



BIOFACH2020

into organic



FRIDAY

FEBRUARY 14TH 2020

BIOFACH MESSE

ROOM HELSINKI - CCN OST

H. 11-11.45AM

BLACK SEA REGION

YIELD VARIABILITY

FOR ORGANIC

CROPS

A close-up photograph of a person's hand, wearing blue denim jeans, gently touching a stalk of golden wheat in a vast field. The background is a soft-focus expanse of similar wheat under a bright sky.

***Analysis on yield variability
for selected crops in the
Black Sea region***

February 2020

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Objectives, scope and methodology of the analysis

Objectives, scope, methodology

- **Objectives:** analysing the **variability of yields for different selections of crops in Russia, Kazakhstan, Ukraine, Moldova and Turkey**
- **Key analytical aspects:**
 - yield variability **over time**;
 - yield variability **among different regions**;
 - yield variability **between conventional and organic farming**.
- **Observation period:** for each crop covered in each country, the analysis covered a period generally spanning from 2006 or 2007 to 2017 or 2018.
- **Quantitative and qualitative evidence for the analysis** was collected through a combination of:
 - **Desk research** focusing on: databases and datasets from official or anyway authoritative sources (*business associations; research institutions*); relevant technical and scientific literature, including online resources. **Languages:** English + relevant national ones.
 - **Interviews with knowledgeable experts.**
- Variability of yields over time and differences in yield between conventional and organic farming are **analysed through descriptive statistics tools** (*period averages, minimum-maximum values, variance, standard deviation, trends over the observed periods*).

Key findings Strengths and limitations

Key findings

- **Yield variability** (over time; across regions; between organic and conventional farming) **ranges from significant to substantial.**
- Especially for **cereals** and **oilseeds**, yields in organic farming are **not necessarily lower** than those in conventional farming; concentration of organic farming in the **most fertile areas** / in the **most efficient farms** often results in **higher yields for organic crops.**
- For **dry peas** and **lentils**, **differences between yields** in organic farming and those in conventional farming are **generally limited.**
- For **cherries** and **strawberries**, yields in organic farming are **substantially lower** than those in conventional farming, mainly due to the use of **high-input techniques** in the latter.

Strengths and limitations

STRENGTHS

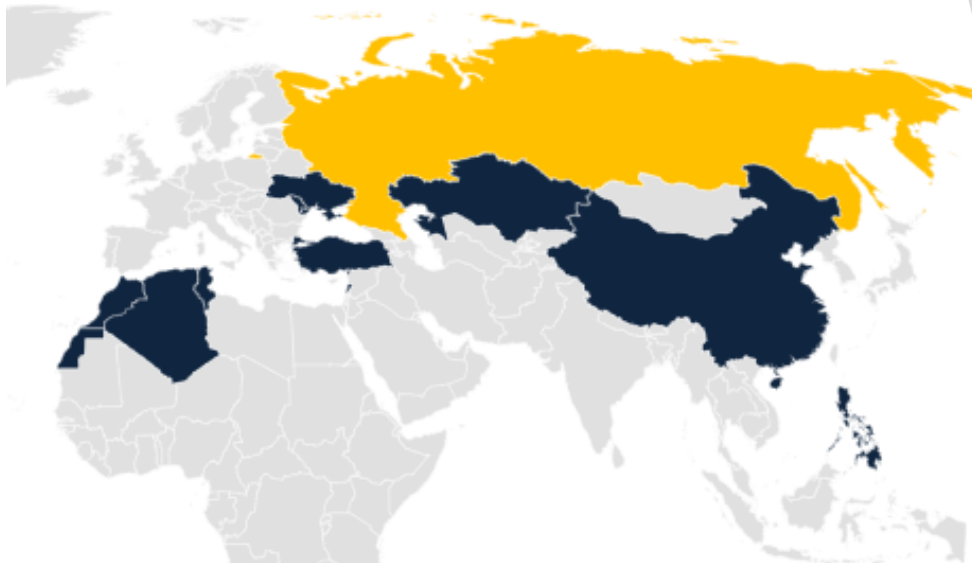
- **Yield variability** for both conventional and organic farming was **analysed under multiple aspects** (over time, across regions...)
- **Substantial quantitative** and **qualitative evidence** was collected via desk research and interviews from a **wide range of sources**, and considered in the analysis → this allowed to (partly) **address significant data gaps** (especially for organic farming) and to **perform triangulation** (to some extent)
- Plausible **explanations of yield variability** were found
- The approach is **applicable to any selection of crops / geographical areas**

LIMITATIONS

- **Availability of quantitative data** on areas, **production** → **yields in organic farming** from **authoritative sources** remains **extremely scarce**
- This **negatively affects the robustness** of any **comparative analysis of yield variability** between conventional and organic farming

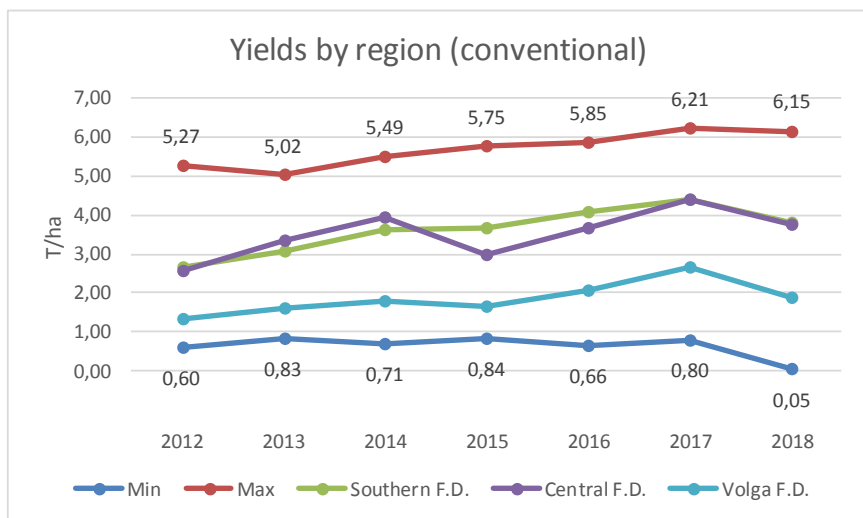
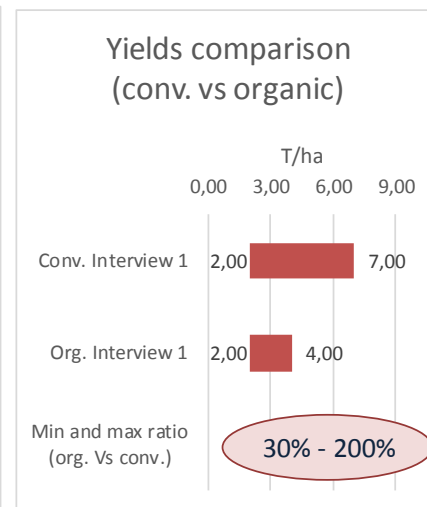
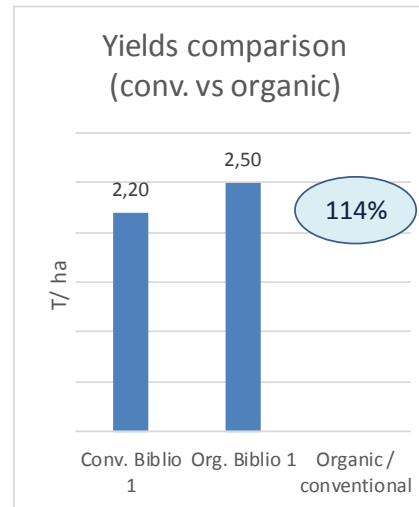
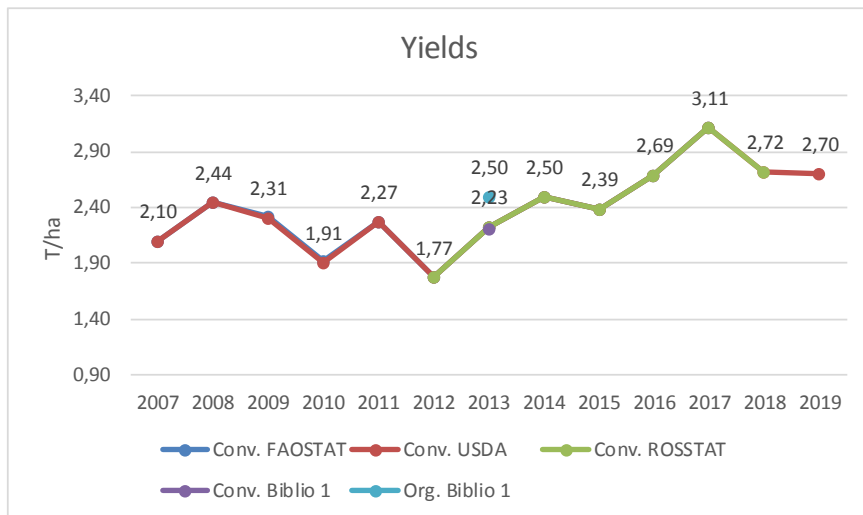


Overview by country



Russia

Russia – all wheat (soft wheat)*



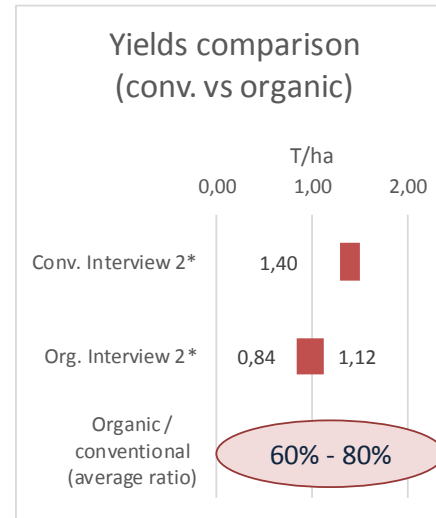
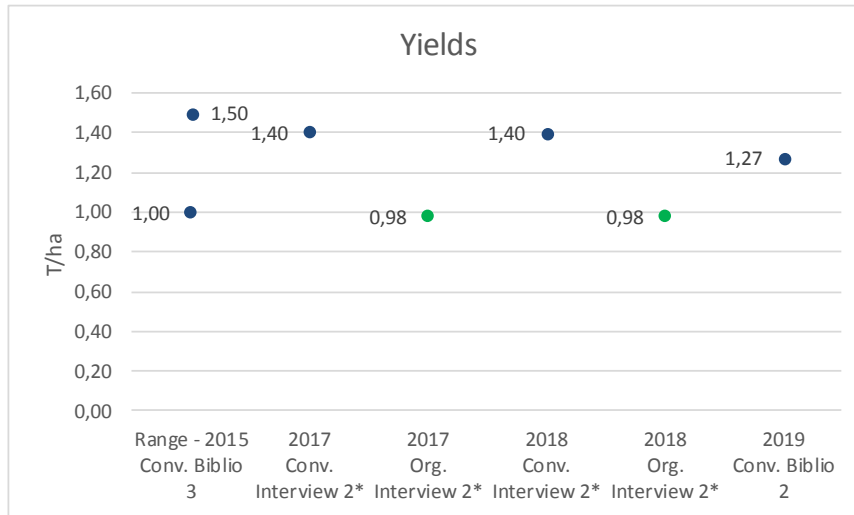
Yields variability (USDA/Rosstat – T/ha): 2007-2019

- Average (conv): 2,49
- Min – Max: [1,77 - 3,12]
- Var: 0,18
- Std. Dev.: 0,42
- Growth last 3 years avg on first 3 years avg: 25%

Main results

- Organic yields generally higher than conventional ones, mainly because of higher efficiency of organic farms and location in more fertile areas (2013 data)
- Relatively low variability of yields over the period
- Significant variability of yields among the different regions
- Avg. yields of main producing areas (Southern, Central and Volga districts) fall in the [1,86-3,63 t/ha] range

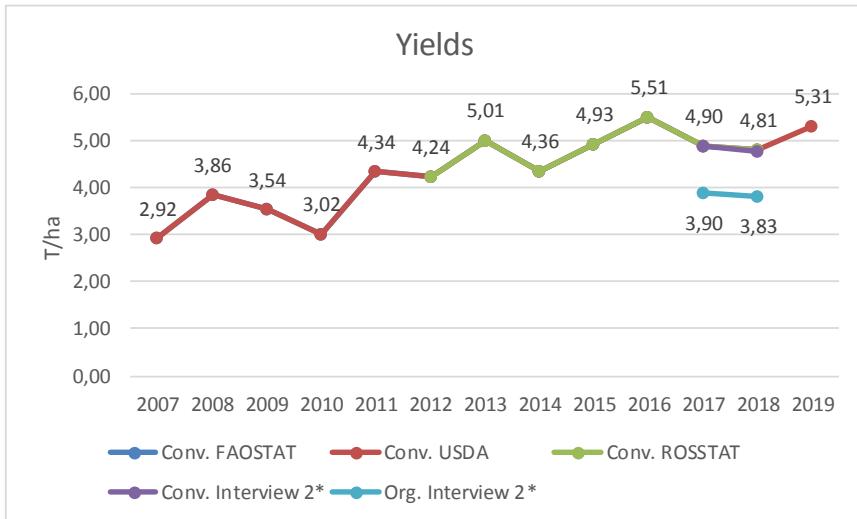
Russia – durum wheat



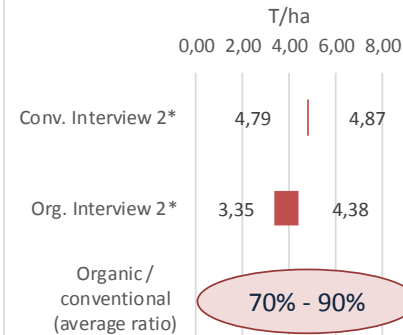
Main results

- Yields generally ranging between 1,00 and 1,50 t/ha at country level
- Production is more geographically concentrated than for soft wheat, with lower variability
- Six regions of Russia cultivate durum wheat in 2018 (APK Inform, 2019): Orenburg oblast (230,000 ha); Chelyabinsk oblast (160,000 ha); Saratov oblast (45,000) ha; Altai Krai, Omsk oblast, Stavropol Krai (30,000 ha each)
- Organic yields generally between 60% and 80% of conventional yields, mainly because of weeds competition, soil born diseases, bunt, fusarium and insects

Russia – corn

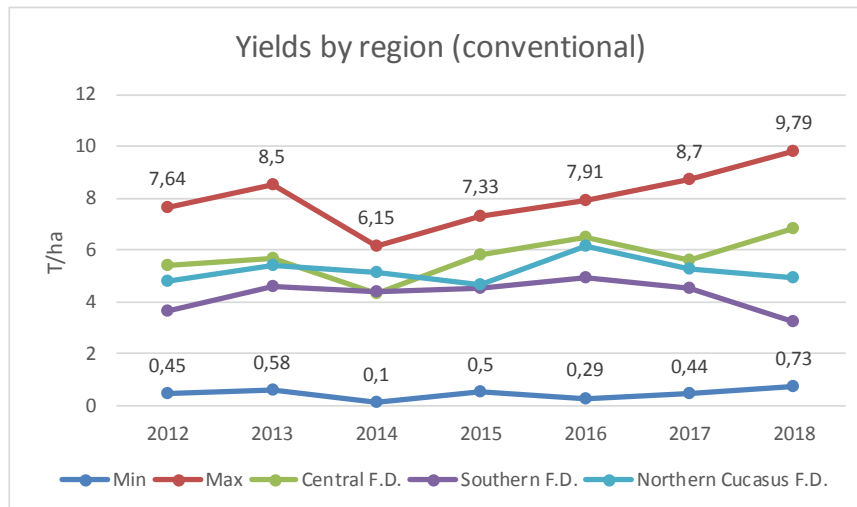


Yields comparison (conv. vs organic)



Main results

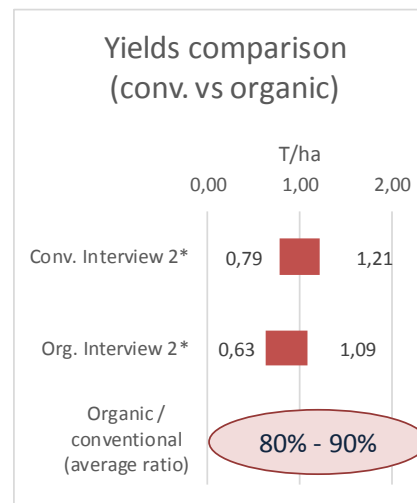
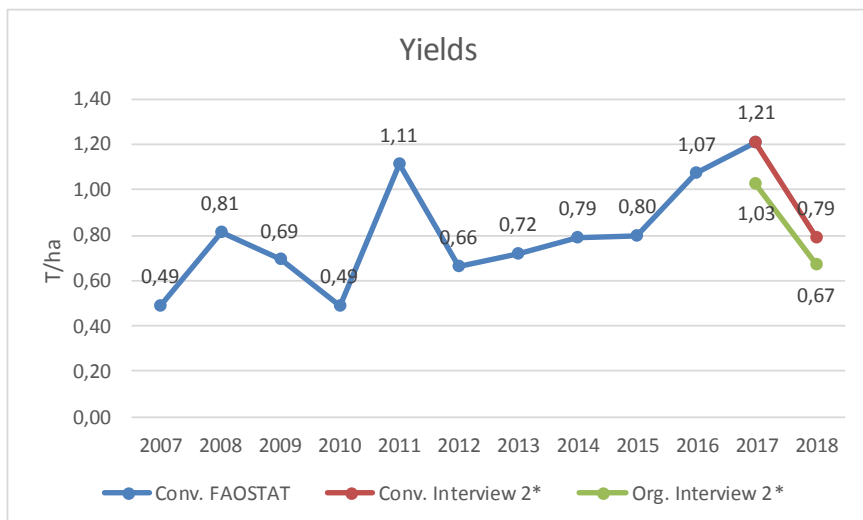
- Yields steadily growing over the 2007-2019 period
- Organic yields generally between 70% and 90% of conventional yields, mainly because of soil-born diseases and insects
- Rather limited variability of yields among the leading producing regions (Central Federal District, Southern Federal District, North Caucasus Federal District), where avg. yields fall in the [4,2 – 5,7] t/ha range
- Standard deviation of yields at country level of 0,83



Yields variability (USDA/Rosstat – T/ha): 2007-2019

- Average (conv): 4,37
- Min – Max: [2,92 - 5,51]
- Var: 0,69
- Std. Dev.: 0,83
- Growth last 3 years avg on first 3 years avg: 46%

Russia – lentils



Main results

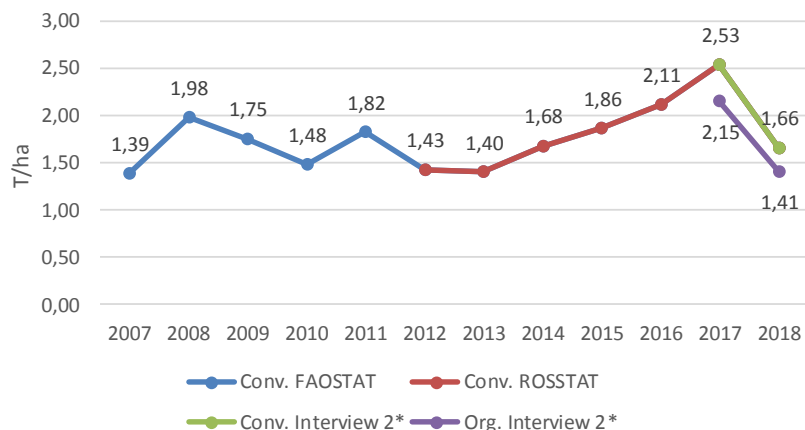
- Yields steadily growing over the 2007-2017 period
- At country level, yields falling in the [0,5 – 1,2] t/ha range
- Organic yields generally between 80% and 90% of conventional ones, mainly because of weeds competition and insects
- Standard deviation of yields is relatively low (0,24) over the observed period

Yields variability (FAOSTAT – T/ha): 2007-2017

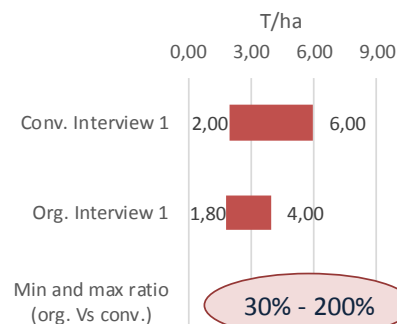
- Average (conv): 0,80
- Min – Max: [0,49 - 1,21]
- Var: 0,06
- Std. Dev.: 0,24
- Growth last 3 years avg on first 3 years avg: 55%

Russia – dry peas

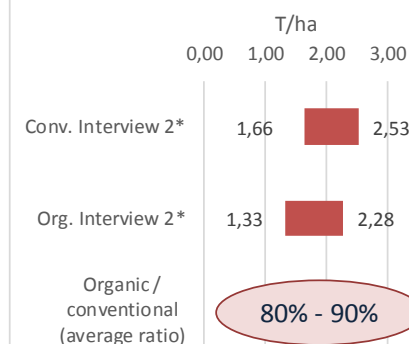
Yields



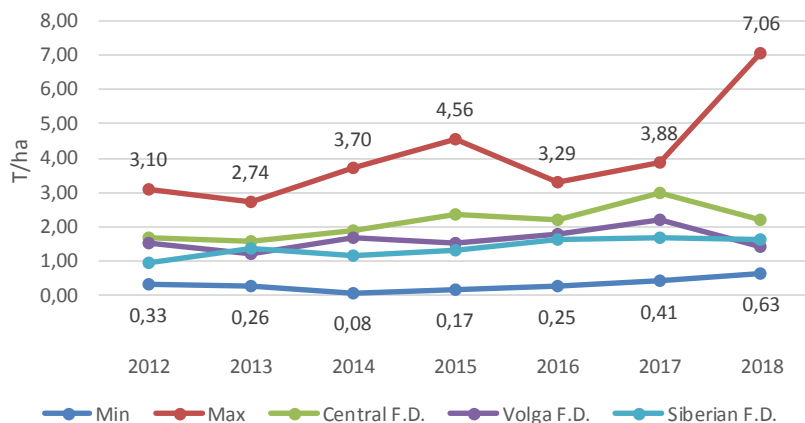
Yields comparison (conv. vs organic)



Yields comparison (conv. vs organic)



Yields by region (conventional)



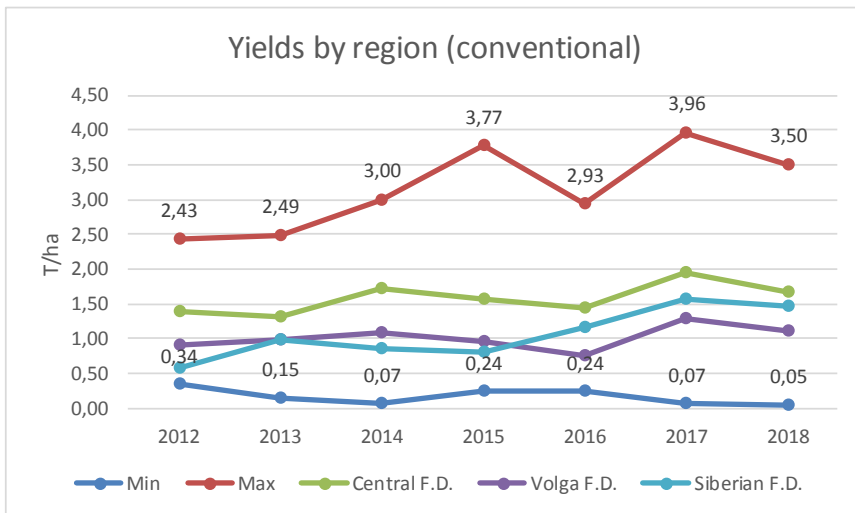
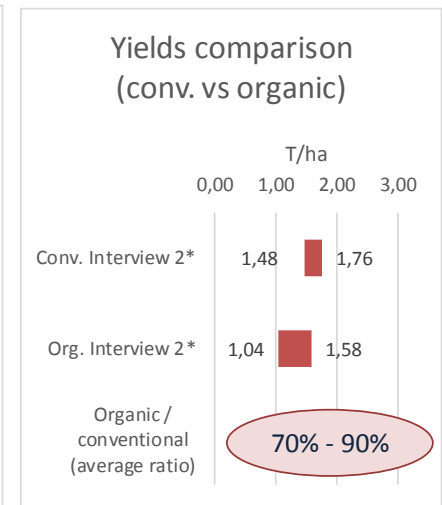
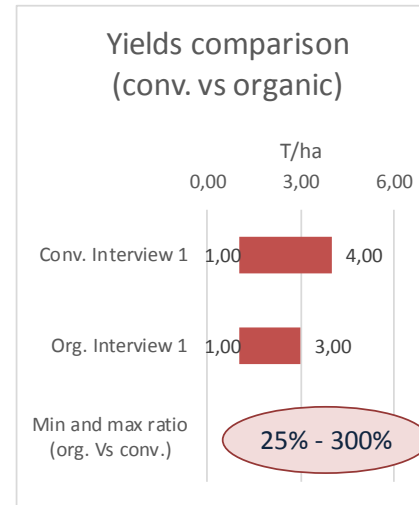
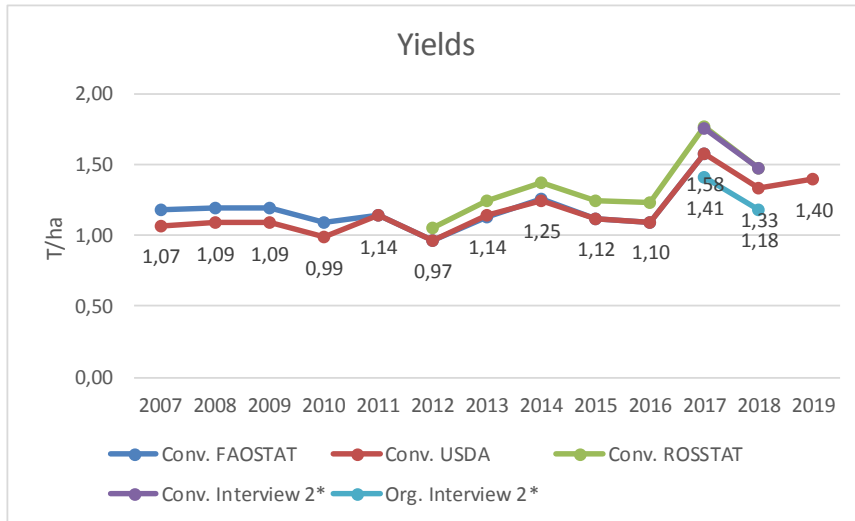
Yields variability (FAOSTAT – T/ha): 2007-2017

- Average (conv): 1,76
- Min – Max: [1,39 – 2,53]
- Var: 0,11
- Std. Dev.: 0,34
- Growth last 3 years avg on first 3 years avg: 23%

Main results

- Growth of yields over the 2007-2018 period with three drops (2009-10, 2012-13 and 2018)
- Organic yields generally slightly lower than conventional ones, mainly because of weeds competition and insects
- Significant variability of yields among the main producing regions, where avg. yields fall in the [1,32 – 2,12] t/ha range

Russia – rapeseed



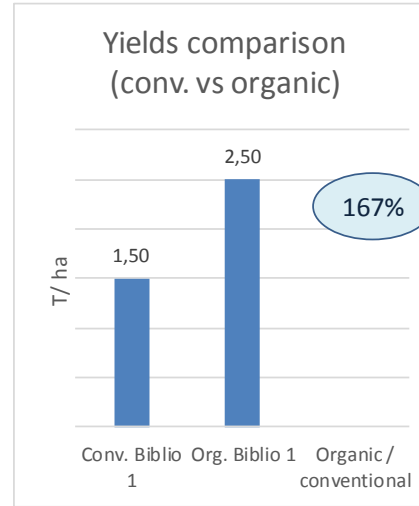
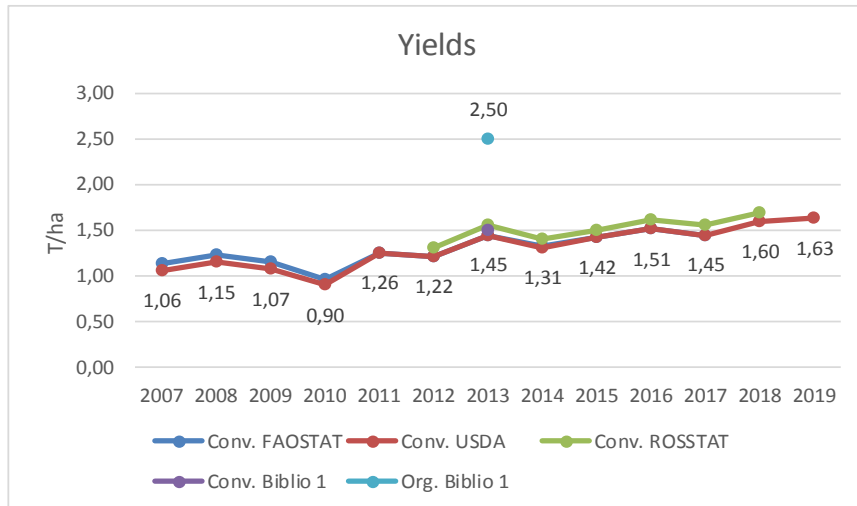
Yields variability (USDA – T/ha): 2007-2018

- Average (conv): 1,17
- Min – Max: [0,97 – 1,58]
- Var: 0,03
- Std. Dev.: 0,17
- Growth last 3 years avg on first 3 years avg: 33%

Main results

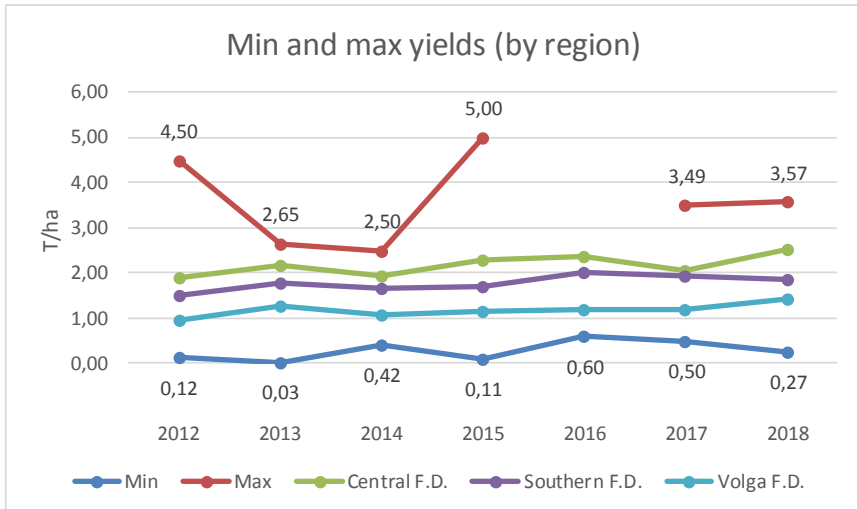
- Yield growth concentrated over the 2016-2019 period
- Organic yields generally slightly lower than conventional ones, with average ratio between 70% and 90%, mainly because of nutrition deficit and insects
- Relatively low variability among the main producing areas, where avg. yields fall in the [1,01 – 1,58] t/ha range
- Relatively low variability of yields at country level

Russia – sunflower seed



Main results

- Organic yields generally higher than conventional ones, mainly because of higher efficiency of organic farms and location in more fertile areas (2013 data)
- Relatively low variability of yields over the period
- Significant variability of yields among the leading producing areas, where avg. yields fall in the [1,2 – 2,2] t/ha range



Yields variability

(USDA – T/ha):

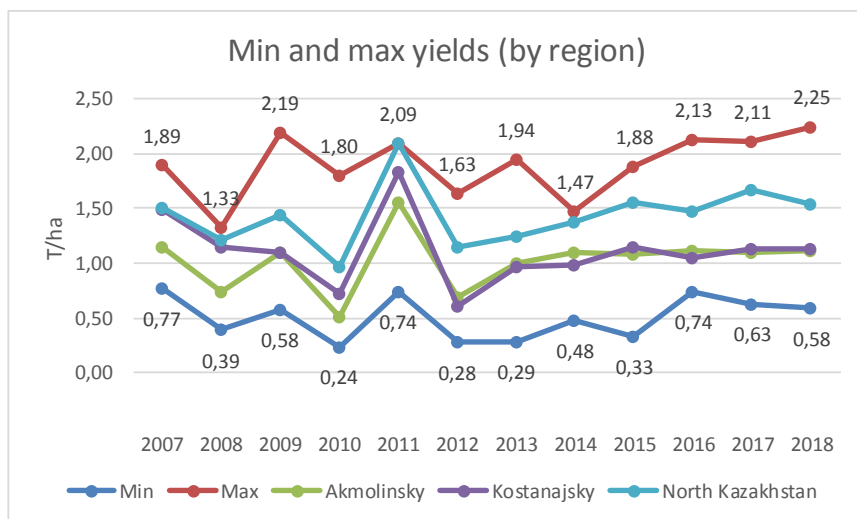
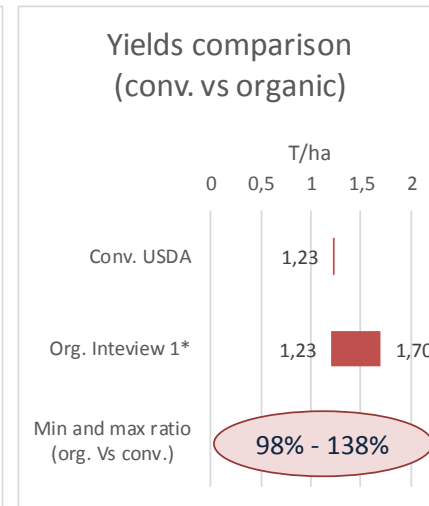
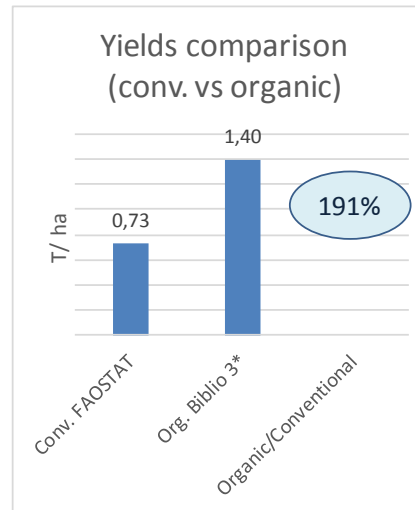
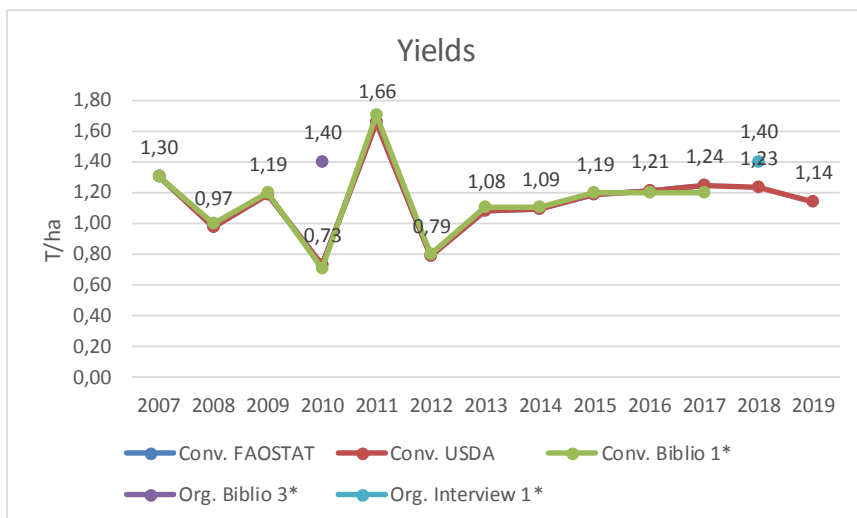
2007-2019

- Average (conv): 1,31
- Min – Max: [0,90 – 1,63]
- Var: 0,05
- Std. Dev.: 0,22
- Growth last 3 years avg on first 3 years avg: 43%



Kazakhstan

Kazakhstan – all wheat (soft wheat)*



Yields variability

(USDA – T/ha):

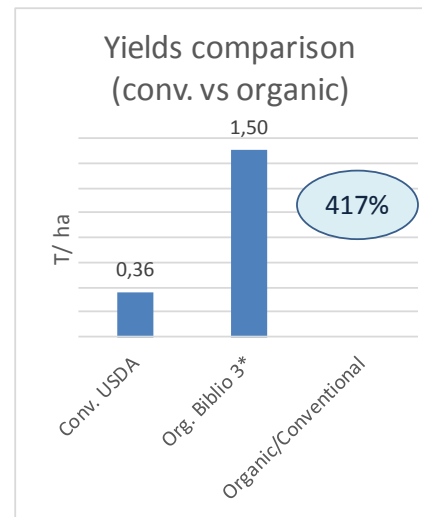
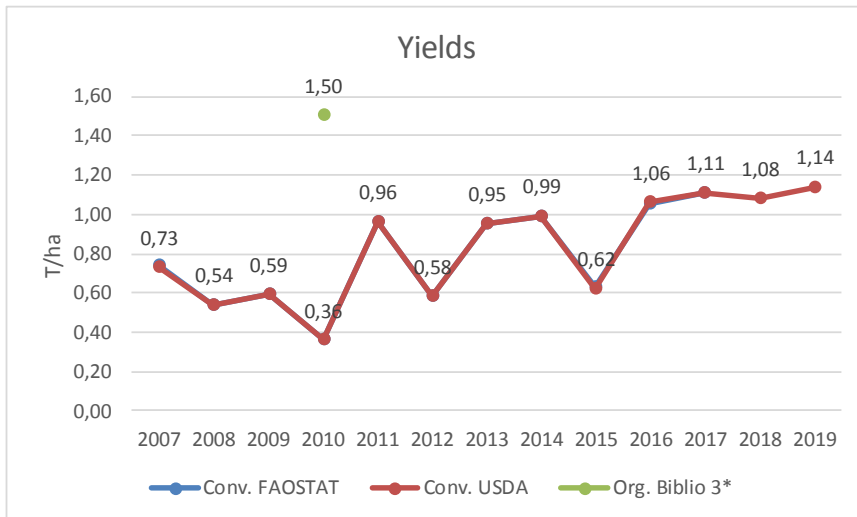
2007-2019

- Average (conv): 1,14
- Min – Max: [0,73 – 1,66]
- Var: 0,05
- Std. Dev.: 0,23
- Growth last 3 years avg on first 3 years avg: 4%

Main results

- Organic yields higher than conventional ones, mainly because of higher efficiency of organic farms and location in more fertile areas (2010 and 2018 data)
- Relatively low variability of yields over the period
- Significant variability of yields among the main producing areas (Akmolinsky, Kostanajsky, North Kaz.), where avg. yields fall in the [0,5-1,9] t/ha range

Kazakhstan – rapeseed



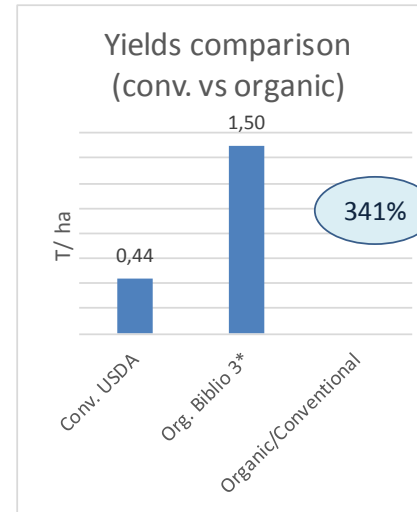
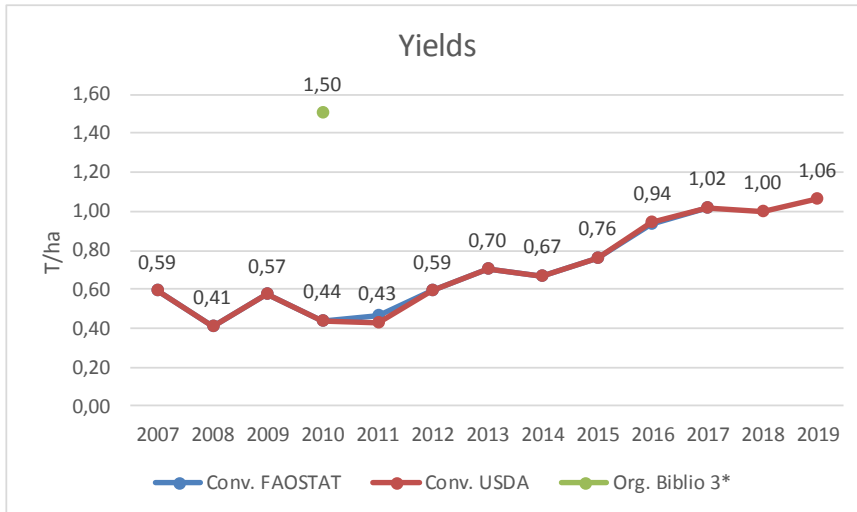
Main results

- Organic yields much higher than conventional ones, mainly because of higher efficiency of organic farms and location in more fertile areas (2010 data)
- Medium variability of yields over the period

Yields variability (USDA – T/ha): 2007-2019

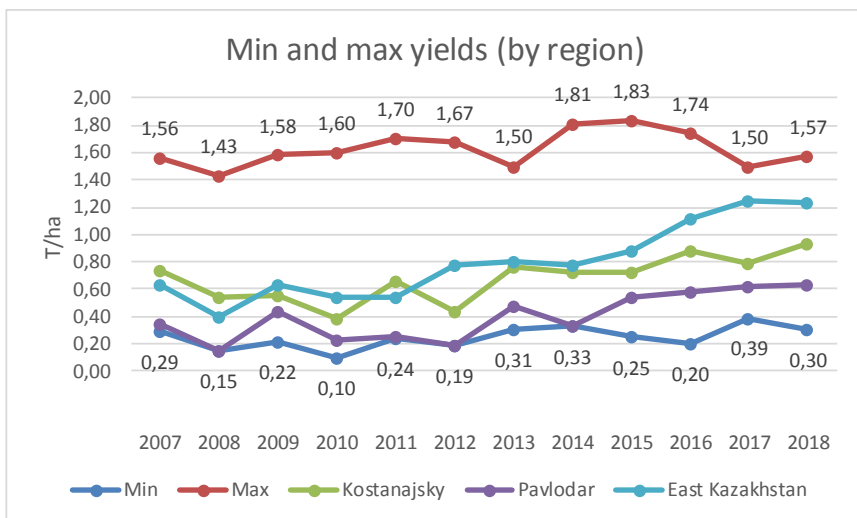
- Average (conv): 0,82
- Min – Max: [0,36 – 1,14]
- Var: 0,07
- Std. Dev.: 0,26
- Growth last 3 years avg on first 3 years avg: 79%

Kazakhstan – sunflower seeds



Main results

- Organic yields much higher than conventional ones, mainly because of higher efficiency of organic farms and location in more fertile areas (2010 data)
- Medium variability of yields over the period
- Significant growth over the observed period and significant yield variability across the main producing areas, where avg. yields fall in the [0,4-0,8] t/ha range



Yields variability

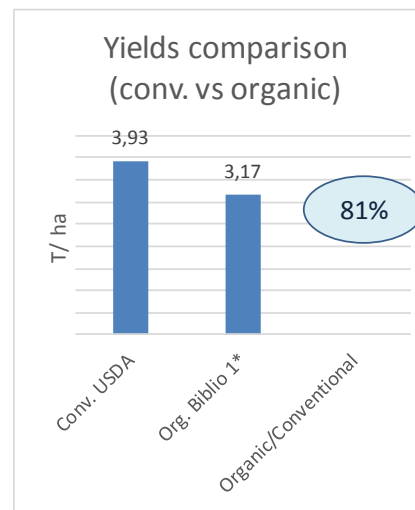
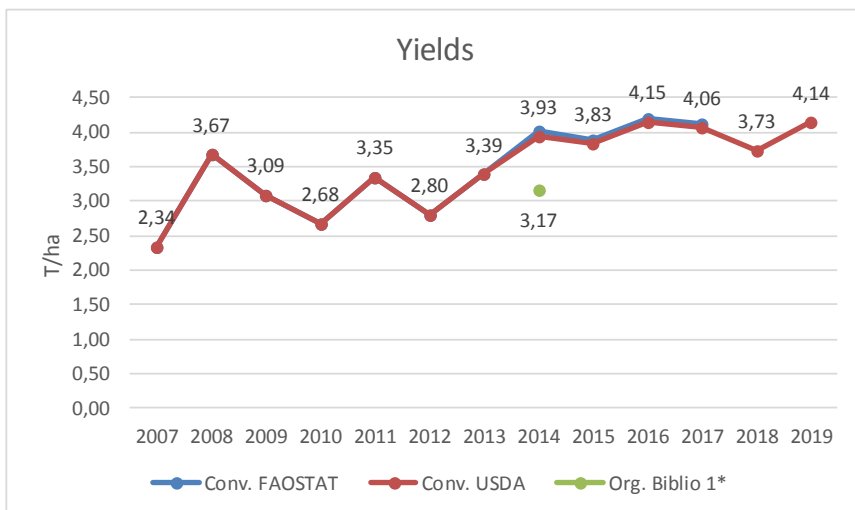
(USDA – T/ha):
2007-2019

- Average (conv): 0,71
- Min – Max: [0,41 – 1,06]
- Var: 0,05
- Std. Dev.: 0,23
- Growth last 3 years avg on first 3 years avg: 96%



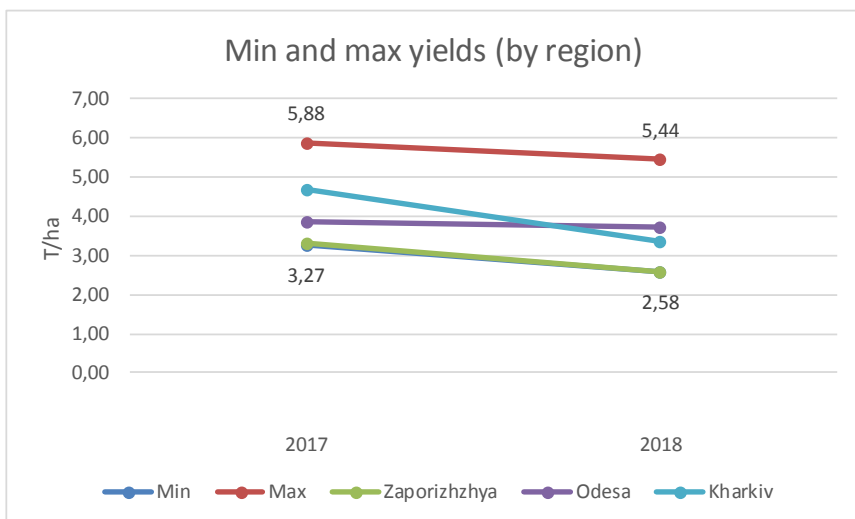
Ukraine

Ukraine – all wheat (soft wheat)*



Main results

- Organic yields slightly lower than conventional ones (2014 data)
- Medium variability of yields over the period
- Medium yield variability across regions, with avg. yields in the three main producing areas falling in the [2,96-4,02] t/ha range (the minimum avg. yields are achieved in the Zaporizhzhya region)



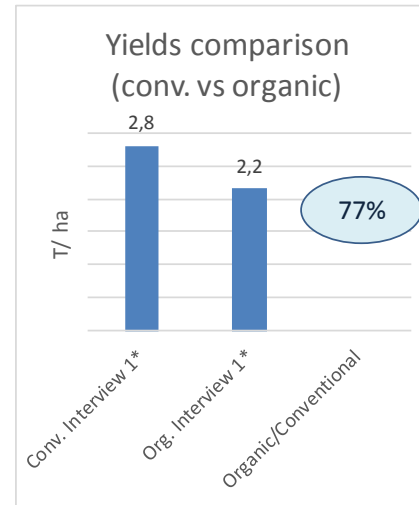
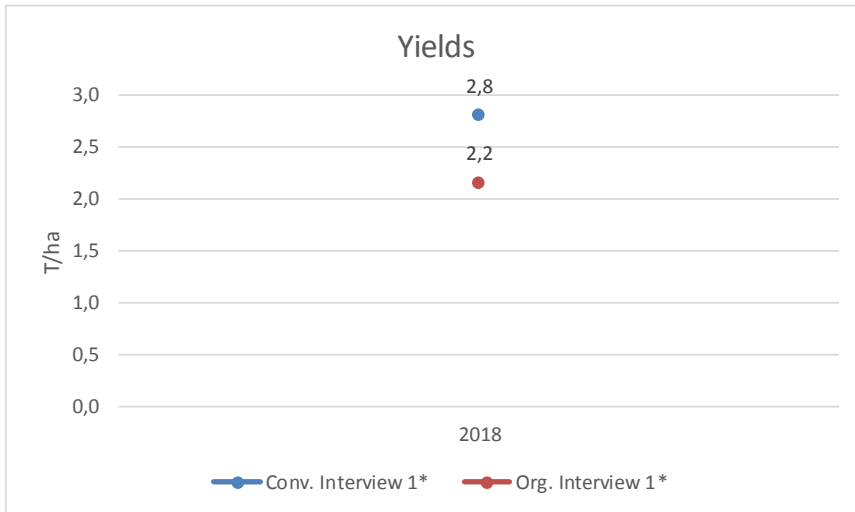
Yields variability

(USDA – T/ha):

2007-2019

- Average (conv): 3,47
- Min – Max: [2,34 – 4,15]
- Var: 0,35
- Std. Dev.: 0,59
- Growth last 3 years avg on first 3 years avg: 31%

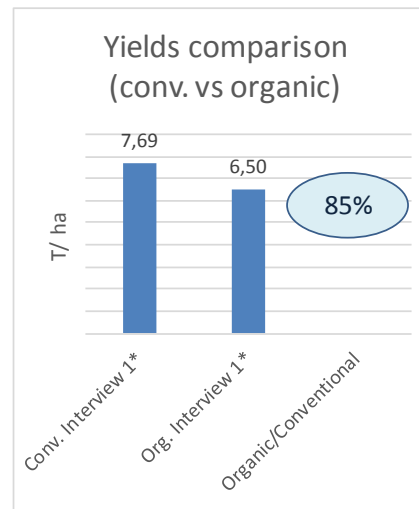
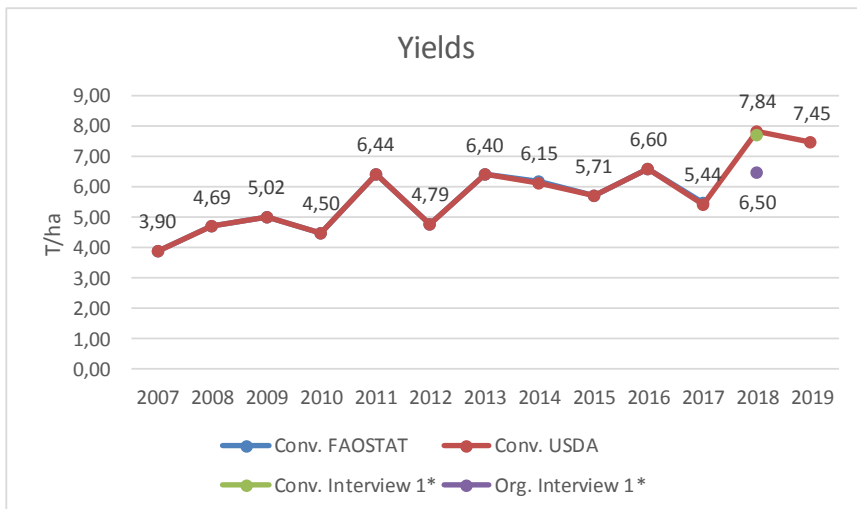
Ukraine – durum wheat



Main results

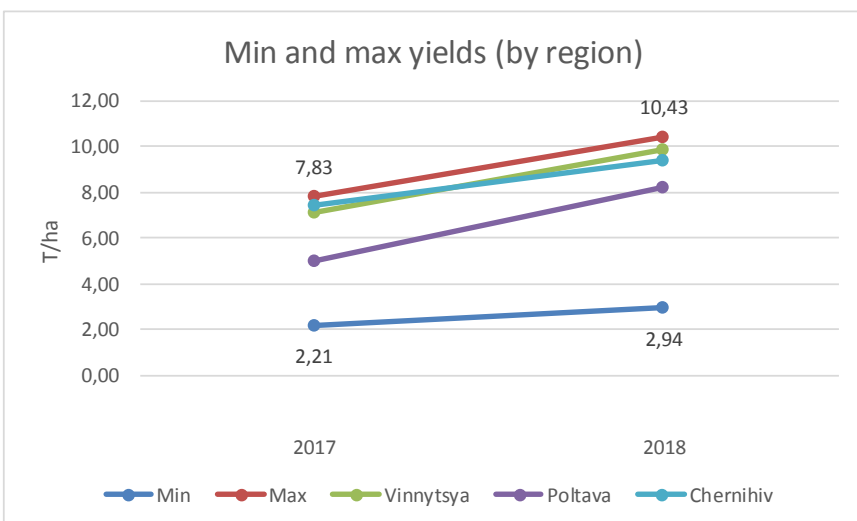
- Organic yields slightly lower than conventional ones (2018 data)

Ukraine – corn



Main results

- Organic yields slightly lower than conventional ones (2018 data)
- High variability of yields at country level over the period
- Significant yield variability across the main producing areas, where avg. yields fall in the [6,63-8,53] t/ha range



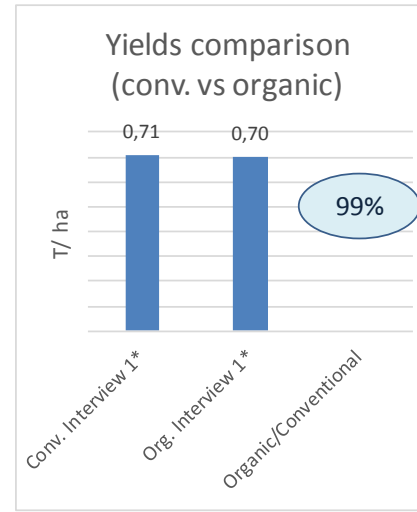
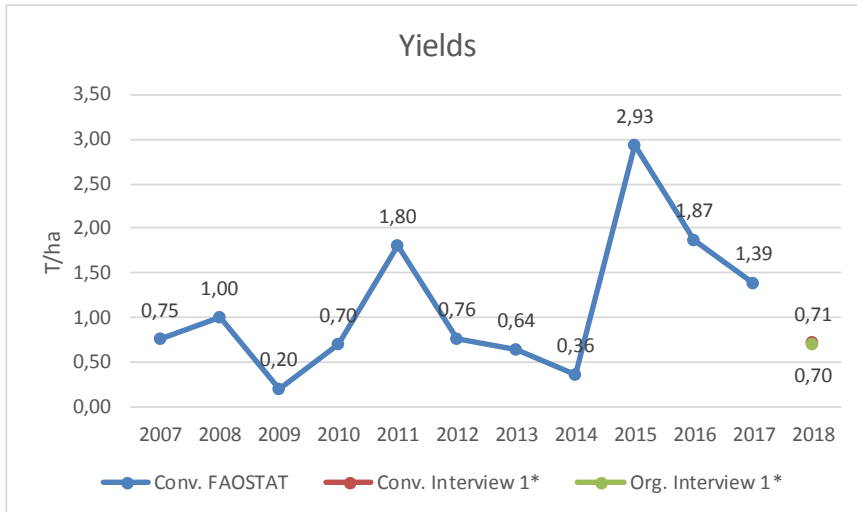
Yields variability

(USDA – T/ha):

2007-2019

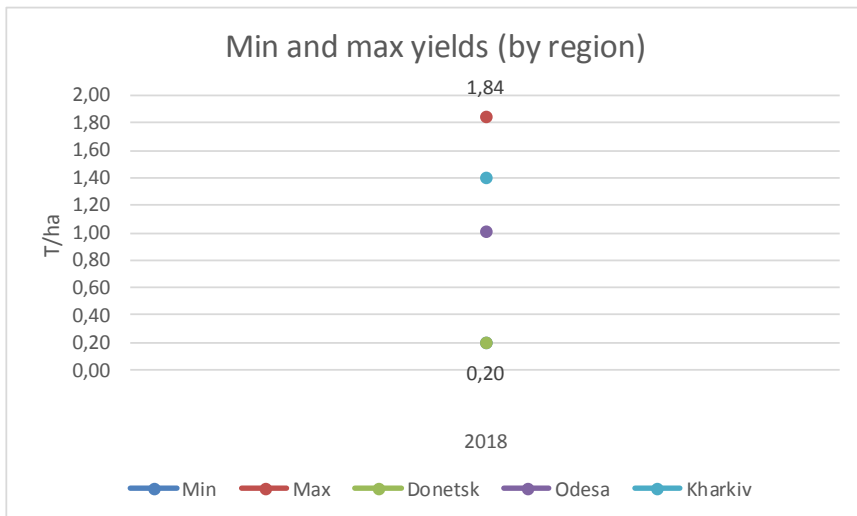
- Average (conv): 5,76
- Min – Max: [3,90 – 7,84]
- Var: 1,39
- Std. Dev.: 1,18
- Growth last 3 years avg on first 3 years avg: 52%

Ukraine – lentils



Main results

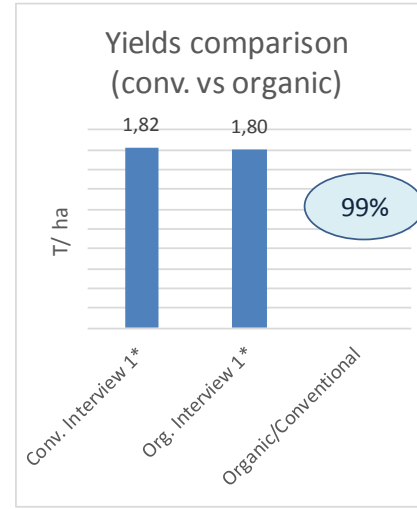
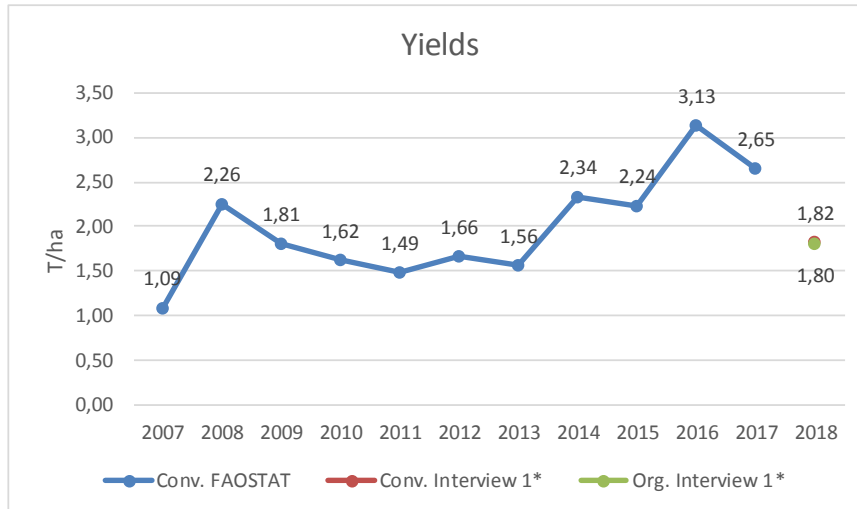
- Organic yields in line with conventional ones (2018 data)
- Medium variability of yields at country level over the period
- Significant yield variability across the main producing areas, where avg. yields fall in the [0,20-1,40] t/ha range (2018 data); the minimum avg. yields are achieved in the Donetsk region



Yields variability (FAOSTAT – T/ha): 2007-2017

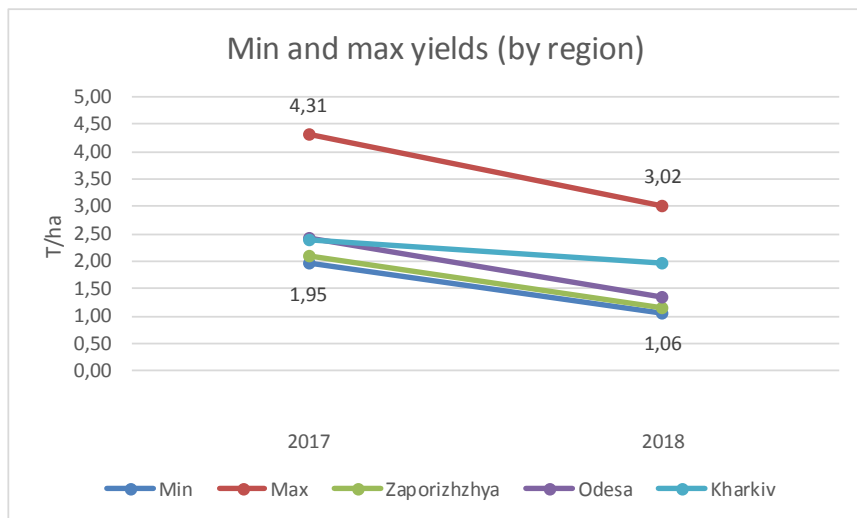
- Average (conv): 1,13
- Min – Max: [0,20 – 2,93]
- Var: 0,65
- Std. Dev.: 0,81
- Growth last 3 years avg on first 3 years avg: 217%

Ukraine – dry peas



Main results

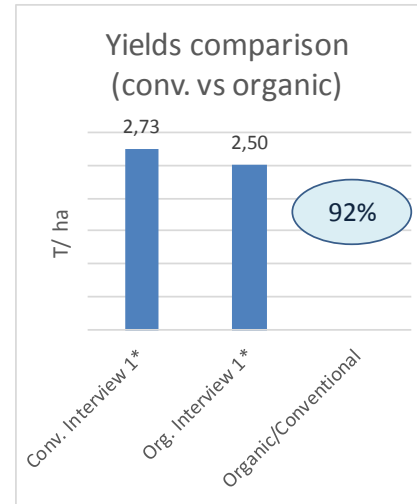
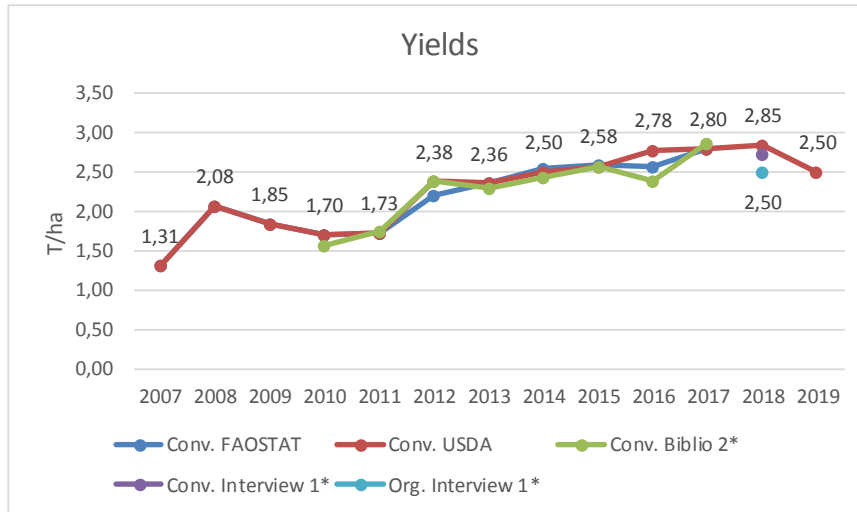
- Organic yields in line with conventional ones (2018 data)
- Medium variability of yields at country level over the period
- Medium/low yield variability across the main producing areas, where avg. yields fall in the [1,63-2,18] t/ha range (avg. yields in Zaporizhzhya region are very close to the minimum)



Yields variability (FAOSTAT – T/ha): 2007-2017

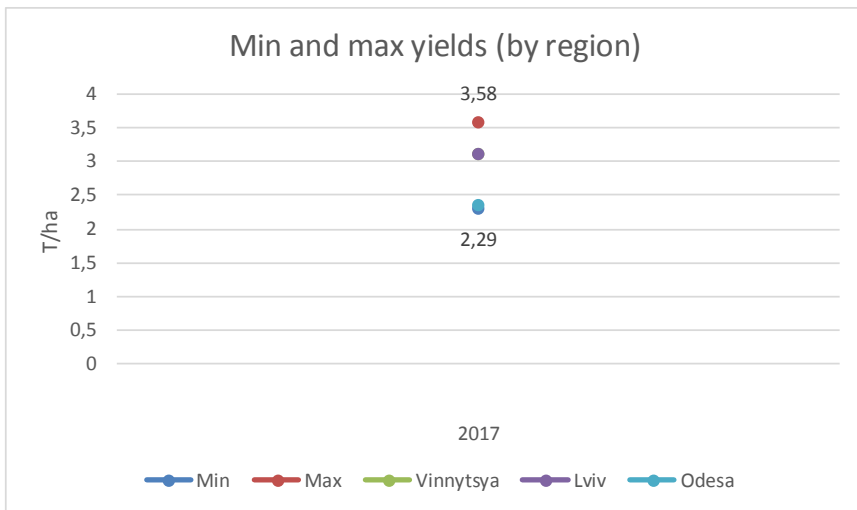
- Average (conv): 1,99
- Min – Max: [1,09 – 3,13]
- Var: 0,35
- Std. Dev.: 0,59
- Growth last 3 years avg on first 3 years avg: 55%

Ukraine – rapeseed



Main results

- Organic yields in line with conventional ones (2018 data)
- Medium variability of yields at country level over the period
- Medium/low yield variability across the main producing areas, where avg. yields fall in the [2,34-3,11] t/ha range (avg. yields in Odesa region are very close to the minimum)



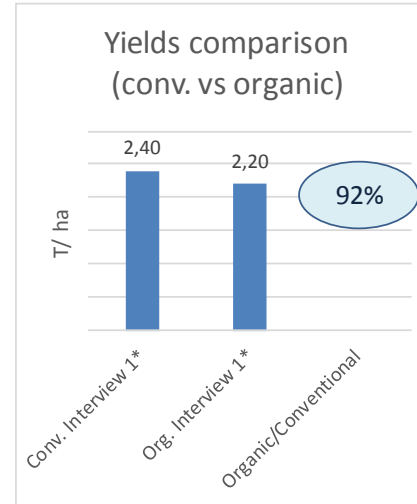
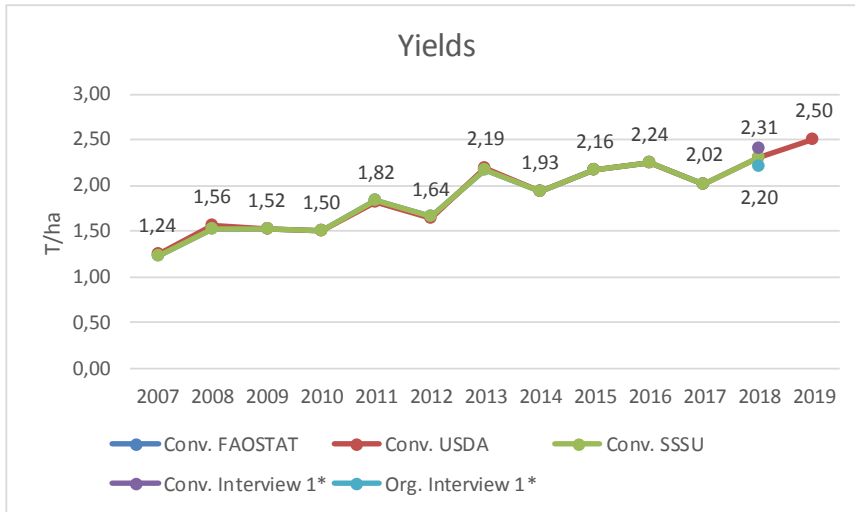
Yields variability

(USDA – T/ha):

2007-2019

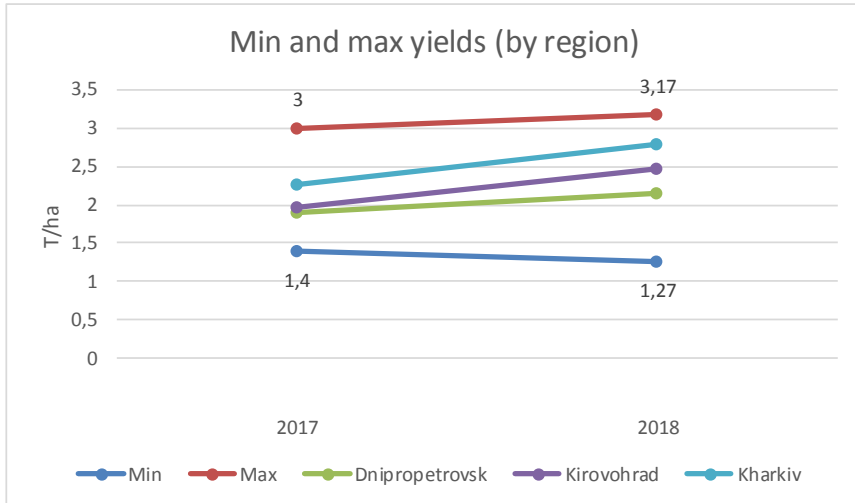
- Average (conv): 2,26
- Min – Max: [1,31 – 2,85]
- Var: 0,24
- Std. Dev.: 0,49
- Growth last 3 years avg on first 3 years avg: 56%

Ukraine – sunflower seeds



Main results

- Organic yields in line with conventional ones (2018 data)
- Relatively low variability of yields at country level over the period and steady growth
- Low yield variability across the main producing areas, where avg. yields fall in the [2,0-2,5] t/ha range



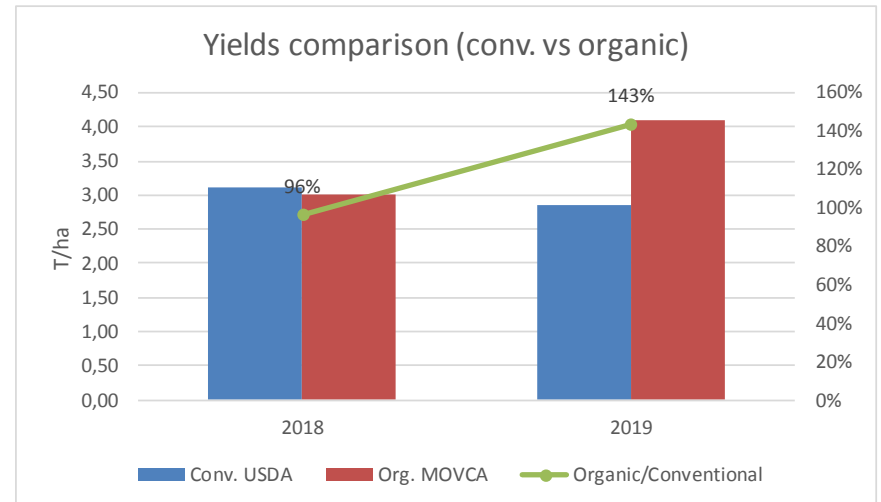
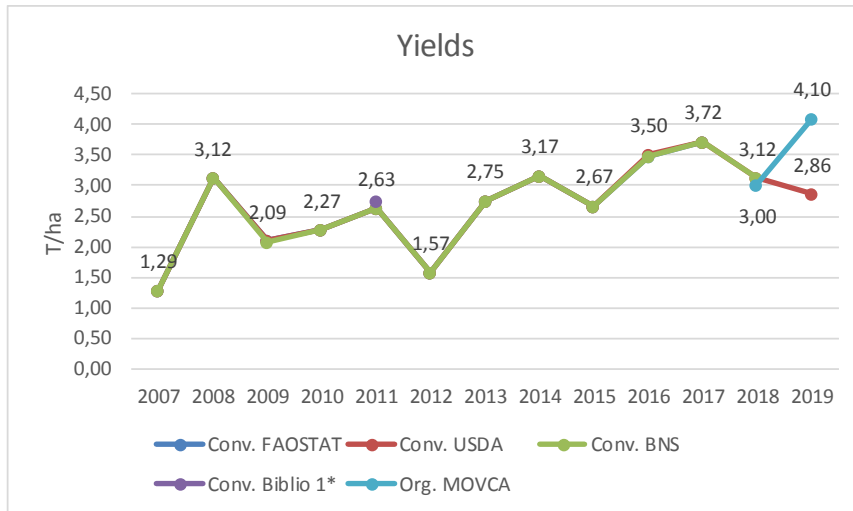
Yields variability (USDA – T/ha): 2007-2019

- Average (conv): 1,89
- Min – Max: [1,24 – 2,50]
- Var: 0,14
- Std. Dev.: 0,38
- Growth last 3 years avg on first 3 years avg: 58%



Moldova

Moldova – all wheat



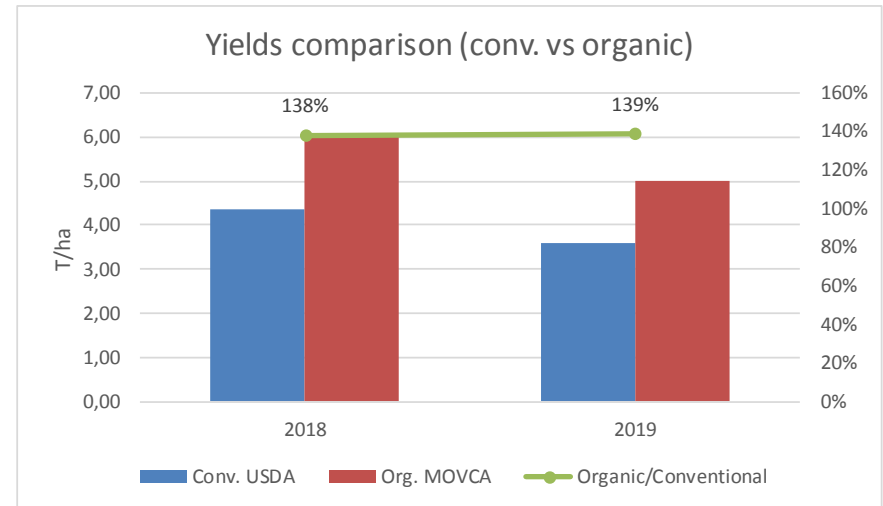
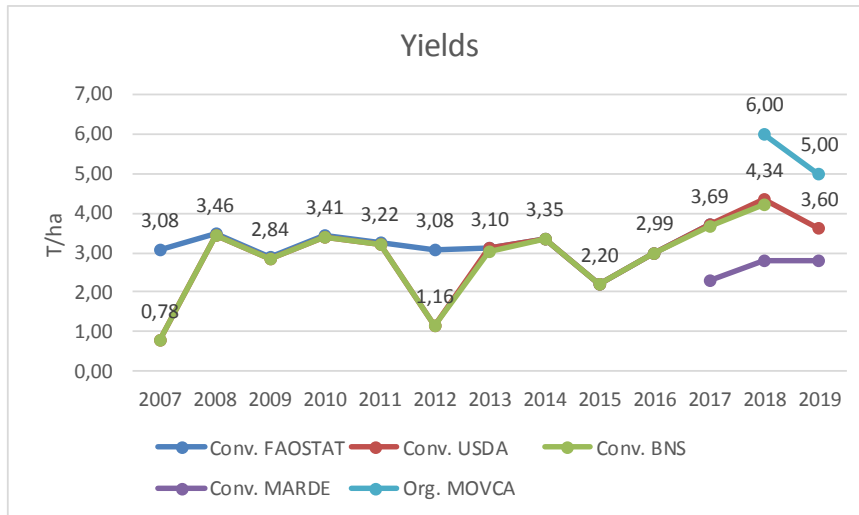
Yields variability (USDA – T/ha): 2007-2019

- Average (conv): 2,67
- Min – Max: [1,29 – 3,72]
- Var: 0,51
- Std. Dev.: 0,71
- Growth last 3 years avg on first 3 years avg: 49%

Main results

- Organic yields generally higher than or in line with conventional ones, mainly because of higher efficiency of organic farms and location in more fertile areas (2018-19 data)
- Conventional yields at country level ranging from 1,29 to 3,72 t/ha over the 2007-19 period
- Unstable growth of yields over the observed period
- Medium variability, with standard deviation of 0,71

Moldova – corn



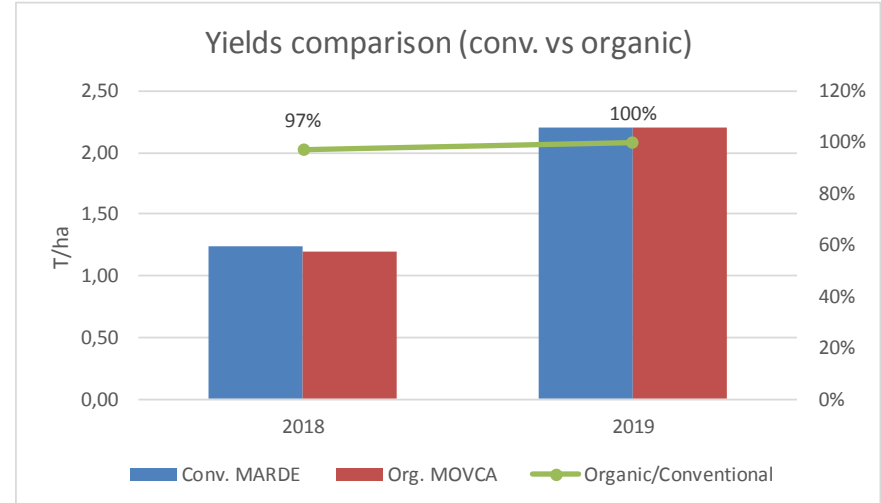
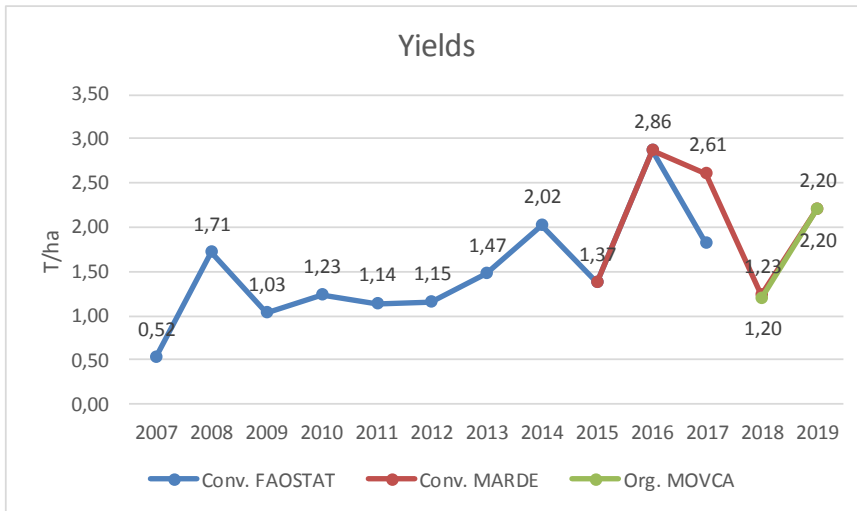
Yields variability (USDA – T/ha): 2007-2019

- Average (conv): 2,93
- Min – Max: [0,78 – 4,34]
- Var: 1,01
- Std. Dev.: 1,00
- Growth last 3 years avg on first 3 years avg: 64%

Main results

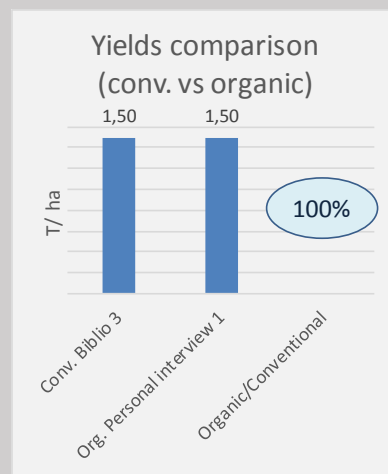
- Organic yields higher than conventional ones in 2018 and 2019, mainly because of higher efficiency of organic farms and location in more fertile areas
- Conventional yields at country level ranging from 0,78 to 4,34 t/ha over the 2007-19 period
- Unstable growth of yields over the observed period
- Medium/high variability, with standard deviation of 1,00

Moldova – dry peas (& lentils)



Lentils:

- According to the document "Particularitățile Biologice, Genetice Și Ameliorative Ale Lintei (Lens culinaris Medic.)" the yield for **lentils in conventional farming in 2016** has been around **1,5 t/ha**



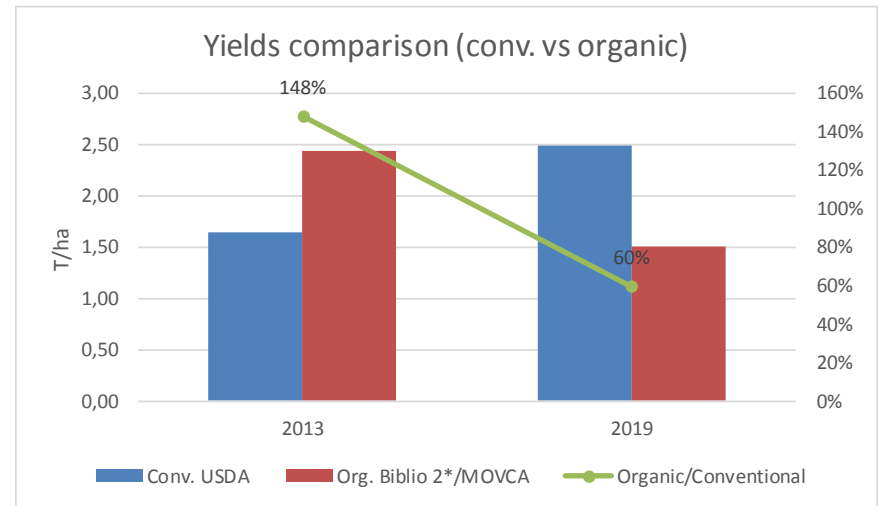
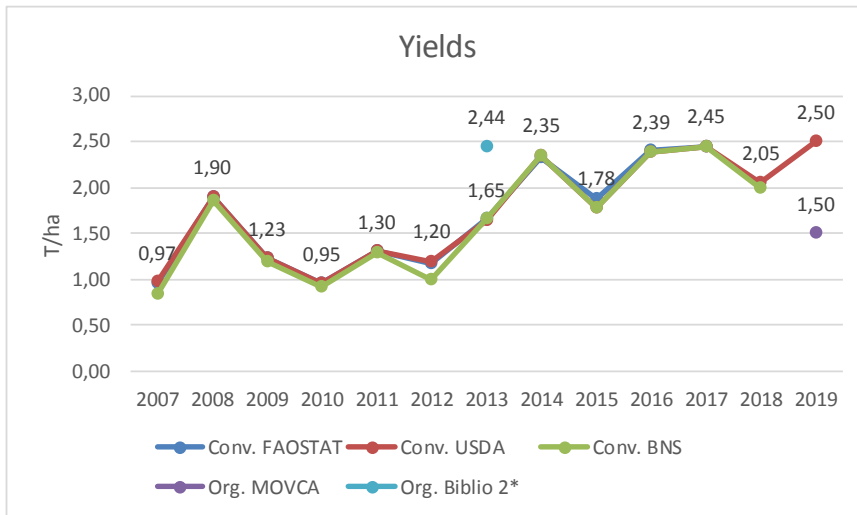
Yields variability (FAOSTAT – T/ha): 2007-2017

- Average (conv): 1,48
- Min – Max: [0,52 – 2,87]
- Var: 0,38
- Std. Dev.: 0,62
- Growth last 3 years avg on first 3 years avg: 86%

Main results

- Organic yields in line with conventional ones in 2018 and 2019, mainly because of higher efficiency of organic farms and location in more fertile areas
- Yields at country level ranging from 0,52 to 2,87 t/ha over the 2007-17 period
- Medium variability, with standard deviation of 0,62

Moldova – rapeseed



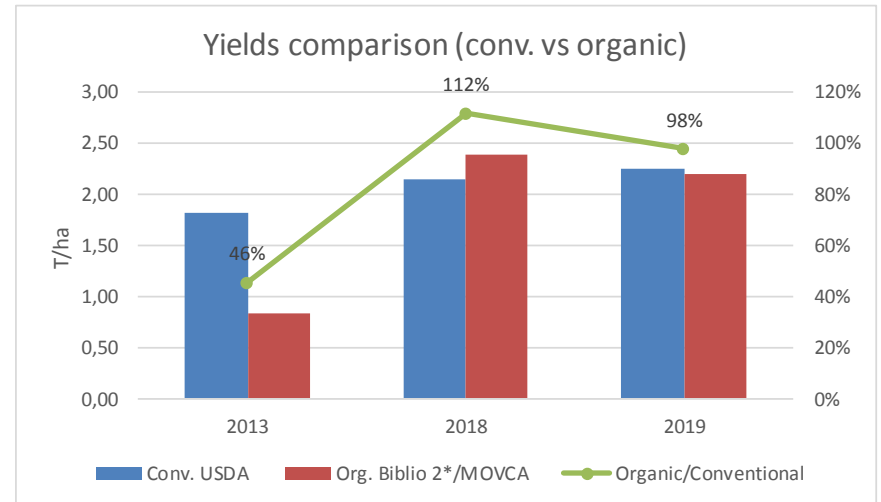
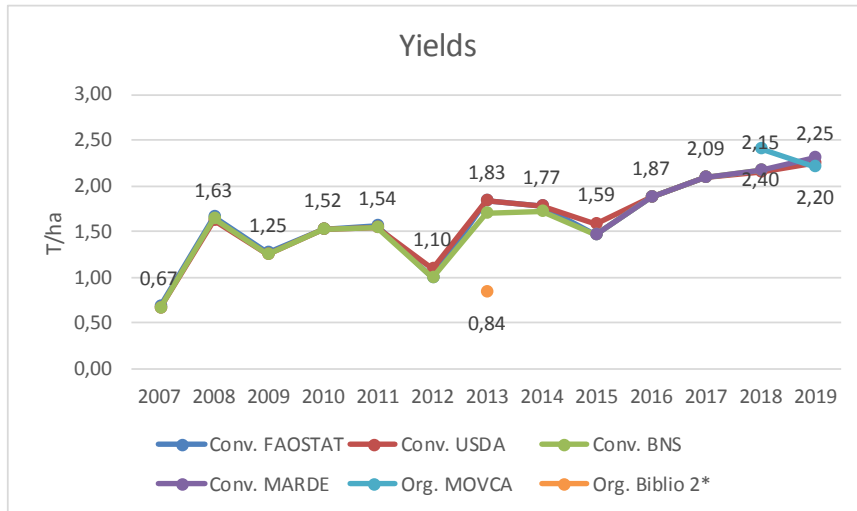
Yields variability (USDA – T/ha): 2007-2019

- Average (conv): 1,75
- Min – Max: [0,95 – 2,50]
- Var: 0,33
- Std. Dev.: 0,58
- Growth last 3 years avg on first 3 years avg: 71%

Main results

- Organic yields higher than conventional ones in 2013 and lower in 2019, also depending on the different sources for organic yields
- Medium variability of yields over the period, with standard deviation of 0,58
- Unsteady growth over the period, with yields falling in the [0,95-2,50] t/ha range

Moldova – sunflower seeds



Yields variability (USDA – T/ha): 2007-2019

- Average (conv): 1,64
- Min – Max: [0,67 – 2,25]
- Var: 0,20
- Std. Dev.: 0,44
- Growth last 3 years avg on first 3 years avg: 83%

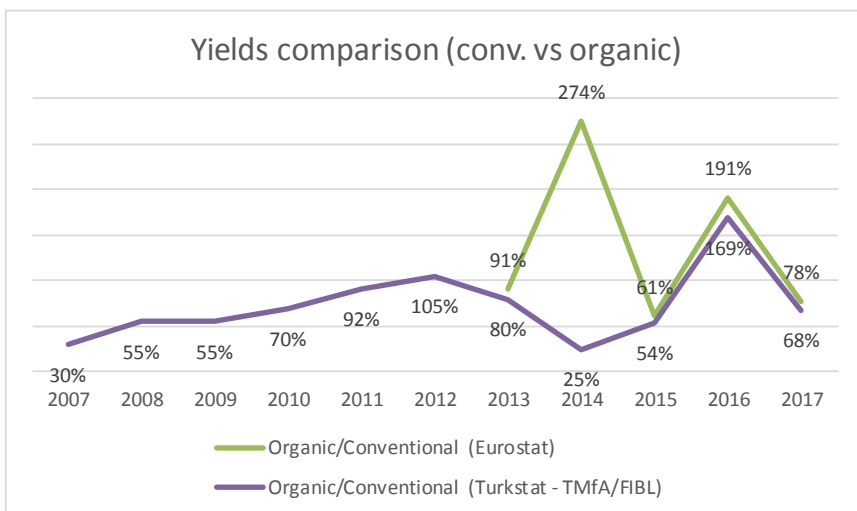
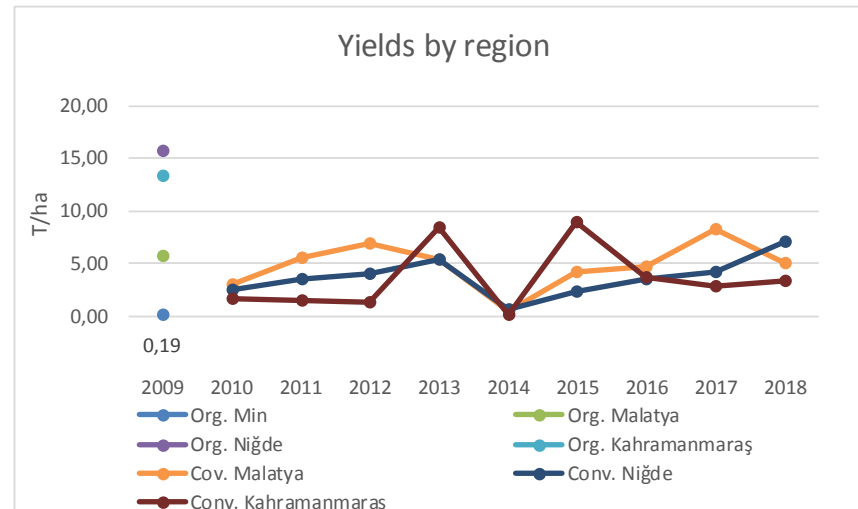
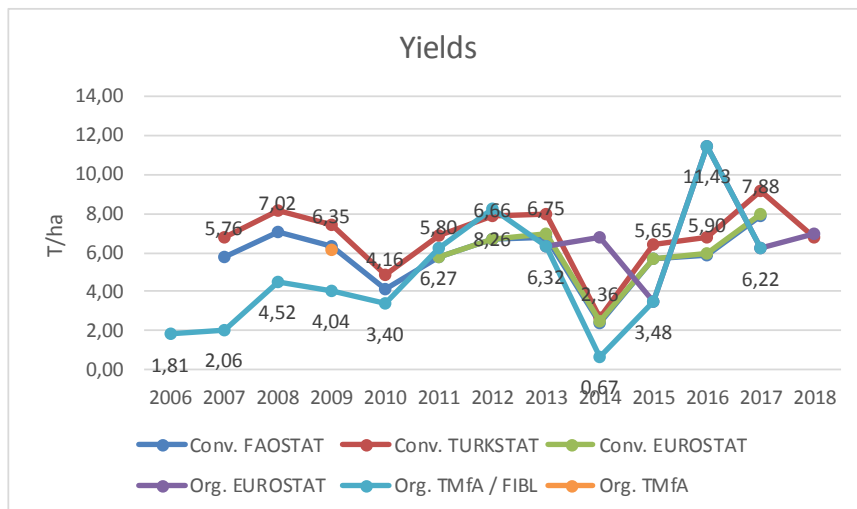
Main results

- Organic yields significantly lower than conventional ones (in 2013) and in line in 2018-19, also depending on the different sources for organic yields
- Medium variability of yields over the period, with standard deviation of 0,44
- Yields at country level over the period falling in the [0,67-2,25] t/ha range



Turkey

Turkey – apricots



Yields variability

(Turkstat/TMfA – T/ha):

Conventional 2007-2018

- Average (conv): 6,80
- Min – Max: [2,68 – 9,17]
- Var: 2,84
- Std. Dev.: 1,68

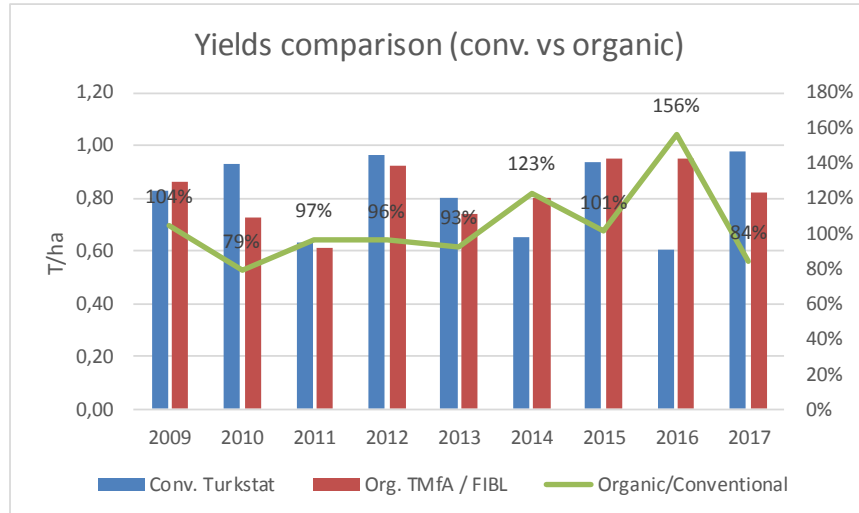
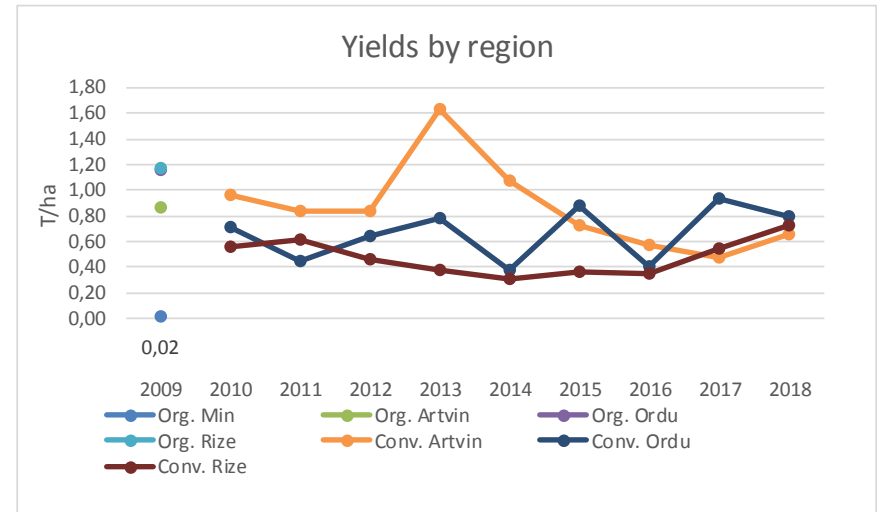
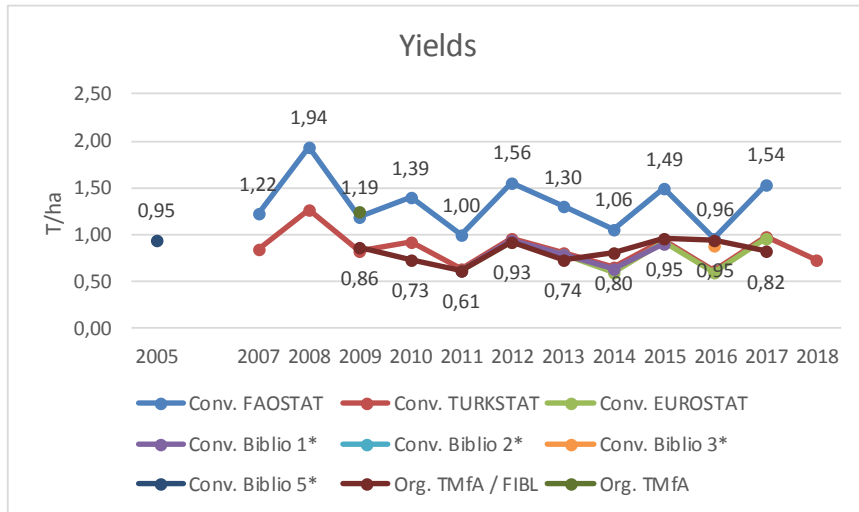
Organic 2006-2017

- Average (org.): 4,87
- Min – Max: [0,67 – 11,43]
- Var: 9,11
- Std. Dev.: 3,02

Main results

- Organic yields generally lower than conventional ones; exceptions mainly due to higher efficiency of organic farms and location in more fertile areas
- High variability of yields over the period, with standard deviation of 1,68 for conventional and 3,02 for organic farming
- Organics yields in the main producing areas in the [5,8-15,7] t/ha range (2009 data)

Turkey – hazelnuts



Yields variability

(Turkstat/TMfA – T/ha):

Conventional 2007-2018

- Average (conv.): 0,85
- Min – Max: [0,61 – 1,27]
- Var: 0,03
- Std. Dev.: 0,19

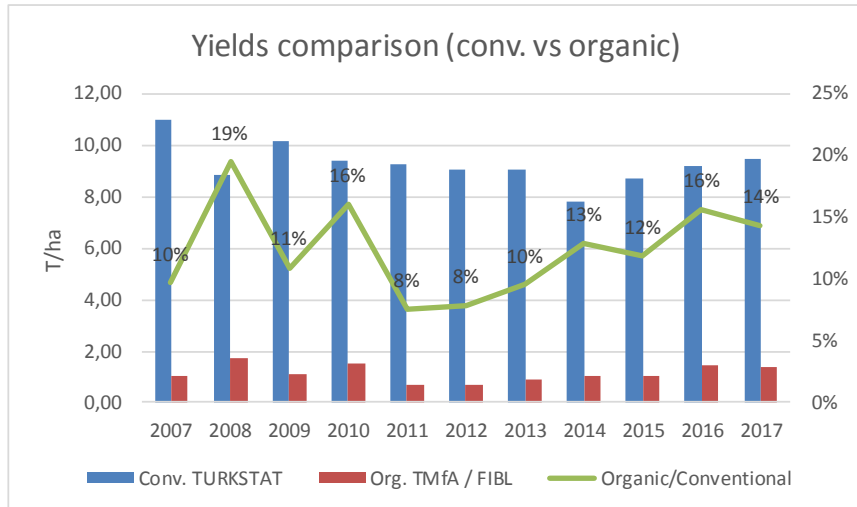
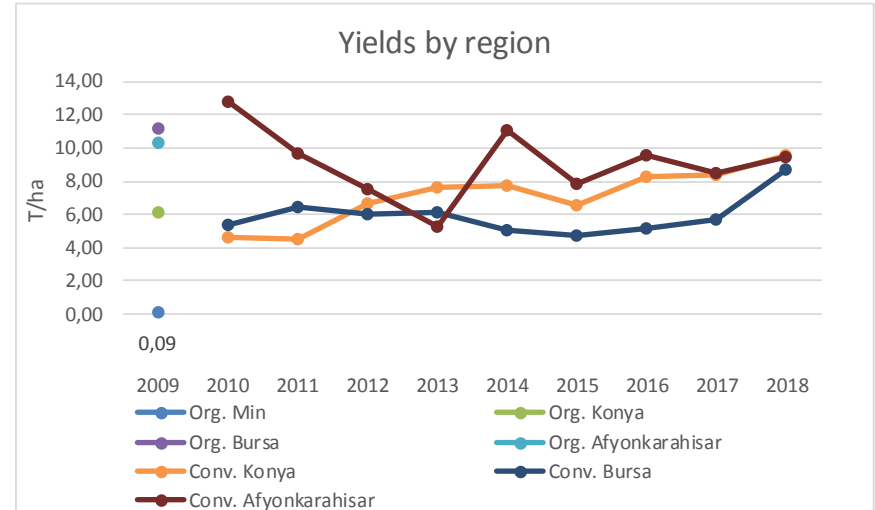
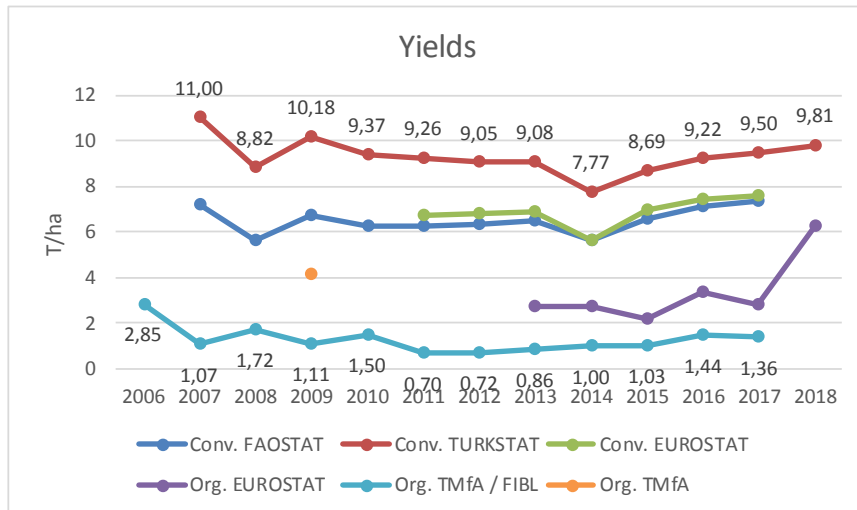
Organic 2009-2017

- Average (org.): 0,82
- Min – Max: [0,61 – 0,95]
- Var: 0,01
- Std. Dev.: 0,11

Main results

- Organic yields generally in line with or higher than conventional ones
- Low variability of yields over the period, with standard deviation of 0,19 for conventional and 0,11 for organic farming
- Low variability of organic yields in the three main producing regions, falling in the [0,86-1,18] t/ha range (2009 data)

Turkey – cherries



Yields variability

(Turkstat/TMfA – T/ha):

Conventional 2007-2018

- Average (conv): 9,31
- Min – Max: [7,77 – 11,00]
- Var: 0,64
- Std. Dev.: 0,80

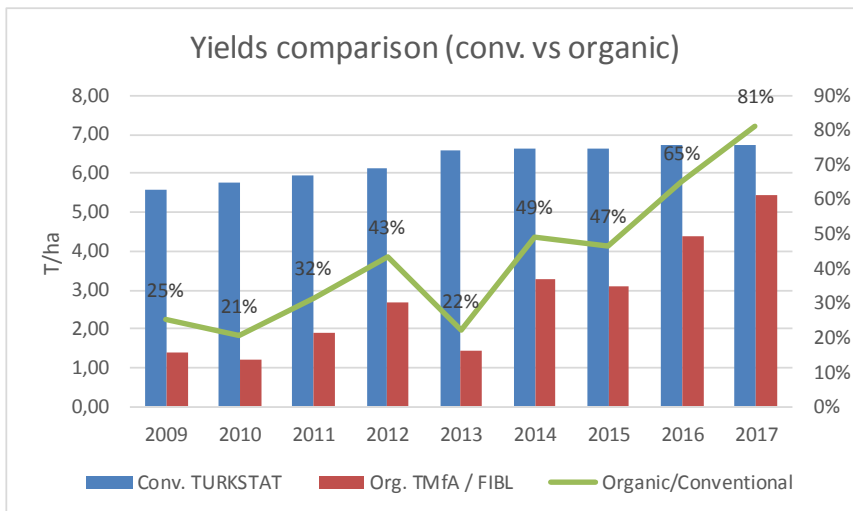
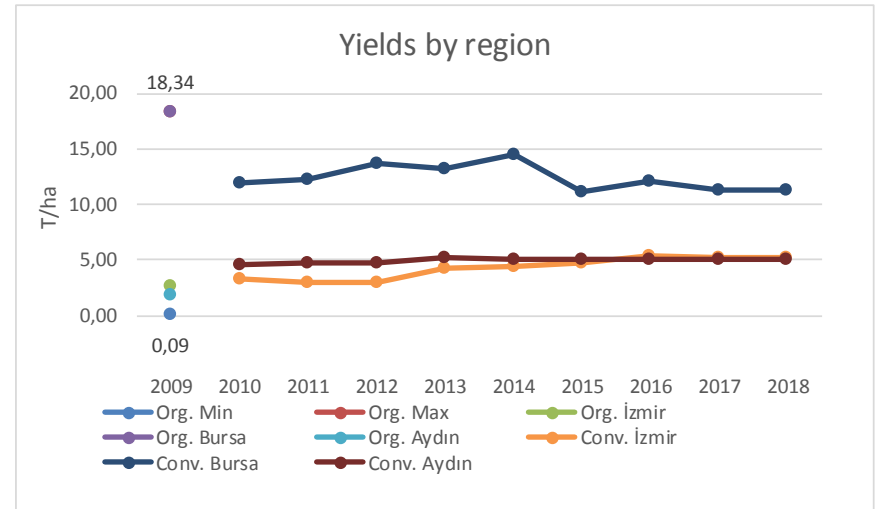
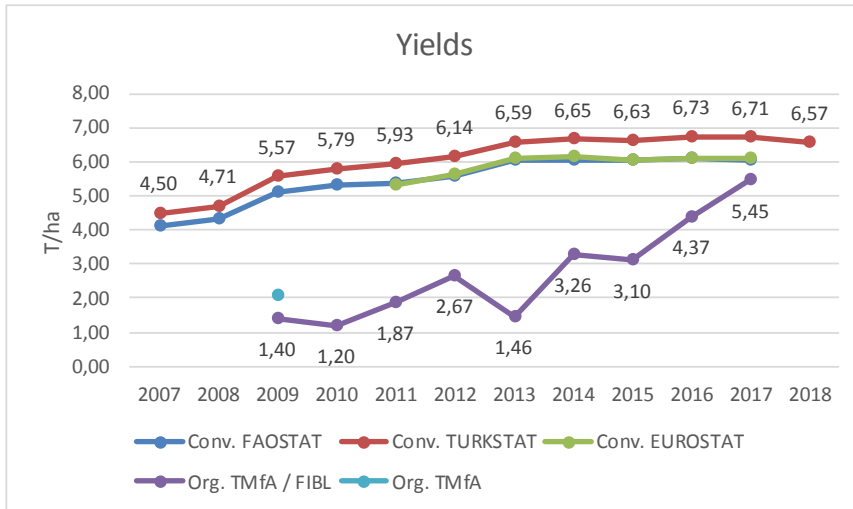
Organic 2006-2017

- Average (org.): 1,28
- Min – Max: [0,70 – 2,85]
- Var: 0,34
- Std. Dev.: 0,59

Main results

- Organic yields significantly lower than conventional ones, mainly because of the high input techniques in conventional farming
- Medium variability of yields over the period, with standard deviation of 0,8 for conventional and 0,59 for organic
- Large variability of organic yields among the main producing areas, falling in the [6,16-11,16] t/ha range

Turkey – figs



Yields variability (Turkstat/TMfA – T/ha):

Conventional 2007-2018

- Average (conv): 6,04
- Min – Max: [4,50 – 6,73]
- Var: 0,61
- Std. Dev.: 0,78

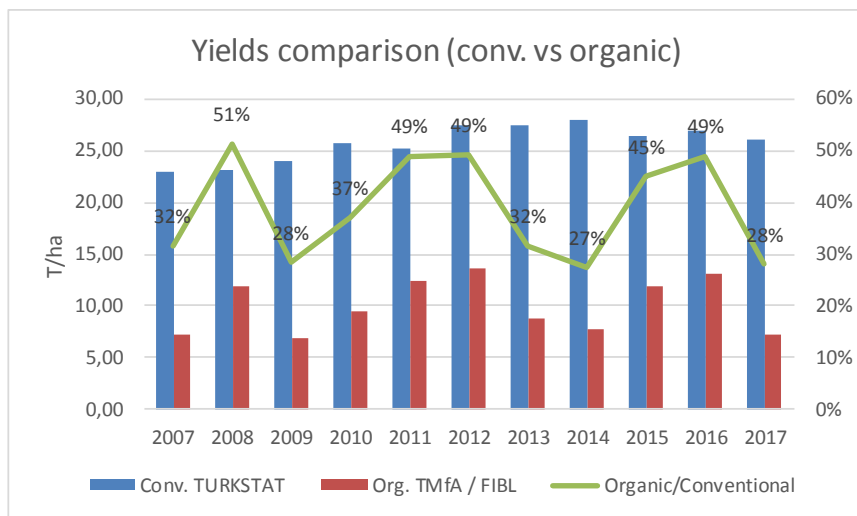
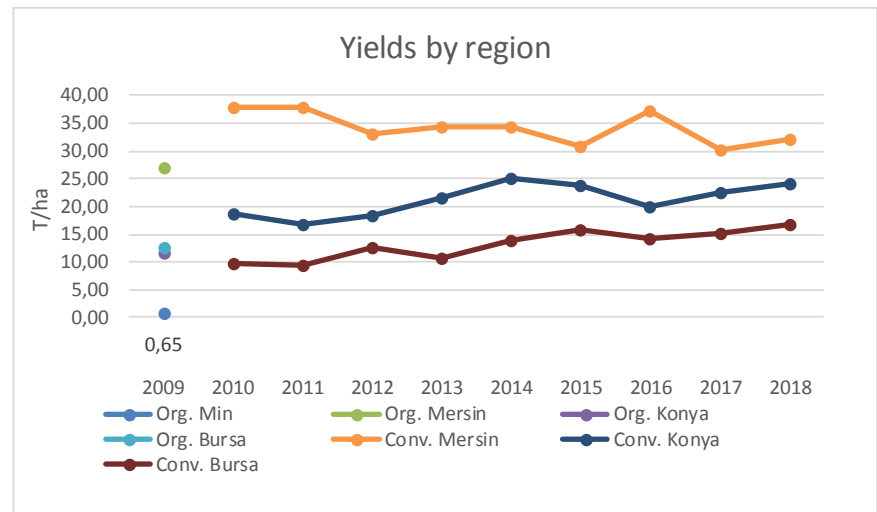
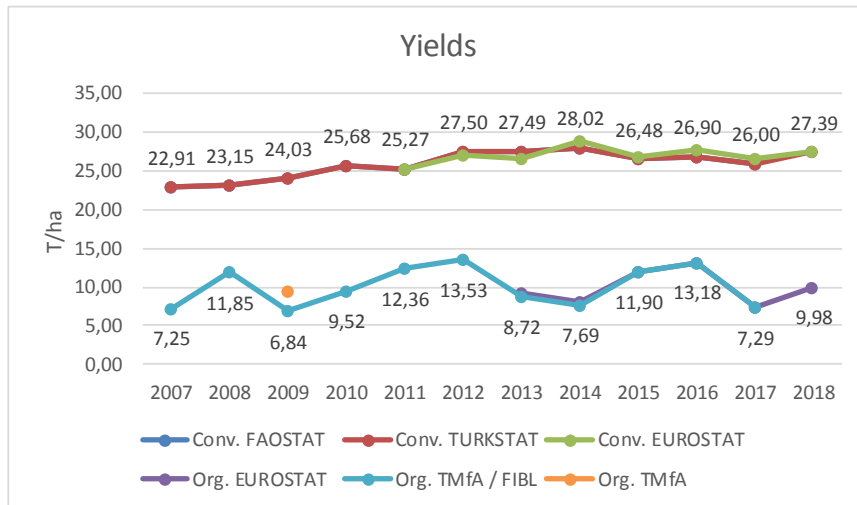
Organic 2009-2017

- Average (org.): 2,75
- Min – Max: [1,20 – 5,45]
- Var: 2,12
- Std. Dev.: 1,45

Main results

- Organic yields lower than conventional ones but steadily filling the gap over the observed period
- Medium variability of conventional yields over the period, with standard deviation of 0,78 and high variability of organic yields (std. dev. 1,45)
- High variability of organic yields among the main producing areas, falling in the [1,94-18,34] t/ha range

Turkey – strawberries



Yields variability (Turkstat/TmFA – T/ha):

Conventional 2007-2018

- Average (conv): 25,90
- Min – Max: [22,91 – 28,02]
- Var: 3,06
- Std. Dev.: 1,75

Organic 2007-2017

- Average (org.): 10,01
- Min – Max: [6,84 – 13,53]
- Var: 6,73
- Std. Dev.: 2,59

Main results

- Organic yields significantly lower than conventional ones over the observed period, mainly because of high input techniques in conventional farming
- High variability of both conventional and organic yields over the period
- Medium variability of yields among the main producing areas, falling in the [11,81-27,03] t/ha range (2009 data)

Thank you for your attention!

Contacts

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