

# **2005/06 ICARDA agronomy research**

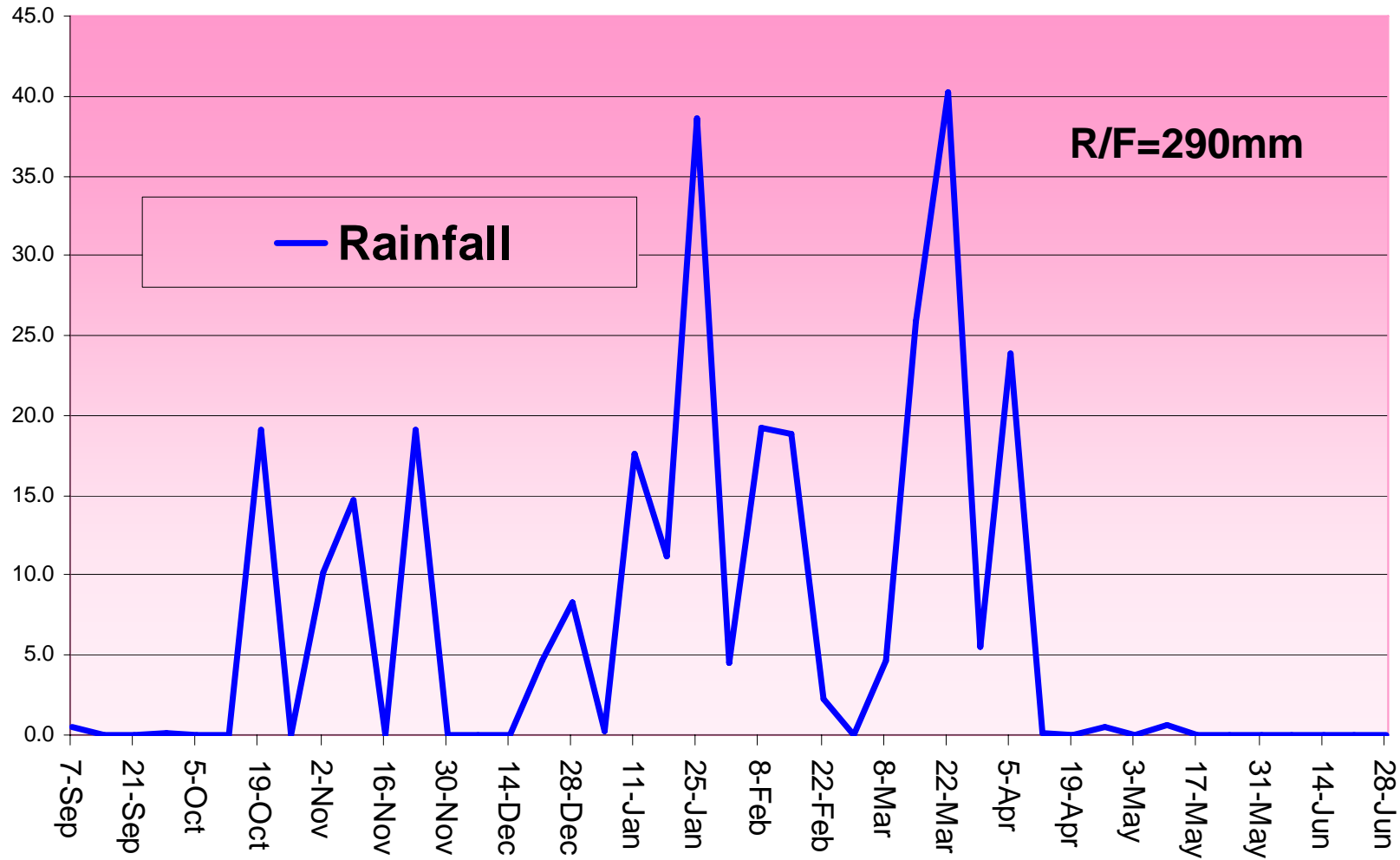
- » **alternative crops**
- » **zero-till and stubble mulching**

**Colin Piggin, Mustafa Pala, Atef Haddad, Juergen Diekmann**

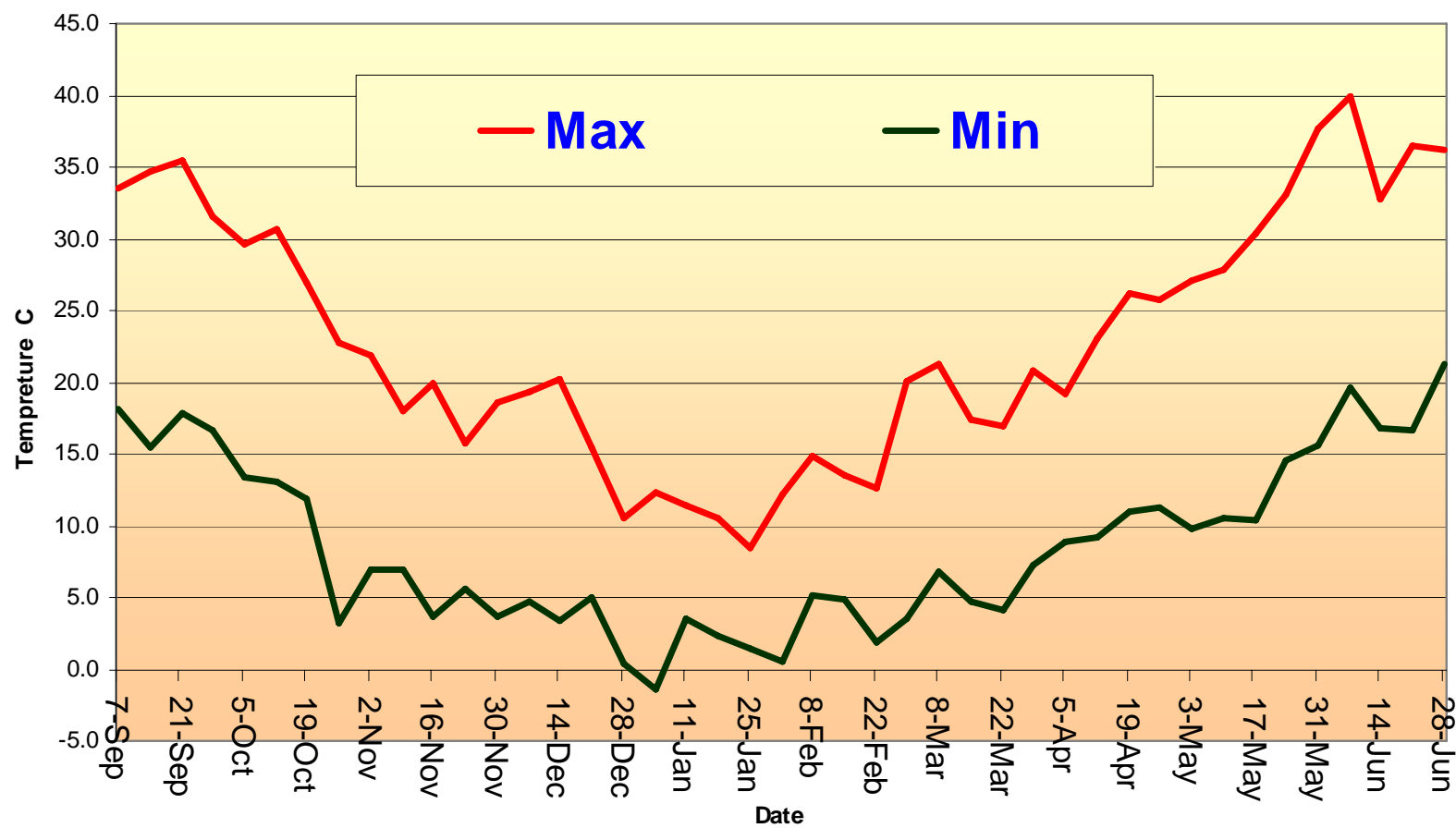
**ACIAR CIM/2004/024 Better crop germplasm and management for improved production of wheat, barley and pulse and forage legumes in Iraq**

**Annual reporting and planning meeting 1-5 October 2006**

## Weekly precipitation at ICARDA for the season 2005-2006



## Average weekly max and min temperatures at ICARDA 2005-2006



# Potential yields

- wheat
  - rainfall 1 Sept 05 to 31 May 06 = 290mm
  - potential yield = available moisture x WUE
    - = (290mm – 100mm) x 20kg/mm
    - = 3.8 t/ha
- constraints
  - December and late April-May without rain

# Testing of alternative crops

**Objective: To evaluate alternative dryland crops for Mediterranean environments**

- **Oats**
- **Oilseeds**
- **Legumes**

1 December 2005



# Oats

1. Brusher
2. Carrolop
3. Euro
4. Kangaroo **Grain, feed, forage**
5. Mitika
6. Possum
7. Wintaroo
8. ICARDA Check

**Planting date: 30 Nov 2005**

**Replicates: 4**

**Fertilizer: 50kg/ha N on 5 March 2006 (tillering)**

**Harvest date: 5 June 2006**

# Oats

6 April 2006



# Oats

10 May 2006



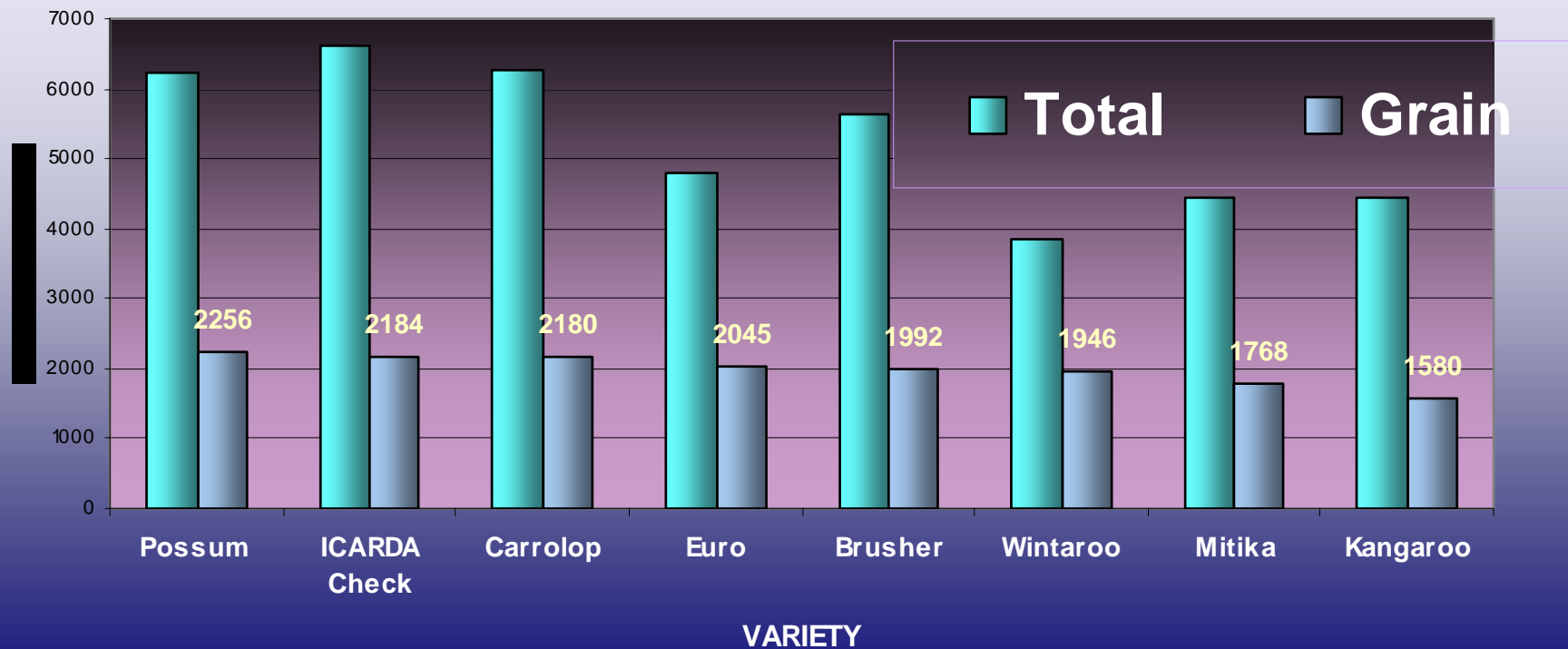
# Oats



10 May 2006

# Oats

Total dry matter and grain yield of oat varieties Tel Hadya Syria 2006



Total DM NS (LSD 2178)  
Grain yield NS (LSD 538)

# Peas

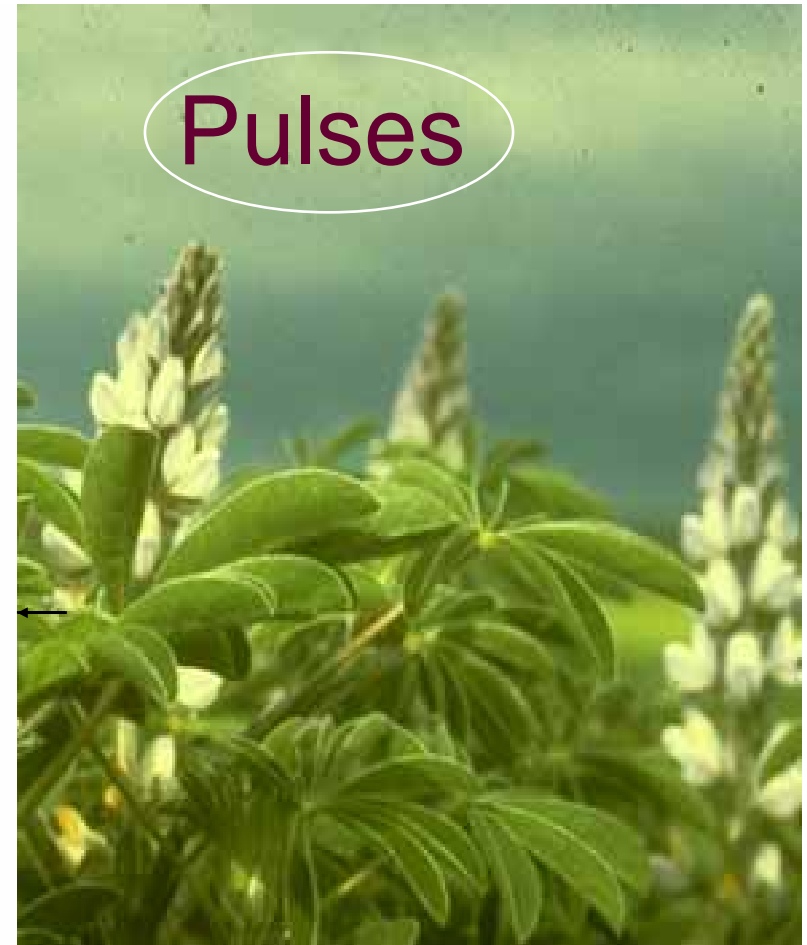
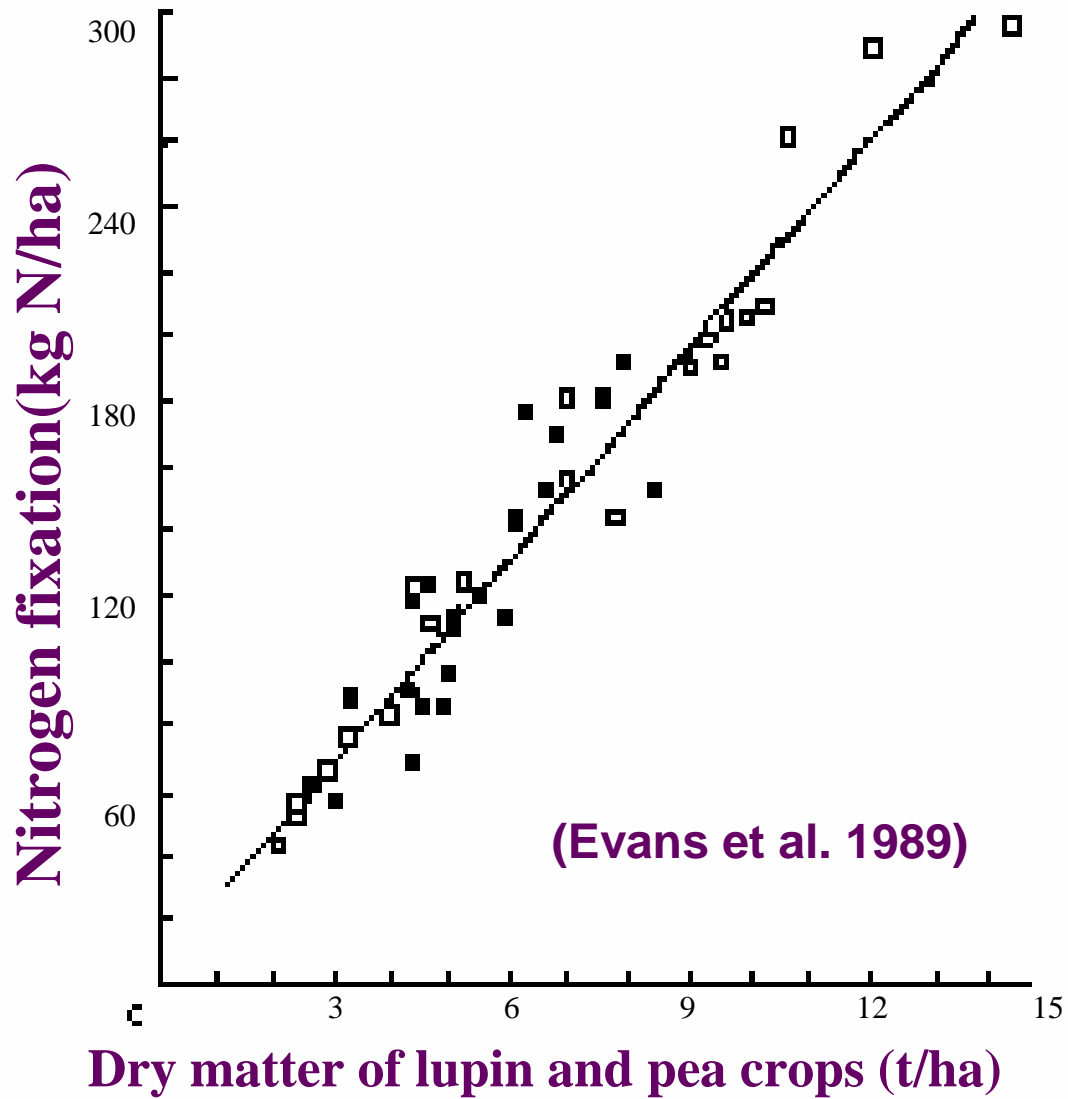
1. Dunwa
2. Helena
3. Kaspá
4. ICARDA Check
5. Local check

**Grain, feed**

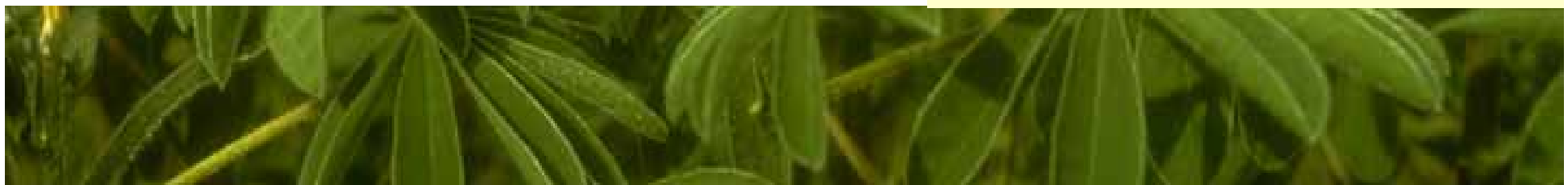
**Planting date: 30 Nov 2005**

**Replicates: 0**

**Harvest date: 20 May 2006**



**The N<sub>2</sub>-fixation of pulses is closely correlated with DM production (about 20kg/ha per tonne pulse)**



## Rotation benefits: Disease Break

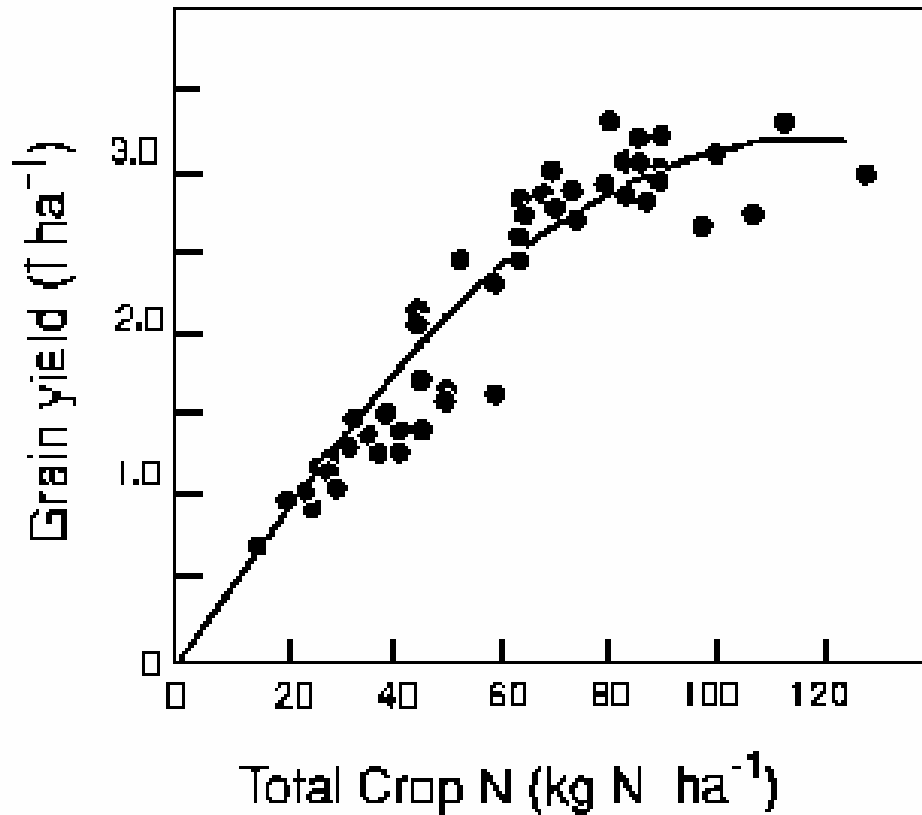
Effect of the previous rotation on N, incidence of take-all and grain yield of wheat - Kapunda Rotation experiment (1986)

Previous crop	Available N at sowing (kg ha <sup>-1</sup> ), 0-50cm depth	% of wheat plants with take-all	Grain yields of wheat (t ha <sup>-1</sup> )
Wheat	52	54	3.3
Pasture	61	42	4.0
Lupins	53	15	4.8

**As the level of grasses in the pasture increases, so does the incidence of take-all in wheat**

# N requirements

Relationship between total crop N and grain yield for wheat



Wheat requires between 20 - 125 kg N/ha over a 3 - 5 month period

# Peas

6 April 2006

Local peas



Kaspa peas



ICARDA peas



# Peas

20 May 2006

Local peas



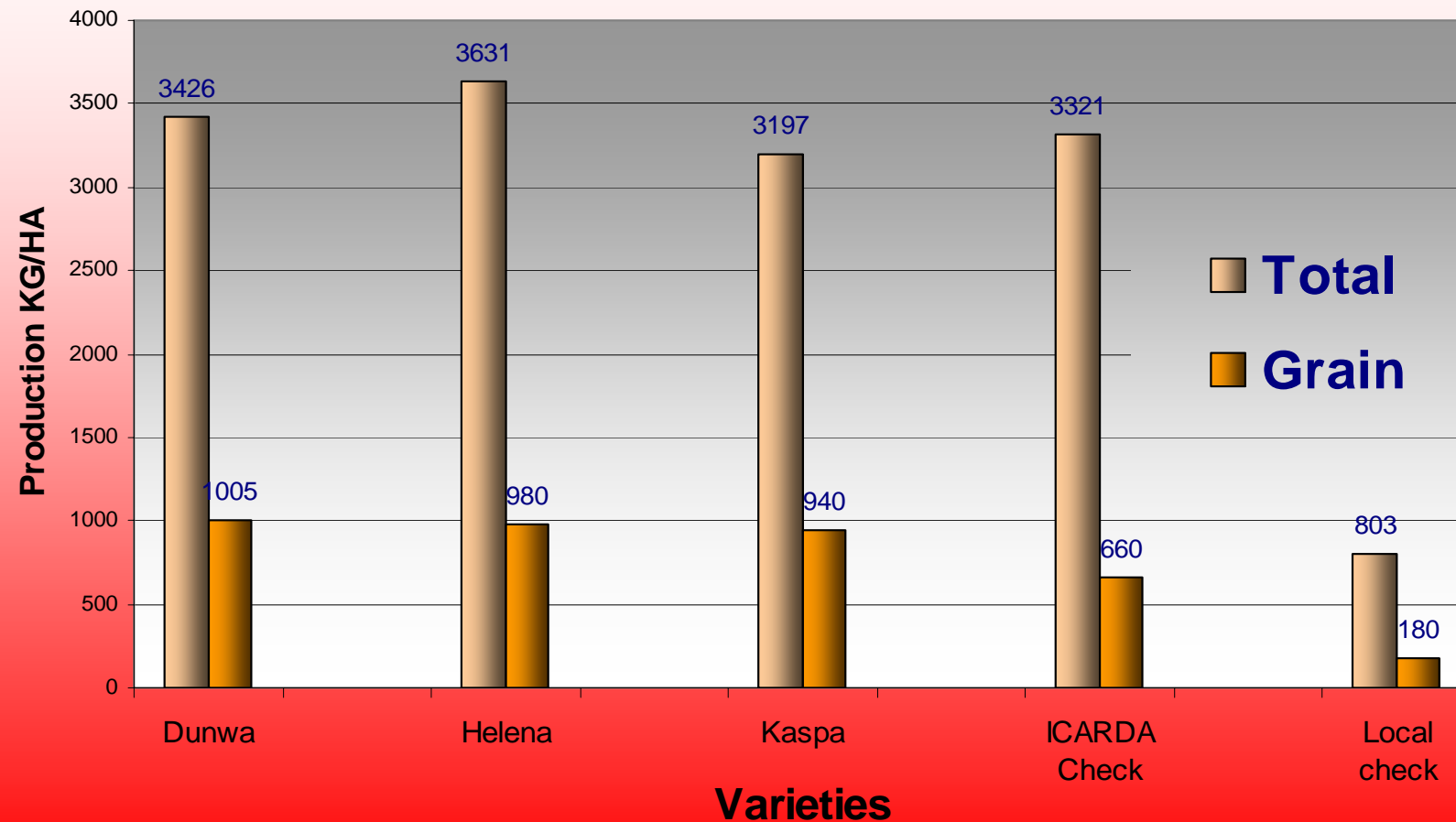
Kaspa peas



ICARDA peas

# Peas

**Total biomass and grain yield (kg/ha) of pea varieties Tel Hadya, Syria 2006**



# Oilseeds

<b>Botanical name</b>	<b>Variety</b>	<b>Common name</b>
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:** 30 Nov 2005

**Replicates:** 4

**Harvest date:** 16-21 June 2006

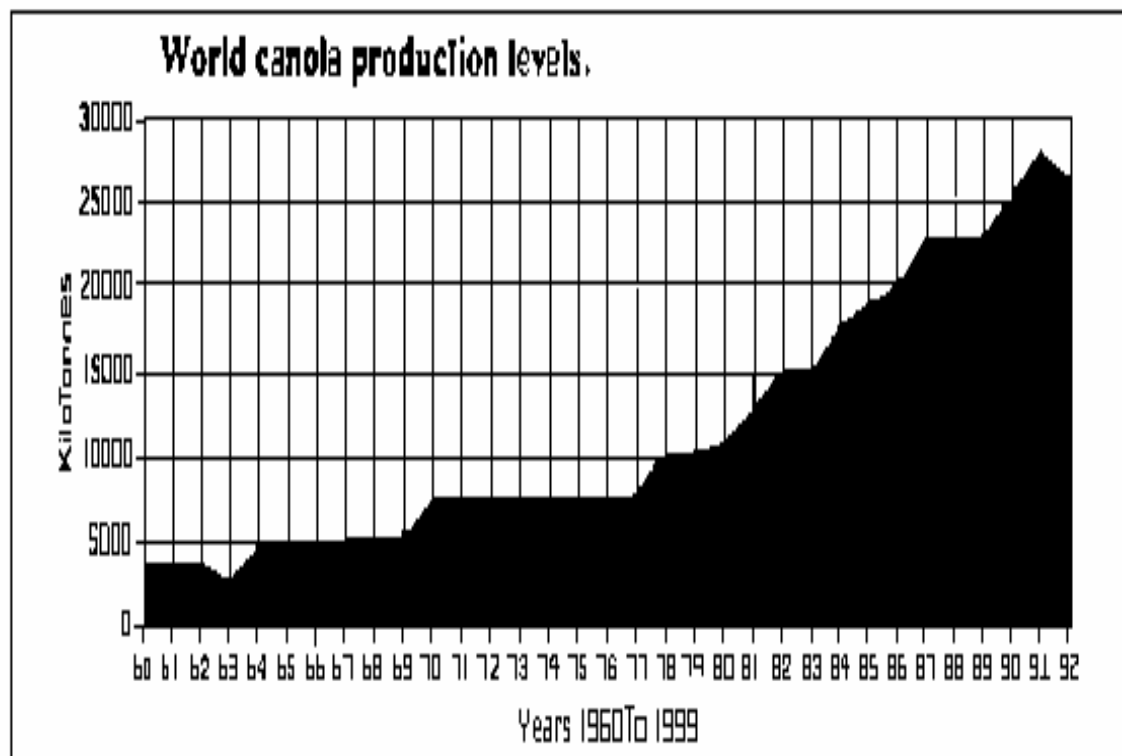
# Oilseed crops



## Vegetable oil in WANA

(Rosegrant et al., 2001)

- 2002 - prodn 2.6 m T; demand 7.0 m T; imports 4.4 m T
- 2020 - prodn 4.3 m T; demand 11.9 m T; imports 7.6 m T



# The effect of rotation with canola and fertiliser-N application on wheat yields (t/ha) - Victoria 1988

Treatment	No fertiliser-N	+ fertiliser-N
	wheat yields (t/ha),	
Lupin - wheat - wheat	4.37	5.52
Lupin - canola - wheat	5.25	6.30

Benefits from: biofumigation, soil water

# Oilseeds



10 May 2006

**Brassica juncea 82NO00-98**



**Brassica juncea Sel21**

**Sinapus alba Tliney**



6 April 2006



# Oilseeds

10 May 2006



**Camelina sativa 4164**



**Camelina sativa 4183**

**Linum usitatissimum Glenelg**



# Oilseeds

6 April 2006

**Brassica rapa Pusa Kalyana**



**Brassica napus DB76-**

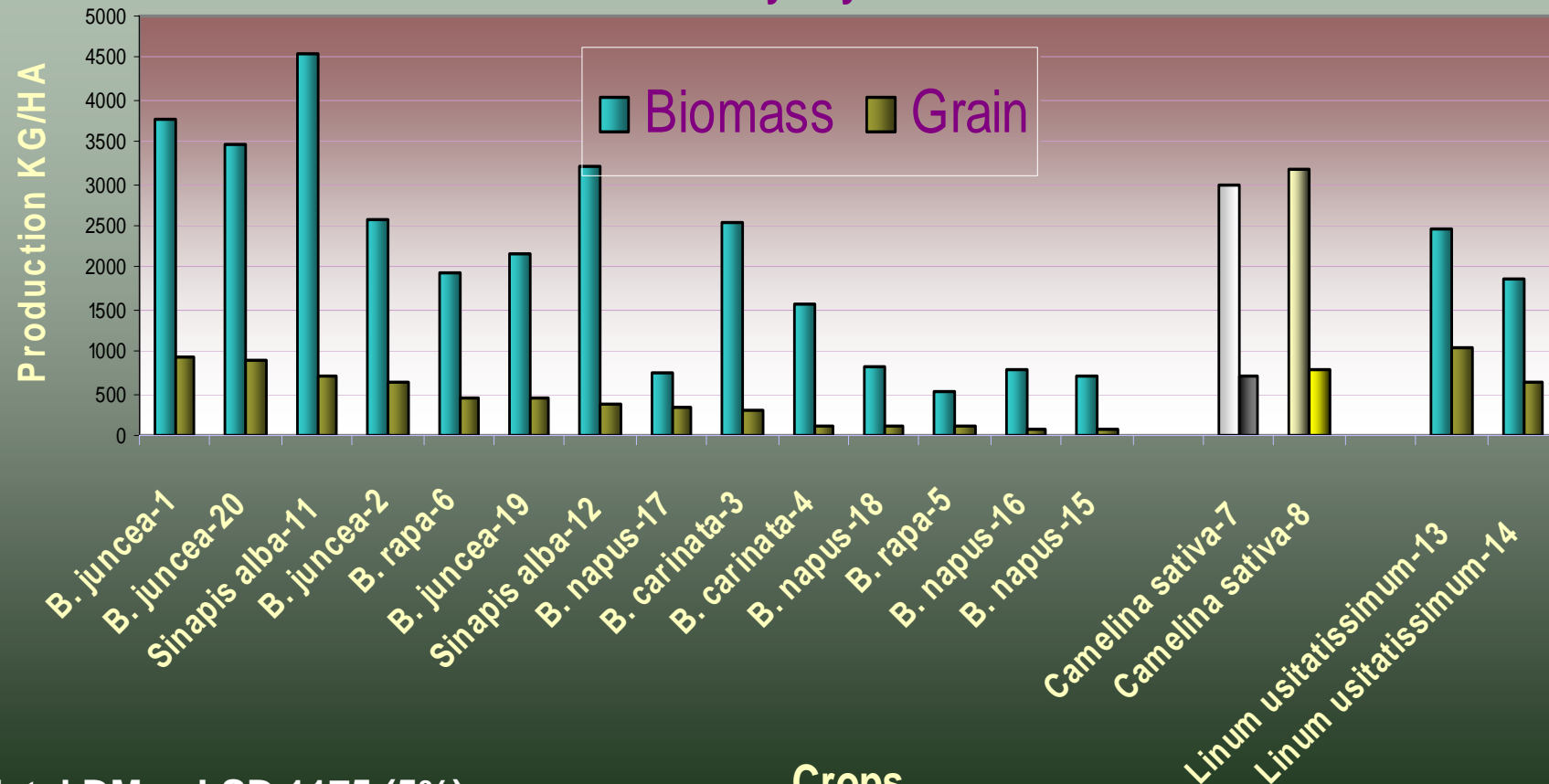


**Brassica carinata 94024.2**



# Oilseeds

Biomass and seed yield of oilseed crops  
Tel Hadya Syria 2006



Total DM LSD 1175 (5%)  
Grain yield LSD 303 (5%)

Crops

# Zero-tillage

**Objective: To evaluate alternative crop establishment techniques in Mediterranean environments**

- **wheat on chickpea stubble**
- **chickpea on wheat stubble**
  
- **conventional cultivation**
- **zero-till/stubble retained**

# Zero-tillage

## Chickpea on wheat stubble

Sowing 12 Dec 2005

Harvest 16 June 2006

Zero-till and stubble mulching



Conventional  
cultivation



# Zero-tillage

## Chickpea on wheat stubble

Conventional cultivation



Zero-till and stubble



# Zero-tillage

## Chickpea on wheat stubble

6 April 2006



Zero-till and stubble

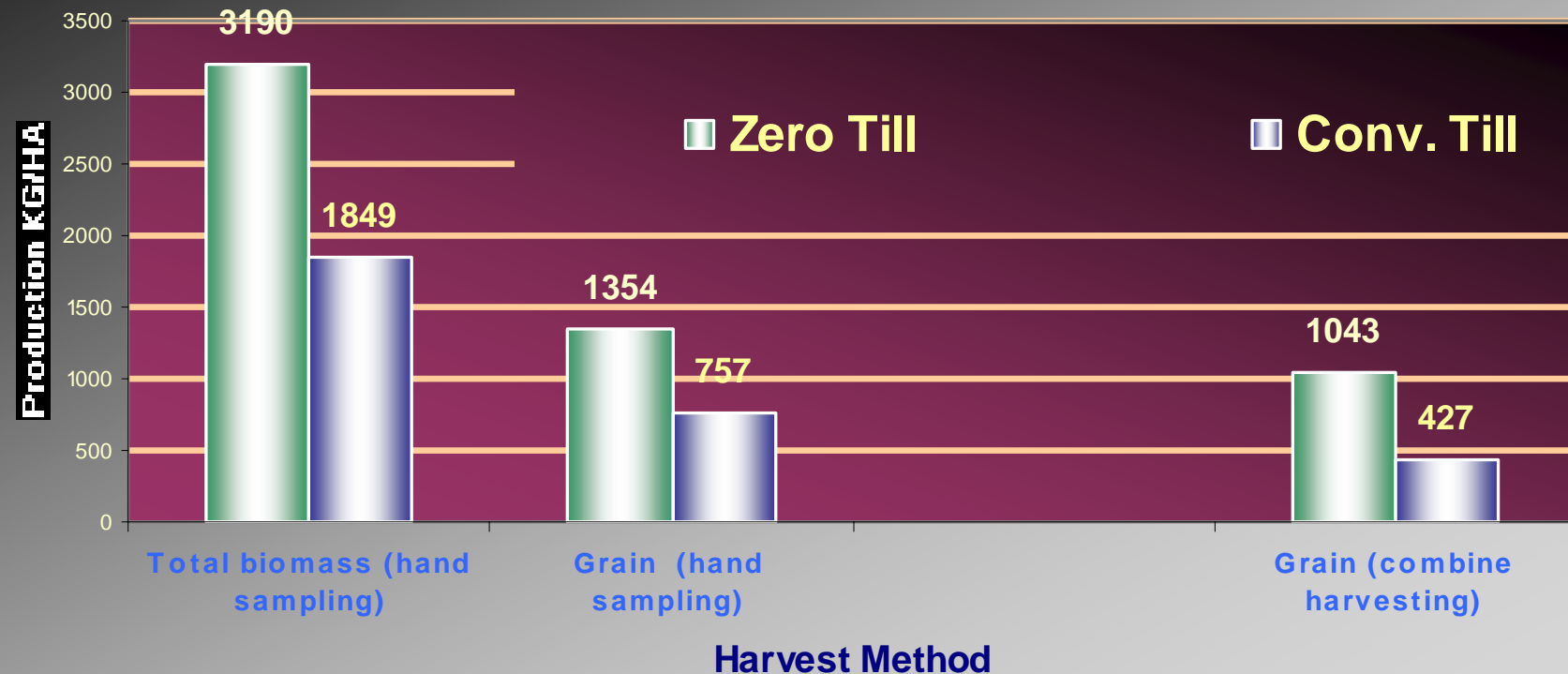
Conventional cultivation



# Zero-tillage

## Chickpea on wheat stubble

Effect of sowing method on chickpea production  
Tel Hadya Syria 2006



# Zero-tillage

## Wheat on chickpea stubble

23 Feb 2006



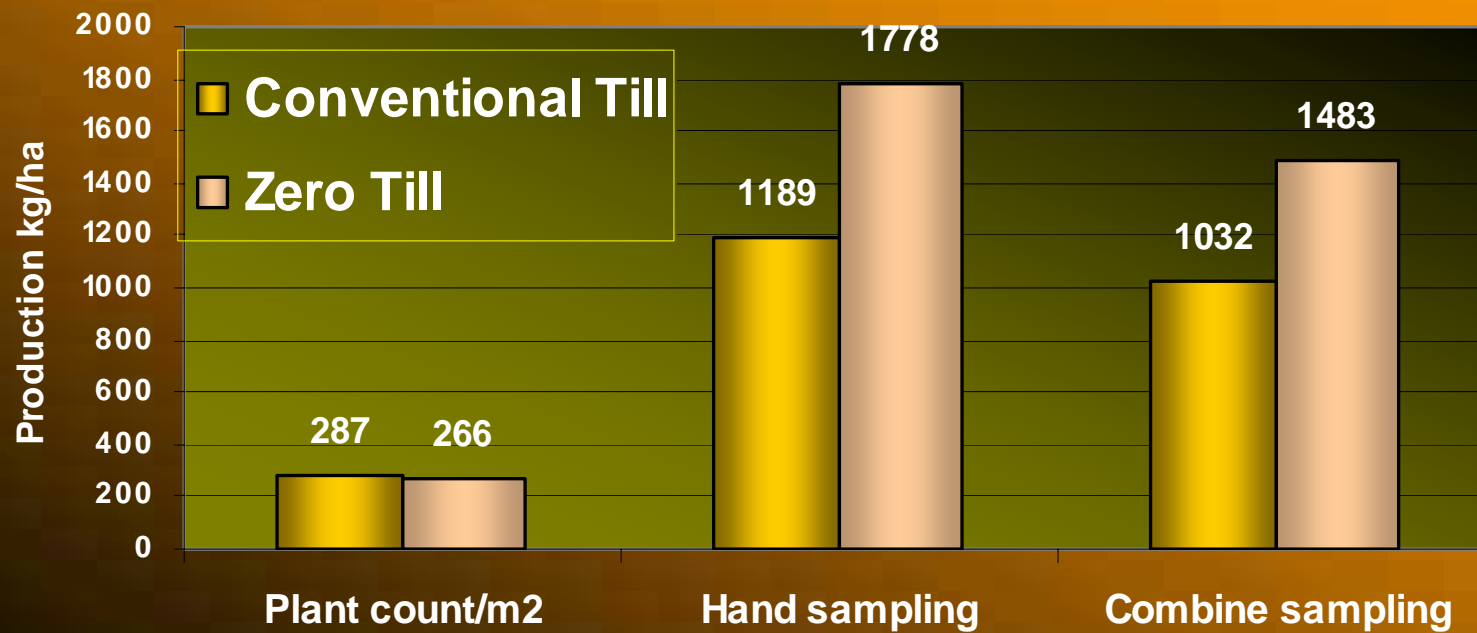
6 April 2006



# Zero-tillage

## Wheat on chickpea stubble

Effect of sowing method on breadwheat production  
Tel Hadya Syria 2006



# Zero-tillage

## Barley on pasture



22 February 2006



14 March 2006

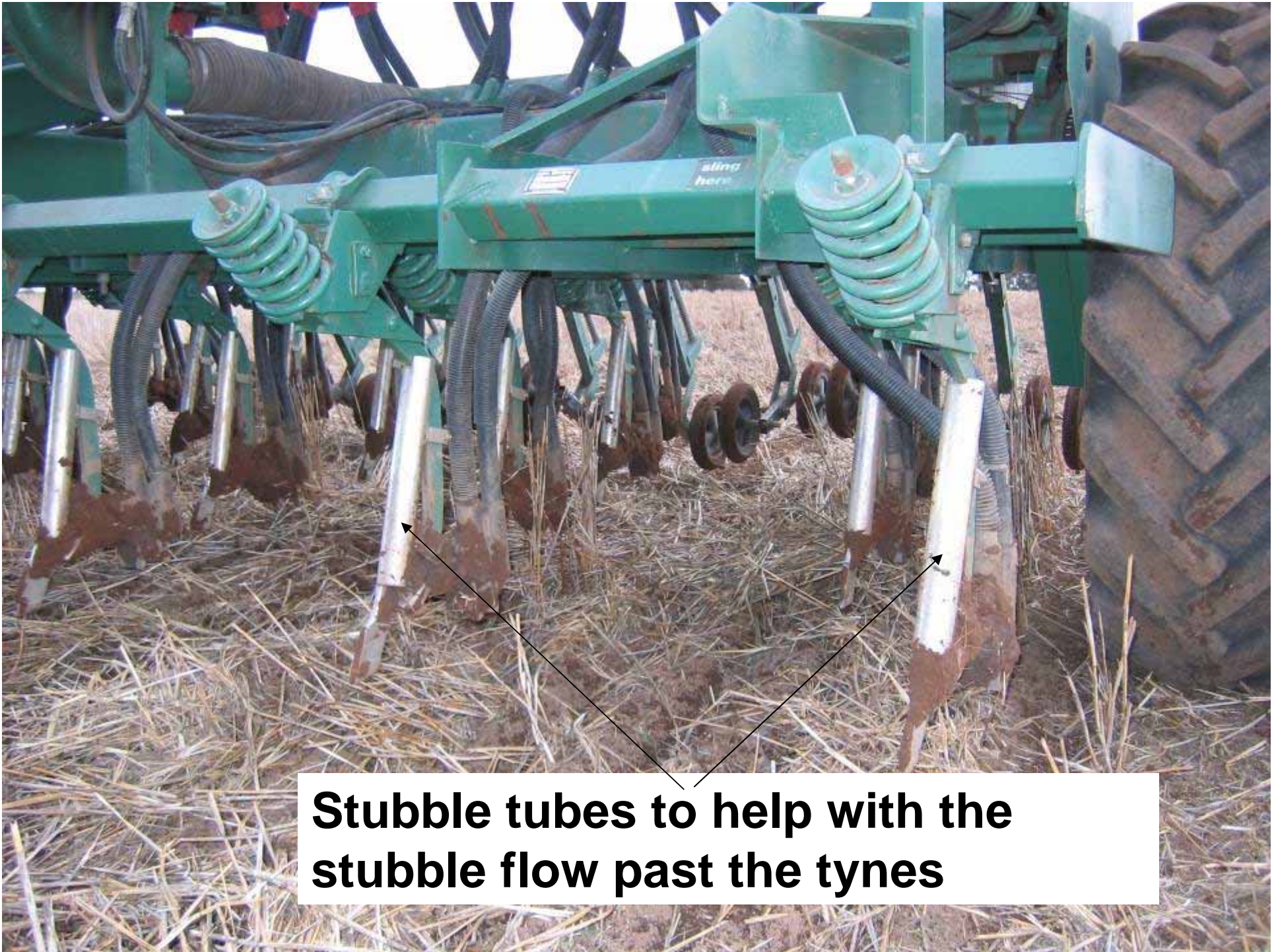


6 April 2006

# Zero-tillage (1980s)



- Little soil disturbance
- Stubble retention



**Stubble tubes to help with the stubble flow past the tynes**

## **Soil loss with different cropping systems, Darling Downs (avg 6 years)**

<b>Cropping practice</b>	<b>Soil loss (t/ha/y)</b>
Bare fallow	31.6
Summer crop	19.8
Stubble incorporated	7.8
Stubble mulch	3.9
Zero tillage	1.8

**With conventional farming as much as 12 ton of topsoil is eroded for each ton of wheat produced**

# Benefits of reduced tillage

- **time, fuel and machinery savings**
- **better soil structure and soil-water dynamics (OM, porosity, etc)**
- **improved trafficability – timely sowing**
- **higher yield potential**

## Initial concerns

- **nutrient tie-up**
- **associated pest and disease problems**
- **machinery difficulties**

## **2005/06 ICARDA agronomy research**

» **alternative crops**

» **zero-till and stubble mulching**

- **showing some interesting results/potential**
- **worth further research, verification and promotion in Iraq**

## 2006/07 ICARDA agronomy research

- **zero-till and stubble mulching**
  - Oats on wheat stubble (C5)
  - Chickpea on wheat stubble (C5)
  - Wheat on lentil stubble (C16)
  - Bread and durum wheat, chickpea, lentil on chickpea stubble (B5)
- **alternative crops**
  - oats, oilseeds, peas adaptation (B7)

