

Yaqui Valley 1989-90 Wheat Crop Survey

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During the period 8-15 April 1990, I examined 65 wheat crops in the Yaqui Valley, chosen strictly at random over the whole Valley (from Bacum to Bacobampo, and from Lobitos to the Carretera Internacional). I walked into each crop some 100 m and estimated by eye weeds (% of crop biomass), lodging (% of area), sowing date, soil fertility and grain yield. Sowing date estimate was based on grain development stage and variety (material ranged from Z70.5 to Z90). Fertility score was more difficult but based on flag leaf size, and colour relative to spike colour. The existence of obvious high fertility patches in most fields (e.g. on edges) served as a guide. It is possible a period of water stress could have caused the appearance of lower fertility, but unlikely. Also noted was planting arrangement, with bed planting referring to clear rows (2 or 3) only on top of the mound, and other yield depressing factors (poor stand, waterlogging, disease). The yield estimate was obviously subjective and included an adjustment of the anticipated effect of season on grain number (1990 considered above average) and of sowing date on grain size, as well as the estimated yield based on appearance of the crop.

RESULTS

Overall

Crops were initially classified into dwarf bread wheat (Oasis or like), semi dwarf bread wheat (Opata or similar) and durum wheat (Altar probably). Yields of each group were not different:

Type	No. of Crops	Estimated yield (t/ha)	
		Mean	Standard dev.
Bread wheat dwarf	13 (20%)	5.77	0.93
" " semidwarf	28 (43%)	5.60	1.09
Durum wheat	24 (37%)	5.72	1.50
Total	65 (100%)	5.68	

If we assume 5% harvest losses the mean yield predicted for the Valley is 5.4 t/ha* - if correct this would be a near record. The distribution of crops amongst types is roughly in accord with earlier statistics for Y89-90.

* Actual official yield for 1989-90 was 5.51 t/ha.

Yield constraints

The distribution of yields amongst crops is interesting:

	Yield class (t/ha)						
	< 1.9	2-2.9	3-3.9	4-4.9	5-5.9	6-6.9	7<
No. of crops	1	2	1	9	19	23	10
	(2%)	(3%)	(2%)	(14%)	(29%)	(35%)	(15%)

Of the 13 crops (20%) with estimated yields less than 5 t/ha, 9 rated only medium fertility or less, 4 had late sowing, 4 had moderate weeds (> 15%), 2 waterlogging and 1 poor stand: some of the crops had combinations of these constraints, but it was clear that inadequate fertility was the predominant constraint.

Another way of looking at the fertility issue is mean yield by fertility class:

Fertility Class	All crops		Crops without other constraints	
	n	Mean Yield (t/ha)	n	Mean Yield (t/ha)
Low-Mod.	3	3.00	3	3.00
Mod.	19	4.88	17	5.13
Mod.-High	22	6.21	21	6.29
High	21	6.23	19	6.41

If we take 6.3 t/ha as expected yield for well managed crops of the top 2 fertility levels, then 3 crops lost 3.3 t/ha each (low-mod. fertility class) and 19 lost 1.2 t/ha each (mod. fertility class): this amounted to an 8.0% yield loss over 65 crops at a potential yield of 6.3 t/ha.

Sowing date classes can be similarly examined:

	Early (< mid Nov.)	Early-mid late Nov.	Mid early Dec.	Mid-Late late Dec.	Late early Jan.
No. of crops	8 (12%)	13 (20%)	24 (37%)	12 (18%)	8 (12%)
Yield (t/ha)	5.91	5.92	5.88	5.49	4.75

For simplicity I concluded from this that 18% of fields lost 10% of yield due to mid-late sowing, and a further 12% lost 20% of yield due to late sowing - over all crops a 4.2% yield loss.

Weed levels averaged 2.0% across all crops with 68% registering zero or less than 1% weeds and only 4 crops (6%) exceeding 10% (the highest was 30%): wild oats was the commonest weed. Overall I estimate a 2.0% yield loss due to weeds.

Waterlogging losses were evident in only 2 fields, one estimated at 50% and the other 30%, giving an overall average loss of 1.2%.

Lodging averaged 1.1% of crop area and since most was late lodging it is assumed the yield loss was only one third of this, or 0.4%. Three fields had more than 10% lodging, all were durum wheats; all other fields had less than 2% lodging.

There were no disease losses observed and the effect of poor stand in one field is too small to consider. In summary therefore the survey identified the following sources of yield loss:

Inadequate fertility	8.0%
Late sowing	4.2%
Weeds	2.0%
Waterlogging	1.2%
Lodging	0.4%

Total	15.8%
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Based on an estimated yield of 5.68 t/ha, this means farm yield without constraints should be $5.68 \times [100/(100-15.8)] = 6.75$ t/ha (or allowing for 5% harvest losses = 6.4 t/ha).

Variation seen around this high yield level (50% of the crops were estimated to yield between 6.0 to 7.5 t/ha) is probably due to luck.

Curiously the survey identified only 23% of crops to be sown on beds (31% were on furrows, and 46% in melgas). The figure for beds is well below that estimated by the Traxler survey in 1988-89.

The field survey took about 13 hours (12 minutes/crop). Is it worth formalizing and repeating on a regular basis? Should it become a regular feature of agronomy training?

RAF/asl.