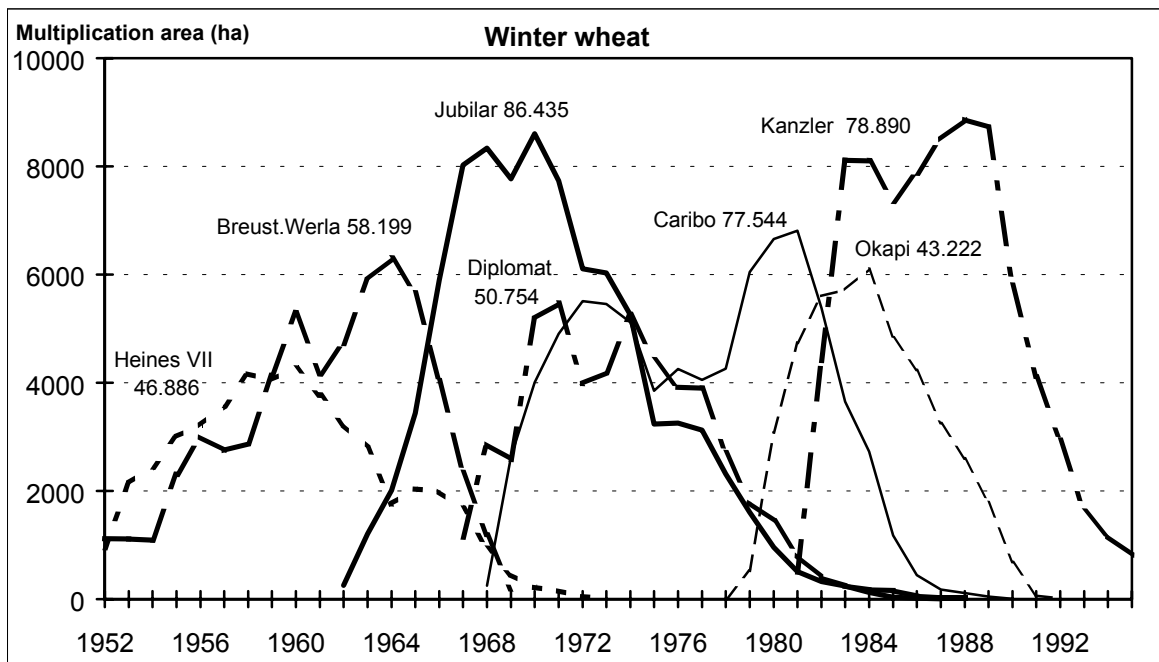
The field trials cover 15 000 Varieties yearly at 700 000 field lots.



The Office of Plant Varieties has set certain criteria for the acceptance of a new variety to become registered, among which the ‘value of cultivation and use’ is one of the most important. Based on these criteria the registration procedure leads to a strong quality-oriented competition process in the domain of plant breeding:

Only about 10% of the initially applied breeding lines pass the examinations successfully. From these varieties only between 10% and 15% achieve considerable market-shares later on. During the period of 1952-1996 based on the multiplication area 8 from around 60 plant breeders of winter wheat had the top market position. The market position resulted only from few very good varieties.

**Fig. 2: Life cycles of the most widespread winter wheat varieties in Germany during the period 1952-1996**



The number behind the Variety name stands for the totally achieved multiplication area.

*Source:* BSA, Vermehrungsflächenstatistik, Josef Efken

Furthermore a new variety wins quickly a greater market share, if the Federal Office of Plant Varieties and the agricultural advisory boards rate the value of this Variety exceptionally high (Fig. 2). In particular the recommendatory-lists are important because they are widely published in the agricultural journals.

These recommendations exert a strong influence on farmer's decisions on buying seed grains. The grain varieties ranging at the top of the field trials regularly receive the best selling results. Thus, as a further result, the progress in plant breeding will be quickly adopted by farmers.

The quality- or performance –based competition process effects also positively international competitiveness because varieties of German plant breeders frequently achieve considerable market shares in neighboring countries like Denmark, the Netherlands or UK.

#### The Federal Certification Offices:

In every federal state is at least one Certification Office with the necessary laboratories for seed examination.

In June/July they carry out the field inspection and at the end of July begin the seed examination of the prepared and sealed seed by means of samples. Sealing of the seed lot (Silos) and Extraction of the samples -except in Bavaria- will be done through officially recognized employees of the trader or multiplier, because the manpower requirements are very high and this is a possibility to reduce the costs of the official examination and certification system. The seed will be recognized if the following minimum requirements are fulfilled:

**Tab. 2: Official minimum requirements of certified seed**

	<b>Certified Seed (Germany: ‘Z-Saatgut’)</b>
Technical Purity	98%
Max. quantity of strange seed	6
Of that: Other Grain seed	3
Germination rate	85%
Wheat, Barley	92%
Rye: Ergot; max. quantity of sclerotia	3
Moisture content	16%
Rye	15%
State of health	The plants on field and the prepared seed have to be mostly free from diseases

The farmer can at least under regular climatic conditions during the vegetation-period fulfill these quality standards without problems.

**Tab. 3: Average germination rate, dependent on grain species**

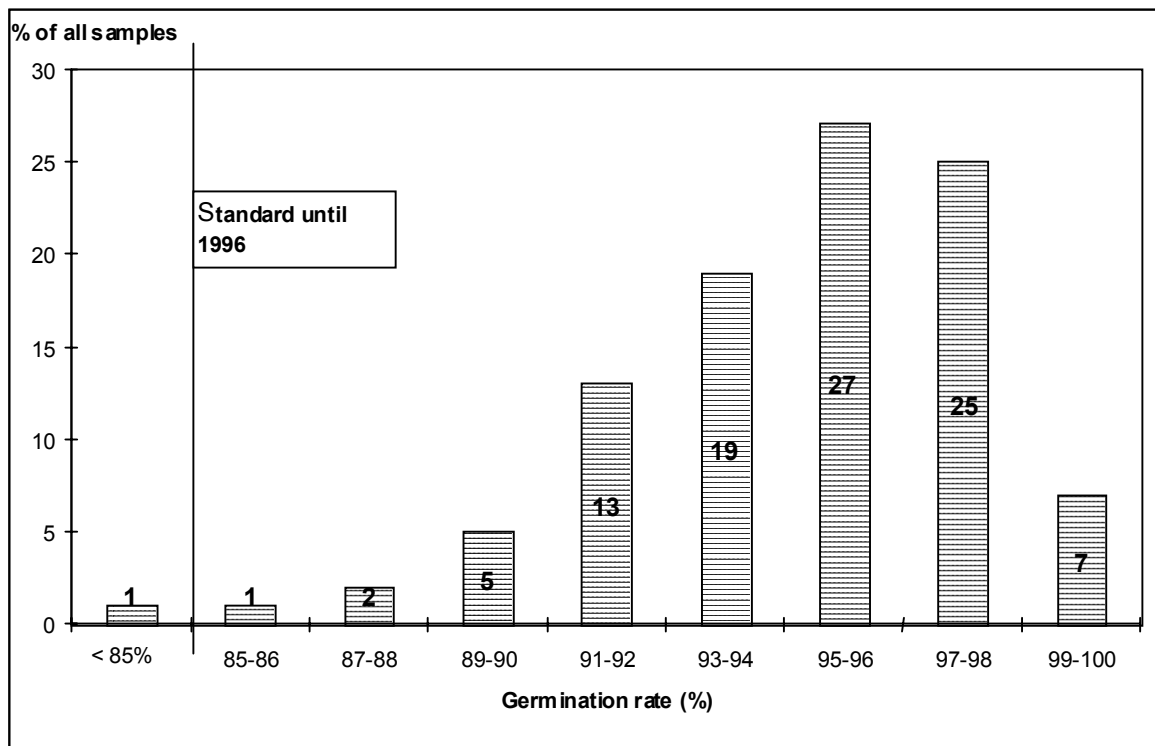
Species	Ø of the years 1979-88		
	Quantity of samples	Ø Germination rate in %	% of samples below 85% germination rate
Winter-barley	11 056	95	1,7
Winter-wheat	18 023	93	1,2
Winter-rye	2 415	89	10,3
Spring-barley	9 057	95	3,6

Spring-wheat	3 538	93	2,8
Oats	6 945	89	11,9

*Source:* nach Fuchs, H., Wenninger, A., Voit, B., Bihler, E.: Die Keimfähigkeit von Saatgetreide. Erfahrungen bei der Saatgutbeschaffenheitsprüfung der Ernten 1979-1988, in Bayerisches Landwirtschaftliches Jahrbuch 67. Jhrg. Heft 5/90, S. 532, eigene Darstellung.

Until 1996 the quality standard was even lower. Thus the rejection-rate until 1996 was at around 1-4% concerning Wheat and Barley and 10-14% concerning Rye and Oats.

**Figure 3: Exemplary Distribution of German Seed Quality**  
Germination rate of Winter Wheat Samples (n = 2508) from 1988



*Source:* Fuchs, H., Wenninger, A., Voit, B., Bihler, E.: Die Keimfähigkeit von Saatgetreide. Erfahrungen bei der Saatgutbeschaffenheitsprüfung der Ernten 1979-1988, in Bayerisches Landwirtschaftliches Jahrbuch 67. Jgg. Heft 5/90, S. 534.

An exemplary distribution of the quality among the species shows Tab. 3 and among the wheat seed of one year shows Figure 3. It can be seen that more than 80% of the seed has a germination rate higher than 92% and only 1% of the seed does not reach the minimum germination rate required until 1996.

Tab.4: Extent of the Examination of Certified Seed in Trade and the Share of Complaints.  
(Results in the period 1981/82 - 1990/91)

	Quantity of controls	Share of Complaints (%)
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	All	Produced in	Imported from		All	Produced in	Imported from	
		Germany	EU	3 <sup>rd</sup> Countries.		Germany	EU	3 <sup>rd</sup> Countries.
Small grain	63.987	60.245	2.306	1.436	7,7	8	2,9	2,4

*Source:* Bericht der Saatgutenerkennungs- und -verkehrskontrollstellen an das BML, (unveröffentlicht).

But in contrast the results of the later official examination of the seed in trade shows, that on average 8% of the German improved and certified seed was below the prescribed minimum requirements and this in a period when the standards were not yet intensified (Tab. 4). On the other hand imported seed had a significant better quality. Basically the results indicate a certain lack of quality consciousness among some of the market participants and that missing market transparency contributes selling seed in spite of insufficient quality.

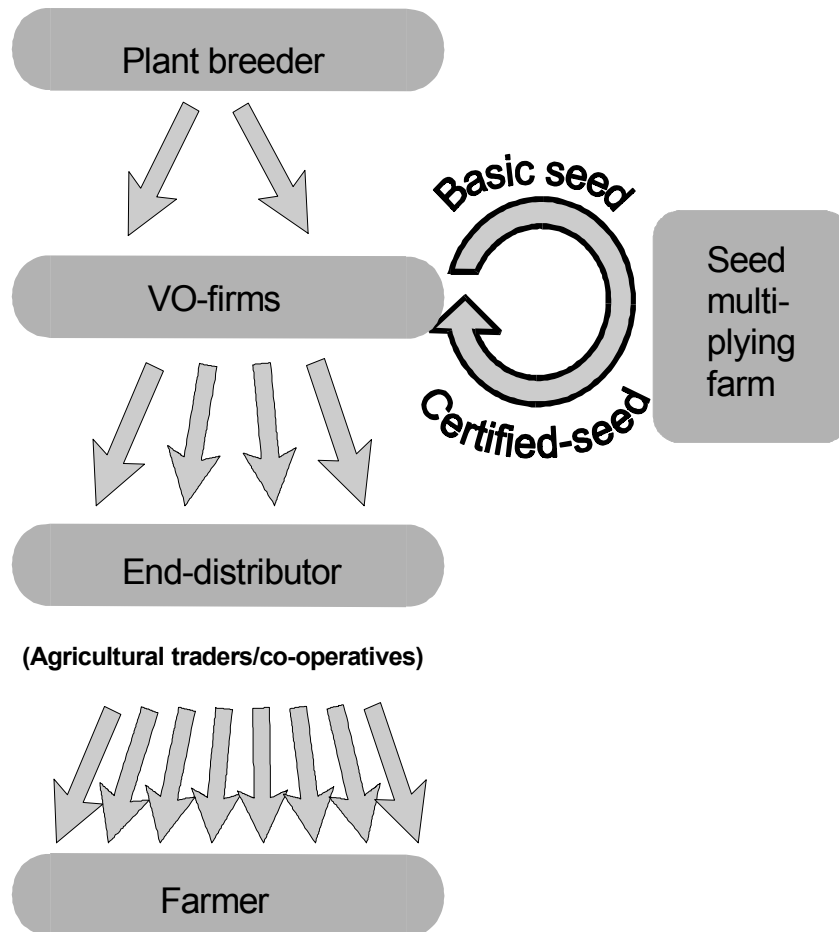
One reason of the especially high complaint-rate in Germany may be the use of employees for sealing and sampling, who are not free of special private interests, consequently a problem of moral hazard. But also in Bavaria, where uninvolved official and external persons extract the samples and seal the silos the same situation exists.

Another reason could be the harmless economic consequences for breeders and traders in Germany when insufficiencies in the seed quality are discovered.

In Denmark, for example, traders or multipliers who are discovered to distribute unsatisfactory seed will firstly be responsible for recourse and secondly set on a yearly published 'black list'; an obviously stronger measure.

In order to get better conclusions concerning the suboptimal quality of German seed grain it is helpful to describe and analyze the organization of the private sector seed grain system in Germany.

**Fig. 4: General Organisation and functional Structure of the Seed Grain Market-Channel in Germany**



- a) **Breeding** = Creation of new Products (varieties) in consideration of the needs of farmers, the relevant industries and the Office of Plant varieties
- b) **Search for capable VO-firms\***) to find markets for the varieties
- c) **Definition** of the private contractual framework between the market participants to **ensure** a correct seed production and to **enforce** the royalty interests.

**Management of seed multiplication and marketing**

- a) **Planning** of the seed production according to the **determination** of the quantitative demand from the different varieties in the regions
- b) **Distribution** of basic-seed and **collection** of the certified-seed
- c) **seed treatment** (seed processing and packaging)
- d) **marketing/distribution** of the certified seed to farmers and/or end-distributors

**Marketing/Distribution** of the certified seed to farmers

The farmer decides

- a) which variety he wants to use
- b) if he wants to buy certified seed or wants to use farm saved seed

It depends on price and quality of the available certified seed!!

**Supervision**

of the multiplication and trade process (in Germany mainly through the official seed control system and with little intensity through the breeders organization but with negligible intensity by traders)

\*) VO-firm = Usually agricultural wholesalers with a special status as controlled seed trading and distribution management firms. They organize seed production and distribution.

Source: Josef Efken

## 4 The grain seed channel in Germany

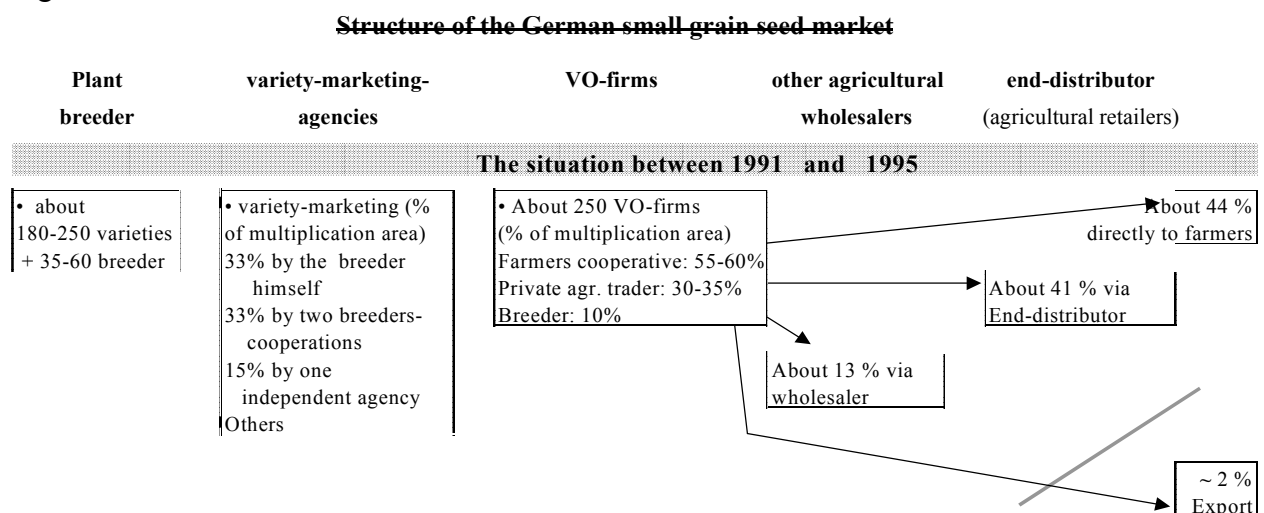
The plant breeder himself is unable to produce seed for the total relevant area in his own range of breeding and management. He, therefore, has to make use of seed multiplying farms and so-called VO-firms on a contract basis (Fig. 4).

VO-firms normally are agricultural wholesalers with a special status as controlled seed trading and distribution management firms. They organize seed production and distribution and effect the final sales to the end-consumer via end-distributors.

The plant breeders objective is to reach and to advise in co-operation with the VO-firms as many end distributors as possible. He, therefore, plans jointly with the VO-firm, which normally has a better insight into the regional situation, the acreage of certified seed to be produced and further marketing activities.

Seed production by contract is practiced in the following manner: The breeders give the seed which is destined for propagation -in most cases basic seed- to a VO-firm. This VO-firm gives the basic seed to the seed multiplying farms, where it is cultivated according to the principles of orderly field cultivation. The seed multiplying farms have to deliver their complete harvest to the VO-firm. Either the seed growers or the VO-firms have a special seed processing unit to treat, dress and pack the seed. After successful seed certification they can sell the certified seed to end-distributors. The breeder receives a fixed royalty on each quantity of certified seed sold from the VO-firm or the end-distributor.

Fig. 5:



*Source:* Josef Efken

Fig. 5 shows the actual structure of the German small grain seed market. There exist more or less five marketing stages.

Normally the breeder or a co-operation of breeders organize the marketing of the different varieties to VO-firms. They manage also all variety-specific promotion and advertising activities.

In Germany we have between 180 and 250 small-grain varieties in the market, but only between 10 to 15% of these varieties reach a significant market share.

Usually agricultural wholesalers have the marketing function of a VO-firm but also the seed enterprises have a department which fulfils this function for the region where the seed enterprise is situated in order to receive also the profit of seed-trading in this region. From the VO-firms market stage 44% of the certified seed is sold directly to the farmers, 41% via end-distributor, and 13% via other wholesalers.

**Tab. 5: Seed change rate or proportion of certified seed used**

Country	Dk	Irl	Nl	UK	Belg	Dtld	Fr	It	Gr	Sp
%	95	80	75-80	70	65	50	50	30	10	10

*Source:* COSEMCO, cited in: LEI-DLO, Rabobank Nederland, (Editor): The World seed market, 1994, P. 16.

The seed change rate, that is the proportion of certified seed used in percent of the total demand, is a suitable measure in order to estimate how well the seed supplier altogether meet the needs of the farmers (Tab. 5).

The seed change rate does not directly refer to the quality of plant breeding, but to the quality of seed multiplication and marketing, because farmers when using farm saved seed compete with the commercial seed production but not with plant breeding.

Germany ranks only on a middle class position in this list and moreover the seed change rate did fall below 50% in the last two years.

And what are the reasons why Danish farmers use nearly exclusively certified seed?

### **Differences in market conduct**

In Germany different organizations have sent questionnaires to farmers to investigate their opinion about certified seed. The results were always very similar: The farmers criticize the high price of certified seed and the poor quality.

To find the reasons of the different situation between Germany and for example Denmark we have to look at the incentives of the traders and VO-firms, because they carry out the seed multiplication management, seed processing and the actual sale of seed, consequently the main possible source of shortcomings in seed production.

## 10. What are the reasons for your company to be a VO-firm in the grain seed market?

-34 of 35 contacted VO-firms have answered-

(Please give the possible reasons a mark; 1 = most important to 5 = least important):

	average-mark
10.1 Because this activity is –independent of other effects- profitable: ----- →	2,29
10.2 Necessary in order to have a wide range of products and services: ----- →	1,91
10.3 A good possibility to improve the customer loyalty: ----- →	2,62
10.4 Fits without much more expenses our company: ----- →	3,59
10.5 The VO-activity helps to new customers: ----- →	3,82

*Source:* Josef Efken

The answers to this question –primarily the high ranking of the answers 10.2 and 10.3- show, that VO-firms see their company as suppliers of a broad range of services.

This characterization of the VO-firms will be underlined by the fact that 20 of the 35 VO-firms contacted said within the questionnaire that they also process the farm saved seed of the farmers, consequently carry out a service which competes with the distribution of certified seed.

But while this service oriented marketing strategy generally also appears in e.g. Denmark, a significant difference between the German and Danish grain seed market is the distinctly different concentration on the VO-firm market stage with more than 250 VO-firms in Germany and only between 10 and 20 in Denmark, where furthermore the two biggest have a market share of the traded certified seed from nearly 90%.

Thus the processing of the official seed has a clearly greater importance for the Danish VO-firms, respectively wholesalers, so that they have no interest in processing farm saved seed in order not to risk the market of certified seed. Furthermore their interests are entirely focused on the official grain seed market, so that they want to have certified seed which has a quality as good as possible, while German VO-firms indeed like to have qualitative good certified seed, it is not their sole interest because they are serving the farmer either with certified seed or with the processing of his own seed.

To reach a seed change rate as high as possible it consequently seems to be better to have a oligopolistic, competitive market constellation on the wholesale- and VO-firm- (that means seed multiplication management-) market stage.



Another basic difference among the seed grain market in Germany and Denmark and also the United Kingdom is found in the way how the market coordination mechanisms are arranged.

While in all of the EU member countries similar official minimum quality standards concerning certified seed exist, the Danish wholesalers have installed an additional performance oriented private contract system. Not the fulfillment of the minimum requirements is the unique hurdle, which the grain seed grower has to overcome, but the contract is in that way arranged, that the better his agricultural performance is (germination rate, purity, etc.), the more he receives per quantity of delivered seed.

In contrast to this, for the German seed grower it is sufficient to reach the prescribed official minimum requirements to get the payment for his service of multiplication. Thus even an excellent seed grower cannot expect additional payments if he e.g. produces seed with a germination rate of 99%. The contractual framework in Germany produces consequently no successive improvement of the quality of the certified seed, as the continuously high level of complaints within the scope of the control of certified seed traded proves.

The aggravating consequence is, that the seed demanding farmer indeed can get continuously improved varieties but not continuously improved commercial seed. Furthermore there exists no product differentiation on the seed level, so that a farmer, who desires to use seed with exquisitely good quality (e.g. Premium-seed), cannot find it on the commercial seed market.

Successful marketing of certified seed therefore requires to implement a detailed and performance-oriented contract system in order to realize and to maintain a system-immanent quality improvement, within the process of seed production. This is an important prerequisite to strengthen the economic position of the plant breeders given the still widespread use of farm saved seed.

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