

Civilised Society rests upon Farmers and Plant Breeders

Symposium on possible interrelations between the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the International Convention for the Protection of New Varieties of Plants (UPOV Convention)

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UPOV Geneva Switzerland

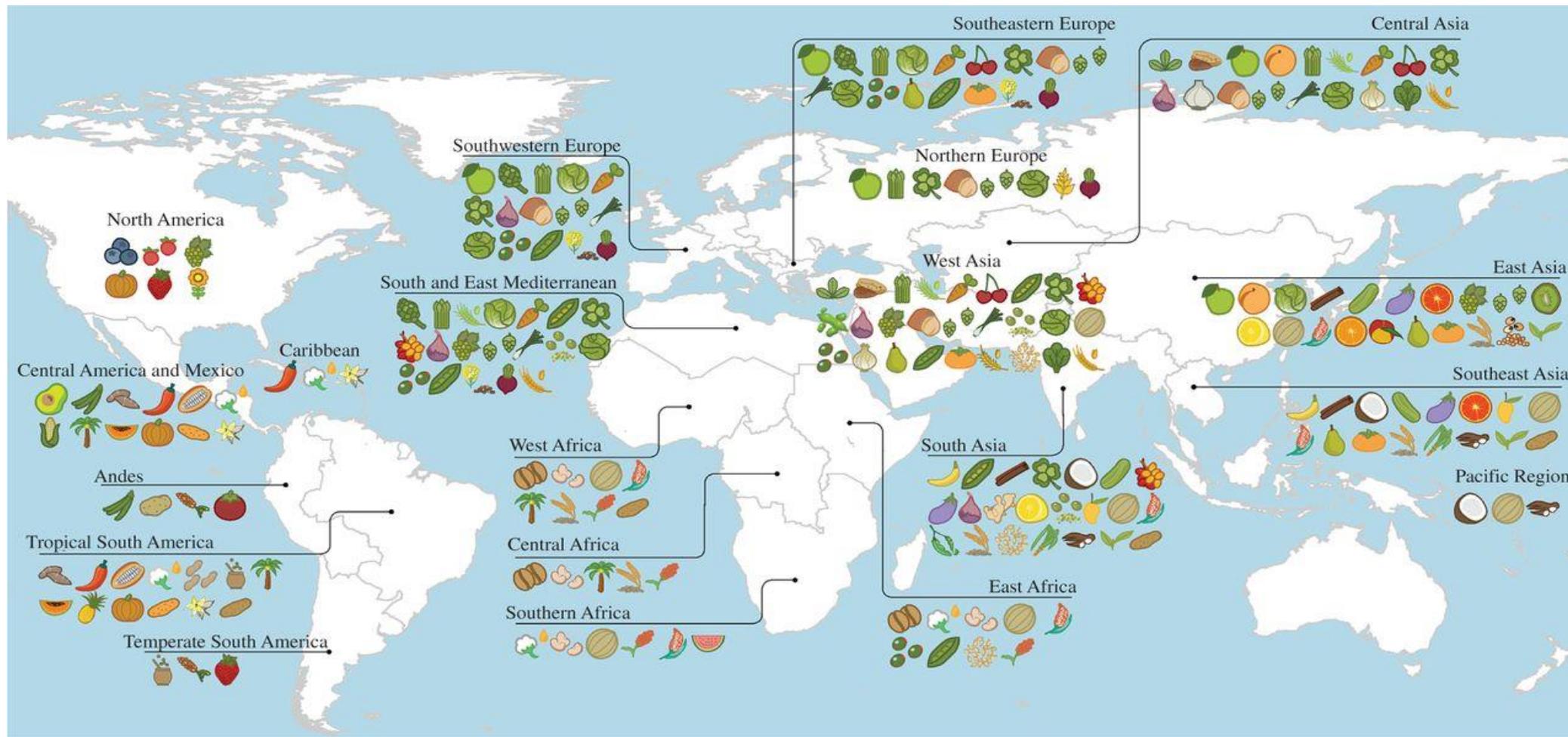
Outline

- **Civilised society is dependent upon a productive and sustainable agriculture**
 - Multilateral-dependencies on plant genetic resources
 - Needs to increase agricultural productivity
- **Farm numbers, sizes, and global crop production**
 - Global numbers and sizes of farms
- **Crop yields, historical - today, landraces-newly bred varieties**
 - U.K. wheat, U.S. maize
- **Critical global dependence on plant breeding to sustain agricultural productivity and support household needs**
 - Contribution of landraces to agricultural production
 - Adaptive characteristics of landraces
 - The intricacies involved making a breeding population to generate diversity
- **UPOV**
 - Increased variety use and further development options for farmers
- **Conclusions**
- **Questions-Discussion**

Primary regions of diversity of major agricultural crops worldwide.

Colin K. Khoury et al. Proc. R. Soc. B 2016;283:20160792

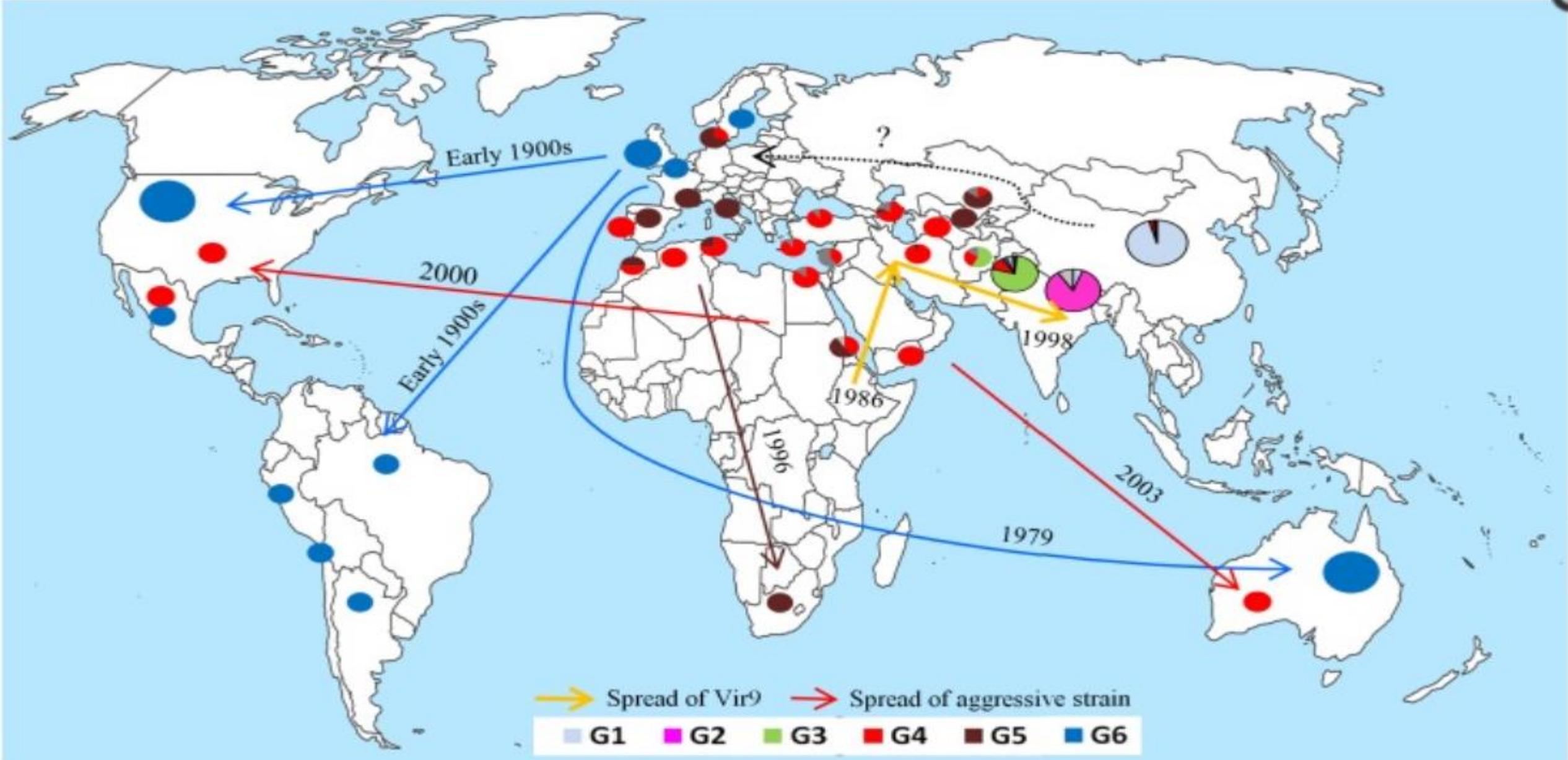
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|-----------------------|----------------------|----------------|------------|------------------|------------------------|-----------------------|--------------|----------------|
| alfalfa | beans | clover | eggplants | hops | melons | pears | rice | sunflower |
| almonds | blueberries | cocoa beans | faba beans | kiwi | millets | peas | rye | sweet potatoes |
| apples | cabbages | coconuts | figs | leeks | oats | pigeonpeas | sesame | taro |
| apricots | carrots | coffee | garlic | lemons and limes | olives | pineapples | sorghum | tea |
| artichokes | cassava | cottonseed oil | ginger | lentils | onions | potatoes | soybean | tomatoes |
| asparagus | cherries | cowpeas | grapefruit | lettuce | oranges | pumpkins | spinach | vanilla |
| avocados | chickpeas | cranberries | grapes | maize | palm oil | quinoa | strawberries | watermelons |
| bananas and plantains | chillies and peppers | cucumbers | groundnut | mangoes | papayas | rape and mustard seed | sugar beet | wheat |
| barley | cinnamon | dates | hazelnuts | mate | peaches and nectarines | | sugarcane | yams |

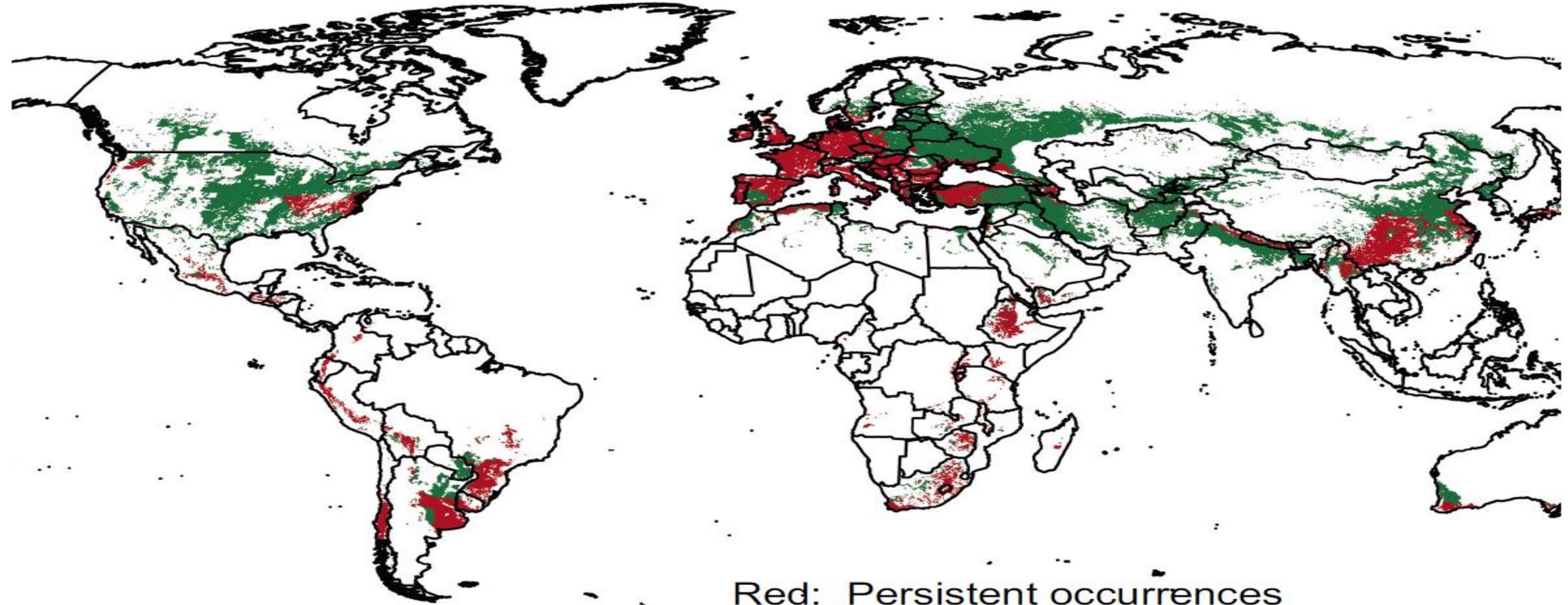
Origin and migration routes of recently emerged populations of wheat yellow rust pathogen.

Ali et al. 2014 PLoS Pathog 10.1371/journal.ppat.1003903



Global vulnerability for yellow rust

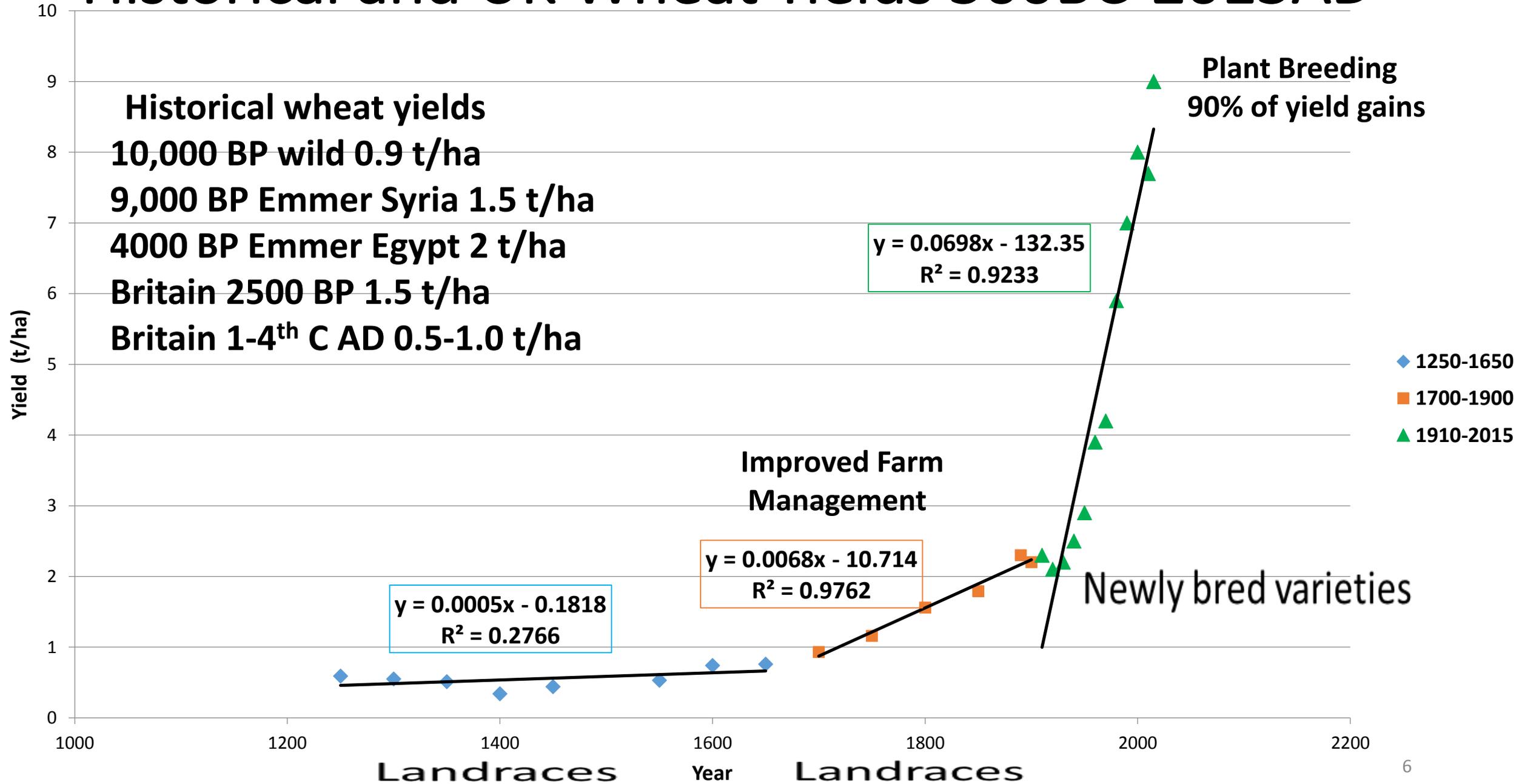
(Modelled by Pardy et al. 2015)



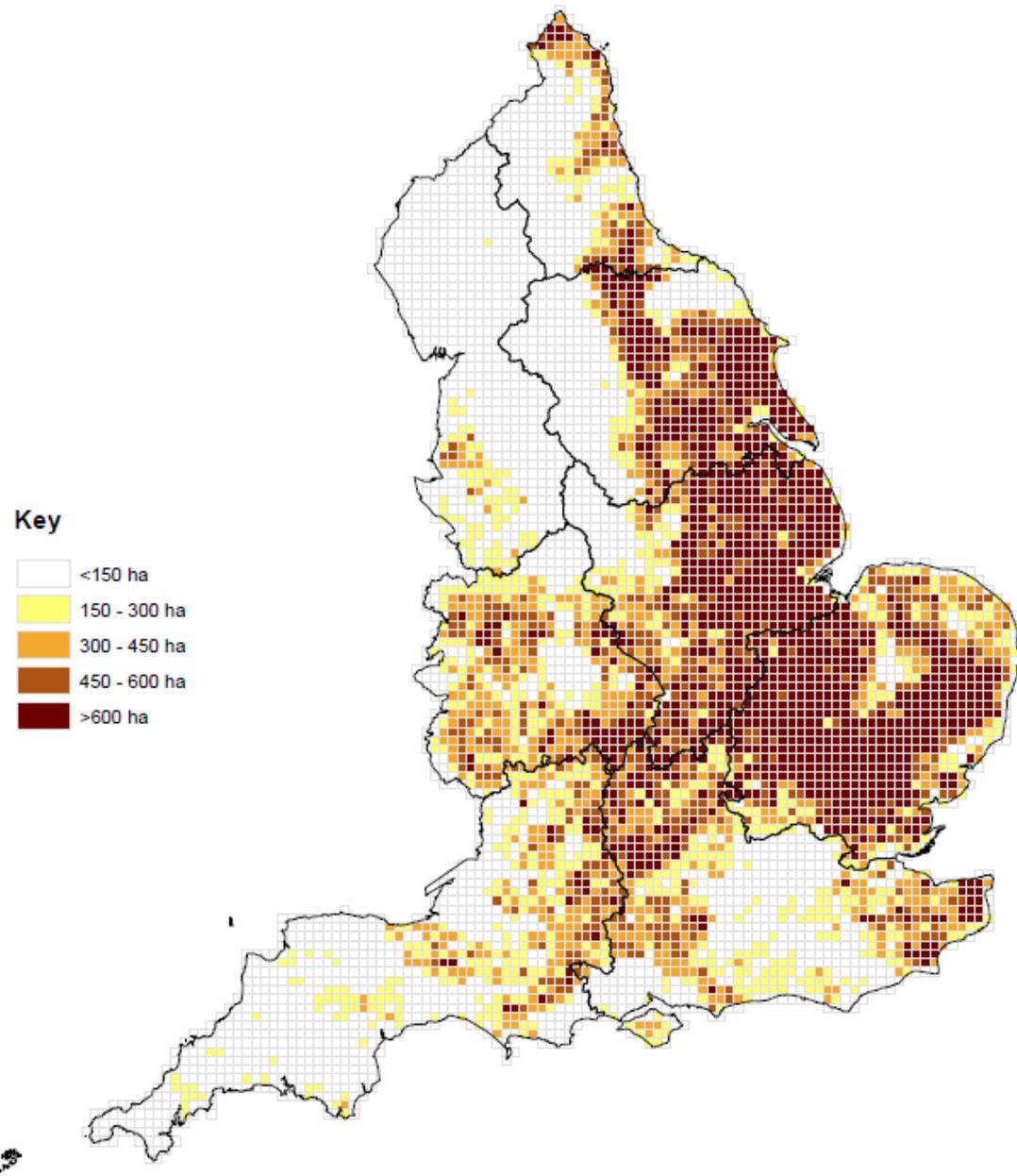
Red: Persistent occurrences

Green: Occasional occurrences

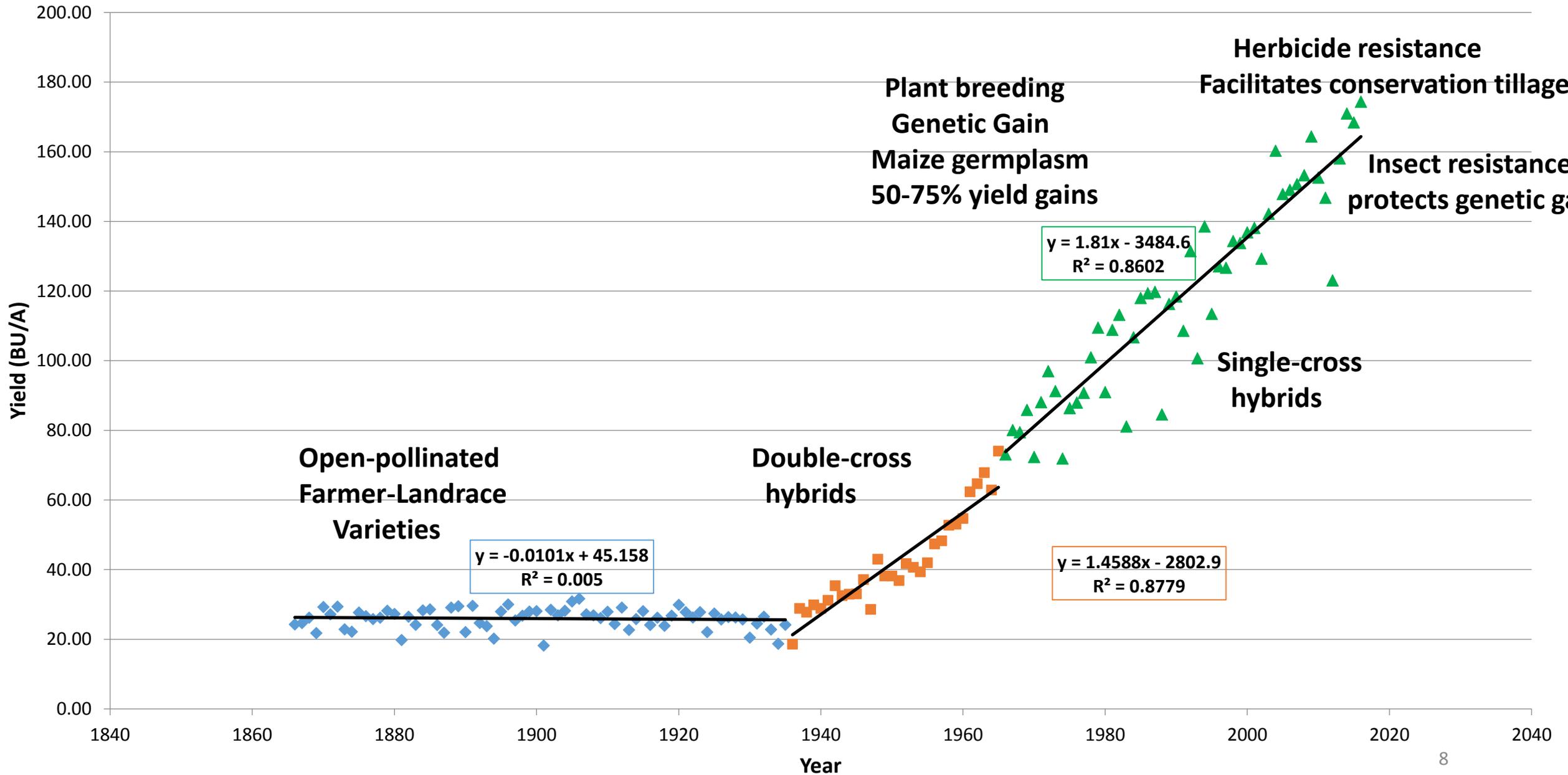
Historical and UK Wheat Yields 500BC-2015AD



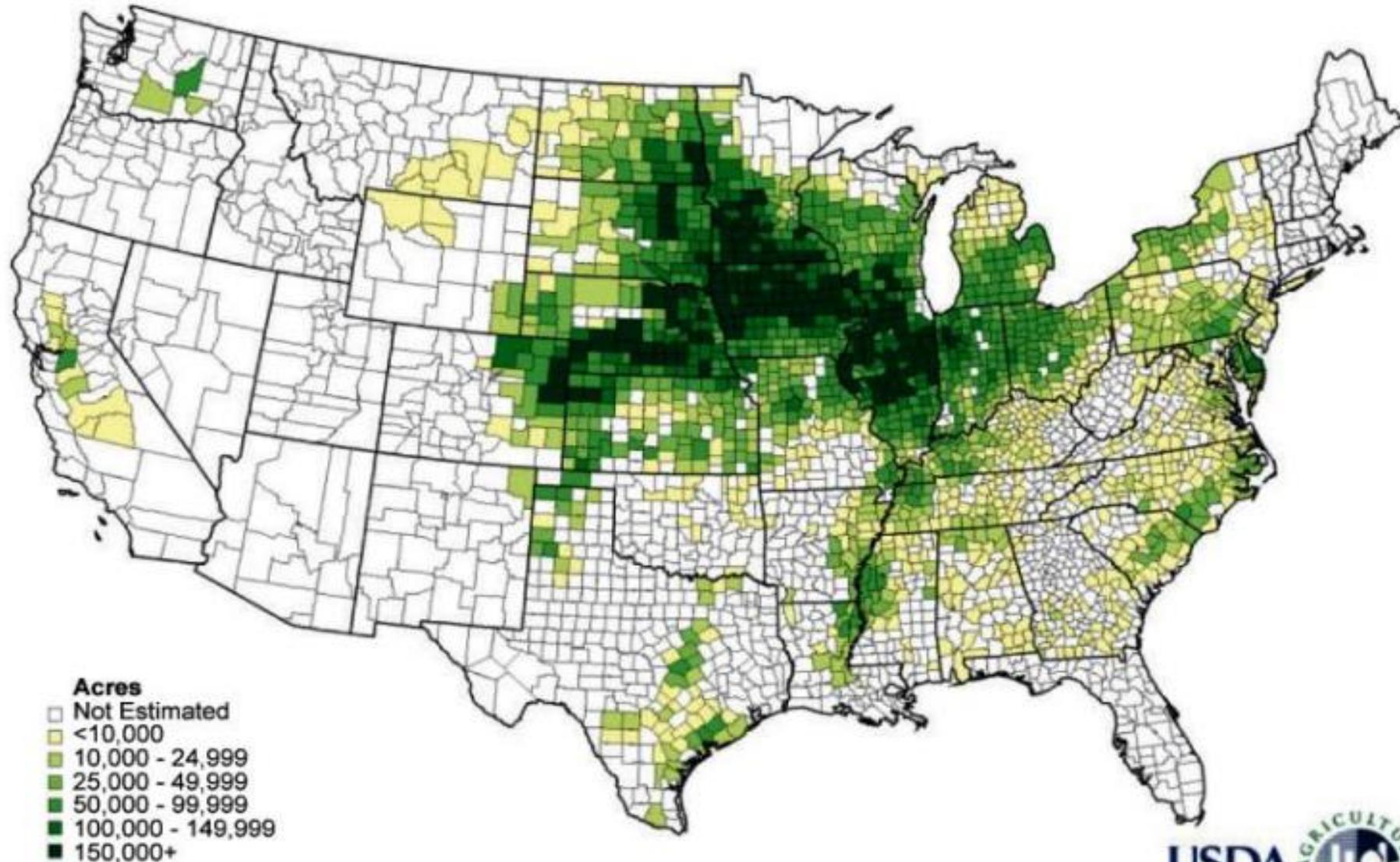
Area of wheat (hectares) by 5km² grid squares: England 2010



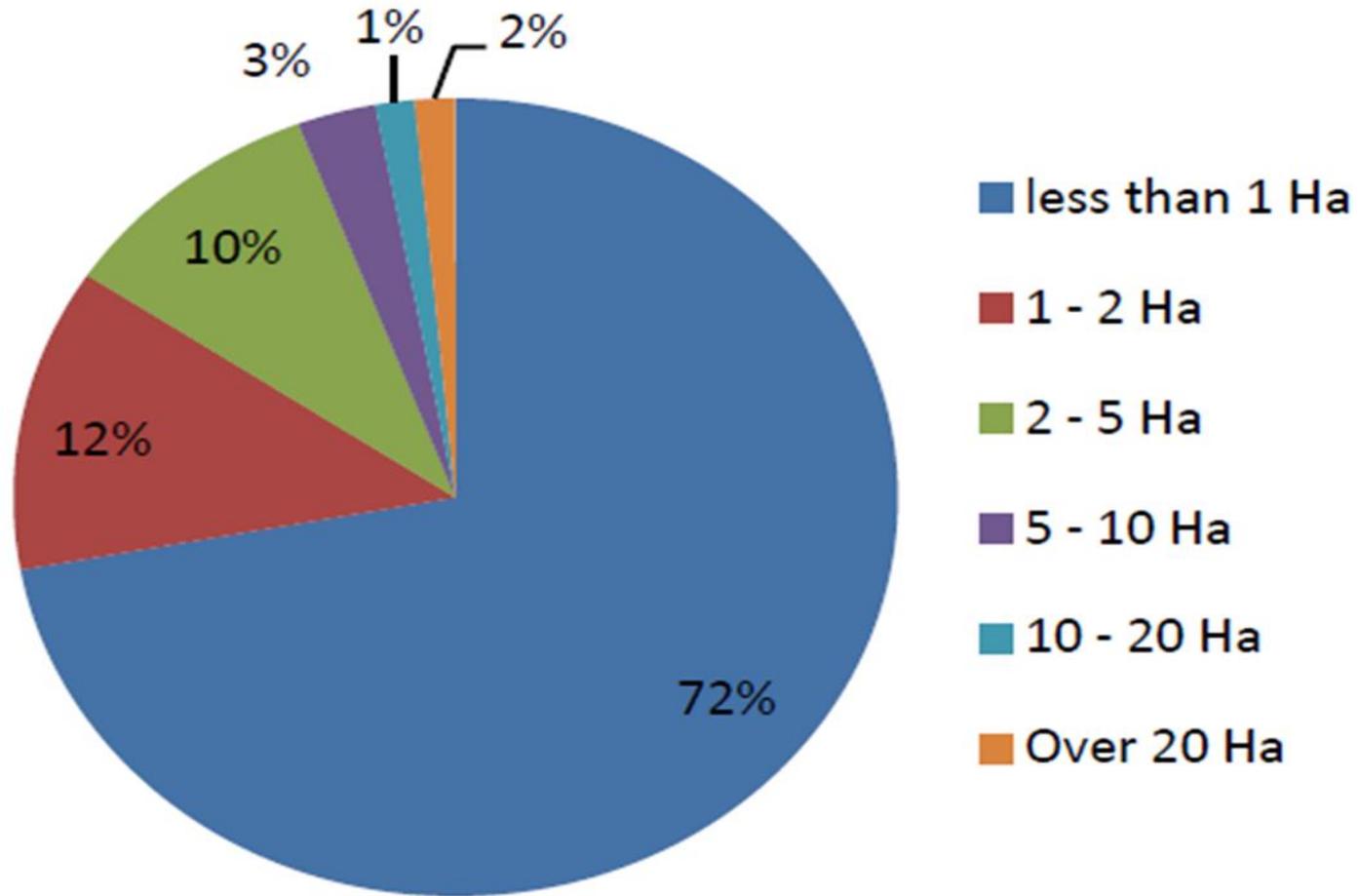
US Maize Yields 1866-2016 (USDA)



Corn for Grain 2011 Harvested Acres by County for Selected States



460 million farms in 111 countries



Global Wheat Production 2005

729 million tonnes

Landrace contribution

(CIMMYT publ.)

Country	Global rank	% Global production	% country landrace production
China	2	15.3%	0
India	3	11.5%	0.24%
Pakistan	10	3.4%	1.3% declining
Turkey	11	3.3%	5.0% (now <1%)
Iran	15	2.3%	38% declining
Kazakhstan	16	1.8%	0
Mexico	30	0.5%	0.2%
Morocco	31	0.5%	<1.0%
Ethiopia	35	0.3 %	88% (96% rainfed)
Nepal	>38	<0.2%	2.9% declining
Tajikistan	>38	<0.2%	1.2% declining

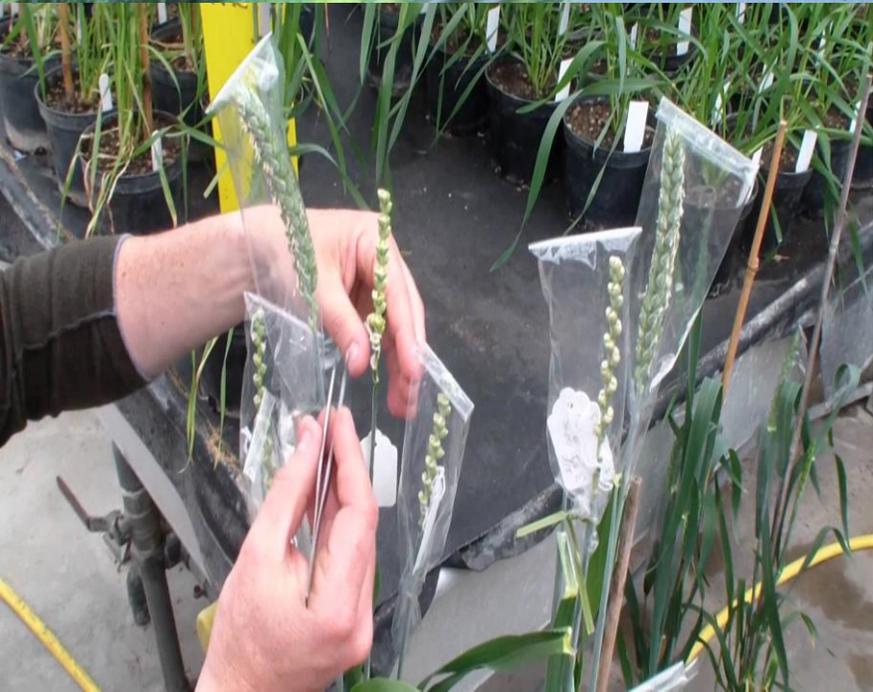
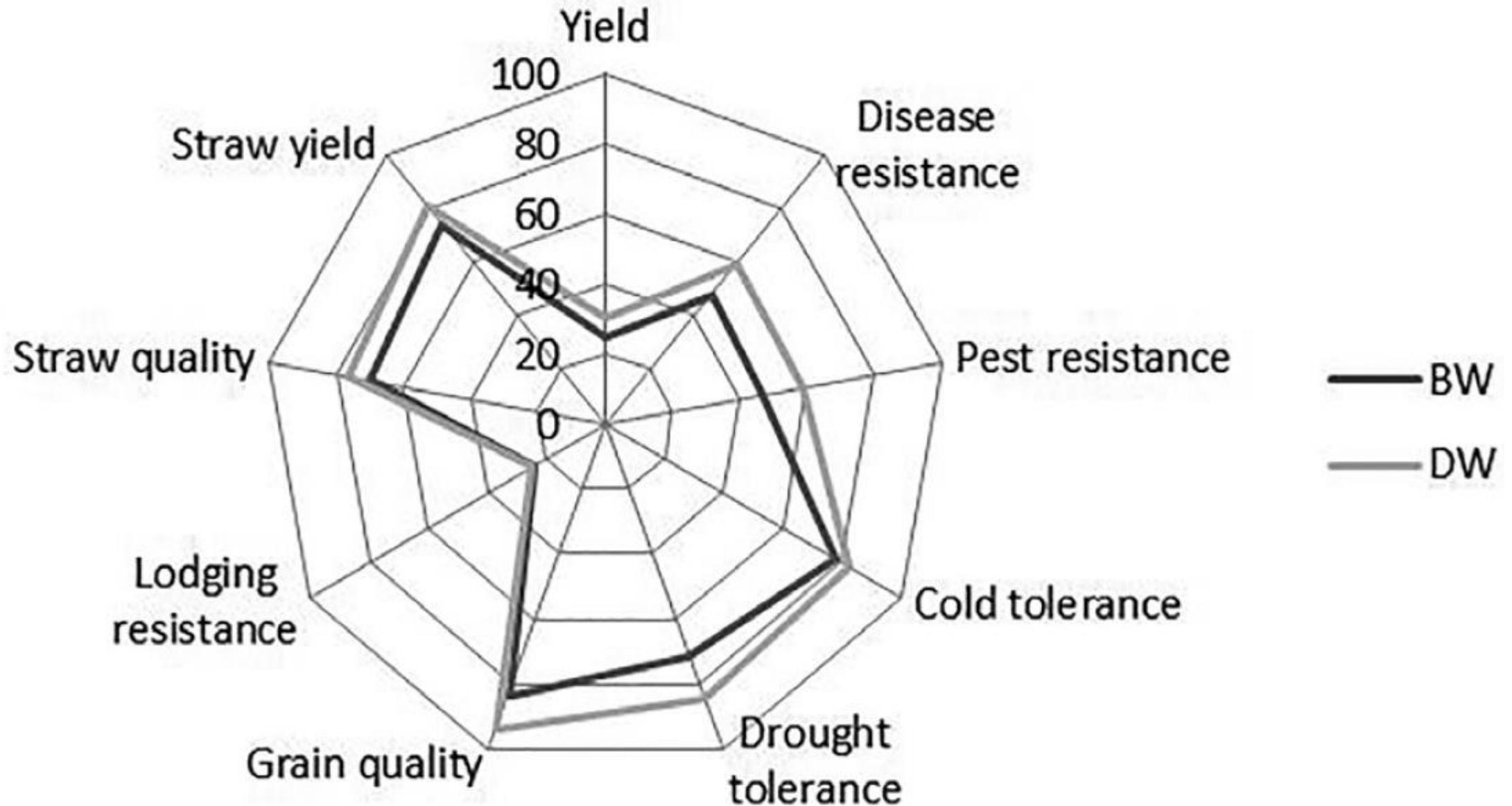


Fig. 2. Percentage of farmers' ratings of different traits of bread wheat (BW) and durum wheat (DW) landraces as good based on a survey of 1026 households in Turkey in 2009 to 2014. Morgounov et al 2016. *Crop Sci.* 56:1–13 (2016). doi: 10.2135/cropsci2016.03.0192



UPOV Mission: Provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of society.

Exceptions to the Breeder's Right
(1991 Act of the UPOV Convention)

COMPULSORY

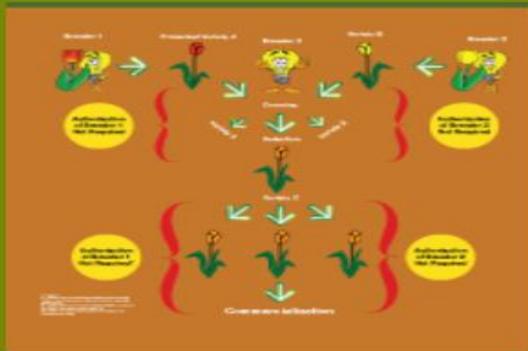
OPTIONAL

Breeding other varieties
("breeder's exemption")

Acts done for
experimental purposes

Acts done privately & for
non-commercial purposes

Farm saved seed 



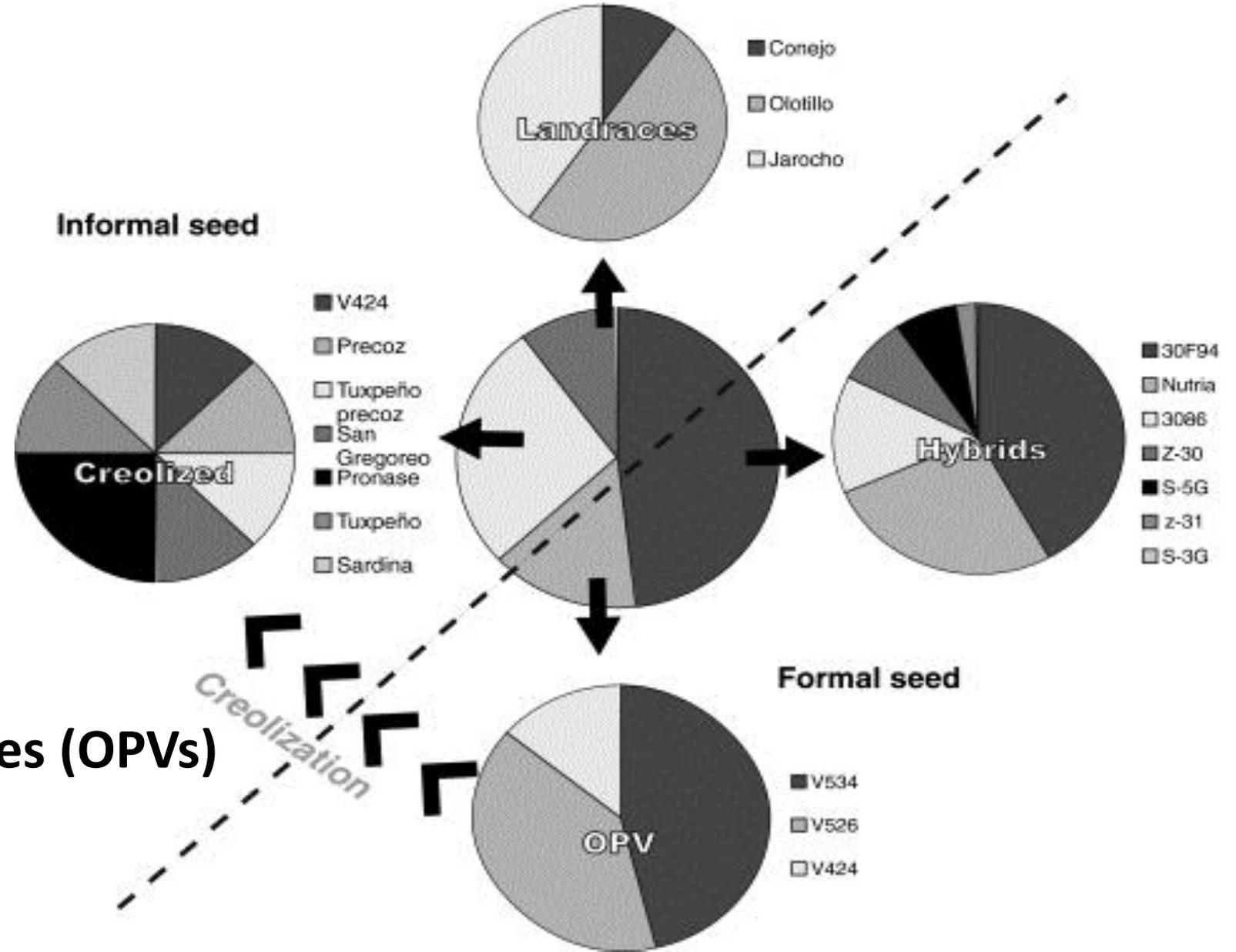
The Breeder's Exemption

Amateur Gardeners

Subsistence Farmers 

Use and Value of newly bred varieties in informal seed systems

Van Heerwaarden, J. Theor Appl Genet. 2009 Sep; 119(5): 875–888.



% planted seed

48% commercial hybrids;
15% open-pollinated varieties (OPVs)
27% creolized seed;
10% traditional landraces.

Wheat and Maize

Landraces-Farmer Varieties Commercial Varieties



Conclusions

- **More plant breeding is required to sustainably raise yields and meet the needs of farmers and of society globally**
 - Agricultural production needs to be 60% higher 2006-2050 (FAO SOW 2014)
 - Plant breeding can improve landraces and better serve needs of all farmers
 - Breeders includes public, commercial, farmer participatory, farmers, NGO
- **UPOV does not inhibit traditional activities of subsistence and small farmers**
 - Approx. 95% of farms are exempted from UPOV farm saved seed requirements; UPOV facilitates global germplasm access for further breeding
 - Sale of harvested protected seed is simply copying; not adding diversity, adapting, or improving seed

Conclusions

- **The ITPGRFA and UPOV Convention both support plant breeding**
 - The ITPGRFA supports conservation, pre-breeding, and breeding support to farmers, crops, and regions not served by commercial breeding
 - The UPOV Convention primarily encourages commercial breeding
 - Formal breeding provides local access to new globally sourced germplasm for production and for further breeding
- **Increased support for the priority areas of the FAO Global Plan of Action is required**
 - Strategic framework for the conservation and sustainable use of plant genetic diversity as per the ITPGRFA
 - Focuses on supporting smaller farmers in developing countries and long term public goods (conservation).

Conclusions

Providing better choices of varieties so that farmers have improved capabilities to manage their farms, regardless of size or range of household and/or commercial needs, is crucial.

Society is dependent successful farmers AND plant breeders. Broad societal support is required to help better meet the needs of all farmers.

Joint advocacy by farmers and breeders that Parties to the ITPGRFA step up to their responsibilities to fund the FAO GPA may enjoy greater success than polarization.

Questions-Discussion