Supplementary materials, methods, figures and tables for

Bellon Mauricio, Mastretta-Yanes Alicia, Ponce Alejandro, Ortiz- Santamaria Daniel, Oliveros-Galindo Oswaldo, Perales Hugo, Acevedo Francisca, Sarukhan Jose. Evolutionary and food supply implications of ongoing maize domestication by Mexican *campesinos*. *Proceedings of the Royal Society* B. Doi 10.1098/rspb.

CONTENT

Materials and Methods

1.1. Estimating farm size structure.

The data on PROCAMPO (now PROGAGRO) beneficiaries were obtained for the spring-summer season of 2010 only for rainfed maize and for all four maize classes reported: maize, white maize, yellow maize, maize –any other annual crop (http://www.sagarpa.gob.mx/agricultura/Programas/proagro/procampo/Beneficiarios/Paginas/2010.aspx, accessed 10 September 2017). These data comprise 1,596,684 beneficiaries (we assume that a beneficiary corresponded to one farm) and included the municipality where they farmed. They were grouped by area planted with maize per farm into size categories: < 3, 3-5, 5-10, 10-20, >20 ha. Using municipality as common variable, these data were matched to SIAP data on average municipal yields and total area planted with maize for the same year and season. This allowed cross-classifying the number of farms that received a PROCAMPO payment by the seven yield classes used above, and the five categories of area planted to maize. We calculated the fraction of the area planted in each of the five categories of area relative to the total in each yield class. We assume that this fraction is the same for all farms planting maize regardless of whether they received PROCAMPO or not. For each yield class, we multiplied this fraction by the total area planted to maize according to SIAP, thus estimating the area planted to maize by all farms planting it for each combination of yield class and area size category. Using the PROCAMPO data we also calculated the average area planted to maize by farm for each combination of yield class and size category. Then the total area planted to maize for each combination of yield class and size category was divided by the average area planted by farm for the same combination, thus estimating the total number of farms by yield class and size of the area planted with maize.

Formal definition of parameters used for estimating the number of farms planting rainfed maize by yield class and farm size class:

ap_{ij} = area planted with maize by PROCAMPO recipients in yield class i and farm size class j

np_{ij} = number of farms planting maize that received PROCAMPO in yield class i and farm size class j

as_i = area planted with maize from SIAP database in yield class i

fz_{ij} = average farm size (ha/farm) of PROCAMPO recipients in yield class i and farm size class j

Υ_{ij} = fraction of area planted to maize by PROCAMPO recipients in yield class i and farm size class j

ne_{ij} = estimated number of farms in in yield class i and farm size class j

$\Upsilon_{ij} = ap_{ij}/\sum_j ap_{ij}$

$fz_{ij} = ap_{ij/}\ np_{ij}$

$ne_{ij} = (as_i * \Upsilon_{ij})/\ fz_{ij}$

$\sum_j ne_{ij=}$ estimated total number of farms in yield class i

$\sum_i ne_{ij}$ = estimated total number of farms in farm size class j

1.2. Estimating area planted with improved and native varieties.

We aimed at estimating the amount of improved seed and farmers´ own seeds used under the rainfed season. There are no specific data on this, but there are three sources of data regarding the supply and use of improved maize seeds in Mexico for 2011 (the year with more data). Donnet et al. [1], which is based on direct interviews with seed companies, SNICIS (2) and SIAP (3), which are official sources but, to our knowledge, do not provide the explicit methodology used to compile the data. Data of these three sources are different in terms of scale and units. Donnet et al. [1] provide data by region, while SNICS [2] and SIAP [3] provide them at the national level. No data source specifies season and water regime (irrigated/rainfed). Data are presented in different units: quantity of seed (bags [1] and tons [2]) and area planted [3]. We estimated how much area could be planted with improved seed based on these three sources. For this, we followed two assumptions regarding the number of seed bags needed to plant 1 ha under irrigation (1 or 1.5 bags) and rainfed (1 bag) conditions; and disaggregated the data to account for irrigated and rainfed conditions (Table S1). Using these data for 2011, we estimated the corresponding values for 2010 assuming the proportion of area planted with improved/farmers' own seeds were the same for both years. We found that the estimates of the area planted with improved seed vary widely depending on the data source and the assumptions on number of seed bags used per ha. Importantly, there is an inconsistency between the amount of seed supplied according to both [1] and [2] when compared to the area planted by [3]. So given this wide range, we decided to average out all the estimates (Table S8), which gave us 1.2 million ha (~20%) planted with improved seed in 2010, and 4.7 million ha planted with farmers´ own seeds. The former estimate matched closely the area planted with maize in municipalities in the top four yield classes (>3 t/ha), and it is also unlikely that farmers will invest the amount of money required to buy hybrid seed just to get yields of ≤3 t/ha—while the latter estimate tallies well with the area planted in municipalities characterized in the lower three yield classes, characterized as *campesino* agriculture. However, we cannot rule out that some improved varieties were used in the lower yield classes and farmers´ own seed was used in the higher yield classes, especially since native varieties can provide reasonably high yields under the right management (see Fig. S2; Table S7). Furthermore, recycling seed of improved varieties, including hybrids, is a common practice; *campesinos*, in particular, commonly manage the seed of improved varieties as landraces for several crop cycles, leading to "creolized" varieties [4]. These varieties can be highly appreciated and are a way in which *campesinos* benefit from improved germplasm while maintaining crop evolution in their fields [4, 5]. Unfortunately there are no national data on the extent of their use. So, while we cannot be completely sure of the allocation of improved, native and creolized varieties by yield class and farm area planted, it is reasonable to assume that most of the former were used in the municipalities in the higher yield classes, while the latter two were used in the lower yield classes.

1.3. Estimating the amount of saved seed to plant one hectare

The amount of saved seed use to plant one hectare was calculated as follows: (a) assuming each seed weighs around 0.35 g, each ear has around 400 grains (384 grains/ear +/- 61 for highland-transition landraces and for subtropical-tropical 412 +/- 97) about 16 kg of seed are used to plant 1 ha ([6]; H. Perales, M. Willcox and M. Bellon, *pers. obs*) that is 114 ears per ha; (b) assuming 50,000 seeds are used per ha (only 30,000 make it to adults) that is 125 ears per ha; (c) following Orozco-Ramirez *et al* [8], who estimated 114 ears per / planted area, with a mean of 0.62 ha, thus giving 184 ears/ha; and (d) following van Heerwaarden *et al* [7] observed values for seed management, where 290 ears are used per seed lot. This is enough to plant around 3-5 seeds per hole, which is a common practice and it is close to a 1% selection pressure, which is usual [8].

1.4. Estimating per capita annual maize consumption.

CONEVAL (Table 10 in [9]) reports a per capita consumption of tortillas of 217.9 g/person/day and 70.2 g/person/day of maize grain. The data on tortilla consumption was converted into maize grain using a 1.3 rate of conversion between maize grain and tortilla [10], equivalent to 167.61 g/person/day that was added to the 70.2 g/person/day for a total of 237.8 g/person/day. This number was increased to account for post-harvest losses assuming a 25% loss that is the mean of the range of 10-40% losses [11]. Although there are other estimates [12, 13] we used the

CONEVAL data since it is the official organization dealing with measuring poverty in Mexico (Table S9).

We calculated four parameters for each municipality:

(a) fp0: the size of the total population that could be fed from local maize production, regardless of the population present. For this parameter we divided the total municipal maize production by the per capita grain consumption corrected by post-harvest losses, regardless of the rural population present.

(b) fp1: the size of the rural population in the municipality that could be fed from local maize production. This parameter was calculated depending on the relationship between fp0 and the rural population in the municipality as follows: if fp0 was equal or greater than the municipal rural population, then the latter was used; but if it was lower, then fp0 was used.

(c) fp2: the size of any additional population that could be fed from surpluses if available beyond fp1. For this parameter, we subtracted the rural municipal population from fp0. So if fp0 was greater than the rural population, then the positive difference that indicated the magnitude of additional people that could be fed (surplus) was reported, otherwise zero was reported, so if there were deficits, they were not taken into account here.

(d) fp3: the size of the net population that could or not be fed from local maize production (fp3). For this parameter we subtracted the rural municipal population from fp0. So if fp0 was: (i) greater than the rural population, then a positive difference indicates the magnitude of additional people that could be fed beyond all the rural population in the municipality; (ii) if not, a negative difference indicates the size of the rural population in the municipality that could not be fed from local production.

Each of these parameters was summed up across all municipalities within each yield class. The magnitudes of the surplus or deficit population that could or not be fed from local maize production were mapped by municipality.

Formal definition of parameters used to estimate the potential contribution of maize production to feed the rural population

$fp0_{ij}$= total population that could be fed from local maize production in municipality (i) and yield class (j)

$fp1_{ij}$= rural population that could be fed from local production in municipality (i) and yield class (j), excluding surpluses

$fp2_{ij}$= surplus population that could be fed from local maize production in municipality (i) and yield-class (j) above the rural population already fed ($fp1_{ij}$)

$fp3_{ij}$= surplus or deficit population that could/could not be fed relative to the total rural population in municipality (i) and yield class (j)

rp_{ij} = rural population in municipality (i) and yield class (j)

tm_{ij}= total maize production in municipality (i) and yield class (j)

cp= per capita maize consumption corrected by post-harvest losses

$$fp0_{ij} = tm_{ij} / cp$$

$$fp1_{ij} = \begin{cases} rp_{ij}, \text{ if } fp0_{ij} \geq rp_{ij} \\ fp0_{ij}, \text{ if } fp0_{ij} < rp_{ij} \end{cases}$$

$$fp2_{ij} = \begin{cases} fp0_{ij} - rp_{ij}, \text{ if } fp0_{ij} - rp_{ij}, > 0 \\ 0, \text{ if } fp0_{ij} - rp_{ij}, \leq 0 \end{cases}$$

$$fp3_{ij} = fp0_{ij} - rp_{ij}$$

$fp0_j = \sum_i fp0_{ij}$

$fp1_j = \sum_i fp0_{ij}$

$fp2_j = \sum_i fp2_{ij}$

$fp3_j = \sum_i fp3_{ij}$

For the calculating the number of potential rural population fed by year from 2003-15 we followed the same procedure described above, but estimating the rural population in each year. The rural population was interpolated by calculating the rate of change between census data from 2000 and 2010 and applied it to the years with no data (2003-2009 and 2011-2013) using 2000 as a baseline.

2. Supplementary Figures and Tables

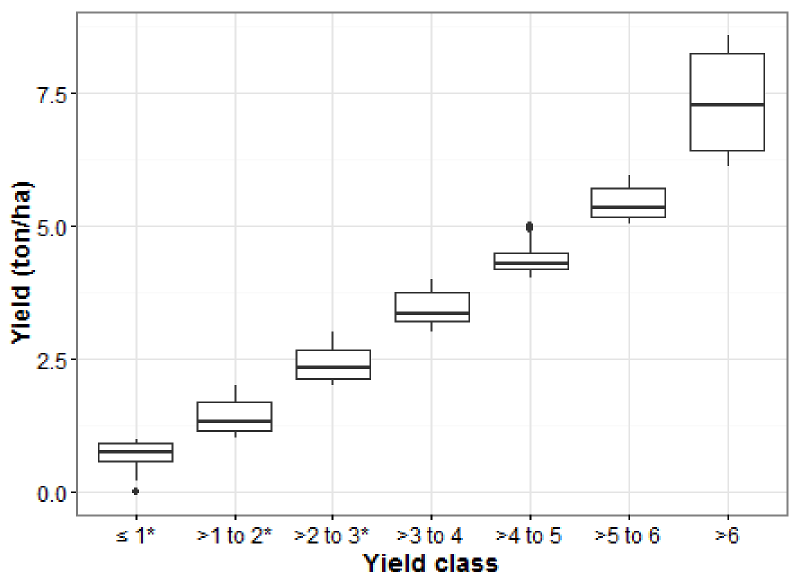


Fig. S1. Box plots of municipal average maize yields for seven yield classes. * indicates yield classes mostly representing *campesino* agriculture.

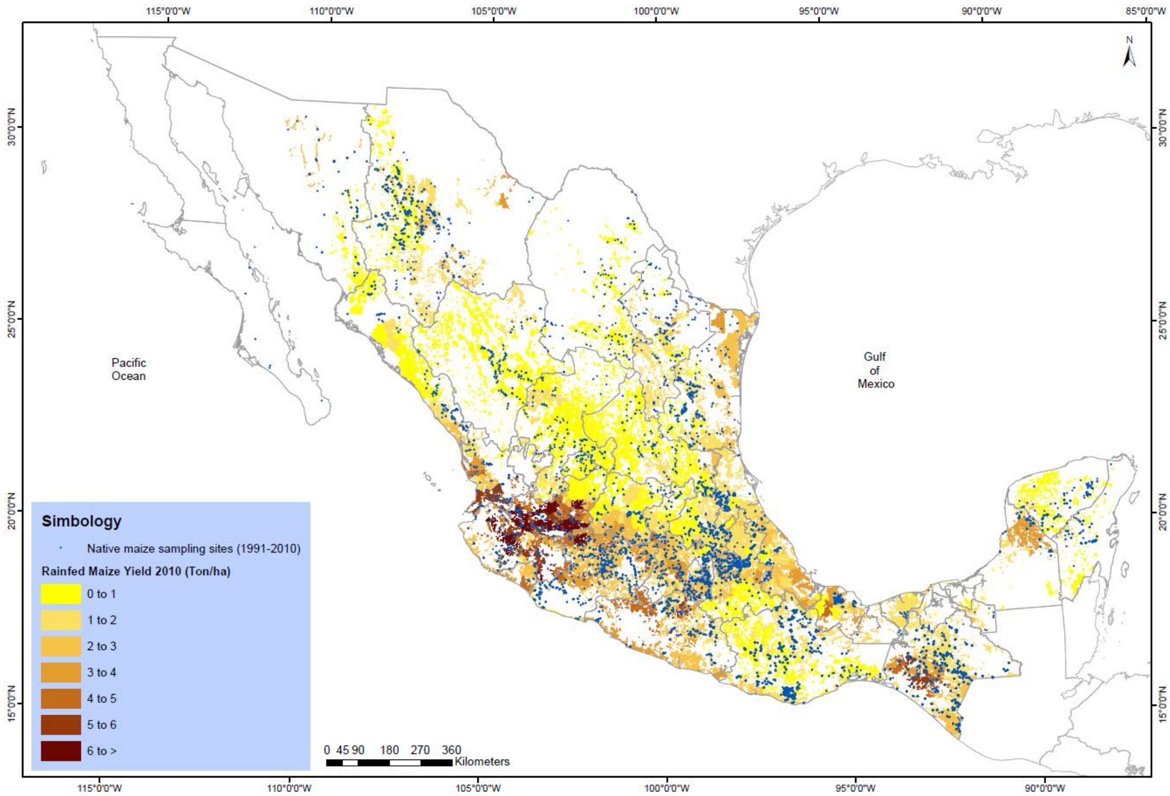


Figure S2. Overlay of the recorded locations where samples of 56 native maize races were collected by CONABIO´s Global Maize Project (in blue) with respect of the municipalities throughout Mexico where rainfed maize was planted by yield class in 2010.

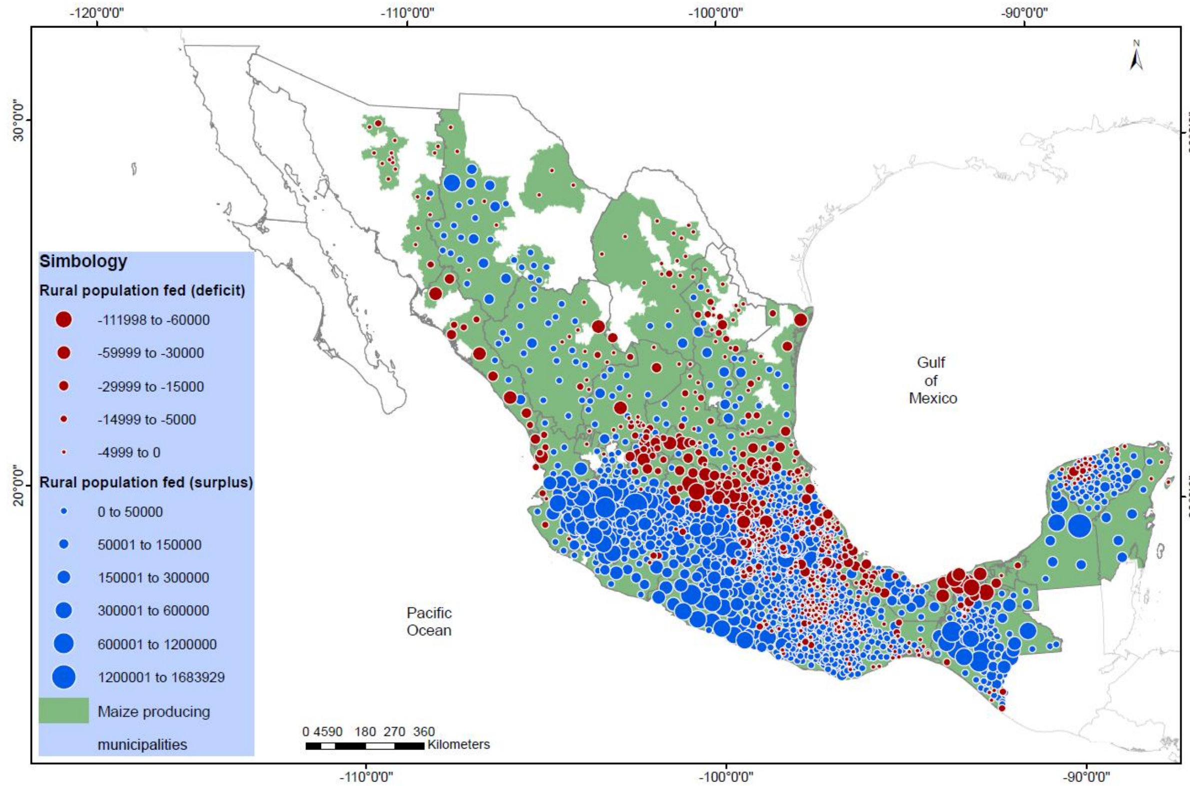


Fig. S3. Spatial distribution of the contribution of local maize rainfed production to feed the rural population in the municipalities where this crop is produced. The size of the circle is proportional to the quantity of people that could (surplus, in blue) or not (deficit, in red) be fed from local maize production. See dynamic visualization of this map at https://conabio.shinyapps.io/surplusdeficitmaizemx6/.

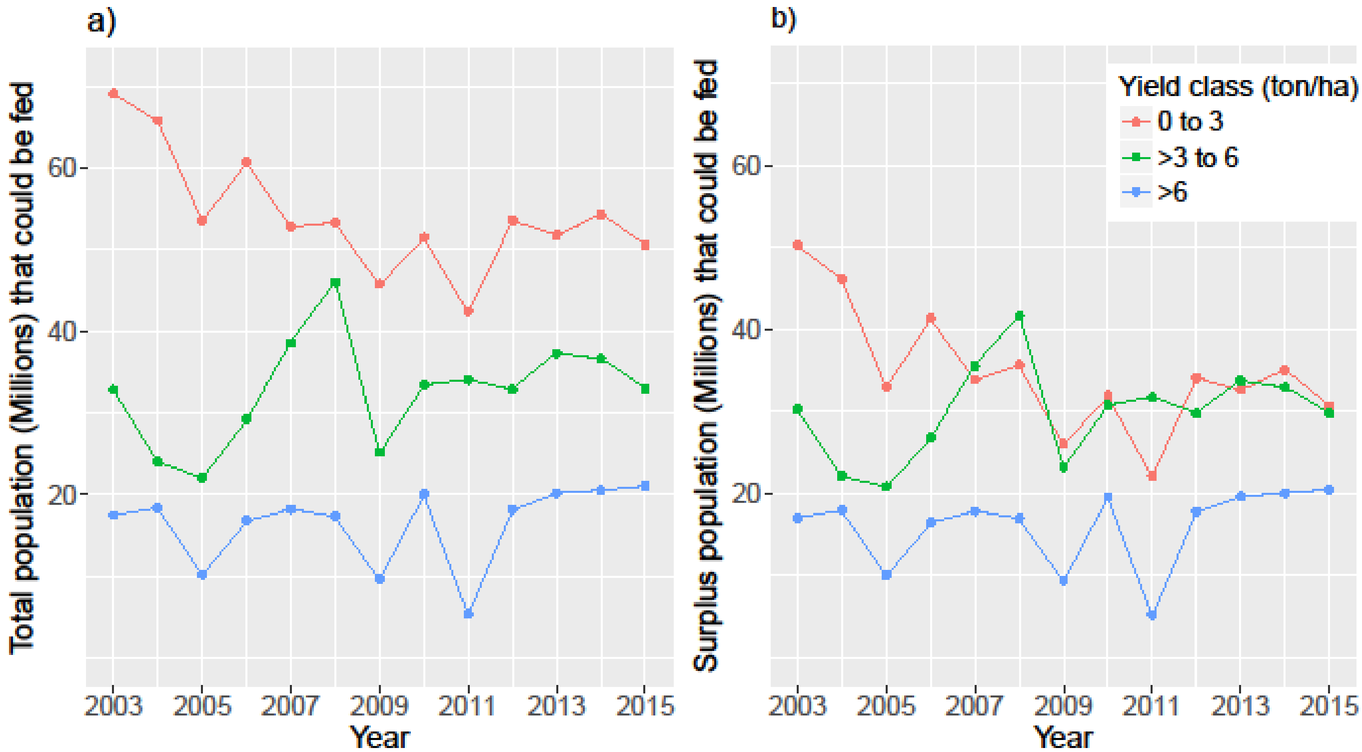
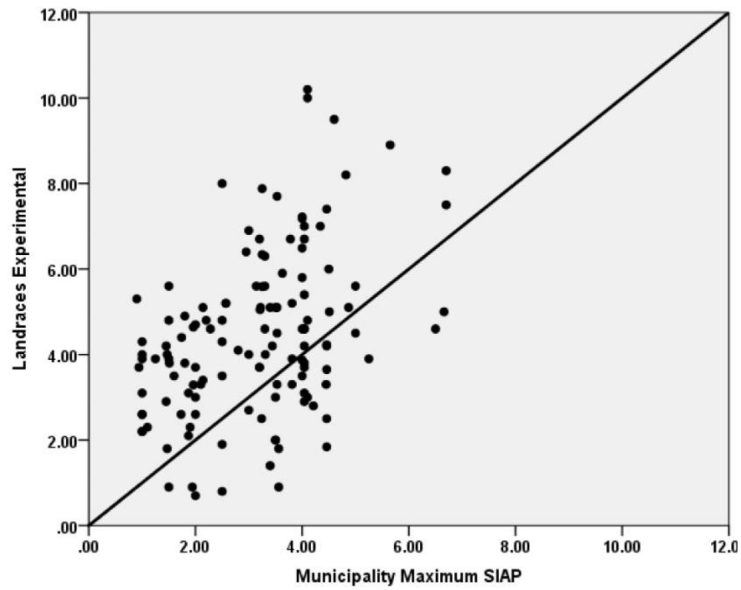


Fig. S4. Potential population that could be fed from rainfed maize production 2003-2015 by 3 yield-level classes. a) Total population that could be fed from local maize production. b) Surplus population that could be fed once all the local rural population in a municipality had been fed. Population data shown as million people. The rural population for each year was interpolated (2003-2009) or extrapolated (2011-2015) by calculating the rate of change for each municipality between census data from 2000 (http://www3.inegi.org.mx/sistemas/tabuladosbasicos/tabentidad.aspx?c=33709&s=est) and 2010 (http://www3.inegi.org.mx/sistemas/tabuladosbasicos/default.aspx?c=27302&s=est) and then applied it to the years with no data (2003-2009 and 2011-2013) using 2000 as a baseline.

(a)



(b)

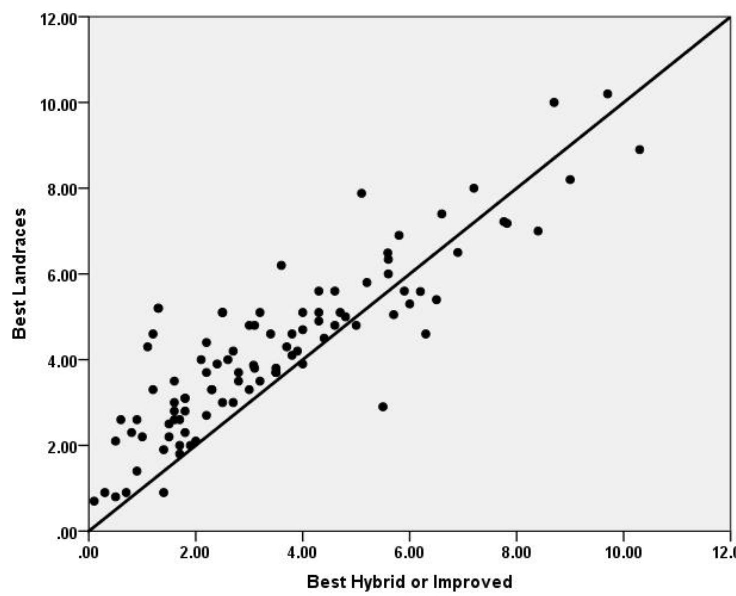


Fig. S5. (a) Reported yields (t/ha) for landrace accessions and maximum yield reported for the municipality (2003-2012) where experiment was done (n=123); (b) Yield (t/ha) for best landrace (or average of best landraces) and best hybrid or improved variety for experiments reported in literature (n=97). 45° line representing equal yield for x and y axes; data in Table S7.

Source	Seed supply				Area planted	Average
	Seed companies (1)		Certified seeds (2)		improved seeds (3)	
A. Number of bags of seed	**2,660,000**		**3,357,350**[*]			
B. Area planted to improved seed 2011 (ha)					**3,946,276**	
C. Total area planted with maize 2011 (ha)[+]	7,750,301					
D. Area planted under irrigation 2011 (ha)[+]	1,715,311					
E. Area under rainfed Spring-Summer 2011 (ha)[+]	5,578,638					
F. Assumed rate of use of improved seed: irrigated, rainfed (bags/ha)	1.0,1.0	1.5, 1.0	1.0, 1.0	1.5, 1.0		
G. Estimated number of seed bags needed to cover the irrigated area[ǂ]	1,715,311	2,572,966	1,715,311	2,572,966		
H. Estimated area under improved varieties rainfed Spring -Summer 2011 (ha)[¶]	944,690	87,034	1,642,040	784,384	2,230,966[#]	
I. Estimated % area under improved varieties[||]	16.9	1.6	29.4	14.1	40.0	20.4
J. Area under rainfed Spring-Summer 2010 (ha)[+]	5,977,454					
K. Area planted in municipalities with average yields > 3t/ha 2010 (ha)[+]	1,290,149					
L. Area planted in municipalities with average yields < 3t/ha 2010 (ha)[+]	4,687,305					
M. Estimated area with improved varieties 2010 (ha)[**]	1,012,225	93,256	1,759,429	840,460	2,390,457	1,219,165
N. Surplus or deficit (ha) of improved seed once irrigated area has/has not been covered (ha)[††]	-277,924	-1,196,893	469,279	-449,690	1,100,307	
O. Estimated area with native landraces & creolized varieties (ha)[‡‡]	4,965,229	5,884,198	4,218,026	5,136,994	3,586,997	4,758,289

Table S1. Estimates of use of improved maize seed and farmers 'own seeds under rainfed conditions in Mexico. Numbers in bold refer to the reported data according to the cited source. [*]Data converted to bags of seed using 20kg/bag. [+]Factual data according to SIAP (http://nube.siap.gob.mx/cierre_agricola/ accessed November 11, 2017) for 2011 and 2010. [ǂ]G= A*F (depending on the number of bags planted/ha). [¶] H= A-G. [#]H=B-D. [||]I=(H/E)*100. [**]M=J*(I/100). [††]N=K-M. [‡‡]O=L+N.

Source	Net consumption (grams/person/day)	Net consumption (kg/person/year)	Post-harvest losses*	Gross consumption (kg/person/year)
CONEVAL [9]+	237.82	86.8	0.25	108.5
Ranum et al. [12]ǂ	267	97.5	0.25	121.8
Stuart [13]§	370	135.1	0.25	168.8

Table S2. Different estimates of maize consumption per capita. In the paper the estimate by CONEVAL was used. *Mean between the range of 10-40% [11]. +Tortillas 217.9 gr/person/day, 1.3 rate of conversion between maize grain and tortilla [10], equivalent to 167.61 gr/person/day plus 70.2 gr/person/day of maize grain. ǂEstimated national consumption. §Mean of 10 field studies based on 24 hour dietary intake data.

Variable	Yield class (t/ha)							Subtotal ≤3	Subtotal >3	Total
	≤1	>1 to ≤2	>2 to ≤3	>3 to ≤4	>4 to ≤5	>5 to ≤6	>6			
Number of municipalities	879	735	384	146	57	27	43	1,998	273	2,271
Total area planted (ha) *	1,851,843	1,714,620	1,120,841	639,128	230,026	130,197	290,798	4,687,305	1,290,149	5,977,454
Total area harvested (ha) *	1,397,114	1,575,511	1,070,470	615,675	219,705	128,985	288,512	4,043,094	1,252,877	5,295,971
Total production (ton) +	1,007,280	2,318,176	2,611,176	2,159,017	961,186	702,838	2,173,132	5,936,633	5,996,173	11,932,806
Mean Yield (t/ha)	0.71	1.43	2.41	3.44	4.36	5.45	7.27	1.30	4.43	1.68
Total population ǂ	24,019,408	27,412,620	21,268,876	7,823,415	1,710,133	1,570,174	3,594,354	72,700,904	14,698,076	87,398,980
Rural population ǂ	7,130,327	9,004,264	5,031,839	2,072,901	577,007	299,153	413,779	21,166,430	33,62,840	24,529,270
Estimated number of farms by range of area planted with maize										
≤3ha ¶	419,325	553,703	316,965	146,371	28,475	7,370	15,401	1,289,993	197,617	1,487,610
3- ≤5 ha ¶	88,634	72,204	58,231	32,295	10,622	4,598	10,137	219,069	57,652	276,721
>5- ≤10 ha ¶	60,235	40,456	30,964	19,203	7,291	4,543	10,907	131,655	41,944	173,599
>10- ≤20 ha ¶	13,108	8,863	5,799	4,056	2,385	1,946	4,367	27,770	12,754	40,524
>20 ha ¶	3,388	2,571	1,446	1,598	1,094	871	1,958	7,405	5,521	12,926
Total	584,690	677,797	413,405	203,523	49,867	19,328	42,770	1,675,892	315,488	1,991,380
Estimated total population that could be fed from maize production ($\sum_i fp0_{ij}$) #	9,283,228	21,364,623	24,064,950	19,897,788	8,858,416	6,477,449	20,027,875	54,712,801	55,261,528	109,974,329
Estimated rural population that could be fed in municipalities where maize was produced ($\sum_i fp1_{ij}$) #	4,280,745	7,659,511	4,655,416	1,858,702	514,745	291,262	413,518	16,595,671	3,078,227	19,673,898
Estimated surplus population that could be fed from local maize production ($\sum_i fp2_{ij}$)	5,002,484	13,705,112	19,409,534	18,039,085	8343,671	6186,188	19,614,358	38,117,130	52,183,301	90,300,431

Estimated surplus or deficit population that could/could not be fed relative to the total rural population ($\sum_i fp3_{ij}$)	2,152,901	12,360,359	19,033,111	17,824,887	8,281,409	6,178,296	19,614,096	33,546,371	51,898,688	85,445,059
Number of deficit municipalities[||]	356	177	62	26	3	1	1	595	31	626
Number of surplus municipalities[||]	523	558	322	120	54	26	42	1,403	242	1,645

Table S3. Characteristics of maize-producing municipalities grouped in seven yield classes and associated population that could be fed from local maize production. Symbols next to Variables indicate in which figure the data appears:[*]Fig. 1a. [+]Fig. 1b. [ǂ]Fig. 1c. [¶]Fig. 1d. [#]Fig 5a. [||]Fig 5b.

Note: The total population of Mexico was 112,336,538 inhabitants in 2010 (http://www3.inegi.org.mx/sistemas/tabuladosbasicos/default.aspx?c=27302&s=est), so the population in maize producing municipalities accounted for 77.8% of all the Mexican population. Based on our estimates, ca*mpesino* agriculture could potentially feed 48.7% of all the Mexican population and 62.6% of the population in maize producing municipalities.

	Yield class (t/ha)		
Area planted with maize/farm	≤ 3 t/ha	>3t/ha	Total
≤ 5 ha	1,509,062 (75.8)	255,269 (12.8)	1,764,331 (88.6)
> 5 ha	166,830 (8.4)	60,219 (3.0)	227,049 (11.4)
Total	1,675,892 (84.2)	315,488 (15.8)	1,991,380 (100)

Table S4. Estimated number of farms that planted rainfed maize in 2010 classified by area planted/farm and municipal yield class (% of the total number of farms in parenthesis).

	Yield class (t/ha)							
Name of primary race	**≤1**	**>1 to ≤2**	**>2 to ≤3**	**>3 to ≤4**	**>4 to ≤5**	**>5 to ≤6**	**>6**	**Total**
Ancho	3	38	64	99	9	12	20	245
Apachito	25	20						45
Arrocillo Amarillo	20	49	26	8		1		104
Azul	56	32	2					90
Blando	8	1	1		3	1		14
Bofo	3			6		1		10
Bolita	277	55	8	7				347
Cacahuacintle		14	14	4				32
Celaya	126	63	49	26	9	3	6	282
Chalqueño	10	43	77	52	3			185
Chapalote	3							3
Chiquito		38						38
Comiteco	31	878	148	40	1	7		1105
Complejo Serrano de Jalisco			1				1	2
Conejo	4	28	34	5				71
Cónico	126	239	248	30	3			646
Cónico Norteño	349	152	47	1	2			551
Coscomatepec		15	27					42
Cristalino de Chihuahua	110	81	9					200
Cubano Amarillo		15	29	1	2	4		51
Dulce		6	4	8			1	19
Dulcillo del Noroeste	3	1						4
Dzit Bacal	17	6		7		3		33
Elotero de Sinaloa	12	18	22	7	7	5	2	73
Elotes Cónicos	45	125	125	39	3			337
Elotes Occidentales	31	62	121	48	10	16	31	319
Gordo	35	13	4					52
Harinoso de Ocho		1						1
Jala		1			5	1		7
Mountain Yellow		2	2					4
Mushito	111	80	36	1				228
Mushito de Michoacán		2	49	3				54
Nal-tel	28	6		7				41
Nal-tel de Altura		5	3					8
Negrito	4	2						6
Olotillo	363	393	68	104	4	15		947
Olotón	1	478	12					491
Onaveño	9	7	10	4		1		31
Palomero de Chihuahua		1						1
Palomero Toluqueño	5	4	3					12
Pepitilla	15	35	82	28	7		1	168
Ratón	101	91	22	39				253

Reventador	23	6	6		3			38
Serrano		8						8
Serrano Mixe	2	27						29
Tablilla de Ocho	7	2	2					11
Tabloncillo	94	54	64	33	28	38	14	325
Tabloncillo Perla	7	15	4	7		1	2	36
Tehua	11	20						31
Tepecintle	112	223	36	40	13	1		425
Tuxpeño	509	890	383	493	75	73	9	2432
Tuxpeño Norteño	106	20	7					133
Vandeño	10	40	72	66	15	13	1	217
Zamorano Amarillo		1	8	10	7		7	33
Zapalote Chico	67	9	1			1		78
Zapalote Grande	11	20	7	6	1			45
Not classified	409	580	314	46	17	19	7	1392
Total	3299	5015	2251	1275	227	216	102	12385
% of samples	26.6	40.5	18.2	10.3	1.8	1.7	0.8	1
Number of different races	42	53	42	31	21	19	12	56

Table S5. Number of samples of native maize landraces sampled by CONABIO´s Global Maize Project all over Mexico classified by primary race and by yield class [14].

Yield classes	Temp	p		Alt	p		Prec	p		Slope	p
1-2	2.252	0.1335		1.932	0.1646		1.663	0.1972		5.826	0.0158
1-3	9.221	0.0024	*	0.031	0.8601		3.146	0.0761		3.242	0.0718
1-4	12.533	0.0004	*	10.382	0.0013	*	18.612	0.0000	*	0.310	0.5777
1-5	0.049	0.8241		0.933	0.3341		5.582	0.0181		0.885	0.3467
1-6	11.562	0.0007	*	4.612	0.0318		14.284	0.0002	*	1.969	0.1606
1-7	38.294	0.0000	*	27.005	0.0000	*	34.276	0.0000	*	1.858	0.1729
2-3	2.958	0.0854		1.577	0.2091		0.452	0.5014		0.009	0.9258
2-4	6.333	0.0119		4.835	0.0279		23.143	0.0000	*	0.783	0.3763
2-5	0.115	0.7343		1.918	0.1661		7.197	0.0073	*	0.028	0.8679
2-6	13.033	0.0003	*	5.331	0.0209		14.898	0.0001	*	1.245	0.2645
2-7	40.564	0.0000	*	27.147	0.0000	*	34.879	0.0000	*	0.728	0.3935
3-4	1.211	0.2711		8.577	0.0034	*	25.417	0.0000	*	0.543	0.4612
3-5	1.127	0.2884		0.760	0.3833		8.179	0.0042	*	0.041	0.8401
3-6	15.161	0.0001	*	4.501	0.0339		15.558	0.0001	*	1.279	0.2580
3-7	44.458	0.0000	*	28.584	0.0000	*	36.772	0.0000	*	0.759	0.3836
4-5	2.614	0.1059		4.925	0.0265		0.184	0.6676		0.363	0.5468
4-6	17.335	0.0000	*	7.203	0.0073	*	8.454	0.0036	*	1.725	0.1890
4-7	50.026	0.0000	*	32.789	0.0000	*	29.520	0.0000	*	1.325	0.2497
5-6	11.561	0.0007	*	2.751	0.0972		9.352	0.0022	*	0.995	0.3185
5-7	43.606	0.0000	*	35.152	0.0000	*	33.352	0.0000	*	0.396	0.5290
6-7	7.590	0.0059	*	19.329	0.0000	*	4.850	0.0277		0.256	0.6132

Table S6. Equality of coefficients of variation summary results of environmental variables. Yield classes: pairwise yield classes tested. Test statistic and p values for the temperature (Temp), altitude (Alt), precipitation (Prec) and slope. Statistically significant ($p>0.01$) values are marked with an *. Yield classes (t/ha): 1=≤1, 2= >1-2, 3= >2-3, 4= >3-4, 5= >4-5, 6= >5-6, 7= >6.

Yield Classes[+]	difference	lower	upper	p-value	*
2-1	57.763	-11.556	127.083	0.1749	
3-1	-34.094	-118.862	50.674	0.8992	
4-1	-268.607	-387.231	-149.983	0.0000	*
5-1	-355.595	-537.523	-173.667	0.0000	*
6-1	-373.584	-630.972	-116.195	0.0004	*
7-1	-318.922	-524.905	-112.939	0.0001	*
3-2	-91.857	-178.601	-5.113	0.0298	*
4-2	-326.370	-446.415	-206.326	0.0000	*
5-2	-413.358	-596.215	-230.501	0.0000	*
6-2	-431.347	-689.393	-173.301	0.0000	*
7-2	-376.685	-583.489	-169.881	0.0000	*
4-3	-234.513	-364.093	-104.933	0.0000	*
5-3	-321.501	-510.755	-132.247	0.0000	*
6-3	-339.490	-602.108	-76.872	0.0027	*
7-3	-284.828	-497.310	-72.347	0.0015	*
5-4	-86.988	-293.635	119.660	0.8775	
6-4	-104.977	-380.393	170.440	0.9206	
7-4	-50.315	-278.425	177.796	0.9950	
6-5	-17.989	-326.016	290.037	1.0000	
7-5	36.673	-229.899	303.245	0.9997	
7-6	54.662	-268.156	377.480	0.9989	

Table S7. PCA test for homogeneity summary results for environmental variables. [+]Pairwise yield classes tested. Those with significant differences ($p<0.05$) are marked with an *. Yield classes (t/ha): 1=≤1, 2= >1-2, 3= >2-3, 4= >3-4, 5= >4-5, 6= >5-6, 7= >6.

Number of ears*	***Ne**⁺*	***Decay He**‡*	***New mutations per site**§*	***New mutations coding regions**¶*
114	$5.24X10^{8}$	$9.53x10^{-10}$	17.10	$9.23x10^{8}$
125	$5.75X10^{8}$	$8.70x10^{-10}$	18.75	$1.01x10^{9}$
184	$8.46X10^{8}$	$5.91x10^{-10}$	27.59	$1.49x10^{9}$
290	$1.33X10^{9}$	$3.75x10^{-10}$	43.49	$2.35x10^{9}$

Table S8. Contribution of the Mexican landraces to maize genetic diversity given different estimates of ears used for seed production. *number of ears used to produce seed for 1 ha. ⁺effective population size, estimated as the number of mother plants (ears) used as seed for all Mexico. ‡decay of heterozygosity. §number of putatively occurring mutation (substitutions) appearing each year (per site). ¶total putative number of new mutations that can occur in the 4.68 Mha of maize fields, considering only the coding regions of the maize genome.

State	Municipality	Community	Yield (t/ha)			Source	Year of experiment
			Landrace experimental	Maximum SIAP 2003-2012*	Hybrid		
Chiapas	Chamula	Los Ranchos	4.2	1.45	.	[15]	2001
Chiapas	Chamula	Pozuelos	2.9	1.45	.	[15]	2001
Chiapas	Comitan	Yoknajab	3.3	4.45	3	[16]	1997&1998
Chiapas	La Independencia	Divisorio	7.4	4.46	6.6	[16]	1997&1998
Chiapas	La Independencia	San Marcos	4.2	4.46	2.7	[16]	1997&1998
Chiapas	Oxchuc	El Retiro	4	1.47	.	[15]	2001
Chiapas	Oxchuc	Rancho del Cura	1.8	1.47	.	[15]	2001
Chiapas	Teopisca &Comitan	Teopisca, Diamante, Chacaljocom	5.05	3.21	5.7	[17]	2008
Guerrero	Atlixtac	Atlixtac	4.6	2.28	3.4	[16]	1986
Guerrero	Iguala	Iguala	4.6	4	6.3	[16]	1980
Guerrero	Taxco de Alarcon	Puente Campuzano	4.7	2	4	[16]	1980
Guerrero	Tlapa	Tlapa	0.9	1.94	0.7	[16]	1986
Guerrero	Zapotitlan Tablas	Ayotoxtla	2.3	1.9	0.8	[16]	1986
Hidalgo	Mixquiahuala de Juárez	Mixquiahuala	5.3	0.9	6	[18]	2006
Mexico	Amecameca	Amecameca	6.3	3.3	.	[19]	2004&2005
Mexico	Atlacomulco	Atlacomulco	5.9	3.63	.	[20]	1995
Mexico	Ayapango	Ayapango	6.7	3.2	.	[19]	2004&2005
Mexico	Calimaya	Calimaya	9.5	4.6	.	[21]	2005
Mexico	Calimaya &Metepec		8.9	5.65	10.3	[21]	2005
Mexico	Jocotitlan	Jocotitlan	7.7	3.53	.	[22]	2004
Mexico	Jocotitlan, Metepec &Toluca	Average of best yields of 3 localities	8.2	4.82	9	[22]	2004
Mexico	Metepec	Metepec	7.5	6.7	.	[22]	2004
Mexico	Metepec	Metepec	8.3	6.7	.	[21]	2005
Mexico	Naucalpan	Cuautitlan Izcali	8	2.5	7.2	[23]	2012
Mexico	Tecamac	Tecamac	7	4.34	.	[20]	1995
Mexico	Temamatla	Temamatla	4	3.31	.	[19]	2004&2005
Mexico	Texcoco	Coatlinchan	3.8	4.04	.	[24]	2000
Mexico	Texcoco	Coatlinchan	4.6	4.04	.	[30]	2001
Mexico	Texcoco	Coatlinchan	3.7	4.04	.	[19]	2004&2005

Mexico	Texcoco	Average of 2 localities	5.4	4.04	6.5	[24]	2000
Mexico	Texcoco	Montecillo	6.7	4.04	.	[20]	1995
Mexico	Texcoco	Montecillo	4.2	4.04	.	[16]	2000
Mexico	Texcoco	Montecillo	3.1	4.04	.	[25]	2003
Mexico	Texcoco	Montecillo	4.6	4.04	.	[19]	2004&2005
Mexico	Texcoco	Texcoco	2.9	4.04	5.5	[26]	1998
Mexico	Texcoco	Texcoco	7	4.04	8.4	[18]	2006
Mexico	Toluca	El Cerrillo Piedras Blancas	5	4.51	.	[22]	2004
Michoacan	Anangueo	Anangueo	3.3	2.1	1.2	[16]	1991
Michoacan	Buenavista	Buenavista	0.9	3.56	1.4	[16]	1988
Michoacan	Caracuaro	Caracuaro	1.9	2.5	1.4	[16]	1988
Michoacan	Charapan	Charapan	4.8	2.2	3	[16]	1991
Michoacan	Charo	Charo-Carrizal	10.2	4.1	9.7	[16]	1996&1997
Michoacan	Charo	Charo-Laguna	3	4.1	2.7	[16]	1996&1997
Michoacan	Charo	Charo-Pilas	10	4.1	8.7	[16]	1996&1997
Michoacan	Cuitzeo	Cuitzeo	4.1	2.8	3.8	[16]	1996&1997
Michoacan	Hidalgo	Joyas de Birruete	5.1	3.22	4	[16]	1991
Michoacan	Huetamo	Huetamo	2.7	3	2.2	[16]	1988
Michoacan	Indaparapeo	Indaparapeo	4.8	4.1	5	[16]	1996&1997
Michoacan	Ixtlan	San Cristobal	4.6	6.5	1.2	[16]	1991
Michoacan	La Huacana	La Huacana	4.2	3.44	3.9	[16]	1988
Michoacan	Morelia	Morelia norte	5.6	3.3	5.9	[16]	1996&1997
Michoacan	Morelia	Morelia sur	4.6	3.3	3.8	[16]	1996&1997
Michoacan	Paracho	Aranza	3.4	2.14	.	[25]	2003
Michoacan	Querendaro	Querendaro	2.8	4.21	1.6	[16]	1996&1997
Michoacan	San Juan Parangaricutiro	San Juan	3.9	5.25	4	[16]	1988
Michoacan	Santa Clara del Cobre	Santa Clara del Cobre	3.5	.	1.6	[16]	1991
Michoacan	Tingambato	Pichataro	5.1	2.14	3.2	[16]	1991
Michoacan	Tiquicheo	Tiquicheo	1.8	3.56	1.7	[16]	1988
Michoacan	Tuzantla	Tuzantla	3.5	4	2.8	[16]	1988
Michoacan	Zitacuaro	Carpinteros	5.2	2.57	1.3	[16]	1991
Michoacan	Zitacuaro	Chichimequillas	5.2	2.57	1.3	[16]	1991
Morelos	Atlatlahuacan	Atlatlahuacan	5	6.66	4.8	[16]	1974&1975

Morelos	Cuautla	Tetelcingo	4.5	5	4.4	[16]	1974&1975
Morelos	Miacatlan	Miacatlan	2	3.5	1.9	[16]	1986
Morelos	Miacatlan	Miacatlan	2	3.5	1.7	[16]	1974&1975
Morelos	Tepalcingo	Tepalcingo	5.8	4	5.2	[16]	1974&1975
Morelos	Tlaquiltenango	V. de Vasquez	3.7	3.2	3.5	[16]	1974&1975
Morelos	Tlaquiltenango	Valle de Vasquez	3.7	3.2	3.5	[16]	1986
Morelos	Tlayacapan	Tlayacapan	6	4.5	5.6	[16]	1974&1975
Morelos	Totolapan	Nepopoalco	5.1	4.87	4.7	[16]	1974&1975
Oaxaca	nd	Sintaxtla	2.1	.	2	[16]	1986
Oaxaca	Ayoquezco	Ayoquezco	3.8	1.8	3.1	[16]	1989
Oaxaca	Juquila??	Ayuquila	2.8	.	1.8	[16]	1986
Oaxaca	Ocotlan	Ocotlan	3	2	1.6	[16]	1989
Oaxaca	San Juan Tamazola	Yucuxina	2.5	3.24	1.5	[16]	1986
Oaxaca	Santiago Tillo	Yucucui	3.8	1.51	3.5	[16]	1988
Oaxaca	Tehuantepec	Tehuantepec	3.5	2.5	3.2	[16]	1987&1988
Oaxaca	Yanhuitlan	Yanhuitlan	2.3	1.1	1.8	[16]	1986
Oaxaca	Zimatlan	Zimatlan	4.9	1.8	4.3	[16]	1989
Puebla	Ayotoxco de Guerrero	Ayotoxco	4.8	2.5	3.1	[16]	1997
Puebla	Chalchicomula de Sesma	Guadalupe Sabinal	3.3	3.53	2.3	[27]	2007
Puebla	Chalchicomula de Sesma	Serdan	5.1	3.53	2.5	[27]	2007
Puebla	Chilchotla	La Trinidad	0.8	2.5	0.5	[16]	1991
Puebla	Cuautinchan	Cuautinchan	2.6	1	1.7	[16]	1987
Puebla	Cuautinchan	Cuautinchan	4	1	2.6	[16]	1988
Puebla	Cuautinchan	Cuautinchan	3.9	1	2.4	[16]	1989
Puebla	Cuautinchan	Cuautinchan	2.2	1	1.5	[16]	1990
Puebla	Cuautinchan	Cuautinchan	4.3	1	1.1	[16]	1991
Puebla	Cuautinchan	Torija	2.2	1	1	[16]	1989
Puebla	Cuautinchan	Torija	3.1	1	1.8	[16]	1990
Puebla	Cuautinchan	Torija	2.6	1	1.6	[16]	1991
Puebla	Esperanza	Esperanza	3	3.5	2.5	[16]	1997
Puebla	G. Victoria	G. Victoria	1.4	3.4	0.9	[16]	1997
Puebla	Guadalupe Victoria	Buenavista de Guerrero	5.1	3.4	2.5	[27]	2007

Puebla	Huejotzingo	San Mateo Capultitlan	7.22	4	7.76	[28]	1993
Puebla	Huejotzingo	San Mateo Capultitlan	3.87	4	3.08	[28]	1994
Puebla	Huejotzingo	San Mateo Capultitlan	7.18	4	7.82	[28]	1995
Puebla	Huejotzingo	Santa Ana Xalmimilulco	6.49	4	5.59	[28]	1994
Puebla	Ixcaquixtla	Pixtiopan	4.8	1.5	4.6	[16]	1986
Puebla	Libres	Libres	4	3	2.1	[16]	1997
Puebla	Mazapiltepec de Juarez	Mazapiltepec	5.1	3.5	4.3	[16]	1997
Puebla	Molcaxac	All landraces, average of six communities	3.9	1.5	.	[29]	2007
Puebla	Molcaxac	Best landrace &hybrid, average of six communities	5.6	1.5	4.3	[29]	2007
Puebla	nd	La Malinche	6.2	.	3.6	[16]	1997
Puebla	Puebla	Valle de Puebla	6.9	3	5.8	[16]	1997
Puebla	Quecholac	Quecholac	0.9	1.5	0.3	[16]	1997
Puebla	San Pedro Tlaltenango	San Pedro Tlaltenango	6.34	3.25	5.6	[28]	1993
Puebla	San Pedro Tlaltenango	San Pedro Tlaltenango	7.88	3.25	5.1	[28]	1994
Puebla	San Pedro Tlaltenango	San Pedro Tlaltenango	5.59	3.25	6.2	[28]	1995
Puebla	San Salvador el Seco	El Seco	6.7	3.78	.	[30]	2000
Puebla	Tecali de Herrera	Ahuatepec	3.5	1.6	.	[30]	2000
Puebla	Tecamachalco	Tecamachalco	3.9	1.25	.	[20]	1995
Puebla	Tetela de Ocampo	Tetela	2.6	1.73	0.6	[16]	1997
Puebla	Tlachichuca	Tlachichuca	5.2	3.81	.	[30]	1997
Puebla	Tlachichuca	Tlachichuca	3.9	3.81	.	[30]	2000
Puebla	Tlachichuca	Tlachichuca	3.3	3.81	2.3	[27]	2007
Puebla	Tlacuilotepec	El Rincon	2.1	1.87	0.5	[16]	1987
Puebla	Tlacuilotepec	El Rincon	3.1	1.87	1.8	[16]	1990
Puebla	Tlahuapan	Tlahuapan	5.6	5	4.6	[16]	1997
Puebla	Tzicatlacoyan	Tepenene	3.7	2	2.2	[16]	1990
Puebla	Tzicatlacoyan	Tepenene	2.6	2	0.9	[16]	1991
Puebla	Zacatlan	Zacatlan	4.4	1.74	2.2	[16]	1997
Puebla	Zaragoza	Zaragoza	4.3	2.5	3.7	[16]	1997
SLP	Rayon	Rayon	3.7	0.94	2.8	[16]	1979
Tamaulipas	Guemez	Guemez	0.7	2	0.1	[18]	2006

Tlaxcala	Apizaco	Apizaco	5.6	3.14	.	[24]	2001
Tlaxcala	Tzompantepec	San Andres Ahuashuatepec	6.4	2.95	.	[19]	2004&2005

Table S9. Experimental yields of native landraces and hybrids. *Maximum average yield reported by SIAP [http://nube.siap.gob.mx/cierre_agricola/ accessed 12 October 2017 for the period 2003-12 for the municipality where the experiment took place.

	Quantity (ton)	%
Production*		
Total	23,301,879	100
(a) Irrigated Autumn-Winter	5,925,934	25.4
(b) Rainfed Autumn-Winter	746,095	3.2
(c) Irrigated Spring-Summer	4,697,044	20.2
(d) Rainfed Spring-Summer	11,932,806	51.2
(d.1) *campesino* agriculture	5,936,633	25.5
(d.2) commercially-oriented agriculture	5,996,173	25.7
Imports[+]		
Total	7,775,258	100
(a) White grain	504,346	6.5
(b) Yellow grain	7,270,912	93.5

Table S10. Quantities of national maize production and of imports during 2010 by season and water regime, and by types of maize imported. *http://nube.siap.gob.mx/cierre_agricola/ . [+] Sistema de Información Arancelaria Via Internet (SIAVI) http: 187.191.71.239, tariff codes: 20053003 (yellow maize) and 10059004 (white maize), accessed April 30, 2018.

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