

Farmers use of diversity
Case study - Europe - the Netherlands

Dr.ir. J.S.C. Wiskerke
Centre for Agriculture and Environment
P.O. Box 10015
3505 AA Utrecht
The Netherlands
Tel: +31 30 2441301
Fax: +31 30 2441318
E-mail: hwiskerke@clm.nl

Introduction: main characteristics of agricultural development in the Netherlands

Dutch agriculture changed considerably during the past five decades. Agricultural change in this period is characterised by three simultaneous patterns of development:

1. Scale-enlargement: the number of farms decreased from 410.000 in 1950 to 111.000 in 1996 while the percentage of the Dutch territory dedicated to agriculture decreased from 58% to 50% in that same period. The number of people employed in agriculture decreased from 581.000 to 284.000 (CBS 1997);
2. Intensification: the yields of arable crops increased by 42% to 140% between 1950 and 1996. For example, the yields of winterwheat increased from 3900 kg/ha in 1950 to 9100 kg/ha in 1996. In that same period the yields of potatoes increased from 25300 kg/ha to 44400 kg/ha (CBS 1997, Wiskerke 1997);
3. Specialisation: mixed farming systems gradually disappeared and specialised arable farms and livestock farms emerged. In arable farming winterwheat, potatoes and sugarbeets became the dominant crops and within each of these crops only a limited number of crop varieties were cultivated at national level. Individual farmers use to cultivate only one or two varieties per crop (Jongerden & Ruivenkamp 1996, Wiskerke 1997).

Plant breeding in the Netherlands: its contribution agricultural development

Improvement of yields in Dutch arable farming has been the result of a combination of new and improved farming methods and technological innovations on the one hand and the introduction of new and improved (i.e. higher yielding) plant varieties on the other hand. In this paper I'll focus on the contribution of plant breeding.

Plant breeding in the Netherlands has been a commercial activity since the beginning of the twentieth century. Commercialisation of plant breeding was enhanced by legal protection after the second world war: first by the the Breeders Decree 1941 and after that by the Seeds and Planting Materials Act (SPMA) of 1967. The SPMA regulates breeders rights and the trade of seeds and planting materials. The regulation of breeders rights is based upon the International Convention for the Protection of New Varieties of Plants,

better known as the UPOV-convention, which was signed in Paris in 1961. In the context of the SPMA a plant breeder can obtain breeders rights for a new plant variety if it meets the criteria of distinguishability, uniformity and stability. If these conditions are fulfilled, the new variety can be registered in the Netherlands Register of Varieties. This implies that for a period of 20 to 25 years (depending on the crop) no one but the owner (i.e. the breeder) is allowed to commercially (re)produce this variety (Wiskerke 1995).

Earlier measures taken in the 1920s were also intended to protect and reward the breeders labor. One of those measures was the Descriptive List of Varieties of Arable crops, hereafter referred to as the List of Varieties. The List of Varieties has been published annually since 1924. Initially the main objective of the List of Varieties was to provide a guideline for farmers in their choice of plant varieties. With the confirmation of the Breeders Decree 1941 its status changed: it took an obligatory form and became binding. In other words, only seeds and planting materials of varieties that were on the List of Varieties were admitted for domestic trade. The Committee for the compilation of the List of Varieties (CLV) decides whether a new variety should be placed on the List of Varieties. The decision of the CLV is based upon the so-called agricultural value research, which is undertaken by the Centre for Plant Breeding and Reproduction Research (CPRO) under the auspices of the CLV. The CLVs takes two criteria into account. First, a new variety has to be of sufficient value to Dutch agriculture, and secondly, a new variety has to be better than existing varieties. For the past decades these criteria have been translated into one single goal for plant breeders, namely higher yields. Because of the export-oriented character of Dutch agriculture, higher yields were considered to be a prerequisite to maintain and enhance the strong Dutch position in the international arena. Sufficient value was thus perceived as sufficient yield potential and better as higher yield potential than the yields of existing varieties (Wiskerke 1997). Due to its intermediary position between the goals shared by the Dutch government and the agricultural sector on the one hand and the objectives of plant breeders on the other hand, the List of Varieties has to a large extent determined the shape and contents of plant breeding activities in the Netherlands over a period of 50 years.

One of the major side-effects of this exclusive focus on higher yields in breeding programmes has been the loss of genetic diversity (Jongerden & Ruivenkamp 1996). Genetic characteristics such as taste, resistance to pests and diseases and quality aspects were considered to be of minor importance in breeding programmes. Pests, diseases and weeds could be controlled with pesticides, so there was no immediate need to incorporate genetic resistance in breeding programmes. And because several quality aspects, for instance baking quality of wheat, were negatively correlated with yield potential, these genetic characteristics were also excluded from breeding programmes (Wiskerke 1997).

Concluding it can be argued that the contribution of plant breeding to the intensification and specialisation of Dutch agriculture has been successful in terms of its initial goals. At the same time it has resulted in the loss of diversity in general and especially in the loss of genetic diversity (Werkgroep Genenbanken 1998). This has, although unintendedly, been the result of the specific Dutch organisation of plant breeding with the List of

Varieties as a steering element within this organisation (Jongerden & Ruivenkamp 1996, Wiskerke 1997).

Farmers use of genetic diversity: examples from arable farming in the province of Zeeland

The description of the development of Dutch agriculture and the specific contribution to this development by plant breeding may lead to the conclusion that it is needless to discuss farmers use of genetic diversity. After all, the genetic diversity within arable crops is limited. However, recent research among arable farmers in the province of Zeeland (Wiskerke 1997) demonstrates that even within a rather homogeneous genetic context there is still diversity with respect to the choice of crop varieties and the demand for specific genetic characteristics. This diversity is amongst others related to different farming styles.

Before clarifying this diversity, let me first explain the concept of farming style. A farming style is a specific ordering of numerous farming related aspects based upon farmers notions of the way farming ought to be carried out. A farming style thus reflects a specific strategy with respect to farm management and development. Farmers themselves use folk concepts to classify themselves and others and to distinguish one style from the other. In arable farming in the province of Zeeland, five different farming styles can be identified (see table 1).

Table 1. Names and characteristics of farming styles in arable agriculture in Zeeland

Name	Characteristics
Yield farmer bulk	Intensive land use, high yields, high use of pesticides and fertiliser, production (wheat, potatoes, sugarbeets, unions)
Machine farmer extensive crop sugarbeets)	Large scale, high level of mechanisation and specialisation, rotation, bulk production (wheat, potatoes,
Thrifty farmer land use	Low costs, low input level (pesticides and fertiliser), extensive
Plantgrower yields), potatoes)	High technical efficiency (relative low level of inputs and high variety of arable crops, value added (e.g. seed
Quality farmer added,	Small scale, labor intensive, special products and crops, value production for niche markets

Source: Wiskerke (1997)

I will use wheat cultivation as an example to illustrate the use of genetic diversity. Looking at wheat production hardly any relationship exists between farming styles and the choice of wheat varieties. Yield farmers and machine farmers tend to prefer high yielding fodder wheat varieties such as Vivant, while the quality farmers show a preference for low yielding baking wheat varieties such as Hereward and different summerwheat varieties. The other two styles have an intermediate position. At the level of genetic characteristics clearer relationships appear (see table 2)

Table 2. Relationship between genetic characteristics of wheat and farming styles

Suitability as cover crop	Resistance to diseases		Yield versus baking quality		Straw sturdiness		
Yield farmer ab	-.06	a	.24	a	-.15	a	-.06
Machine farmer a	.03	ab	.24	a	-.03	a	-.24
Thrifty farmer -.13	a		-.41	b	.10	a	.23
Plantgrower b	-.15	a		-.10	ab	.27	a
Quality farmer .49	b		-.37	b	-.21	a	-.05

Calculated scores (i.e. indication of correlation) per colom followed by different letters are significantly different (t-test: $p < 0.05$).

Source: Wiskerke (1997).

Table 2 for instance demonstrates that resistance to diseases is an important characteristic for quality farmers. Yield is important to yield farmers and machine farmers and not to thrifty farmers and quality farmers. Instead the prefer good baking quality. For thrifty farmers and plantgrowers its important to grow wheat that is suitable as a cover crop. This preference can be explained by the fact that good soil management is an important element of these two farming styles.

Similar relationships between genetic characteristics and farming styles also exist for other arable crops (Wiskerke 1997). This means that farmers themselves do not always share the same view as the CLV when it comes down to defining criteria as sufficient agricultural value and better than existing varieties. The above also demonstrates that there is a need among farmers for more diversity than the CLV has allowed for a long period of time.

Creating diversity

Although there seems to be a demand for more diversity on the List of Varieties, most arable farmers do not perceive the varieties currently available as a constraint to their

practices and strategies. However, a small group of arable farmers in Zeeland is of the opinion that the List of Varieties limits their goals and strategies. These farmers are united in an initiative called Zeeuwse Vlegel. In 1990 they founded a corporation. The corporation's objective is to realise an ecologically sound and profitable cultivation of high quality baking wheat and to establish close contact between producers and consumers. Together the participating farmers produce 250 tons of wheat meal that is sold to 108 bakers. Zeeuwse Vlegel bread is sold in 265 bakeries and supermarkets (Wiskerke 1997). To meet the corporation's objective the participating farmers decided to abandon the use of pesticides and chemical fertilisers.

This objective of the Zeeuwse Vlegel can be seen as a critical reaction to mainstream agricultural development in the Netherlands. One farmer explains: *You know where your wheat ends up and where and how it is milled. You have more insight into the producer-consumer chain. That's very important as far as I'm concerned. Most arable farmers just don't know where their wheat ends up or what is done with it.* Another farmer adds: *I became convinced that conventional arable farming was a dead-end street. The increasing dependence on pesticides bothered me. I wanted to change that and the Zeeuwse Vlegel provided me with the opportunity to gain experience with environmentally sound wheat cultivation.*

The main problem confronting the Zeeuwse Vlegel was (and still is) how to obtain wheat varieties that suited its objective. The List of Varieties was of little help as most registered varieties are high-yielding non-baking wheat varieties. In addition, the few baking wheat varieties on the List of Varieties are very susceptible to diseases and therefore of little use. Through international contacts the Zeeuwse Vlegel managed to obtain baking wheat varieties from different European countries (Belgium, France, Germany) that suited its objectives. As these varieties are registered on the EU-List of Varieties, the cultivation of these varieties is allowed in all member states. By growing a wide range of varieties that are not common to Dutch agriculture the Zeeuwse Vlegel contributes to creating genetic diversity at regional level. Recently the Zeeuwse Vlegel has reached an agreement with the Centre of Genetic Resources and the Louis Bolk Institute to examine the possibilities of using landraces and old baking wheat varieties in organic farming and sustainable production systems like the Zeeuwse Vlegel.

This brief description of the Zeeuwse Vlegel demonstrates that small groups of farmers succeed in creating genetic diversity instead of just using what's available. Creating diversity however demands a lot of effort and innovation. More often than not such initiatives are hampered by institutionalised economic and political networks as described in the second paragraph of this paper. Hopefully the efforts of the Zeeuwse Vlegel contribute to a thorough restructuring of this network, especially with respect to the legal system (UPOV, SPMA) and the criteria used in compiling the List of Varieties.

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