

Conclusions

- High genetic heterozygosity
- Distribution on PCoA plot is as broad as Florida varieties
- Broad genetic background

Highly diverse and worth to conserve

- No clear correlation between geographical origin and genetic background

Collect and conserve from broad geographic range

Genetic Integrity of Germplasm

Specific question:

What is the consequences of genetic Integrity of germplasm conserved in different genebanks ?

Genetic integrity of germplasm conserved in different genebanks



Photos: Courtesy of Dr. Kawase / NIAS Genebank

Hypothesis:

Genetic Diversity of the Germplasm Should be Genetically Equivalent



Differences in management are assumed

Regeneration process in genebank management

Ideal: Use as many individual as possible

BUT Cost for regeneration is the biggest constrain

Table Total and average cost of genebank (Horna, 2008)

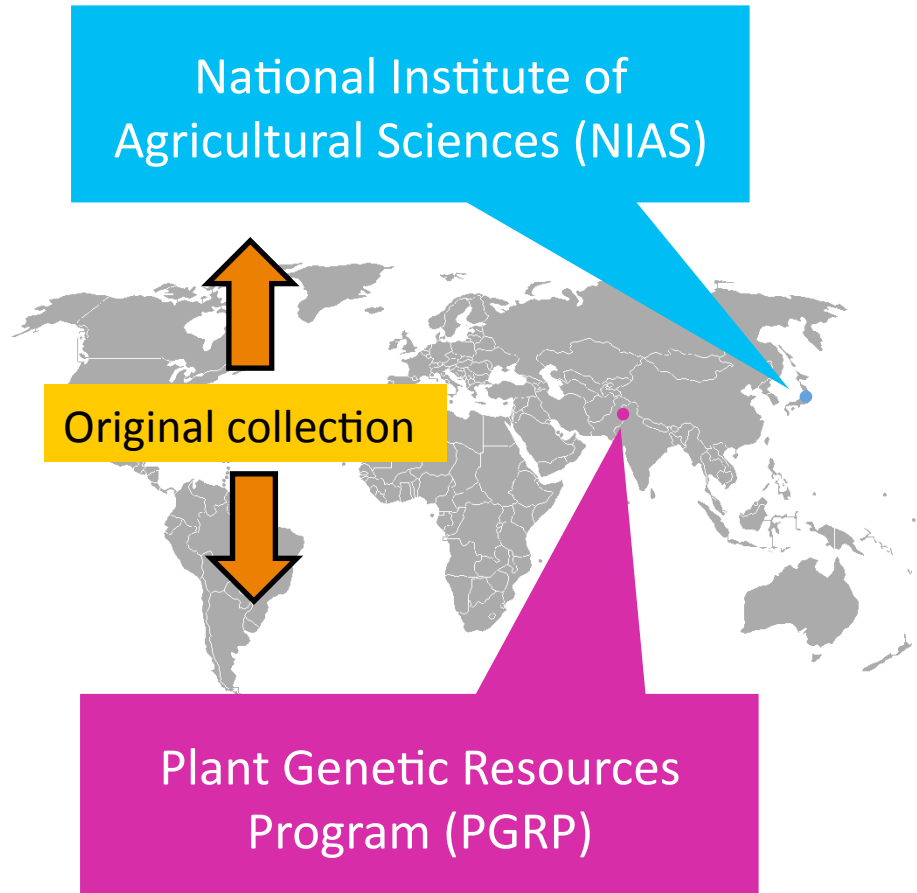
Activities	Number of accessions	Total capital cost (\$/year)	Total quasi-fixed cost (\$/year)	Total labor costs (\$/year)	Total non-labor costs (\$/year)	Average capital cost (\$ /acc)	Average quasi-fixed cost (\$ /acc)	Average variable cost (\$ /acc)	Total AC (\$ /acc)
Acquisition	4,950				3,524.80				
Characterization	2,000				1,671.48				
Safety duplication	9,450				4,247.28				
Long term storage	83,930				9,893.62				
Medium term storage	86,080	31,000.00	15,393.79	5,363.43	15,977.30	0.42	0.18	0.38	0.85
Germination testing	29,250	22,000.00	10,734.21	7,249.21	3,783.79	0.78	0.37	0.38	1.52
Regeneration	7,400	87,899.06	33,064.54	125,118.99	8,213.50	11.88	4.47	18.02	34.36
Seed health testing	7,300	1,449.36	3,100.81	300.01	0.00	0.20	0.42	0.04	0.66
Distribution	6,200	7,804.44	21,624.13	4,889.11	9,151.05	1.26	3.49	2.26	7.01
Data management	86,800	1,704.26	31,617.32	6,858.03	6,773.35	0.02	0.36	0.16	0.54
Total	N.A.	190,463.75	154,807.12	162,445.30	63,236.18	16.58	18.62	25.96	61.16

46.15% of total capital cost

US\$ 34.36 per acc.

Materials and Methods

Hirano et al. 2009. Crop Sci. In press.



- Gene bank accessions
 - National Institute of Agrobiological Sciences, Japan (NIAS)
 - Plant Genetic Resources Program, Pakistan (PGRP)
- Original collections
- 17 accessions
- AFLP (Vos *et al.* 1995)

Results and Discussion

Table Basic information of NIAS and PGRP

	Location	Regeneration Frequency	Field location	Geographic position of field (lat /long)	Growing season	Min. / max (°C)	No. of indiv. used for regeneration
NIAS	Tsukuba, Japan	0 to 1time.	Sapporo	43.00 N /141.40 E	Sep.-Jun.	-6.7 / 22.3	About 15
			Iwate	39.73 N / 141.13 E	Sep.-Jun.	-5.3 / 23.8	
			Ibaraki	36.02 N / 140.10 E	Oct.-Jun.	-2.7 / 24.9	
			Fukuyama	34.50 N / 133.38 E	Oct.-Jun.	0.5 / 26.9	
PGRP	Islamabad, Pakistan	Once in 1998.	Islamabad	33.70 N / 73.12 E	Nov.-Jun.	2.9 / 29.7	Few

Environmental condition of regeneration field are different

individuals for regeneration are different

Variation within a genebank was greater than between different genebanks

Table Result of AMOVA

Variation source	df	SS	Variance component	% of variation
Among popl.	2	27.59	0.36	6
Within popl.	48	251.88	5.25	94
Total	50	274.47	5.61	100

Table Result of Chi square test

# of Loci	P Chi-sq.	value P
O vs P	2.40	0.12 (ns)
O vs N	2.02	0.16 (ns)

No significant differences of AFLP loci between different genebanks

Table Comparison of unchanged AFLP Loci between Original vs NIAS and Original vs PGRP

NIAS Acc. Name	1-1 matches				0-0 matches				# of Sub Acc.
	Exp.	Obs.	χ^2	<i>p</i>	Exp.	Obs.	χ^2	<i>p</i>	
2303_5	64	62	0.06	0.80	97	89	0.72	0.40	1
2426_3	69	66	0.13	0.72	92	84	0.76	0.38	6
2428_2	67	61	0.54	0.46	94	89	0.28	0.60	3
2435_1	64	64	0.00	1.00	93	93	0.00	1.00	4
2435_2	64	64	0.00	1.00	93	93	0.00	1.00	3
2435_3	64	64	0.00	1.00	93	93	0.00	1.00	2
2439_2	63	59	0.25	0.61	98	81	3.57	0.06	3
2440_2	66	65	0.02	0.90	95	75	5.33	0.02*	5
2445_1	65	65	0.00	1.00	96	89	0.55	0.46	2
2505_1	68	68	0.00	1.00	93	90	0.10	0.75	2
2513_2	68	64	0.24	0.63	93	91	0.04	0.83	2
2588_2	67	60	0.73	0.39	94	78	3.28	0.07	3
2590_1	66	65	0.02	0.90	95	93	0.04	0.84	4
2592_1	70	70	0.00	1.00	91	91	0.00	1.00	6
2593_1	67	67	0.00	1.00	94	86	0.74	0.39	8
2593_3	65	63	0.06	0.80	96	88	0.73	0.39	6
2594_1	69	61	0.93	0.34	92	79	2.14	0.14	5

No significant differences

PGRP Acc. Name	1-1 matches				0-0 matches			
	Exp.	Obs.	χ^2	<i>p</i>	Exp.	Obs.	χ^2	<i>p</i>
2303_5	64	62	0.07	0.80	97	90	0.54	0.46
2426_3	69	55	3.56	0.06	92	91	0.01	0.92
2428_2	67	63	0.25	0.61	94	86	0.74	0.39
2432_6	68	64	0.25	0.62	93	93	0.00	1.00
2435_1	64	64	0.00	1.00	93	93	0.00	1.00
2436_2	64	64	0.00	1.00	93	93	0.00	1.00
2439_2	63	59	0.27	0.60	98	89	0.91	0.34
2440_2	66	65	0.02	0.90	95	92	0.10	0.75
2445_1	65	52	3.25	0.07	96	89	0.55	0.46
2505_1	68	66	0.06	0.81	93	91	0.04	0.83
2513_2	68	64	0.25	0.62	93	89	0.18	0.67
2588_2	67	56	2.16	0.14	94	83	1.46	0.23
2590_1	66	65	0.02	0.90	95	92	0.10	0.75
2592_1	70	67	0.13	0.71	91	90	0.01	0.92
2593_1	67	62	0.40	0.53	94	91	0.10	0.75
2593_3	65	61	0.26	0.61	96	89	0.55	0.46
2594_1	69	57	2.53	0.11	92	82	1.22	0.27

No significant differences

Exp.: expected number of bands in the accession, that is equivalent to number of bands observed in Original. Obs.: observed number of bands in NIAS accessions, Chi square tests were carried out with df=1. *: Significant with 5% of confident interval

Unintended selection might have occurred at PGRP

Disappearance of bands observed in 12 accessions of PGRP

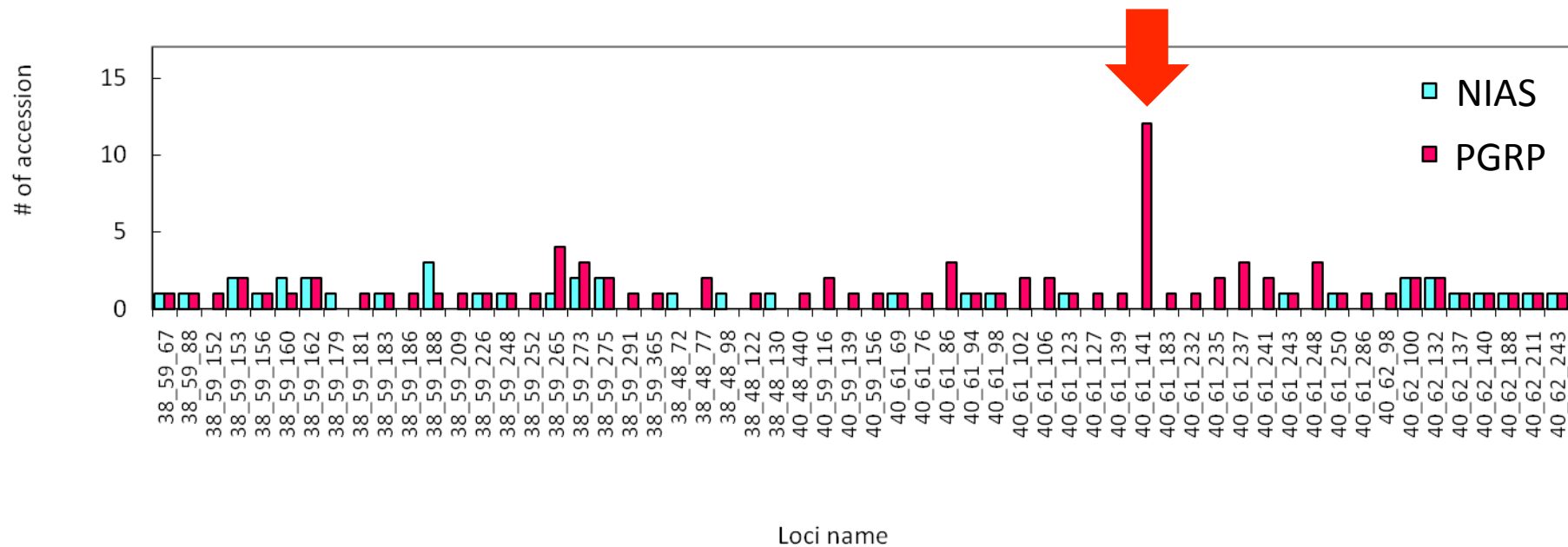


Fig. Disappearance of bands in wheat landraces at different loci