Intelligent crop production

Active Farming

3C – the crop establishment concept

Westerkappeln II trials site

Conventional and conservation arable farming using a fertiliser strategy based on stabilised Nitrogen fertiliser

*

Overview of the results

System techniques

Details

AMAZONE

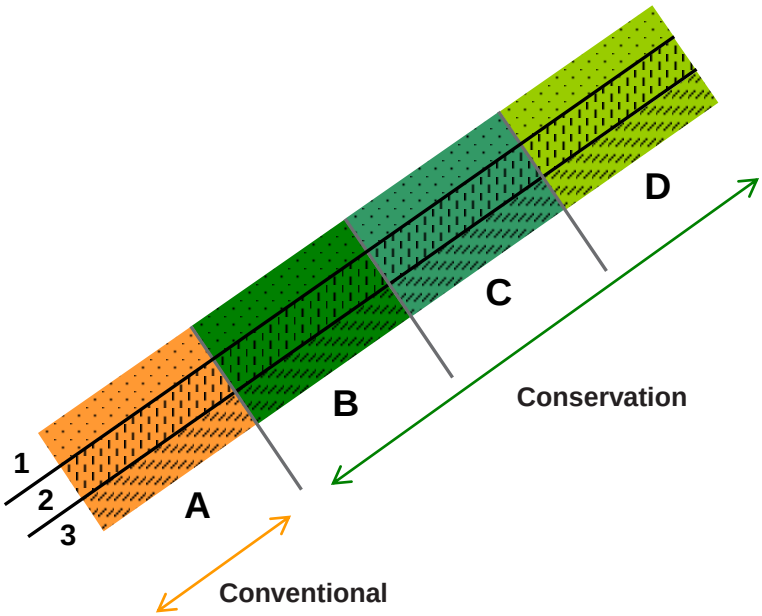
* Here, in this trial, only one crop (winter wheat) is monitored and so the site for the trial changes from year to year.

Overview of the results: Westkappeln II trials site

Aim of the trials:

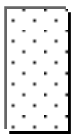
Are there advantages over the plough in using conservation tillage techniques in sandy, loam locations and differing Nitrogen fertiliser strategies?

Trials structure:



Plot A	Plot B	Plot C	Plot D
Plough 25 cm	Mulch sowing 22 cm	Mulch sowing 15 cm	Mulch sowing 8 cm

Fertilisation:



1: 52 kg N/ha as ASS
2: 138 kg N/ha as Nstab

1: 120 kg N/ha as Nstab
2: 70 kg N/ha as Nstab

1: 120 kg N/ha as Nstab+S
2: 70 kg N/ha as Nstab

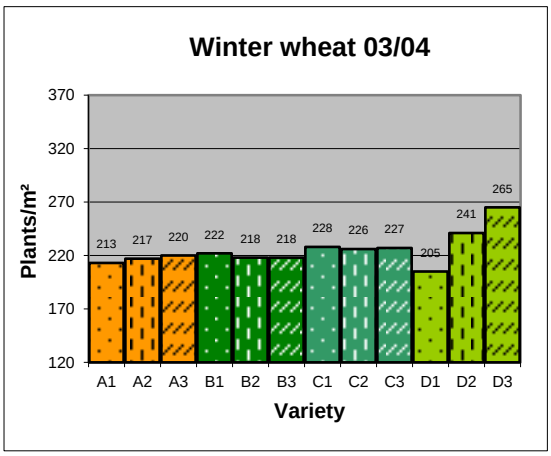
Initially, a stubble cultivation is carried out over all the plots with a compact disc harrow. Plot A is ploughed at a depth of 28 cm. In the min-till plots B and C, the soil tillage is carried out with a tine and disc combination cultivator at a depth of 20 cm and at 10 cm respectively. Plot D is worked again with the compact disc harrow at a depth of 8 cm.

As fertiliser, a Nitrogen stabilised fertiliser was used, with and without, Sulphur and as a farm-representative system, ASS was also applied.

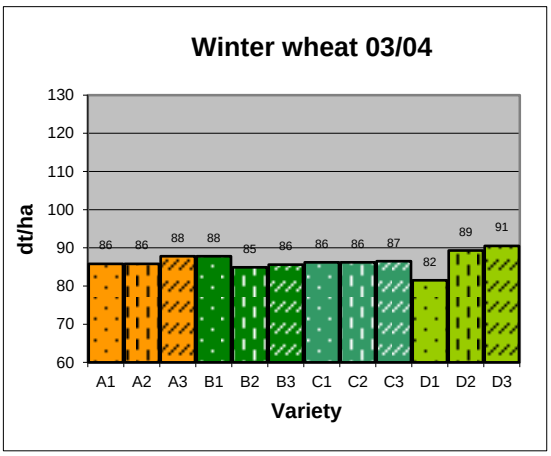
For seeding there is also just one level of intensity; all the plots are sown with an active seed drill combination.

Trials results 03/04 – 05/06:

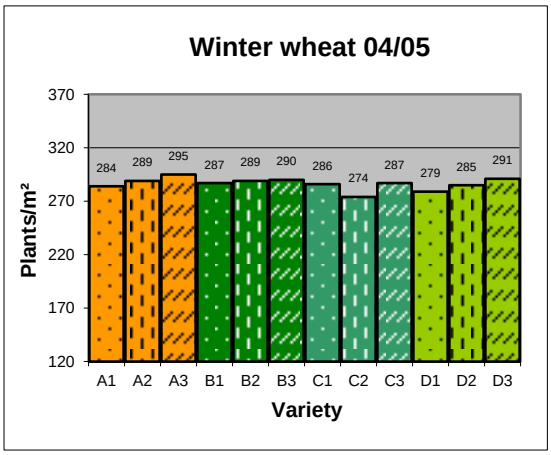
Plant emergence



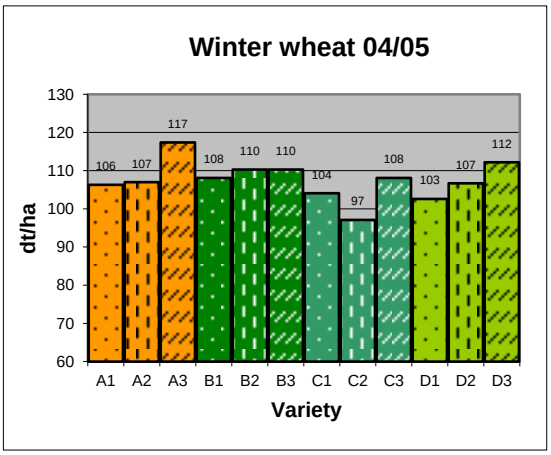
Yield



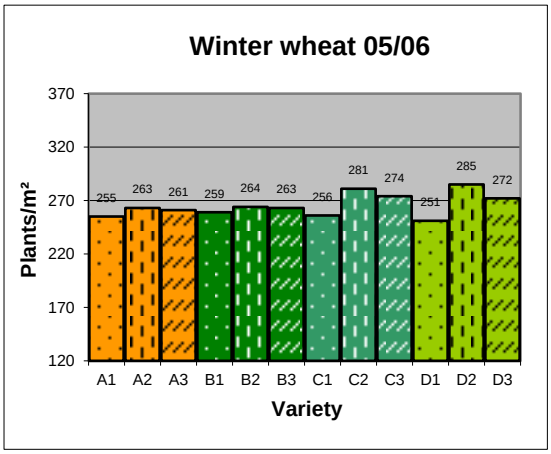
Plant emergence



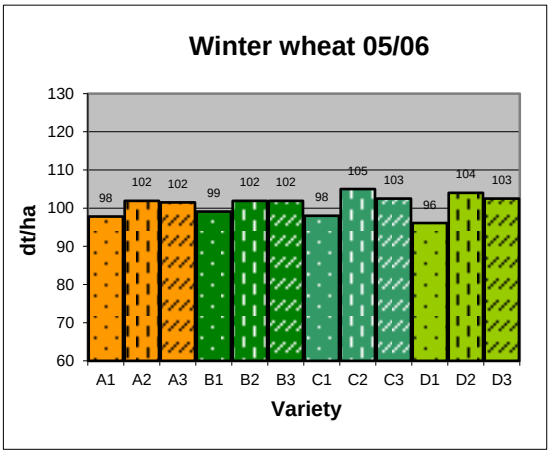
Yield



Plant emergence

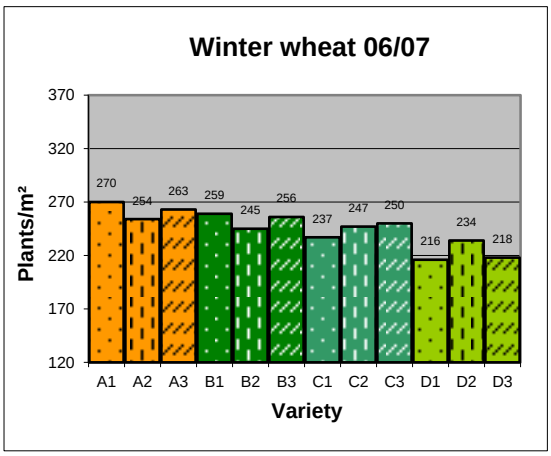


Yield

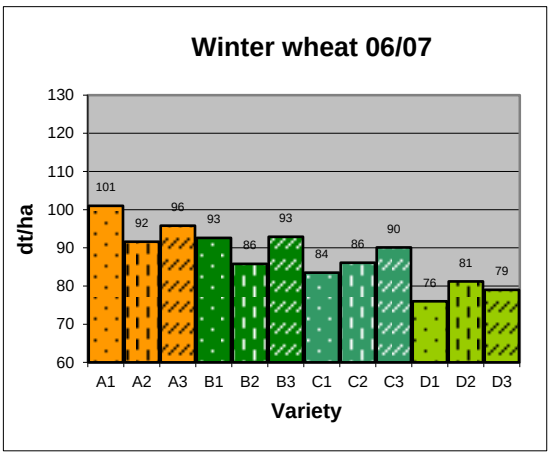


Trials results 06/07 – 08/09:

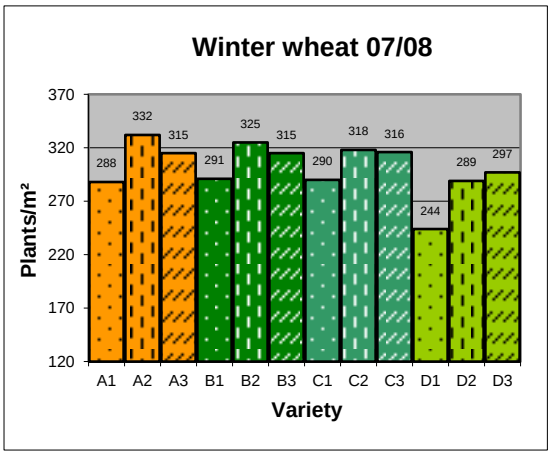
Plant emergence



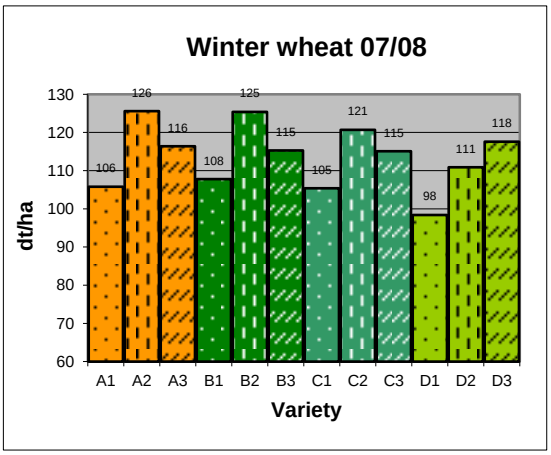
Yield



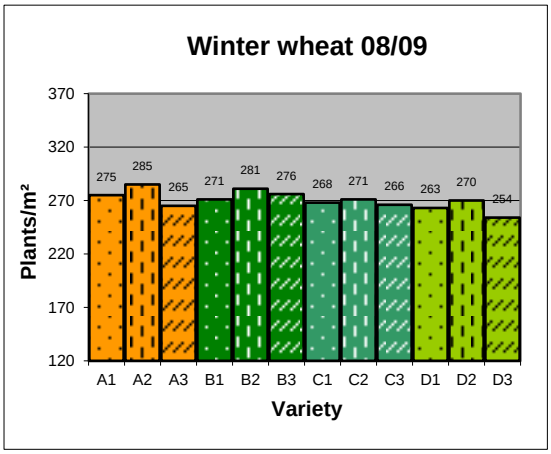
Plant emergence



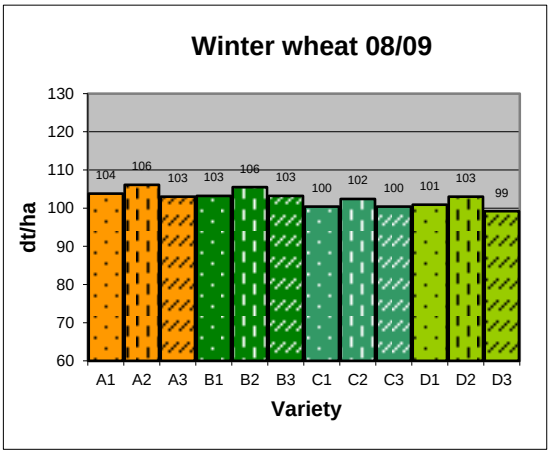
Yield



Plant emergence

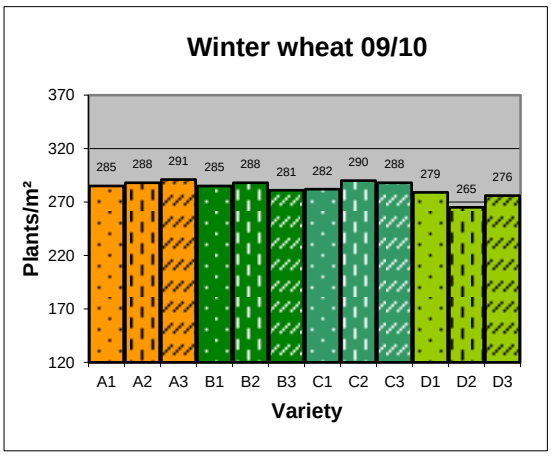


Yield

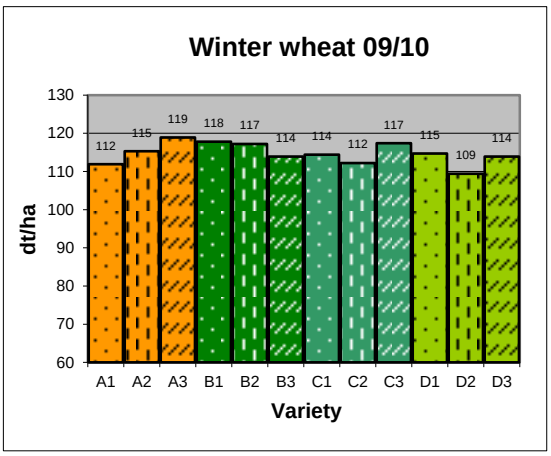


Trials results 09/10 – 10/11:

Plant emergence



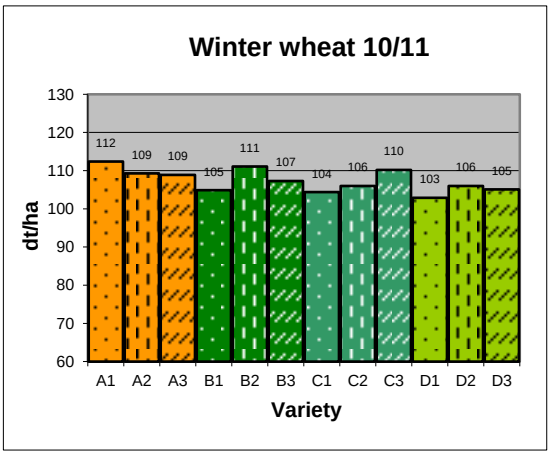
Yield



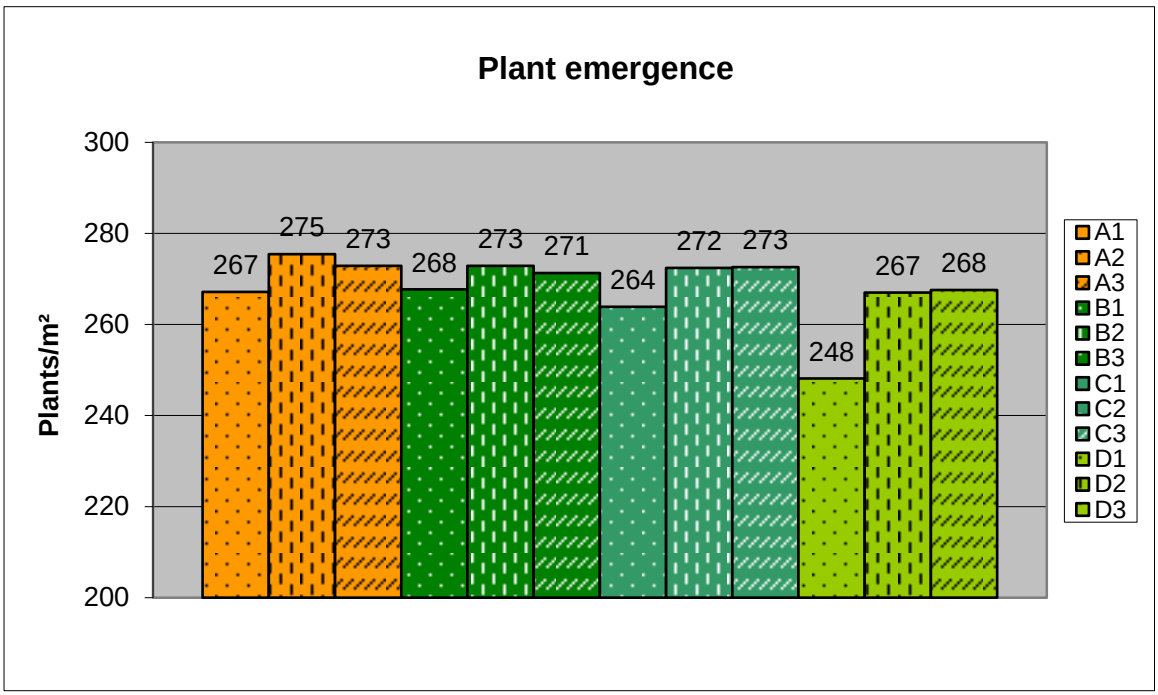
Plant emergence

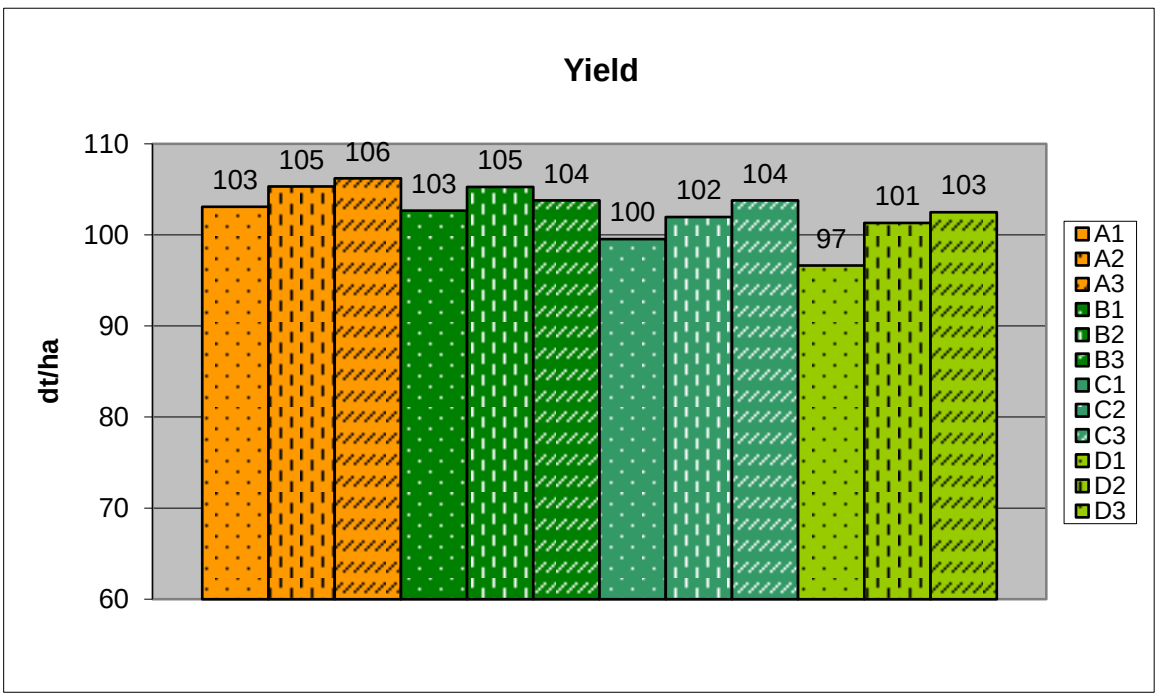
Data not collected
in this trials year!

Yield



Average trials results 03/04 – 10/11:



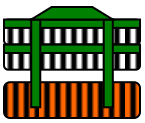


System techniques: Westerkappeln II trials site

Trial plots for tillage, seedbed preparation and sowing

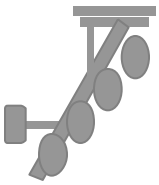
	Plot A Plough 25 cm			Plot B Mulch sowing 22 cm			Plot C Mulch sowing 15 cm			Plot D Mulch sowing 8 cm		
	Plot A1	Plot A2	Plot A3	Plot B1	Plot B2	Plot B3	Plot C1	Plot C2	Plot C3	Plot D1	Plot D2	Plot D3
Stubble working	Catros 6 cm											
Tillage	Plough 25 cm			Cenius 22 cm			Cenius 15 cm			Catros 8 cm		
	Catros											
Seedbed and sowing	KG - AD-P Super											

Stubble cultivation



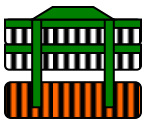
Catros
on all variants

Soil tillage



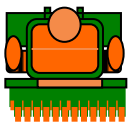
Plough in A

Cenius
on all variants



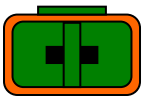
Catros in D
(and in A after the plough)

Sowing



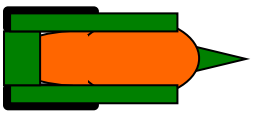
AD-P Super
on all variants

Fertilisation



ZA-M
on all variants

Crop protection



UX
on all variants

AMAZONE trials site in the Westerkappeln region (North Rhein Westfalia)

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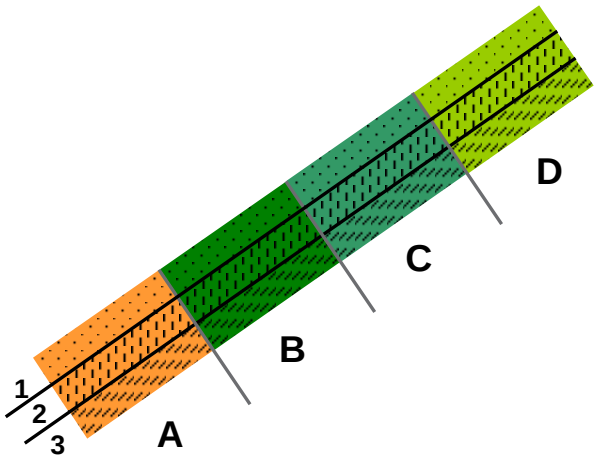
Alongside the trials site at the farm of Hermann Helmich in Westerkappeln



Plot A was worked conventionally with the plough, plots B, C, D & E were worked using conservation tillage techniques and then each was fertilised using 3 fertiliser variants.

Stubble cultivation over the whole area using a Catros compact disc harrow (6 cm deep).

Differing degrees of soil tillage carried out at varying depths using the plough, cultivator and compact disc harrow.

As fertiliser, a Nitrogen stabilised fertiliser was used, with and without Sulphur, and as a farm-representative system, ASS was also applied.

For seeding there is also just one level of intensity; all the plots are sown with an active seed drill combination.

Site data	
Soil	Loamy sand/sandy loams, brown soil
Climate	Annual rainfall 800 mm, average temperature: 8.5°C
Crop rotation	Maize, winter wheat, winter barley
Tramline width	15 m

Trial results in an overview :

When mulch sowing methods are used, strategies with N-stabilised fertilisers produce better results than strategies with partially or non-stabilised fertilisers.

A relatively high first N application with stabilised fertilisers before the beginning of vegetation also turns out to be of advantage for mulch sowing systems.

Crop control via a two application strategy with N-stabilised fertilisers leads to optimum yields and profitability when they are combined with N-min sampling and/or the use of a N-sensor for the second application.

Trial plots for fertilisation

	Plot A Plough 25 cm			Plot B Mulch sowing 22 cm			Plot C Mulch sowing 15 cm			Plot D Mulch sowing 8 cm		
	Plot A1	Plot A2	Plot A3	Plot B1	Plot B2	Plot B3	Plot C1	Plot C2	Plot C3	Plot D1	Plot D2	Plot D3
Stubble working	Catros 6 cm											
Tillage	Plough 25 cm			Cenius 22 cm			Cenius 15 cm			Catros 8 cm		
	Catros											
Seedbed and sowing	KG - AD-P Super											
Fertilisation 1. application: beginning of vegetation	52 kg N/ha ASS	120 kg N/ha Nstab	120 kg N/ha Nstab+S	52 kg N/ha ASS	120 kg N/ha Nstab	120 kg N/ha Nstab+S	52 kg N/ha ASS	120 kg N/ha Nstab	120 kg N/ha Nstab+S	52 kg N/ha ASS	120 kg N/ha Nstab	120 kg N/ha Nstab+S
Fertilisation 2. application: ES 30–32 stalk extension	138 kg N/ha Nstab	70 kg N/ha Nstab	70 kg N/ha Nstab	138 kg N/ha Nstab	70 kg N/ha Nstab	70 kg N/ha Nstab	138 kg N/ha Nstab	70 kg N/ha Nstab	70 kg N/ha Nstab	138 kg N/ha Nstab	70 kg N/ha Nstab	70 kg N/ha Nstab

Yield results (dt/ha) in comparison

	Plot A Plough 25 cm			Plot B Mulch sowing 22 cm			Plot C Mulch sowing 15 cm			Plot D Mulch sowing 8 cm		
	Plot A1	Plot A2	Plot A3	Plot B1	Plot B2	Plot B3	Plot C1	Plot C2	Plot C3	Plot D1	Plot D2	Plot D3
Winter wheat 03/04												
Seed rate seeds/m²	300											
Seedling emergence (plants/m²)	213	217	220	222	218	218	228	226	227	205	241	265
Yield dt/ha	**86**	**86**	**88**	**88**	**85**	**86**	**86**	**86**	**87**	**82**	**89**	**91**
Winter wheat 04/05												
Seed rate seeds/m²	300											
Seedling emergence (plants/m²)	284	289	295	287	289	290	286	274	287	279	285	291
Yield dt/ha	**106**	**107**	**117**	**108**	**110**	**110**	**104**	**97**	**108**	**103**	**107**	**112**
Winter wheat 05/06												
Seed rate seeds/m²	300											
Seedling emergence (plants/m²)	255	263	261	259	264	263	256	281	274	251	285	272
Yield dt/ha	**98**	**102**	**102**	**99**	**102**	**102**	**98**	**105**	**103**	**96**	**104**	**103**
Winter wheat 06/07												
Seed rate seeds/m²	300											
Seedling emergence (plants/m²)	270	254	263	259	245	256	237	247	250	216	234	218
Yield dt/ha	**101**	**92**	**96**	**93**	**86**	**93**	**84**	**86**	**90**	**76**	**81**	**79**
Winter wheat 07/08												
Seed rate seeds/m²	300											
Seedling emergence (plants/m²)	288	332	315	291	325	315	290	318	316	244	289	297
Yield dt/ha	**106**	**126**	**116**	**108**	**125**	**115**	**105**	**121**	**115**	**98**	**111**	**118**
Winter wheat 08/09												
Seed rate seeds/m²	300											
Seedling emergence (plants/m²)	275	285	265	271	281	276	268	271	266	263	270	254
Yield dt/ha	**104**	**106**	**103**	**103**	**106**	**103**	**100**	**102**	**100**	**101**	**103**	**99**
Winter wheat 09/10												
Seed rate seeds/m²	300											
Seedling emergence (plants/m²)	285	288	291	285	288	281	282	290	288	279	265	276
Yield dt/ha	**112**	**115**	**119**	**118**	**117**	**114**	**114**	**112**	**117**	**115**	**109**	**114**
Winter wheat 10/11												
Seed rate seeds/m²												
Seedling emergence (plants/m²)												
Yield dt/ha	**112**	**109**	**109**	**105**	**111**	**107**	**104**	**106**	**110**	**103**	**106**	**105**
Average												
Seedling emergence (plants/m²)	267	275	273	268	273	271	264	272	273	248	267	268
Yield dt/ha	**103**	**105**	**106**	**103**	**105**	**104**	**100**	**102**	**104**	**97**	**101**	**103**

Appraisal of the trial results from Westerkappeln II

Improved traffic carrying ability of the soils after conversion to a mulch sowing system can also be noticed on the Westerkappeln site. The infiltration capacity has increased so that even intense rain does not cause problems any more. Because soil life is more active also straw rotting has improved.

In respect of fertilisation strategies suited best for mulch sowing systems the following recommendations can be derived from the trials: Considering the average of the individual fertilisation plots across all tillage methods one can see that plot C (1st application: 40 % sulphur, stabilised N fertiliser (120 kg N); 2nd application: 46 % stabilised N fertiliser (70 kg N)) produced the highest yield result. The plot B, also with a relatively high first application dose of a stabilised N fertiliser, reaches a medium level.

Depending on the crop development in the autumn and further weather developments in winter, the first N dose should be applied as early as possible. The first application in mid-February with stabilised N mineral fertiliser (about 120 kg/N/ha) and the second application at growth stage ES 30 – 32 with about 70 kg N/ha. It is also important here to provide a sufficient Sulphur supply along with fertilisation.

If the crops are supplied with Nitrogen in time, the risk of shortages due to dryness in the spring are considerably lower. Because the advantages that stabilised N fertilisers offer consist in the fact that they release nutrients only when the temperatures rise, they are available to the crops exactly at the time when they are needed. At the same time this produces the effect that the application times for the first and second application can be carried out more flexibly which enables a reduction in the work peaks often found in the spring.