



**MOUNTAIN
HER**

**Deliverable achievement report
D3.2.1 Analyze field performances
across research station locations
for management practices**

To identify the best management practices to improve agronomic performances. Ten (10) genotypes of Durum wheat and Barley (Table 1a), including two checks (Commercial and landrace) (table 1b), were planted at four research stations at Morocco, Tunisia, Algeria, and Lebanon (table 2), under two practices: conventional following the standards procedures of the station and agro-ecological practices as suggested by each of the four countries (Table 3). Genotypes were planted in three replicates using alpha lattice design with three replicates

Table 1a: Evaluated ten genotypes of durum wheat and barley across four locations

Crop	Pedigree	Name	GID
DURUM	Sebatel1/7/Ossl1/Stj5/5/Bidra1/4/BezazSHF//SD 19539/Waha/3/Stj/Mrb3/6/Icajihan1	Sebajihan	800034160
DURUM	Shaba//Geromtel1/Icasyr1	Shabassem	800034166
DURUM	Amedakul1/TriticumdicoccoidesSyriancollection/ /Loukos	Nachit	800043267
DURUM	Korifla/AegSpeltoidesSyr//Mrb5	Jabal	800018569
DURUM	Icasyr1/3/Gcn//Stj/Mrb3	Zagharin2	800043194
DURUM	F413J.S./3/ARTHUR71/LAHN//BLK2/LAHN/4/QUA RMAL	Faraj	800028288
DURUM	Ghzael/Icaqinzen	Ghzael/Icaqinzen	800064933
DURUM	180500 87	180500 87	800064560
DURUM	Kenzera//ITAig:90724/Durex	Kenzera//ITAig:907 24/Durex	800065394
DURUM	Farkassem/Sissem	Farkassem/Sissem	800064810
BARLEY	Zanbaka/H.spont.41-2/4/Arar/H.spont.19-15//Hml/3/H.spont.41-1/Tadmor/5/Zanbakian/7/Lignee527//Bahtim/DL 71/3/Api/CM67//Mzq/5/Alanda-01/4/WI2291/3/Api/CM67//L2966-69/6/Lignee527/Chn-01//Arar/Rhn-03	SICB12-0382-OTR-OTR-05KF-015AREC-5AREC-OKF	24766
BARLEY	WI3257/4/ALISO/CI3909-2//HB602/3/MOLA/SHYRI//ARUPO*2/JET/5/Atah ualpa/IraqiBlack	ICB09-0290-OAP-OAP-020KF-8TR-OAUB-OMR-OMR	24781
BARLEY	Chifaa	Chifaa	4395
BARLEY	SLB15-05/4/H.spont.96-3/3/Roho//Alger/Ceres362-1-1/5/Roho/4/Zanbaka/3/ER/Apm//Lignee131	ICB09-0843-OAP-OAP-OMC-2MC	13330
BARLEY	Moroc9-75//WI2291/WI2269/5/SLB15-05/4/H.spont.96-3/3/Roho//Alger/Ceres362-1-1	ICB09-0866-OAP-OAP-OMC-2MC	13336
BARLEY	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/P ETUNIA 1		22761
BARLEY	80.5162/MSEL//GLORIA-BAR/IAR.H.485/6/ATACO/BERMEJO//HIGO/3/CAL I92/ROBUST/4/PETUNIA 1/5/PETUNIA 1/CHINIA/3/ATACO/BERMEJO//HIGO/6/ZIGZIG/3 /M9846//CCXX14.ARZ3/PACO	HIICB12-290-OTR-OTR-OMR-OMR-1MR	.
BARLEY	DATCHA//MSEL/ND21117	ICM1213CJ28-33CJ-010CH-05CJ-4CH-OMR	.
BARLEY	UC 1047 / 11HB44	UCD013-012-0CD-0CD-0CD-OMR-2MR	.

BARLEY	UC 1266 // L94/BCD-TTA/3/UC1280	UCD014-121-OCD- OCD-OMR-OMR- 1MR	.
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Table 1 b: Durum and barley Checks specific to each country

	Crop	Name
Morocco	DURUM Local Commercial check	Karim
Morocco	DURUM Local Landrace	Oued Zenati
Lebanon	DURUM Local Commercial check	MARGHERITA
Lebanon	DURUM Local Landrace	99314
Tunisia	DURUM Local Commercial check	Maali
Tunisia	DURUM Local Landrace	Chili
Algeria	DURUM Local Commercial check	Bousselam
Algeria	DURUM Local Landrace	MBB
Morocco	BARLEY Local Commercial Check	Amalou
Morocco	BARLEY Local Landrace	Rabat 071
Lebanon	BARLEY Local Commercial Check	Rihane
Lebanon	BARLEY Local Landrace	Arta
Tunisia	BARLEY Local Commercial Check	Rihane
Tunisia	BARLEY Local Landrace	Djebali
Algeria	BARLEY Local Commercial Check	Fouara
Algeria	BARLEY Local Landrace	Tchideret

Table 2: Experimental location in the four Mountains regions

Country	Mountain system	Station name	Altitude (m)	Soil type
Morocco	Middle Atlas Mountain	Annoceur	1,440	Stony clay limestone
Algeria	Atlas Tellien Mountains	Setif	995	Stony clay limestone
Tunisia	La Dorsale Tunisienne	El Kef	1,255	Silty clay soil
Lebanon	Bekaa	Tal Amara	905	Clay/sandy limestone

Table 3: Agro ecological practices used per country

Morocco	Lebanon	Tunisia	Algeria
*Direct seeding using Seed driller *Reasoned and split fertilisation based on soil analysis. *Intercropping cereal-faba bean *Manual weeding	*Targeted NPK use *Minimum tillage *Rotation with legumes *Reduce N use *Manual weeding	*Minimum tillage *Barley grazing	*CA with false seeding and delay in sowing *Forage rotation *Soil compost amendment *Cover fertilization with 100% organic *Manual weeding

Field performances Analysis across research station locations

Field performances including grain yield, spike number/m² and plant height of durum wheat and barley genotypes as conducted under agro ecological and conventional management are presented in table for Algeria, Lebanon, Morocco and Tunisia. (Table 4 a, b)

Table 4a: Durum Wheat Field performances across four research station locations

Durum Wheat	Grain Yield (T/ha)		Spike/m ²		Height (cm)	
	Conventional	Agroecological	Conventional	Agroecological	Conventional	Agroecological
Algeria	1.64±0.07	1.56±0.06	362,0±15.37	382.63±24.65	65.11±0.88	65.86±0.83
Lebanon 24	2.27±0.10	2.90±0.08	236.50±9.22	226.33±8.39	77.53±1.39	70.53±1.68
Lebanon 23	4.07±0.14	4.00±0.13	445.67±16.22	421.33±16.52	86.88±1.52	84.38±1.39
Morocco	0.90±0.05	1.18±0.06	222.28±7.45	267.72±5.98	72.78±1.52	70.97±1.51
Tunisia	0.38±0.04	0.48±0.05	128.72±7.75	169.42±13.02	82.42±1.16	74.19±1.53

Table 4 b: Barley Field performances across four research station locations

Barley	Grain Yield (T/ha)		Spike/m ²		Height (cm)	
	Conventional	Agroecologica l	Conventional	Agroecologica l	Conventiona l	Agroecologica l
Algeria	1.97±0.12	2.23±0.1	361.7±12.31	331.67±20.24	66.47±0.94	64.22±0.94
Lebanon 24	2.31±0.10	2.95±0.13	291.0±18.22	315.0±14.6	69.03±1.47	72.55±1.61
Lebanon 23	4.14±0.14	3.84±0.19	652.5±39.60	665.83±34.22	84.53±1.78	75.05±1.62
Morocco	1.09±0.1	1.29±0.1	282.0±13.79	287.0±14.03	70.44±1.58	68.86±1.77
Tunisia	0.94±0.09	1.53±0.1	222.75±18.33	249.15±24.88	96.72±1.66	92.9±1.51

The results showed that the highest grain yield was reached at Lebanon (Tal Amara) for Durum Wheat and Barley under both agro ecological and conventional management, followed by the yields achieved in Algeria. (Figure 1)

Globally, durum wheat and barley management under agro ecological practices led to an average grain yield gain of 8.5% and 12% respectively for durum wheat and barley. In the case of Tunisia, the performance of barley genotypes achieved 38% of increase with agro ecological management.

In Morocco, the highest yield gain due to agro ecological practices was observed in durum wheat with 23% of gain compared to conventional practices.

However, in the case of Algeria, no differences in performance between the two managements were observed for grain yield production.

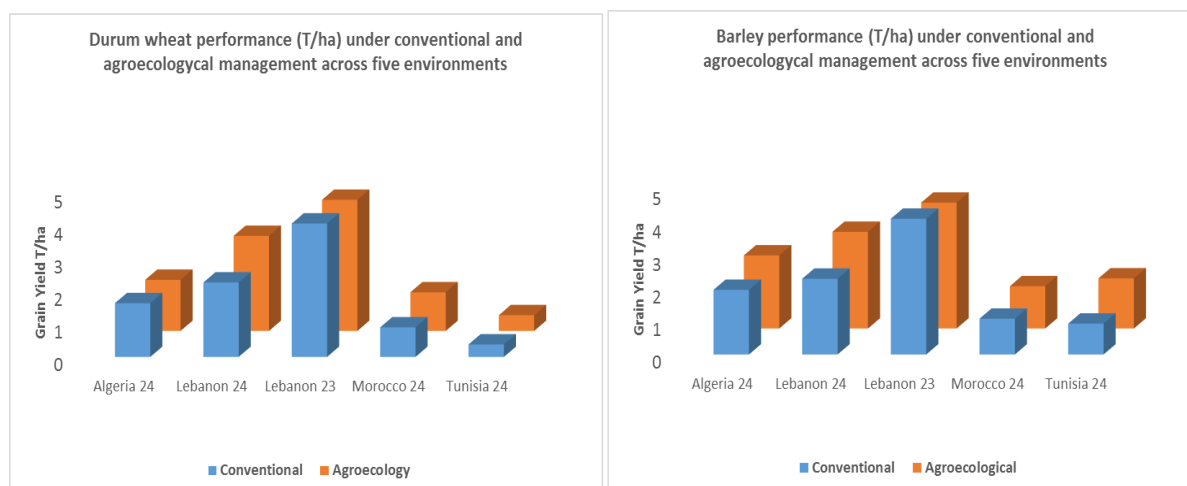


Figure 1: Durum wheat and Barley performances under conventional and agro ecological managements across five environments

The global analysis for Durum wheat and barley genotypes tested in the five environments showed significant effect of environment (management and site), Genotype and GXE interaction for the majority of the parameters: Grain yield, spikes/m² and Height. The means are reported in table 5.

Table 5: Global analysis of grain yield, spike/m² and height for DW and Barley tested genotypes in five environments (Morocco, Lebanon23, Lebanon 24, Tunisia and Algeria)

	DF	DURUM WHEAT			BARLEY		
Management/Traits		Grain yield (T/ha)	Spikes/m ²	Height cm	Grain yield (T/ha)	Spikes/m ²	Height cm
Agro Ecological management		2.03±0.1	293.49±9.76	74.59±0.76	2.38±0.09	371.78±15.21	74.41±0.99
Conventional management		1.87±0.10	282.45±9.89	75.54±0.85	2.09±0.1	361.90±15.15	77.43±1.09
Source of variation:							
Management	1	**	*	NS	***	NS	**
Site	4	***	***	***	***	***	***
Management*site	4	***	**	***	***	NS	***
Genotypes	17	*	***	***	***	***	***
Variation coefficient (CV)		26	24.64	9.22	26.28	28.37	10.74

Agro ecological management allowed 8.5% and 12% of grain yield increase for Durum wheat and Barley respectively. However, no effect was noticed between conventional and agro ecological practice for height in durum wheat and for spike/m² in barley.

ANOVA analysis showed highly significant effects of site for all studied traits.

Morocco (Annoceur)

There was significant effect of management on grain yield and spike/m², the increase were 16 and 17% respectively for durum wheat. While grain yield gain reached 15.5% for barley. (Figure 2)

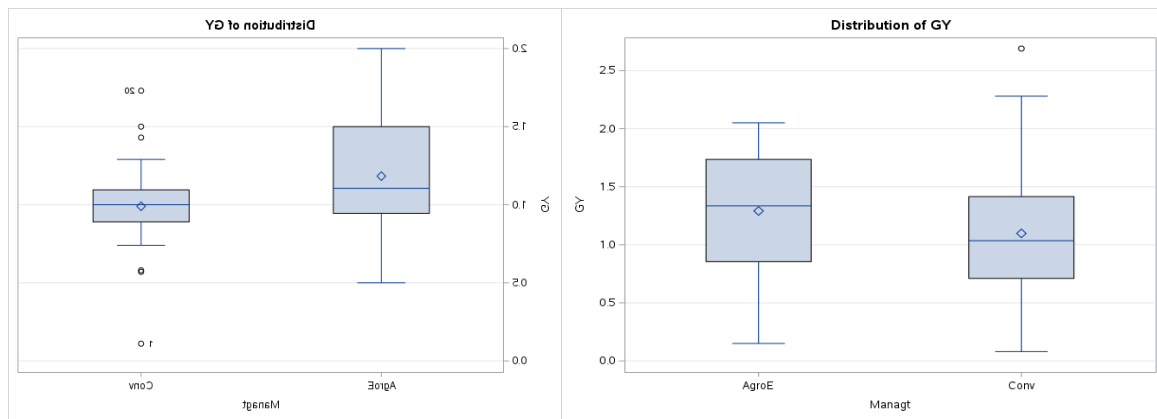


Figure 2 : Grain yield (T/ha) distribution for Durum wheat (left) and Barley (right) at Annoceur Morocco

Tunisia (El Kef)

There was significant effect of agro ecological management on grain yield for durum wheat and barley. The gains were 19 and 39% respectively for the two crops.

Agro ecological management affected significantly durum wheat plant height and spike/m². This practice reduced height by 9 % but increase spikes/m² by 24%. However, no effect had been revealed for these two parameters for barley (figure 3) .

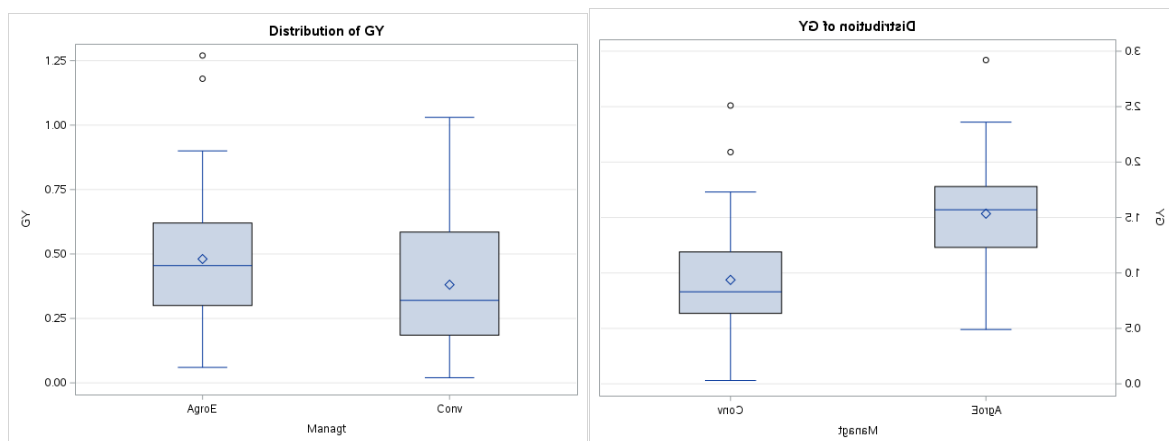


Figure 3 : Grain yield (T/ha) distribution for Durum wheat (left) and Barley (right) at El Kef (Tunisia)

Algeria

Agro ecological management had significant effect only on number of spike for barley (8% of increase) and durum wheat (5% of increase) (Figure 4) . No effect was shown for grain yield in this location.

Also, no differences in performance between the two managements were observed for grain yield production.

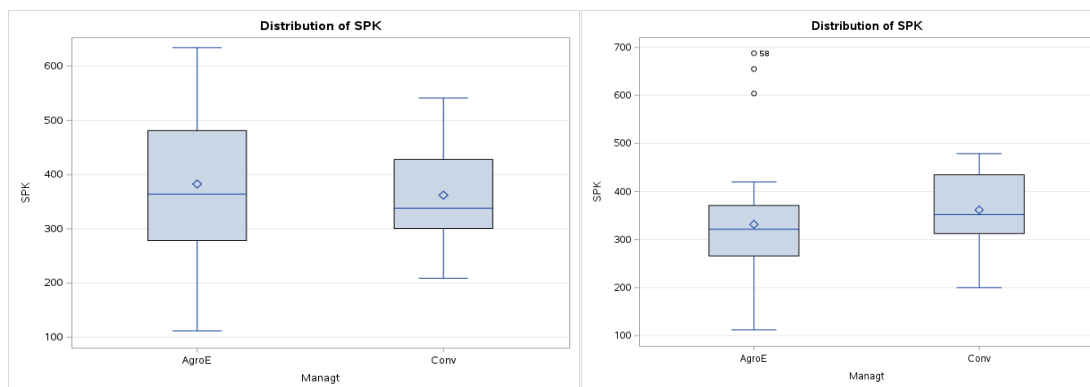


Figure 4 : Distribution of Spike number(/m²) for Durum wheat (left) and Barley (right) at Setif (Algeria)

Lebanon (Tal Amara)

Yield and components

At the Tal Amara site during 23-24 crop season, significant effect between conventional and agro-ecological practices has been shown for grain yield of both durum wheat and barley with an increase of 22% for each crop. The same trend was shown for height which increased by 4 and 9% respectively for barley and durum wheat (figure 5).

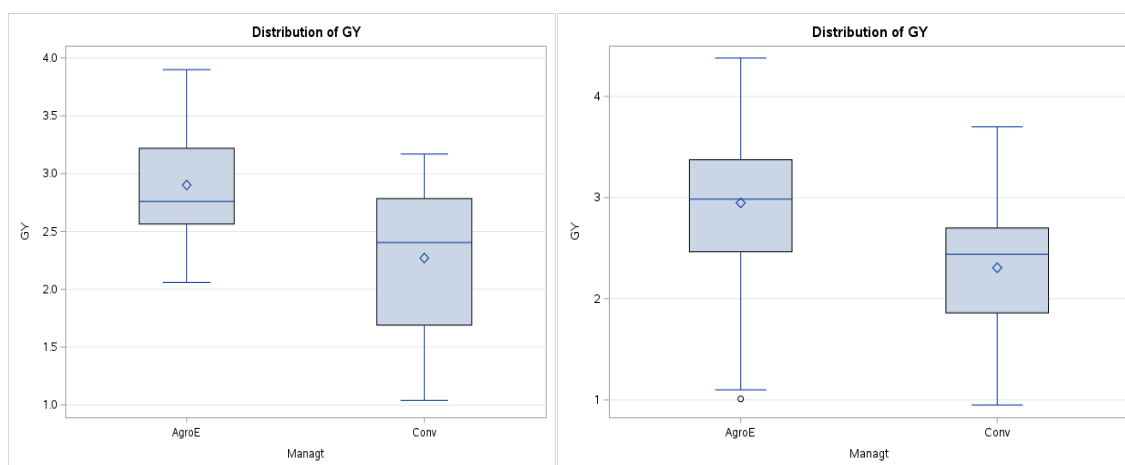


Figure 5: Grain yield (T/ha) distribution for Durum wheat (left) and Barley (right) at Tal Amara (Lebanon)

At the same site, during 22-23 season, grain yields were higher than those of 23-24, but there was no significant effect of management on durum performance and low effect on barley was shown (Figure 1).