

**Project number:** 5375  
**Funding source:** Teagasc

**Date:** Sept, 2012  
**Project dates:** Jan 2005 - Dec 2008

## An assessment of the potential of cultivar mixtures in Ireland



### Key external stakeholders:

Cereal growers, advisers and agronomists, cereal seed suppliers

### Practical implications for stakeholders:

Using cultivar mixtures rather than single cultivar monocultures has been shown internationally to have potential in low input and organic production systems. However cultivar mixtures have not previously been extensively assessed under Irish conditions and in particular under high input conditions. Results from this work indicate that cultivar mixtures offer little advantage or disadvantage, other than the cost of mixing seed, over single cultivar stands for winter wheat and spring barley under high input Irish conditions. Similarly there was little evidence to support the use of cultivar mixtures under organic conditions in Ireland.

### Main results:

There was no grain yield or grain quality benefit, compared to using single cultivar monocultures, of mixing cultivars of either winter wheat or spring barley under Irish conditions under conventional high input or organic conditions.

There was some indication that mixtures could reduce variation in yield and quality between environments but effects were small.

There was no indication that cultivar mixtures were more efficient than single cultivar stands in terms of nitrogen use efficiency.

### Opportunity / Benefit:

The work suggests that the use of cultivar mixtures under productive Irish conditions gives little benefit and growers should continue to use single cultivar stands

### Collaborating Institutions:

University College Dublin

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### 1. Project background:

Most cereals in Ireland are grown in cultivar monocultures with high levels of external inputs. However cultivar monocultures can have disadvantages such as vulnerability to diseases and yield instability as a result of year to year and site to site variation in environmental conditions. International work would suggest that the use of cultivar mixtures could offer a potential method of reducing the need for external inputs, increasing yield through better resource utilization and increasing yield stability over sites and seasons. Much of the previous work with cereal cultivar mixtures has focused on their ability to reduce the effects of fungal pathogens, particularly in low input systems. Their potential in systems where fungal diseases are controlled with fungicides and high levels of inputs are applied, as occurs in Irish cereal production systems, has received relatively little attention.

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### 2. Questions addressed by the project:

Are mixtures of cultivars higher yielding than single cultivar stands for winter wheat and spring barley in high input Irish production systems?

Do mixtures offer greater yield stability between sites and seasons than single cultivars?

Do mixtures utilize resources more efficiently than single cultivar stands?

Do cultivar mixtures outperform single cultivar stands under organic conditions?

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### 3. The experimental studies:

A series of field experiments with winter wheat and spring barley were carried out over three seasons 2006-2008 with normal commercial levels of pesticide and fertilizer inputs. Spring barley experiments were repeated at four locations in each season. Four cultivars of spring barley were compared with a range of mixtures of these cultivars varying in number and proportion of component cultivars. Winter wheat experiments were carried out at one location and the cultivars and composition of the mixtures used varied between seasons. Some experiments included different fertilizer N levels to determine if cultivar mixtures, by using nitrogen more efficiently, could lead to a reduced requirement for fertilizer N. Grain yield, grain quality and in some experiments the cultivar composition of the mixtures at harvest was determined.

A comparison of four-component cultivar mixtures with their component cultivar monocultures of spring barley was carried under organic conditions in two seasons (2006 and 2007) at Oak Park Research Centre.

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### 4. Main results:

Results of experiments carried out under conventional inputs did not show any advantages of cultivar mixtures over cultivar monocultures in terms of grain yield or quality enhancement due to better resource use efficiency for the two crops investigated under Irish conditions. Grain yield of mixtures was similar to the mean yield of the component cultivars grown in monoculture. There was also no indication, in any of the experiments carried out, that the use of cultivar mixtures might allow the reduction of fertiliser N inputs. Results did suggest that mixtures can be beneficial in terms of grain yield and quality stability across environments but effects were small and inconsistent. Overall the work did not show any significant benefits of mixtures of either spring barley or winter wheat in conventional production systems. There was also no indication of any consistent advantage of using cultivar mixtures under organic conditions in terms of either grain yield or grain quality.

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### 5. Opportunity/Benefit:

The results indicate that cultivar mixtures of either winter wheat or spring barley are of little advantage to Irish cereal producers compared to cultivar monocultures.

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**6. Dissemination:**

Fabre, P. 2010 An assessment of cereal cultivar mixtures in Ireland. PhD thesis, Faculty of Agriculture, University College Dublin.

Fabre, P. et al. (2008) Stability of spring barley cultivar mixtures and monocultures., *Agricultural Research Forum*, Tullamore , 12-13 Mar 08.

Hackett, R and Fabre, P. 2005 An assessment of the potential of cultivar mixtures under conventional and organic management systems in Ireland. Crops Research Centre Oak Park Research Report 2005 p. 30

Hackett, R and Fabre, P. 2006 An assessment of the potential of cultivar mixtures under conventional and organic management systems in Ireland. Crops Research Centre Oak Park Research Report 2006 pp17-18

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**7. Compiled by:** Richie Hackett

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