

# Linked ICARDA agronomy research 2007-08

- » zero-till and stubble mulching
- » alternative crops

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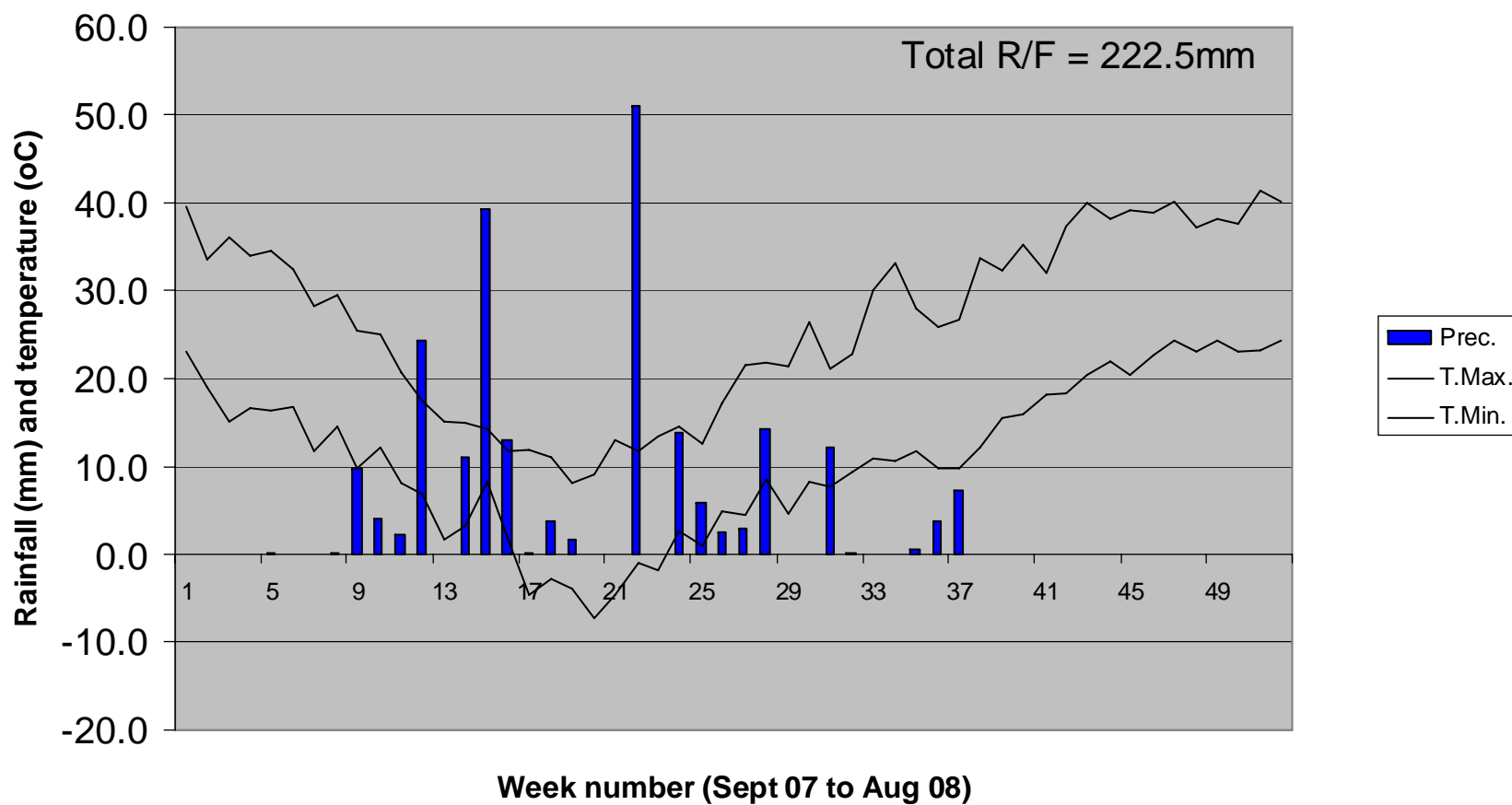
ACIAR CIM/2004/024 Better crop germplasm and management for improved production of wheat, barley and pulse and forage legumes in Iraq

Reporting-planning meeting, ICARDA, 7-11<sup>th</sup> Sept 2008

# ICARDA rainfall

R/F (26 Oct – 22 May) = 222mm

Weekly rainfall and mean maximum and minimum temperatures



# Potential yields

- rainfall late Oct 07 to 30 April 08 = 222mm
- potential yield = available moisture x WUE
  - wheat =  $(222 - 60\text{mm}) \times 20\text{kg/mm} = 2.8 \text{ t/ha}$
  - lentil =  $(222 - 115\text{mm}) \times 15\text{kg/mm} = 1.6 \text{ t/ha}$

## Constraints

Rainfall to 22 May: 222mm

18 Dec-6 Feb: 46 days with minimum at 5cm: - 0.4 to - 11.5°C

23-27 Apr: 6 days 35-39°C



# Zero-tillage 2007-08

## Trials

- lentil after wheat (C16) – LT trial
- wheat, chickpea, barley, lentil rotation (B4) – LT trial

## Treatments

### Establishment

- conventional cultivation
- zero-till/stubble retained

### Time of sowing (only C16)

- early
- late

# Lentil on wheat stubble – C16

2007-08

Zero-till



6 April 08

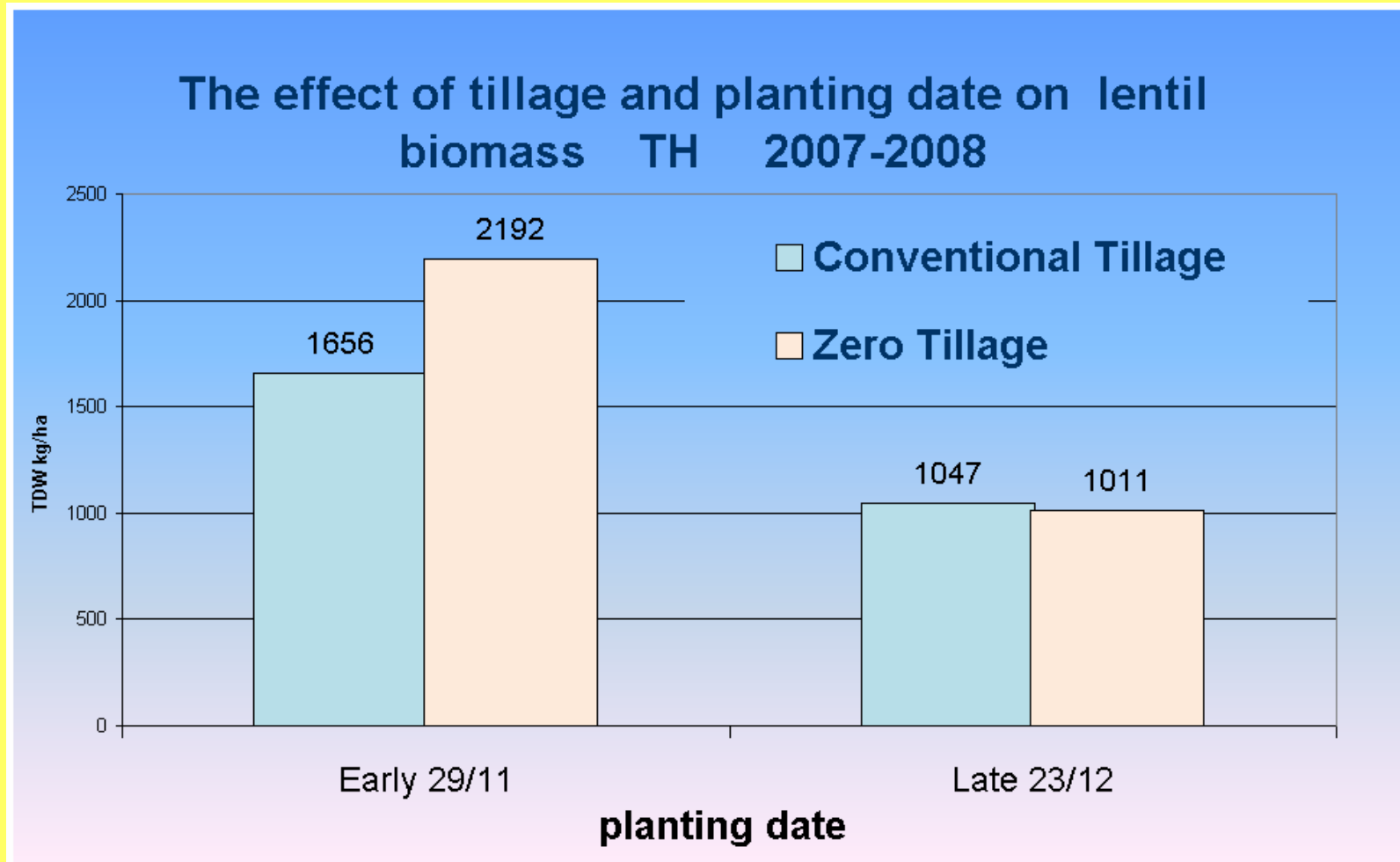
Early sowing  
28-29 Nov 07

Conventional till



Late sowing  
23 Dec 07





**Sig effects: Dates \*\*; Tillage x dates \***

**LSD: Within T = 317; T x D = 357**

# Lentil on wheat stubble – C16

2007-08

Zero-till

29 April 08

Conventional till



Early sowing  
28-29 Nov 07



Late sowing  
23 Dec 07



# Lentil on wheat stubble – C16

2007-08

29 Apr 08



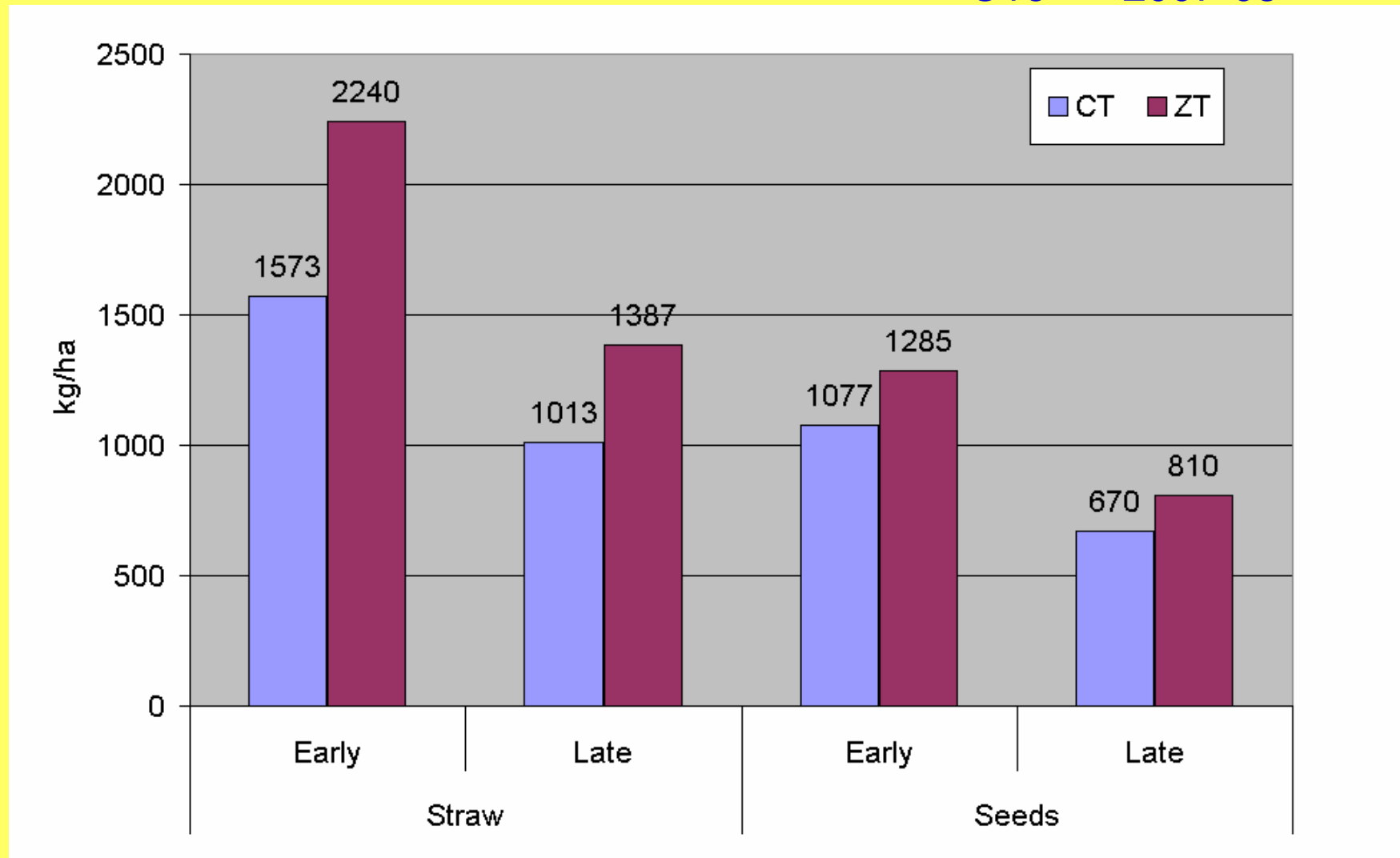
18 May 08





# Straw and grain yields (kg/ha)

Lentil on wheat stubble -  
C16 2007-08



Main effects:

**Tillage\*; Date\*\***

**Tillage\*; Date\*\***

LSD (5%):

**Tillage = 358 kg/ha**

**Tillage = 147 kg/ha**

**Date = 211 kg/ha**

**Date = 202 kg/ha**



# Zero-tillage

4 crop rotation – B4

2007-08

Photos 2 April 08

## Zero-till

1 Nov 07



11 Nov 07



29 Nov 07



28 Nov 07



Barley

Wheat

Chickpea

Lentil

26 Nov 07



26 Nov 07



23 Dec 07

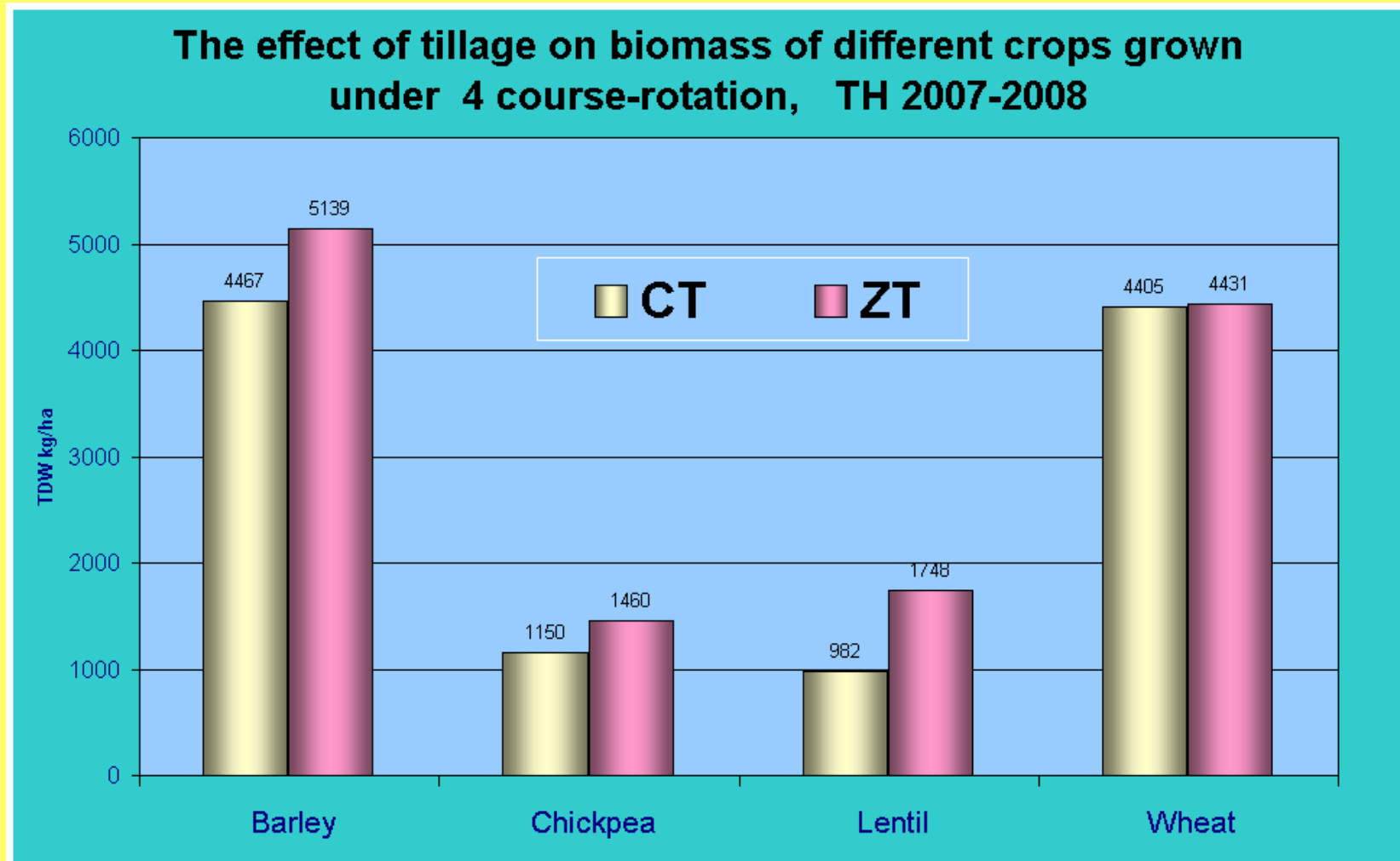


24 Dec 07



## Conventional till

Sampling: 6 April 08



LSD

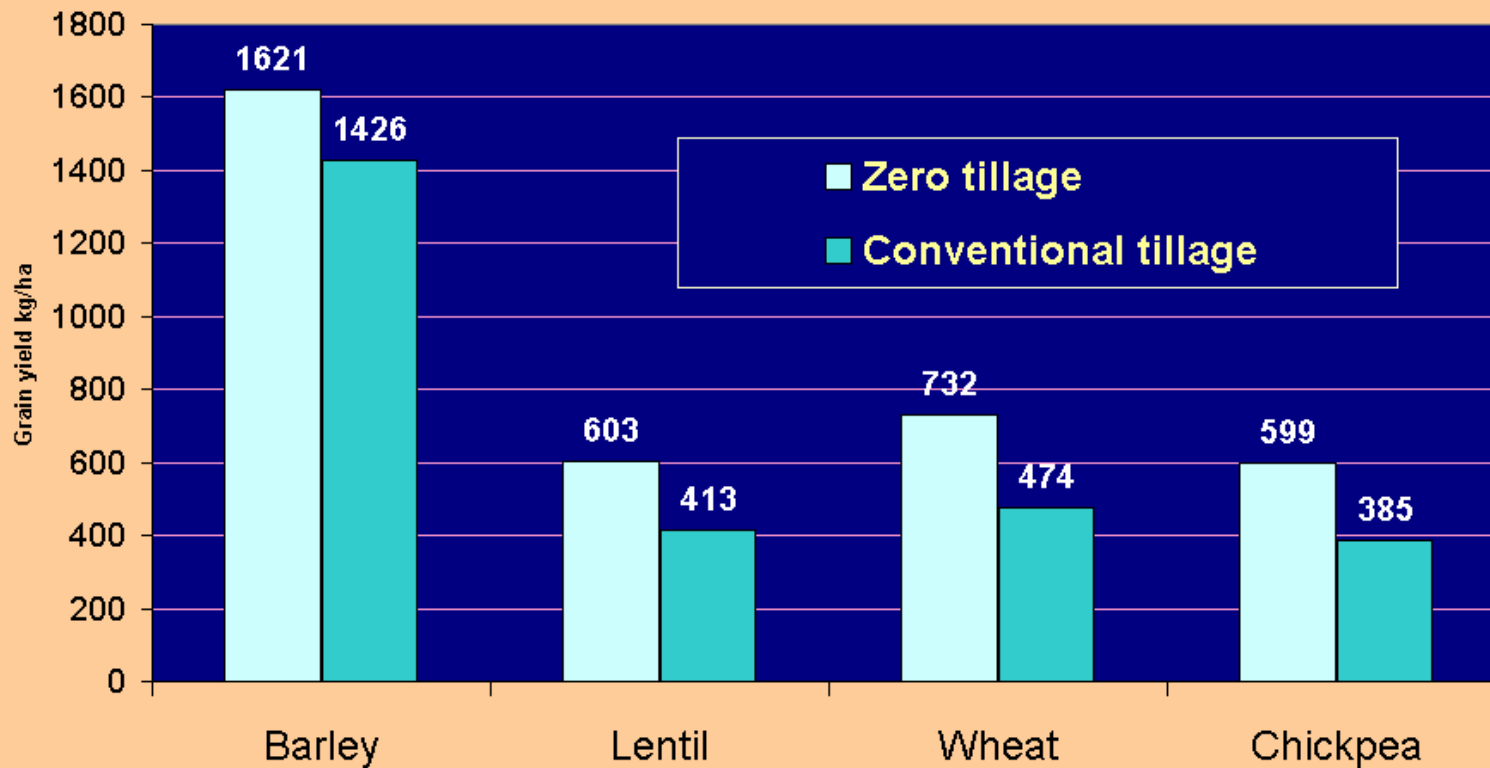
Main effects:

Crops = 636\*\*; Tillage NS

Interactions:

Crops x tillage NS

*The effect of tillage practices on grain yield of cereal/legume 4 course rotation TH 2008*



LSD

Main effects:

Tillage = 74 \*\*; Crops = 104 \*\*

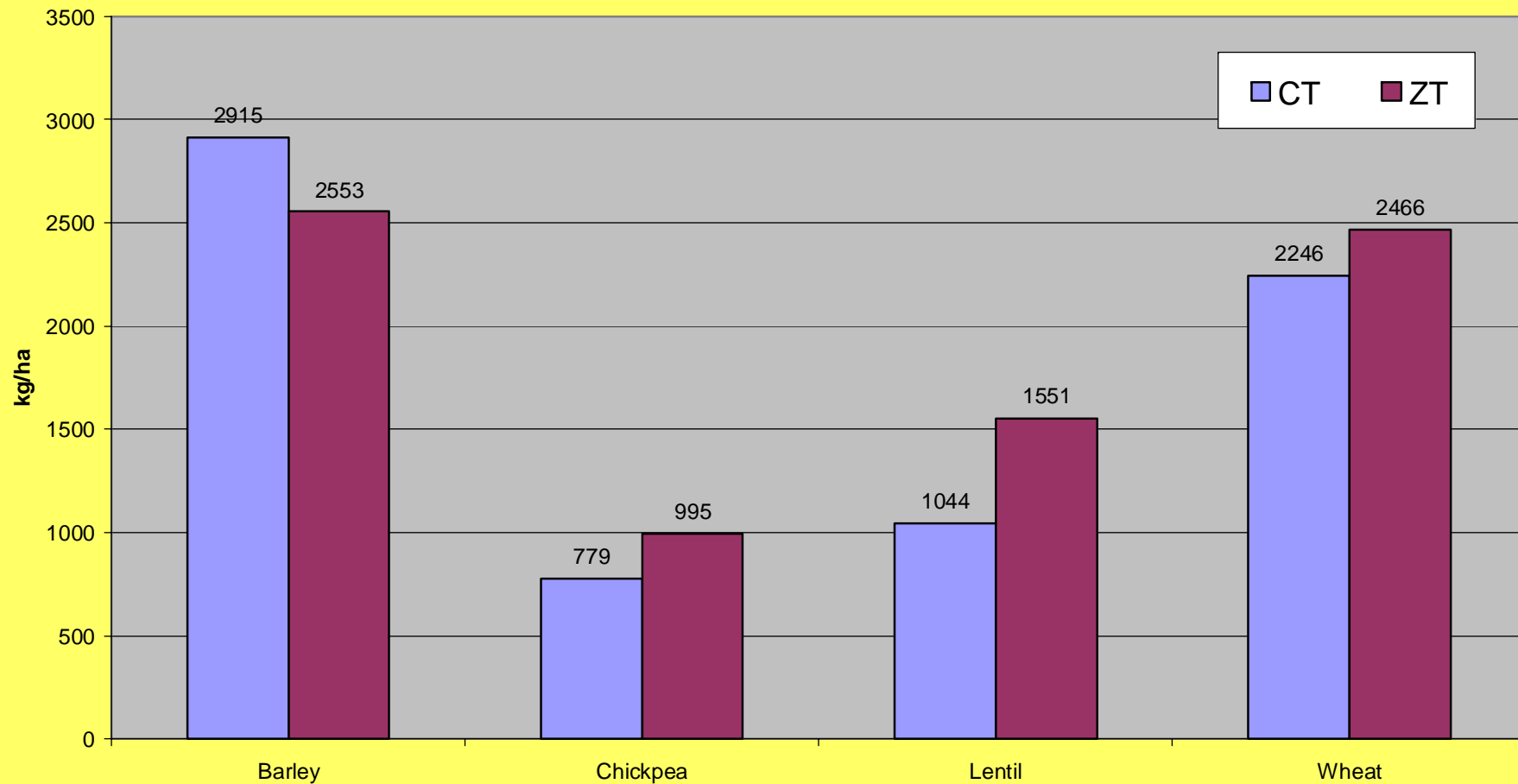
Interaction:

Crops x tillage NS ( $LSD_{BT} = 135$ ;  $LSD_{WT} = 147$ )



# Zero-tillage 4 crop rotation – B4 2007-08

The effect of tillage practices on straw yield of cereal/legume 4-course rotation TH 2008



LSD

Main effects:

Crops = 419 \*\* ; Tillage = NS

# ZT at ICARDA

2004/05

0.4ha (B7) – 16 plots

2007/08

0.4ha (B7)

3.0ha (B4)

6.0ha (C16)

8.0ha (C15) - barley seed prodn

17.4ha

2008/09?

More trials and seed production



## Cost of field operations in cereal/legume rotations under CT and ZT

Crop	Operation	Conventional tillage		Zero tillage		
		Implement	Cost SL/ha	Implement	Cost	
Cereals	Cultivation	Duck-foot	600		SL/ha	
	Seeding	Cereal drill	400	ZT planter	500	
	Weed control	Pre-planting			Glyphosate*	650
		Post-em.		1500	Post-em.	1500
<b>Total cereals</b>			<b>2500</b>		<b>2650</b>	
Lentil	Plough	MB or Disc	1500			
	Cultivation	Duck-foot	600			
	Seeding	Cereal drill	400	ZT planter	500	
	Weed control	Pre-planting			Glyphosate*	650
		Post-em.		3000	Post-em.	3000
	Harvesting	15 l/day/ha	3750	17 l/day/ha	4250	
<b>Total lentil</b>			<b>9250</b>		<b>8400</b>	
<b>Total system for 7 SL/l</b>			<b>11750</b>		<b>11050</b>	
<b>Total system for 25 SL/l</b>			<b>16050</b>		<b>11650</b>	
<b>% cost increase</b>			<b>37%</b>		<b>5%</b>	

\* pre-planting glyphosate may not be required in many years

A. Haddad 2008

# Project review (April 08)

## Some reviewer comments on ZT

- “a significant success of the project to date has been the introduction of zero tillage (ZT) as a soil and crop management option for Iraq and ... Syrian farmers”
- “the economic advantages have special attraction to Iraqi farmers now faced with greatly increased fuel costs” (US 1 cent to \$1 in 06-08)
- “great impact seems assured in the short term given the rapid expansion of ZT technology over 100 Mha worldwide during the last two decades, and its particular application to low-rainfall areas”

# Linked ZT demonstrations

2007-08



El Bab



Azaz





# Local construction of ZT seeders

Objective: To adapt and increase availability and uptake of zero-till seeders

- lack of cheap, ZT seeders constraining awareness and adoption
- discussed engaging local machinery manufacturers in Iraq and Syria to adapt and manufacture ZT seeders at the Sept 07 reporting/planning meeting

# Construction of ZT seeders in Syria

Hypothesis: local availability of ZT seeders limits adoption

- exchange visits with ICARDA and 4 manufacturers in Syria
- contracted to manufacture local ZT prototypes

ICARDA visits

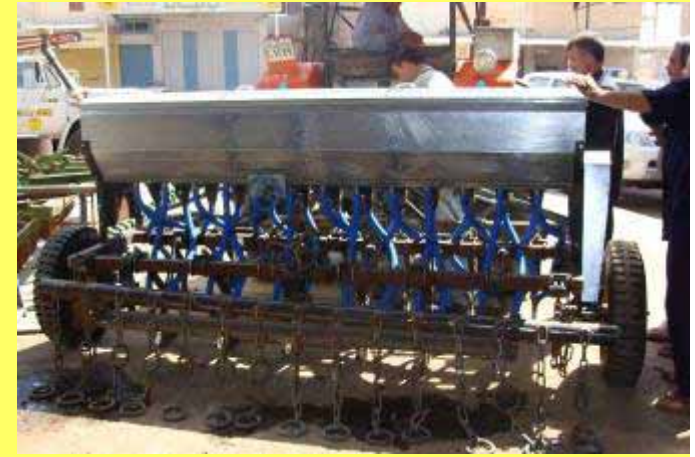


Workshop visits



# Local construction of ZT seeders

Excellent progress with Kamishley, El Bab and Qabassin manufacturers



El Bab 26 Aug 2008

Qabassin 26 Aug 2008

Kamishley 31 July 2008

# ICARDA fabrication of ZT plot seeder

Fabrication of ZT points for Wintersteiger small plot cone seeder



# ZT cropping and stubble grazing

- stubble retention is important for moisture conservation, soil OM, erosion control
- most Australian farmers graze stubbles with many benefits retained (OM and nutrients returned)
- crop-livestock interactions ( $\pm$ stubble) need more research in Middle East

Corowa NSW April 08



# ZT cropping and stubble grazing

- heavy grazing does not negate many ZT benefits

Merridin WA July 2008



# Testing of alternative crops

2007-08

Objective: To evaluate alternative dryland crops for Mediterranean environments

- Oats
- Oilseeds
- Legumes



# Oats

2007-08

## Continuing

1. Variety comparison (4 reps)
2. Seed production

Sown 6 Dec 2007

Photos 19 Mar 08



# Oats

2007-08

1. Brusher
2. Carrolop
3. Euro
4. Kangaroo
5. Mitika
6. Possum
7. Wintaroo
8. ICARDA check
9. ICARDA short
10. ICARDA tall

Grain, feed, forage

Planting date: 6 Dec 07

Replicates: 4

Harvest date: 10 June 08

# Oats

ICARDA short



2 April 2008



Euro

Possum

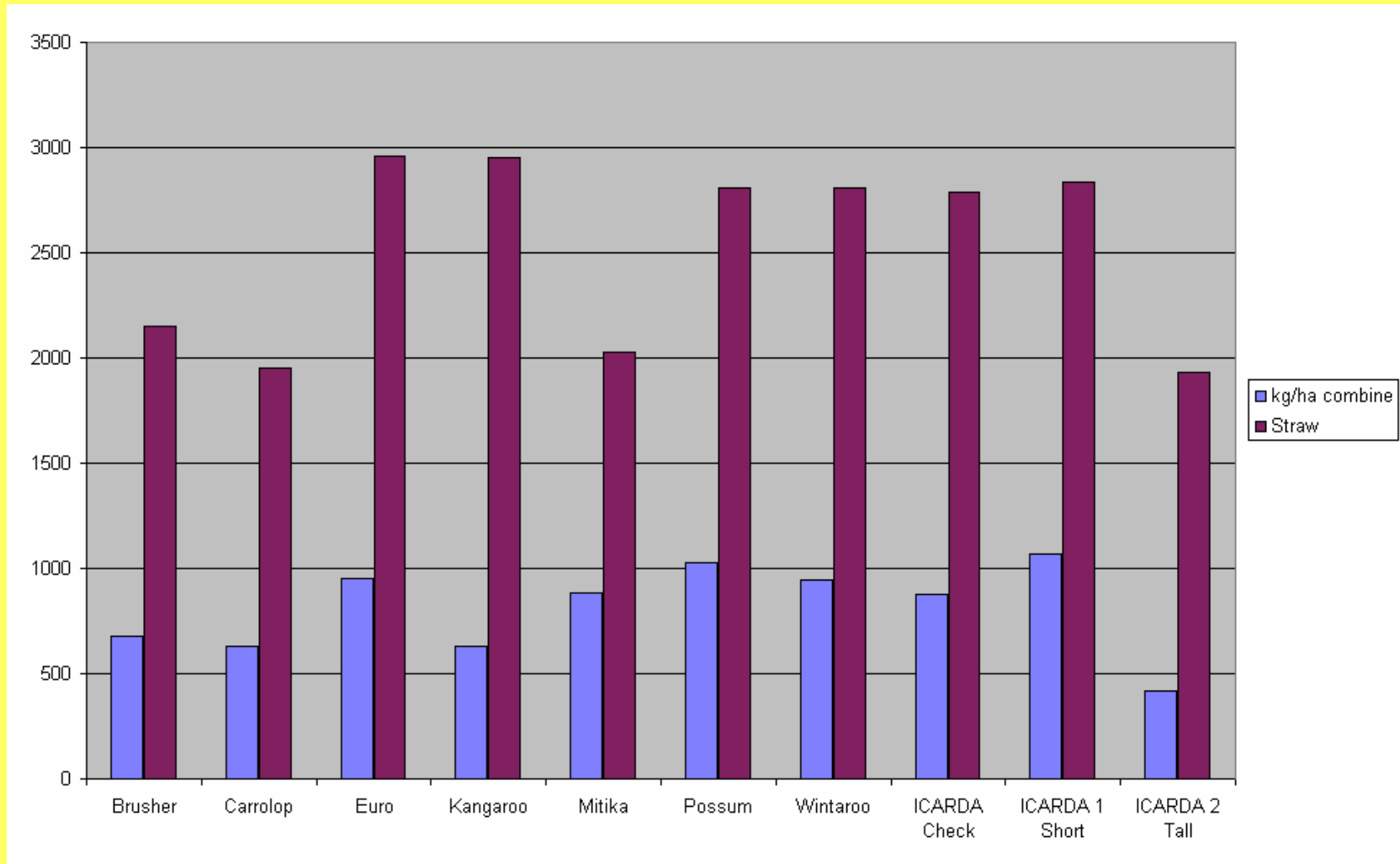


Wintaroo

# Oats

(kg/ha)

2007-08



Planting 6/12/07

Harvest 10/6/08

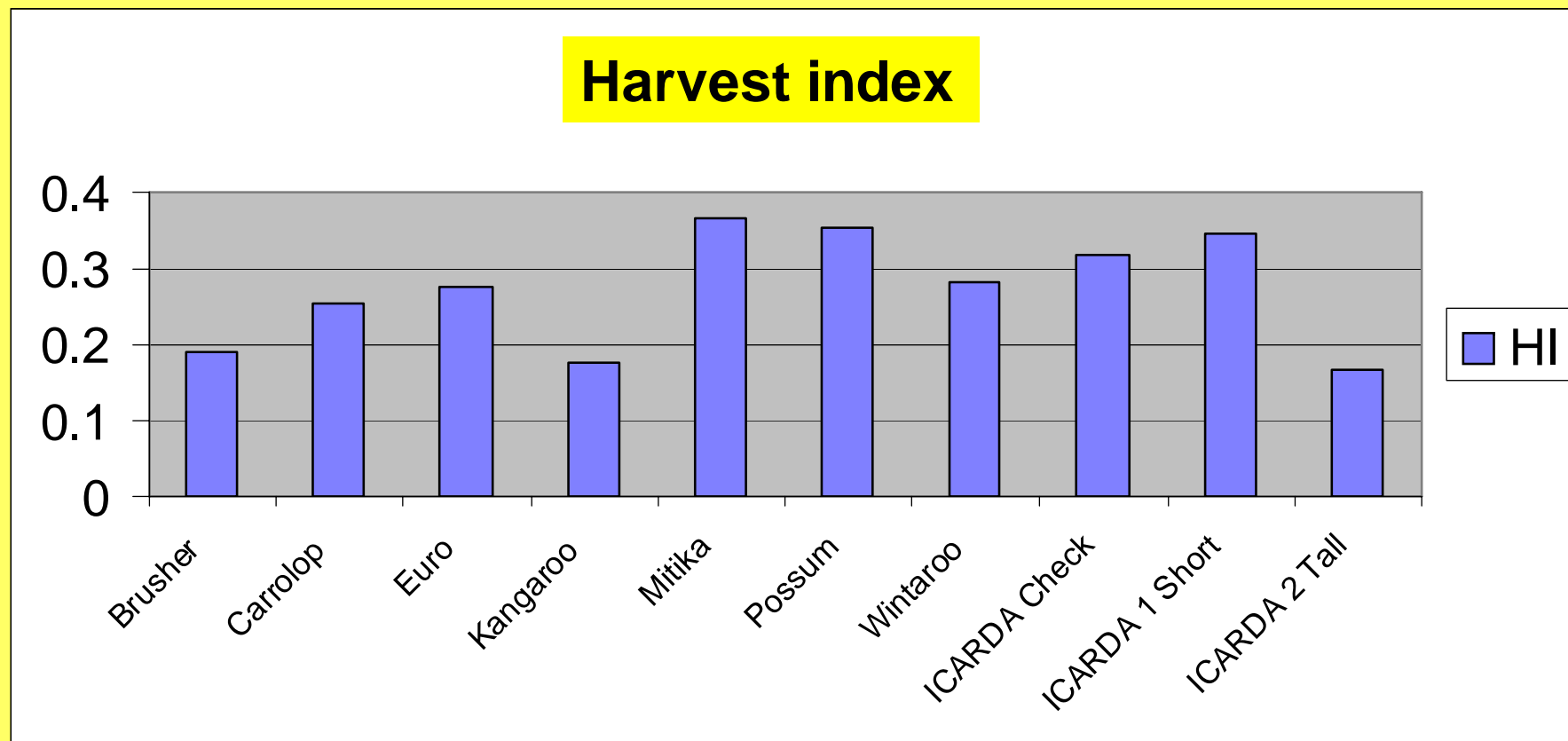
Grain yield \*\* (LSD = 352)

Straw biomass NS

# Oats

(kg/ha)

2007-08



Planting 6/12/07

Harvest 10/6/08

HI \*\*

LSD = 0.10

# Oat seed production 2006-07

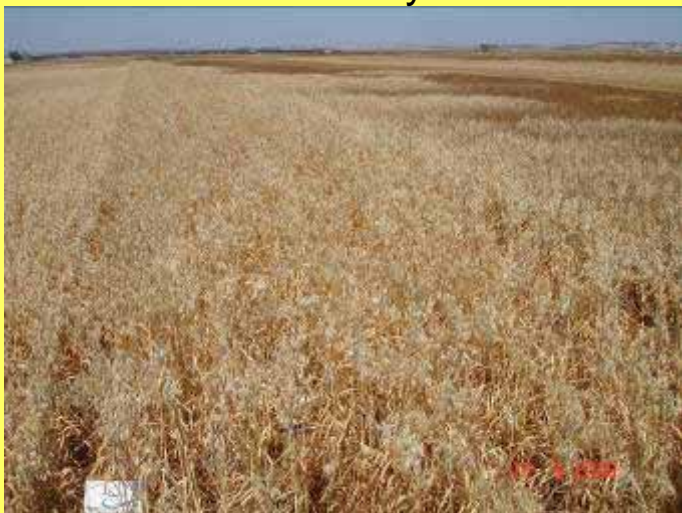
ICARDA check 9 Mar 08



Mitika 19 May 08



ICARDA tall 19 May 08



Sown 8 Nov 07

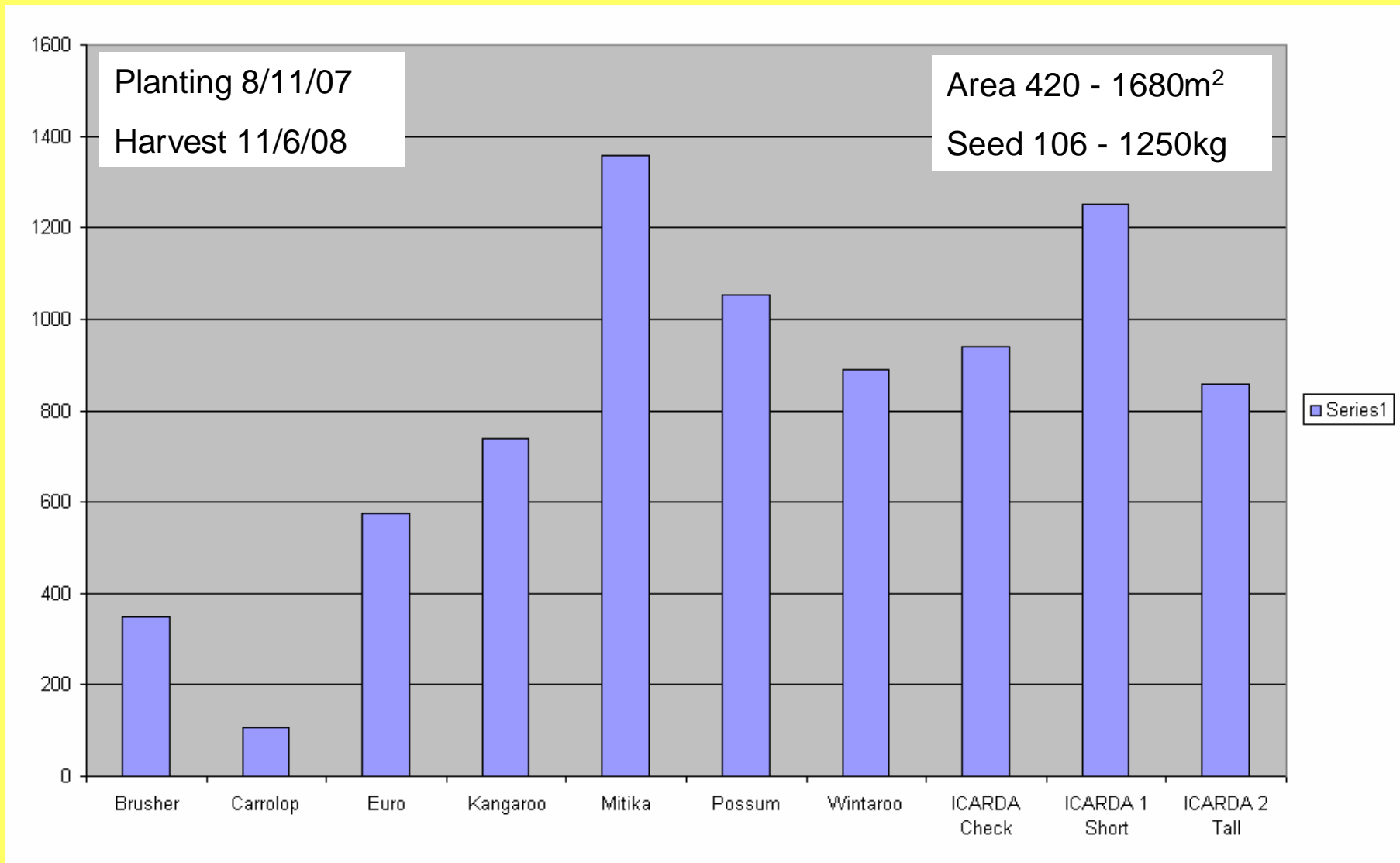
Harvested 10-11 June 08

Mitika 9 Mar 08



# Oat seed production 2006-07

kg/ha



# Peas

2007-08

1. Dunwa
2. Helena
3. Kaspá
4. ICARDA Check
5. Local check

Grain, feed

Planting: 7 Jan 08

Replicates: 0

Harvest: 25 May 08

# Peas

Sown 7 Jan 08

Photos 2 Apr 08

2007-08

Continuing

1. Variety comparison (4 reps)
2. Seed production



Dunwa



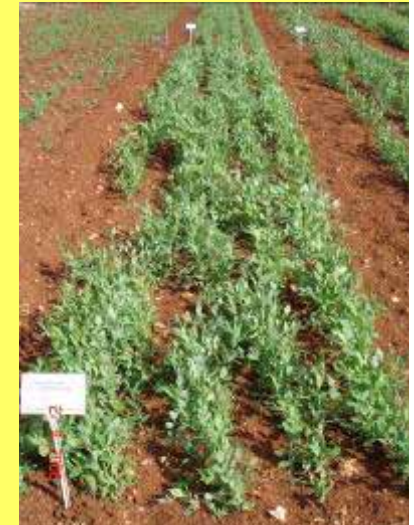
Helena



Kaspa



ICARDA check



# Peas 2008

2 April 2008



Local peas



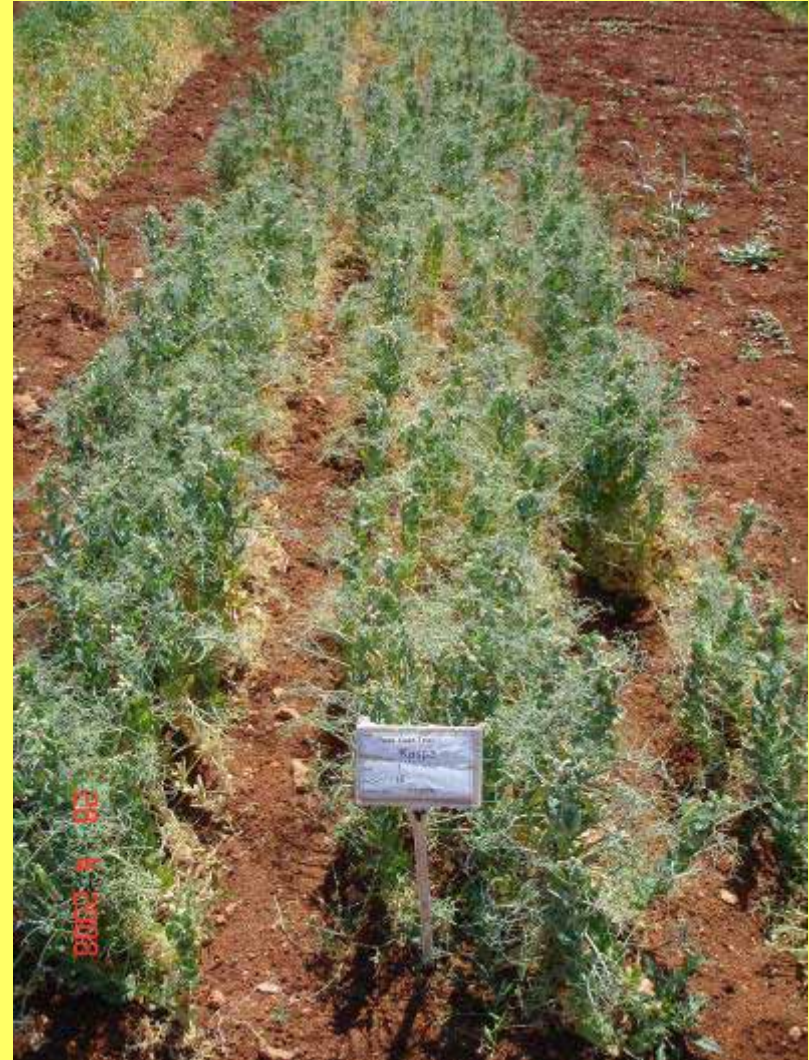
Kaspa peas

# Peas 2008

28 April 2008



ICARDA check



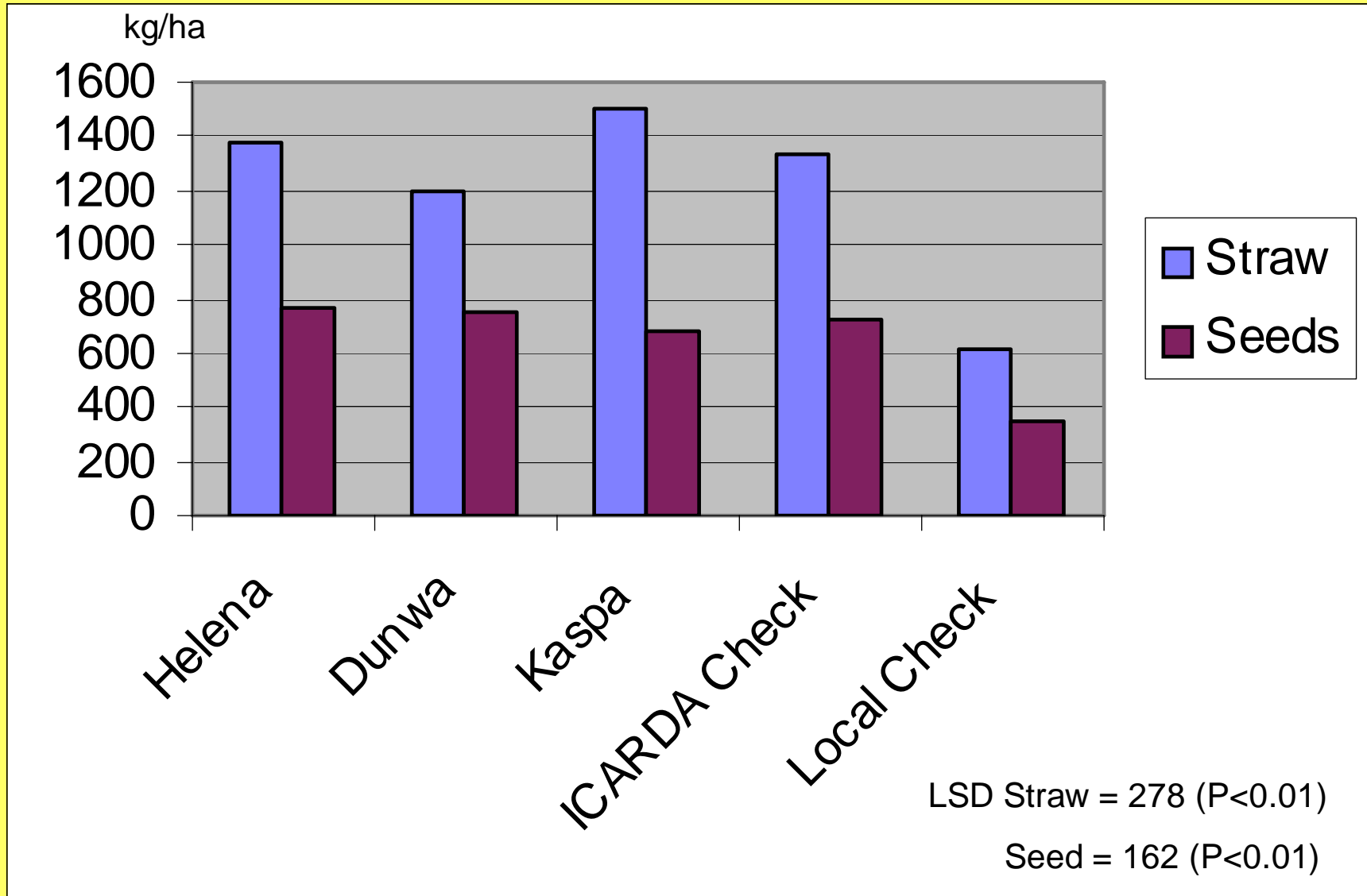
Kaspa

# Peas

Harvest: 25 May 08

Area: 60m<sup>2</sup>

Seed: 2.1 - 4.6kg



# Oilseeds

Botanical name	Variety	Common name
Brassica juncea	Sel 21, 4355, 82NO00-67, 82NO00-98	Indian mustard
Brassica carinata	94024.2, 195923.5.2	Ethiopian mustard
Brassica napus	Tramby DB62-OOW2, DB76-OOW6, DB163-OOW2	Canola
Brassica rapa	91182, Pusa Kalyana	Turnip rape
Camelina sativa	4164, 4183	False flax
Camelina alyssinica	337110, 94053	Crambe, Camelina
Sinapis alba	Tliney, 94488	White/English Mustard
Linum usitatissimum	Glenelg, 110637	Linseed, Linola

**Uses:** oilseed, feed, mustard, soil conditioner (fumigant, macropores)

**Planting date:** 25 Dec 2007

**Replicates:** 4

# Oilseeds

2007-08

Continuing

Variety comparison - very poor establishment  
- no harvest

19 May 08



# 2008 ICARDA agronomy research

- **zero-till and stubble mulching**
  - continues to perform well in very dry conditions
    - ZT always similar or higher yield than CT
    - benefits likely to increase with time
  - areas for research in new project
    - e.g., spraying before sowing, time of sowing, pest/disease management, fertiliser requirements, integration with livestock
  - local machinery fabricators developing interesting concepts
- **alternative crops**
  - oats and peas showing good potential for rotations
  - brassicas disappointing and need further research