

ADVANCES IN THE DEVELOPMENT OF NEW VARIETIES BETTER ADAPTED TO CLIMATE CHANGE IN CROPS AND FORAGES: A SOUTH AMERICAN PERSPECTIVE

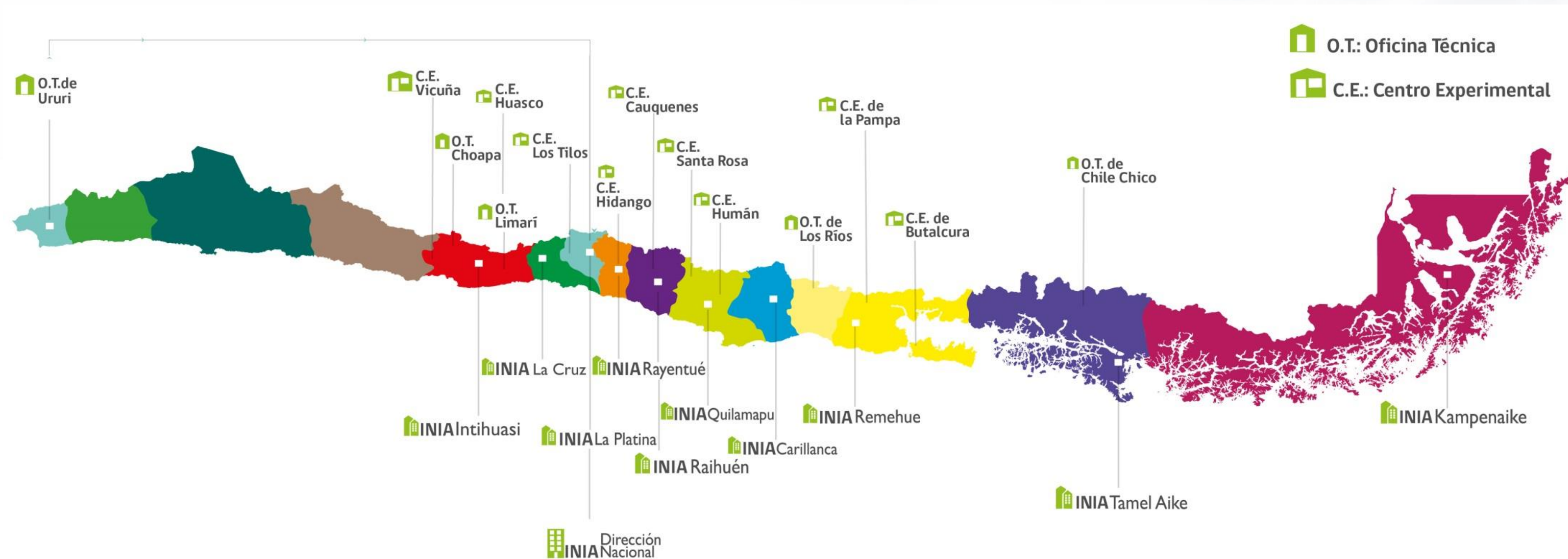
UPOV SEMINAR, OCT.'2022

Dr. Fernando Ortega Klose
fortega@inia.cl



INIA IS THE MAIN AGRICULTURAL RESEARCH INSTITUTE IN CHILE, WHICH BELONGS TO THE MINISTRY OF AGRICULTURE

- ▶ INIA was established in 1964.
- ▶ National coverage throughout its 10 regional research centers , experimental centers, technical offices, labs and gene banks.



GEOGRAPHY AND CLIMATES

- **5.1 million ha.** of arable land in a territory of 75 million ha.
- Population: **17,248,450** (13% rural)

Southern Hemisphere: off-season Agricultural production

Outstanding sanitary conditions: **Fitosanitary Island**



North: Desert



West: Pacific Ocean



East: Andean Mountain Range



South: Southern Ice

Diversity of climates: **diversity of production**

NUMBER OF VARIETIES IN THE CHILEAN RVP BY ORIGIN (July 2022)

MOST VARIETIES ARE INTRODUCED

AGRONOMIC EVALUATION OF VARIETIES IS NOT COMPULSARY IN CHILE

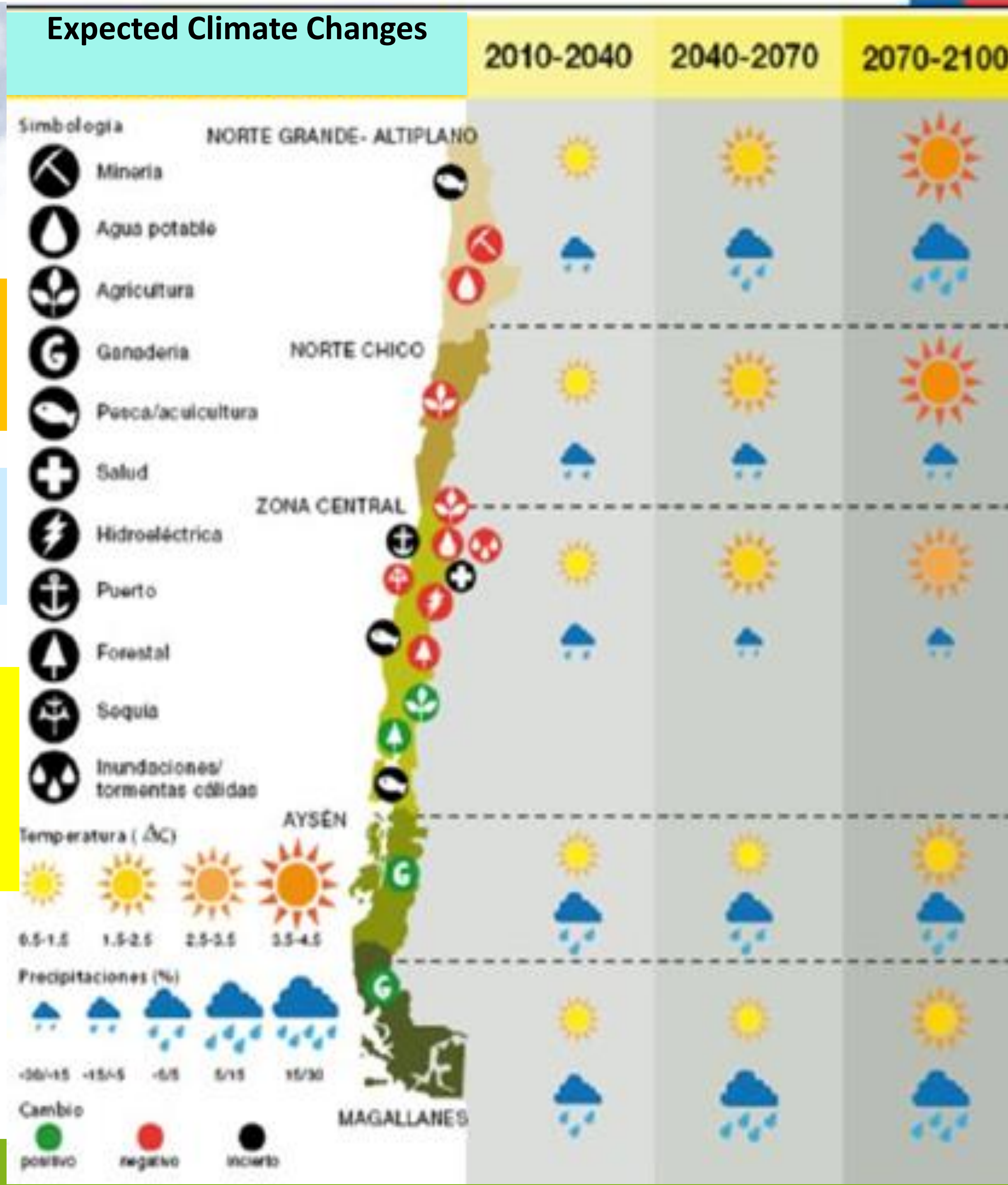
PLANT GROUP	TOTAL	INTRODUCED	CHILEAN	INIA
FRUIT CROPS	707	672	35	4
FIELD CROPS	125	72	53	33
ORNAMENTAL	45	44	1	0
VEGETABLES	19	18	1	1
FORAGES	11	8	3	3
FORESTRY	10	8	2	0
ORNAMENTAL	45	44	1	0
TOTAL	917	822	95	41

Source: Adapted from Servicio Agrícola y Ganadero (Chile) information.

Temperature increases between 2 and 4 ° C are estimated across the country by the end of the century

Considerable reduction in the Andean area capable of storing snow is estimated

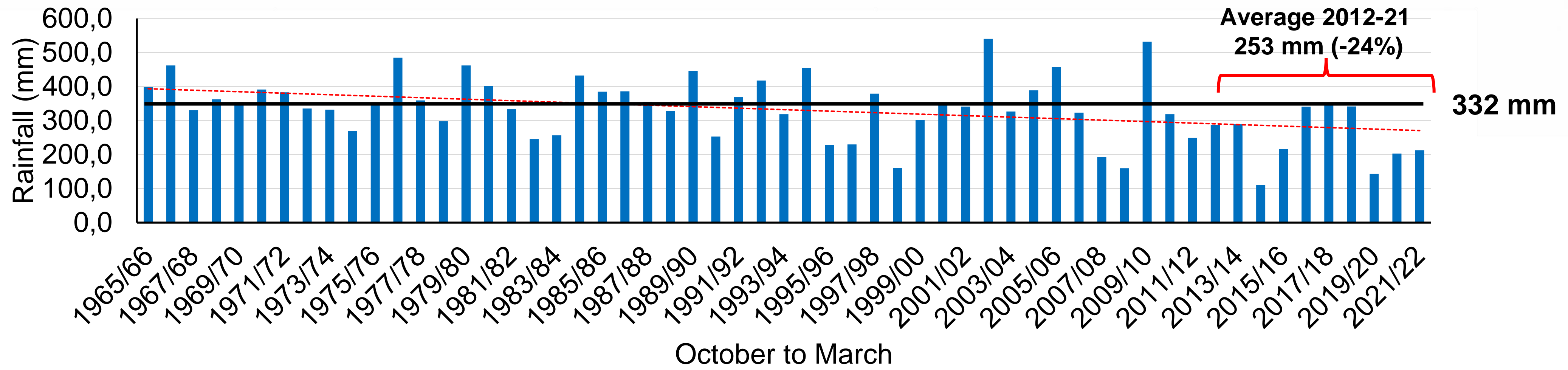
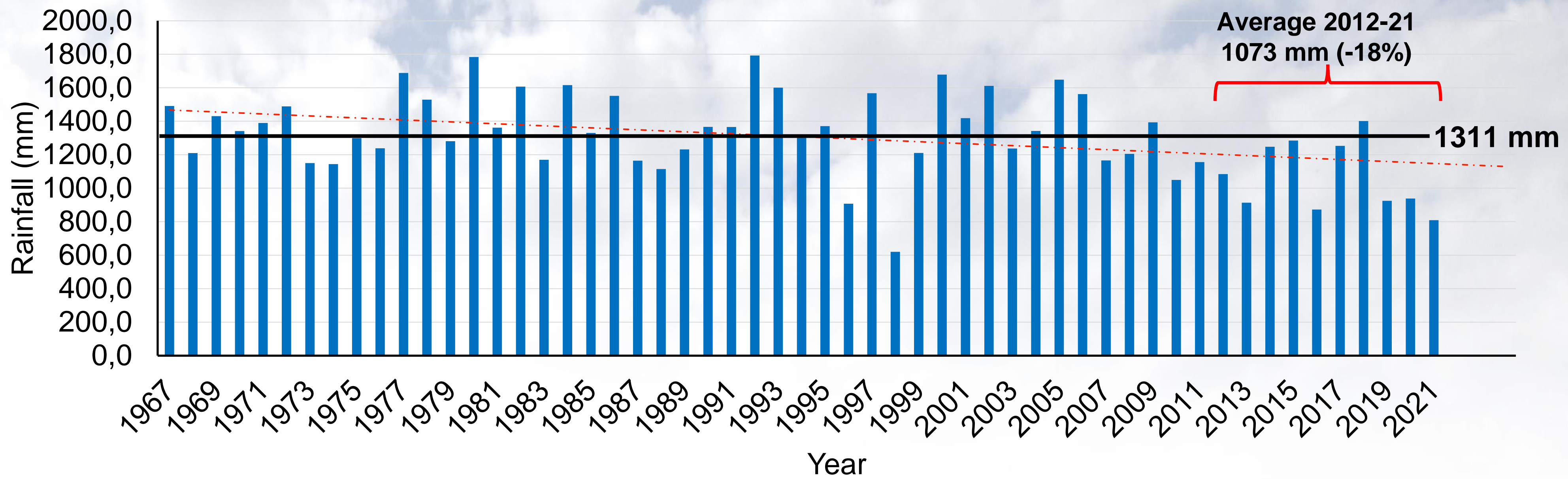
An estimated reduction of water available for irrigation and considerable increase in the number of months with water deficit



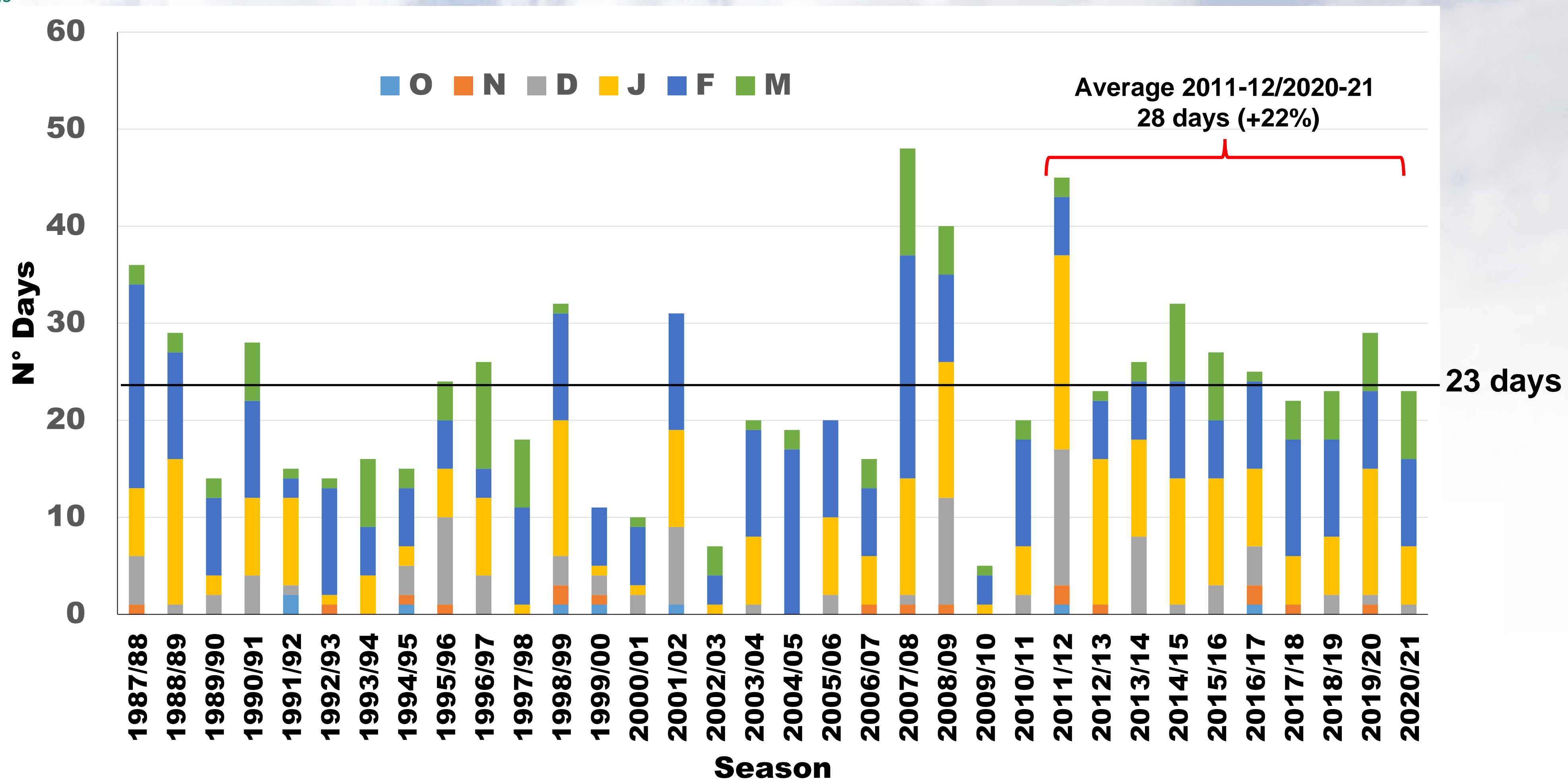


RAINFALL AT CARILLANCA RESEARCH CENTER, CHILE (38°41'S, 72°25'W)

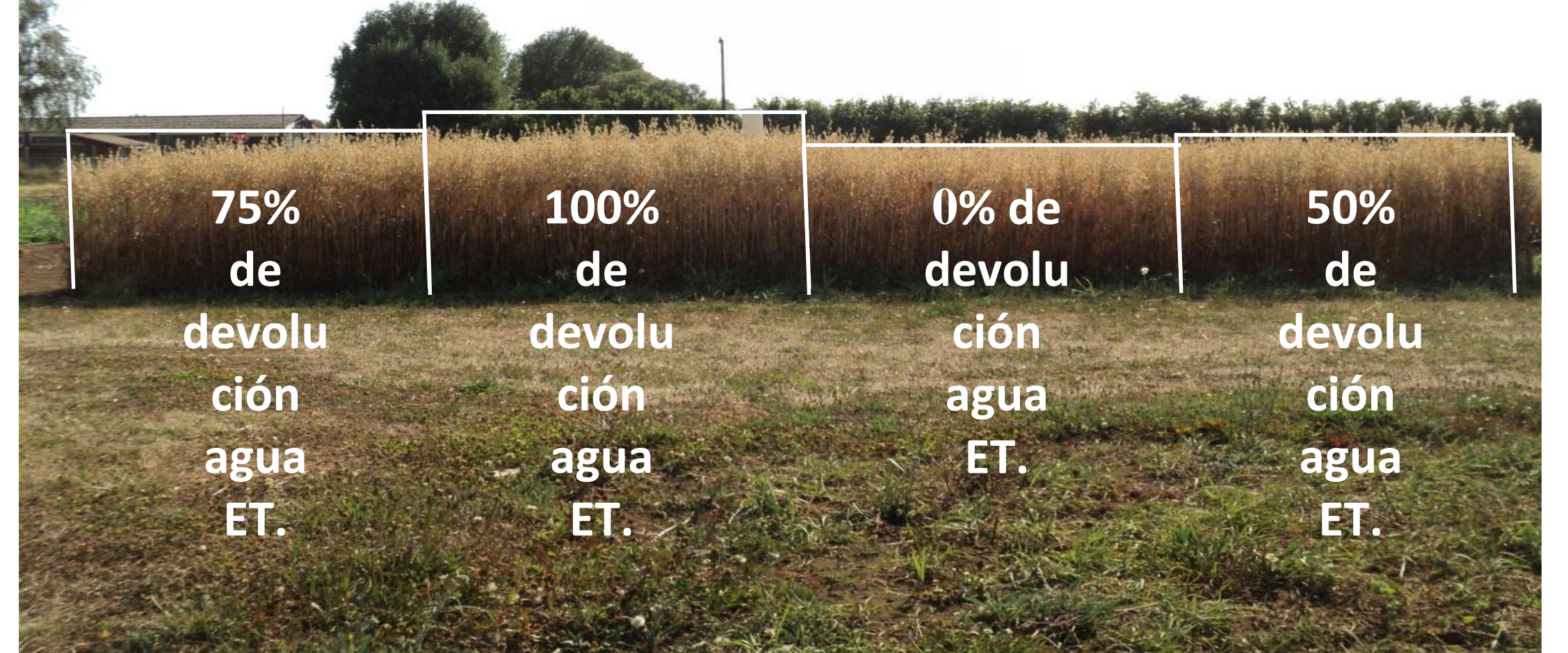
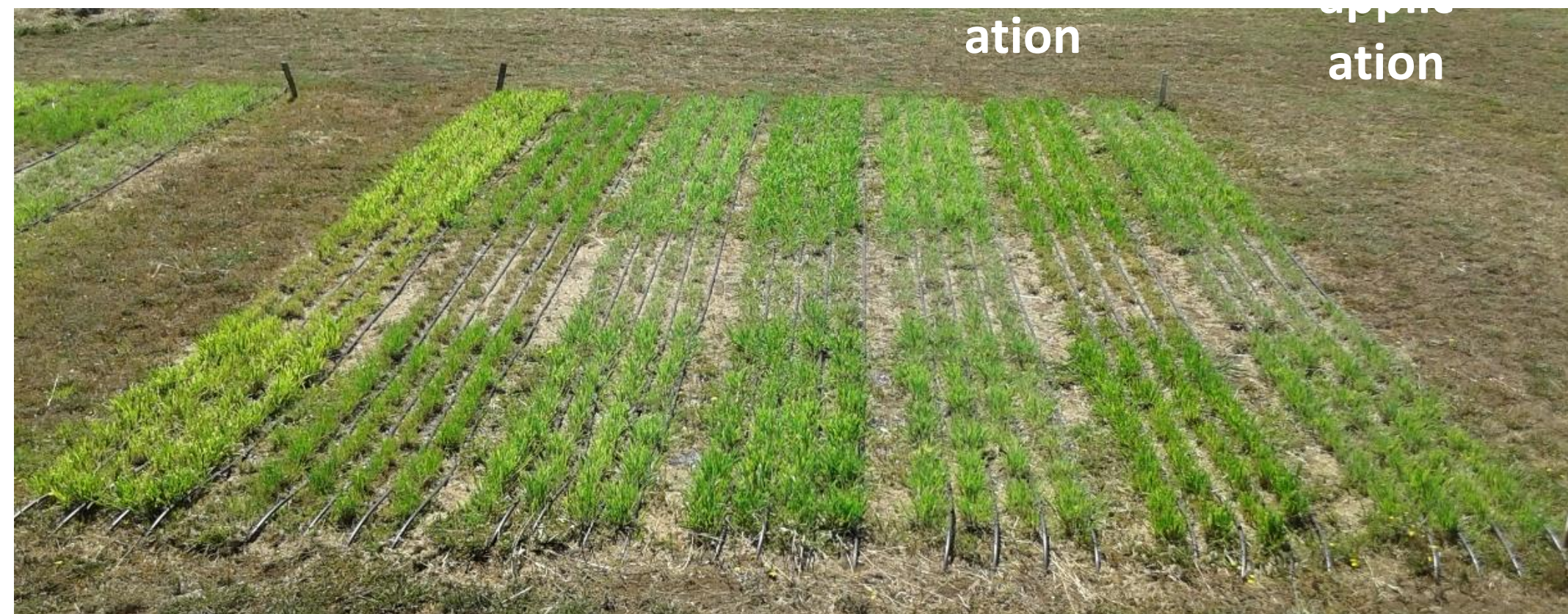
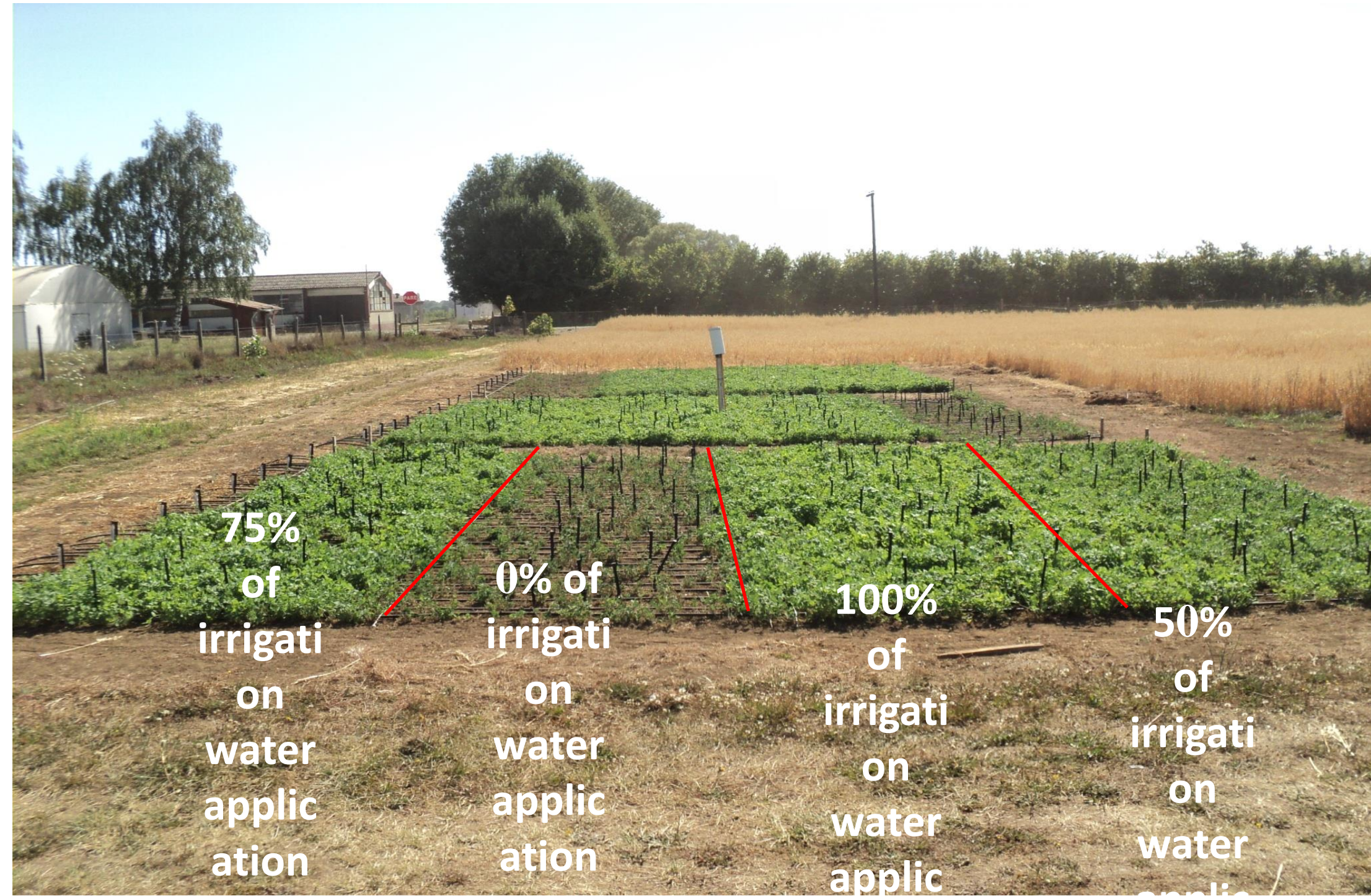
Instituto de Investigaciones Agropecuarias



NUMBER OF DAYS WITH MAXIMUM TEMPERATURES ABOVE 27°C. CARILLANCA RESEARCH CENTER, CHILE (38°41'S, 72°25'W)



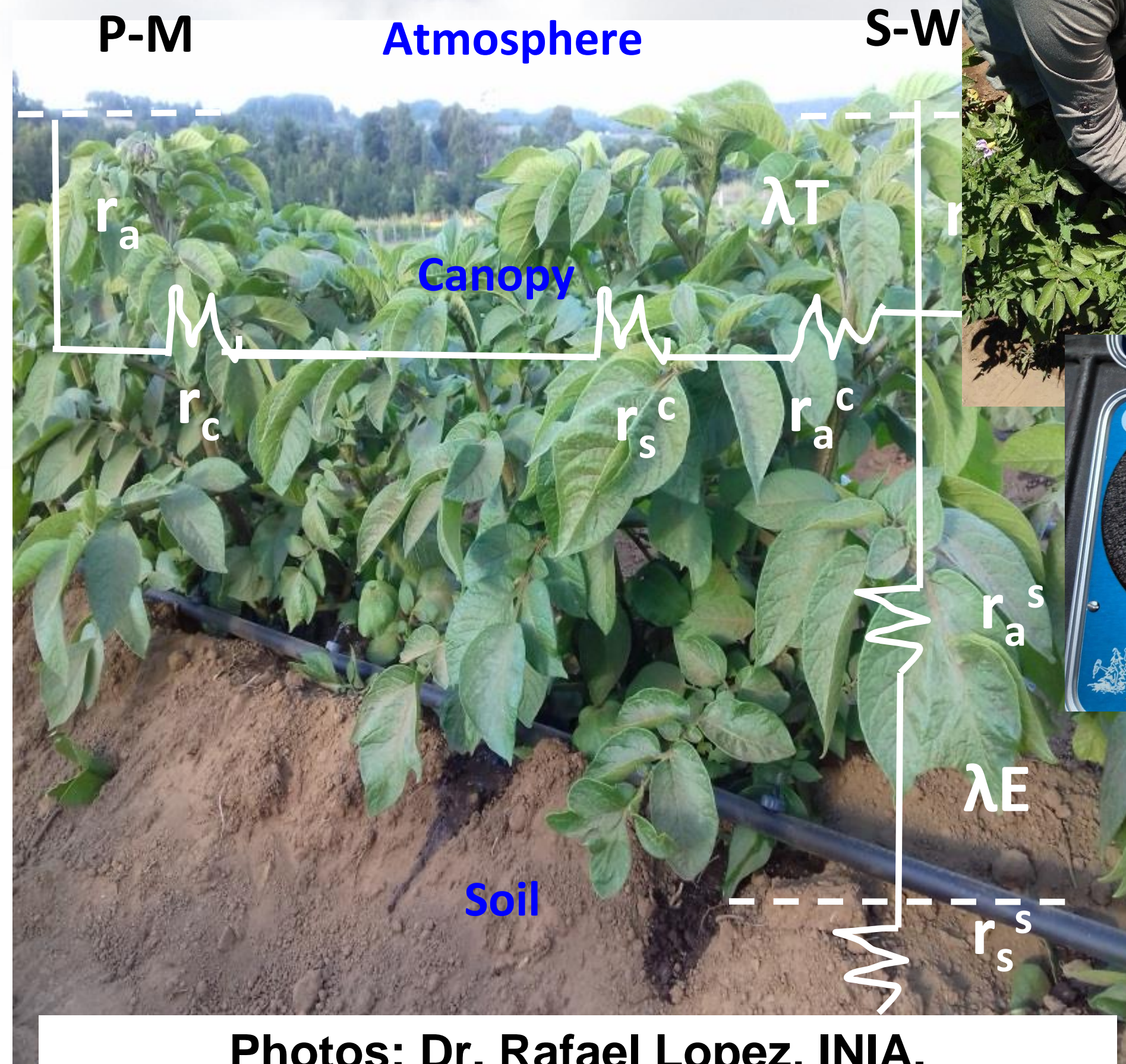
SCREENING OF ADVANCED LINES FOR WATER STRESS (WHEAT, OAT, RICE, FORAGES, POTATOES, MURTILLA, QUINOA, LUPIN..)



ROOT PHENOTYPING AND PHYSIOLOGICAL EVALUATION

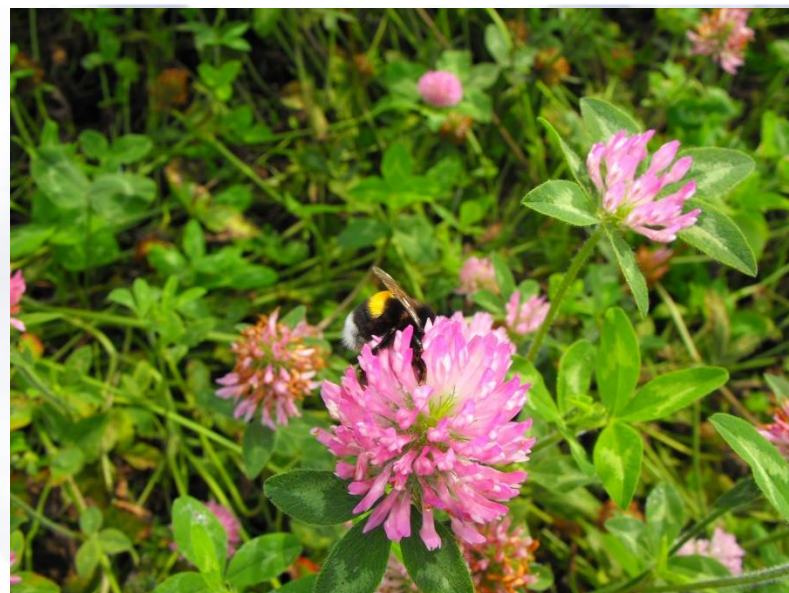


Photos: Dr. Luis Inostroza, INIA.

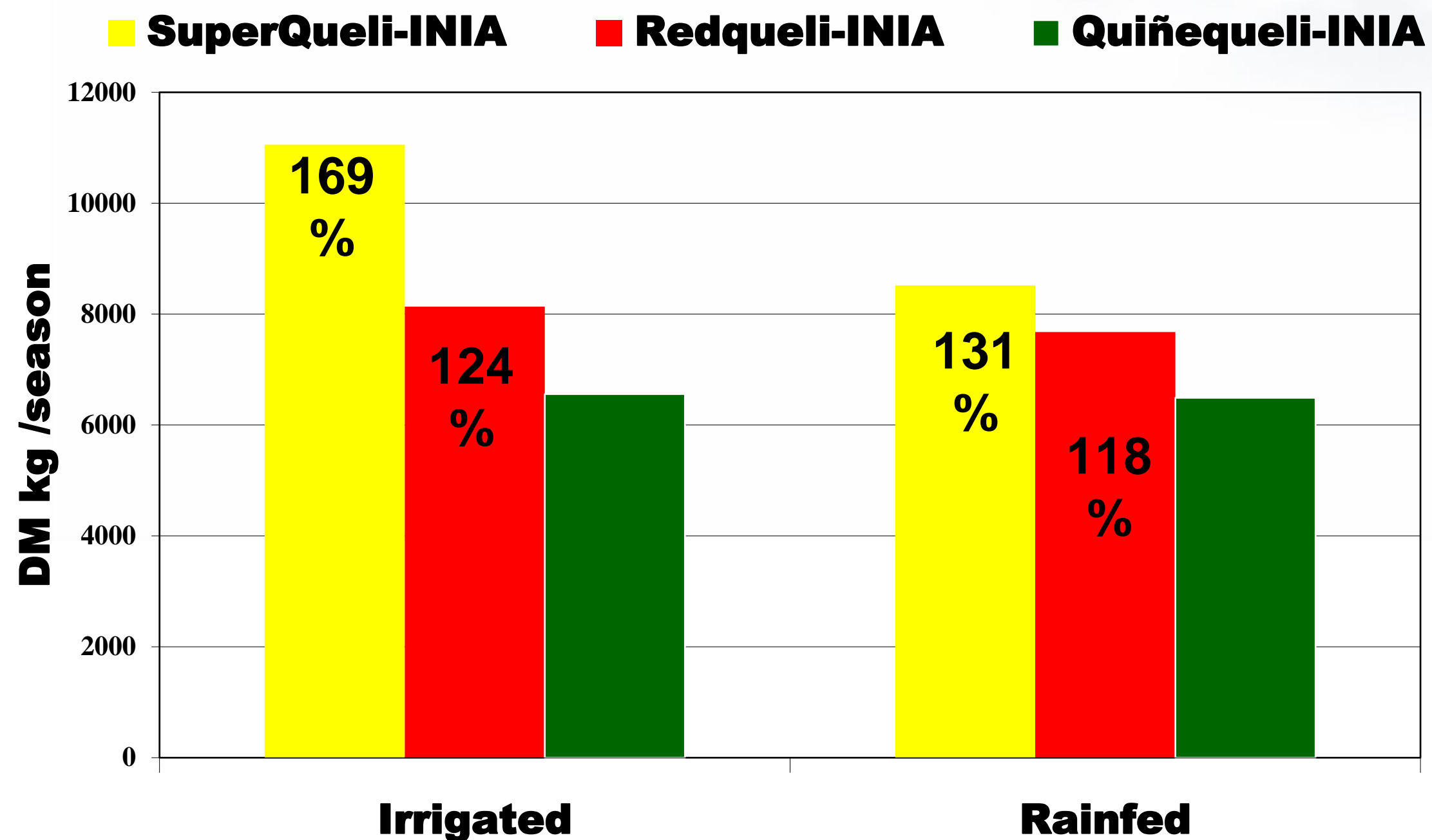


Photos: Dr. Rafael Lopez, INIA.

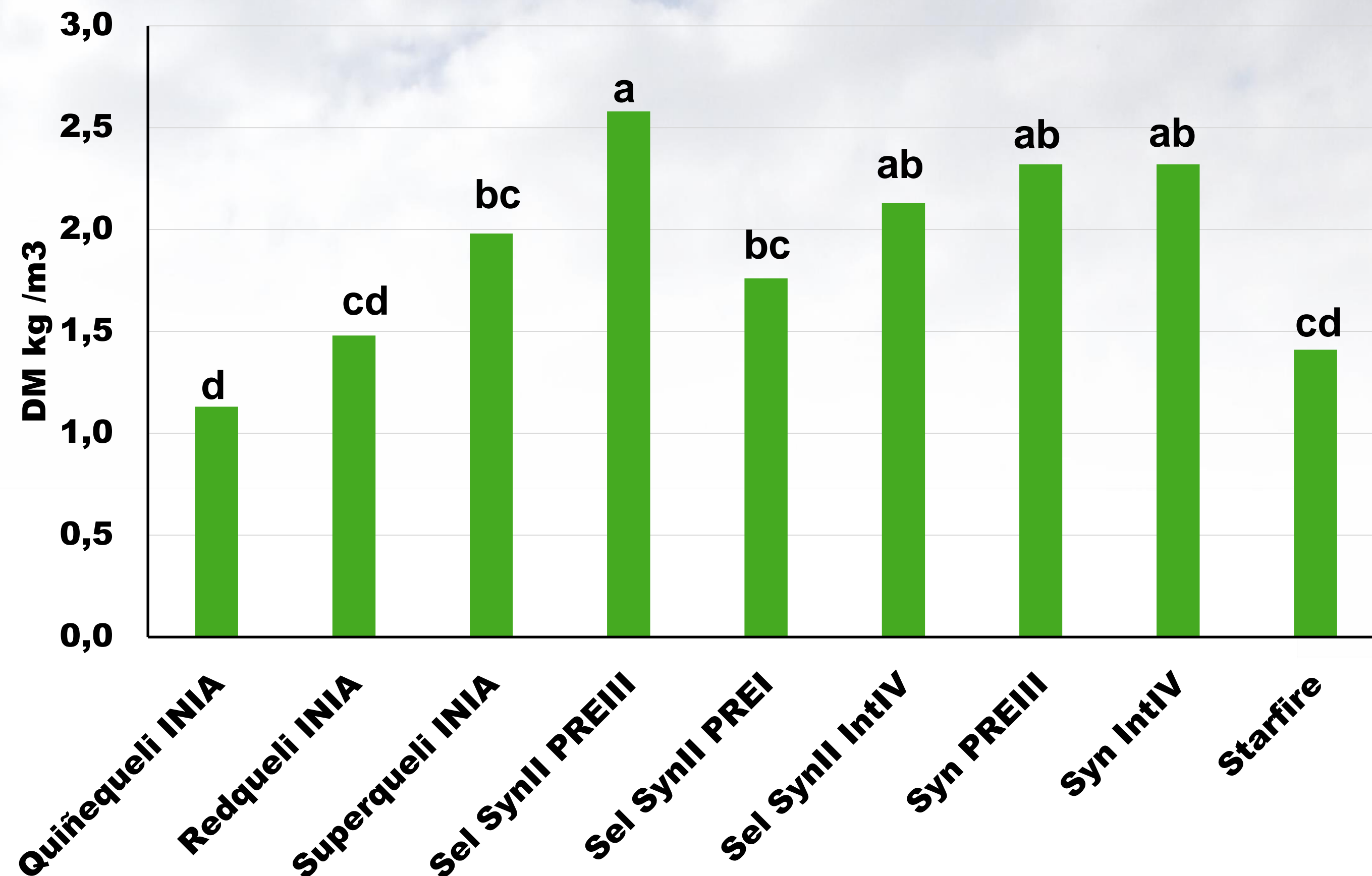




AVERAGE FORAGE YIELD OF RED CLOVER AT CARILLANCA STATION



WATER USE EFFICENCY IN TWO GROWING SEASONS



Adapted from: Fernando Ortega, Leonardo Parra, and Andrés Quiroz. 2014. Breeding red clover for improved persistence in Chile: a review. *Crop & Pasture Science*. DOI: 10.1071/CP13323

Adapted from R.López-Olivari and F.Ortega-Klose. 2020. Response of red cover to deficit irrigation: dry matter yield, populations, and irrigation water use efficiency in southern Chile. *Irrigation Science*, DOI: 10.1007/s00271-020-00693-0

THE LONG WAY TO BREED THE FIRST TWO CHILEAN *BROMUS VALDIVIANUS* VARIETIES



**Collection
(1994-96)**



**Charac., evaluation and
selection (1998-2001)**



**Breder seed increase
(2001-2002)**



**Evaluation, cutting-
grazing (2001-2007)**



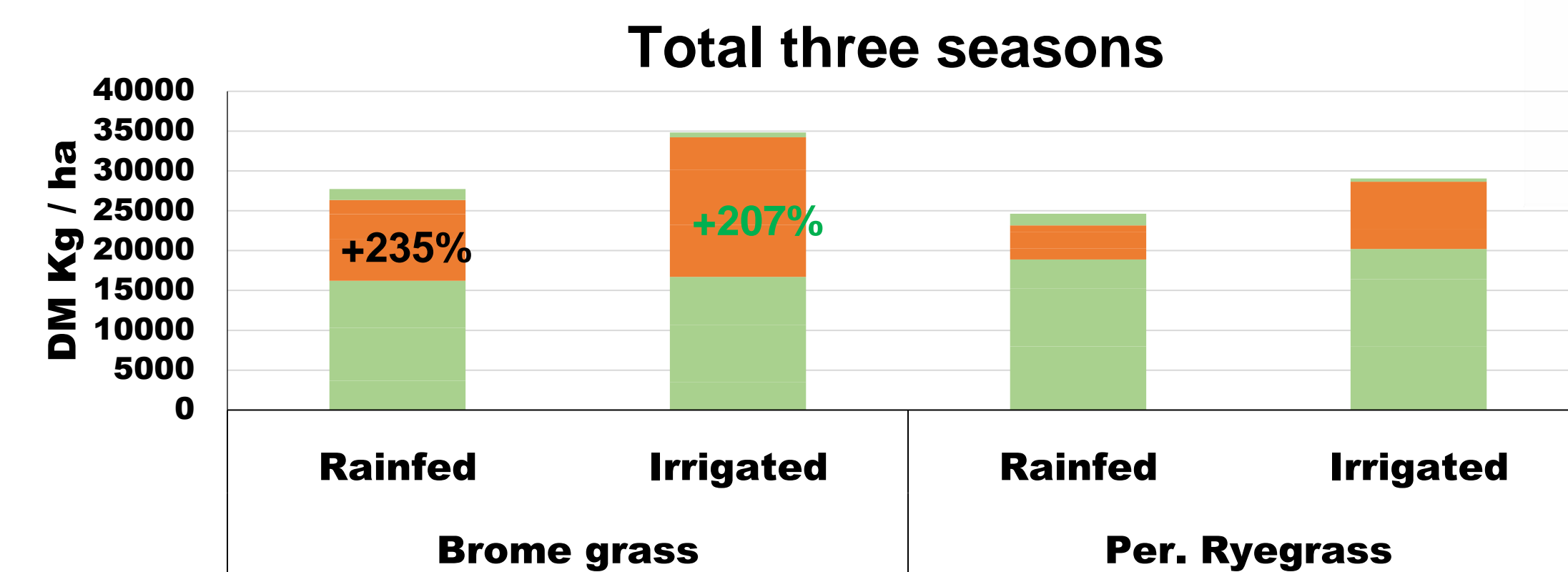
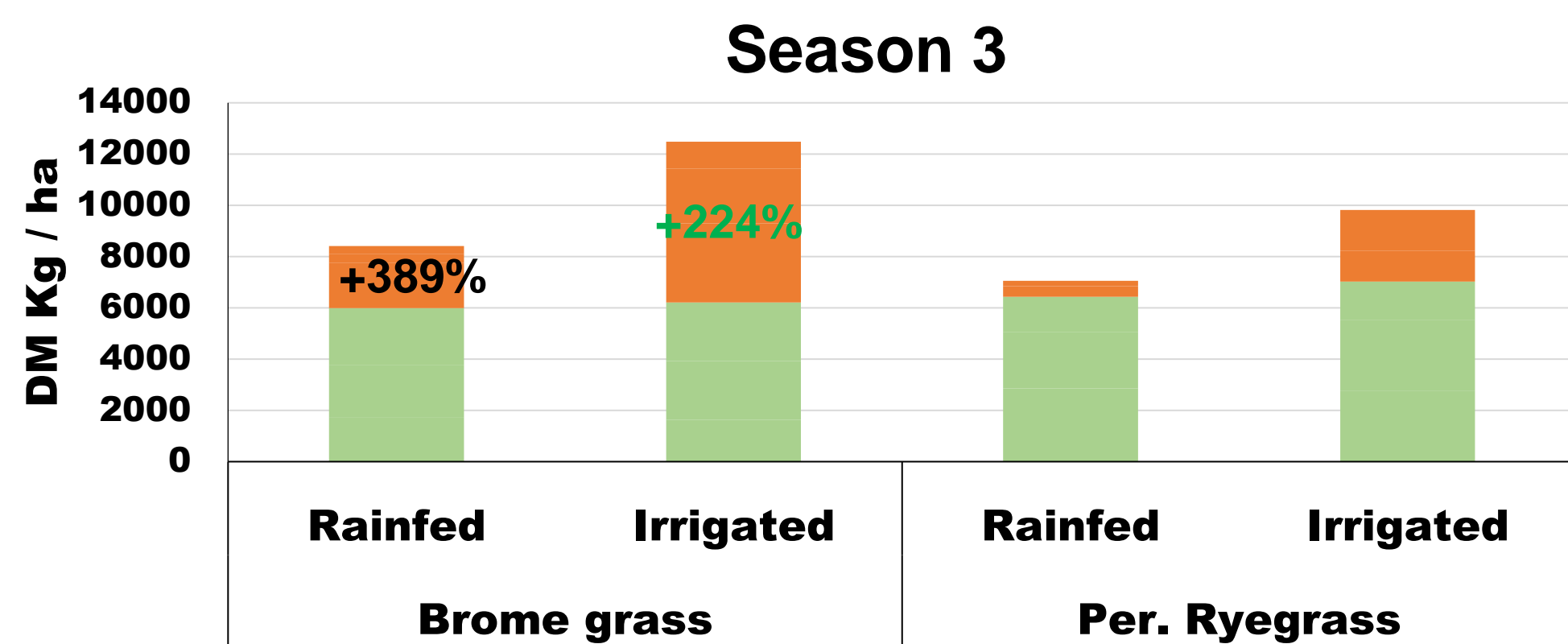
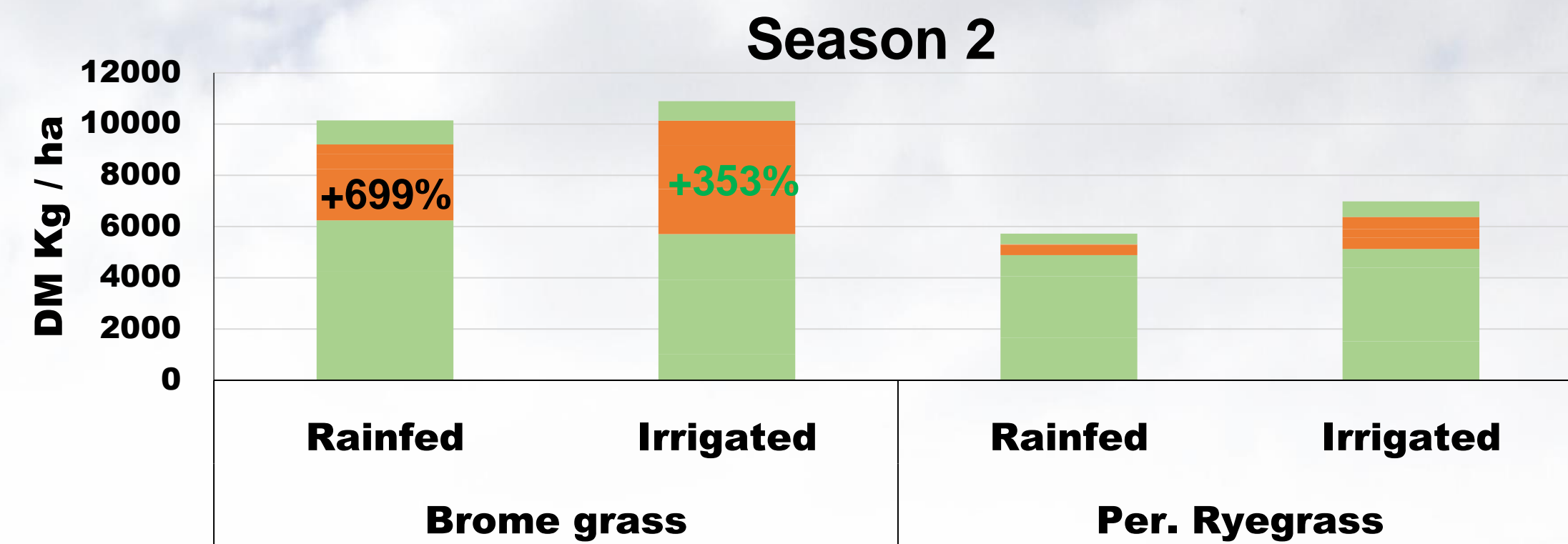
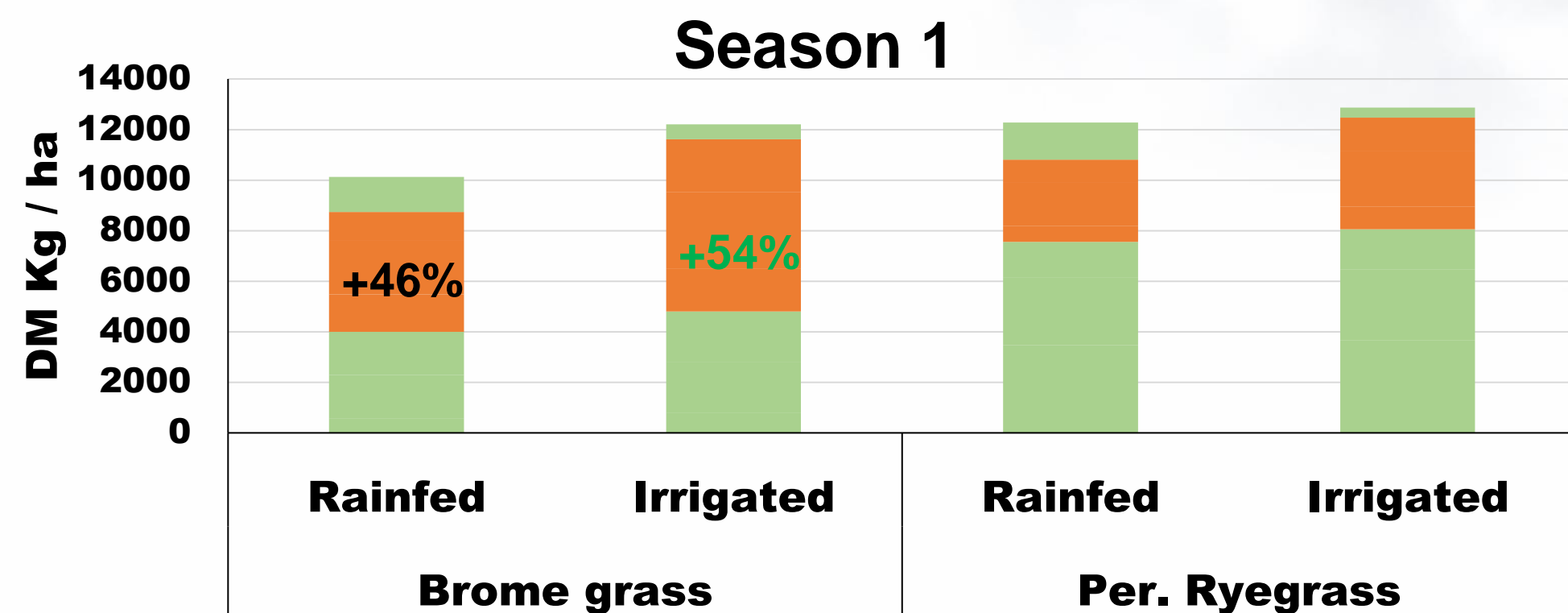
**Commercial seed
production**

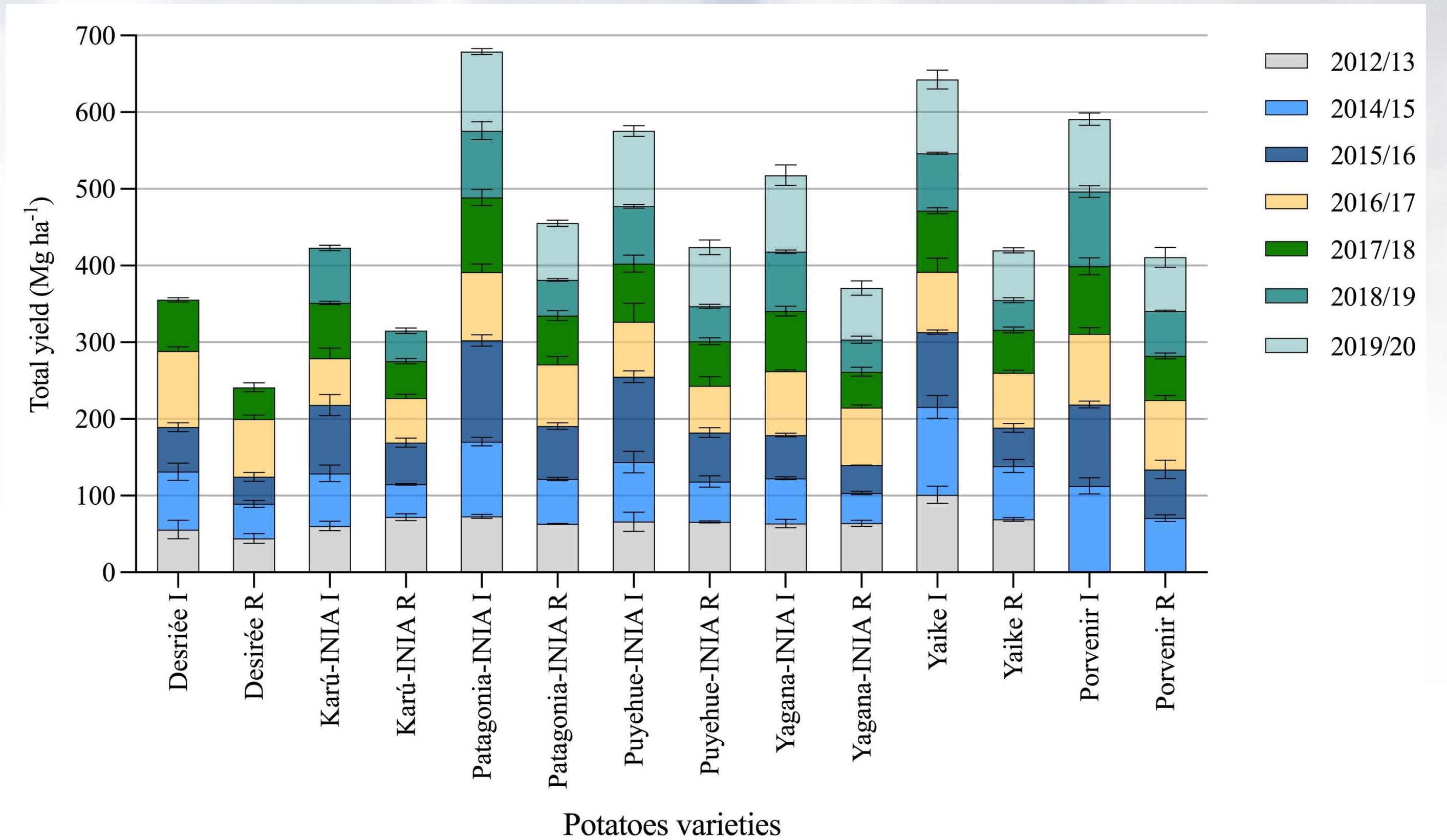
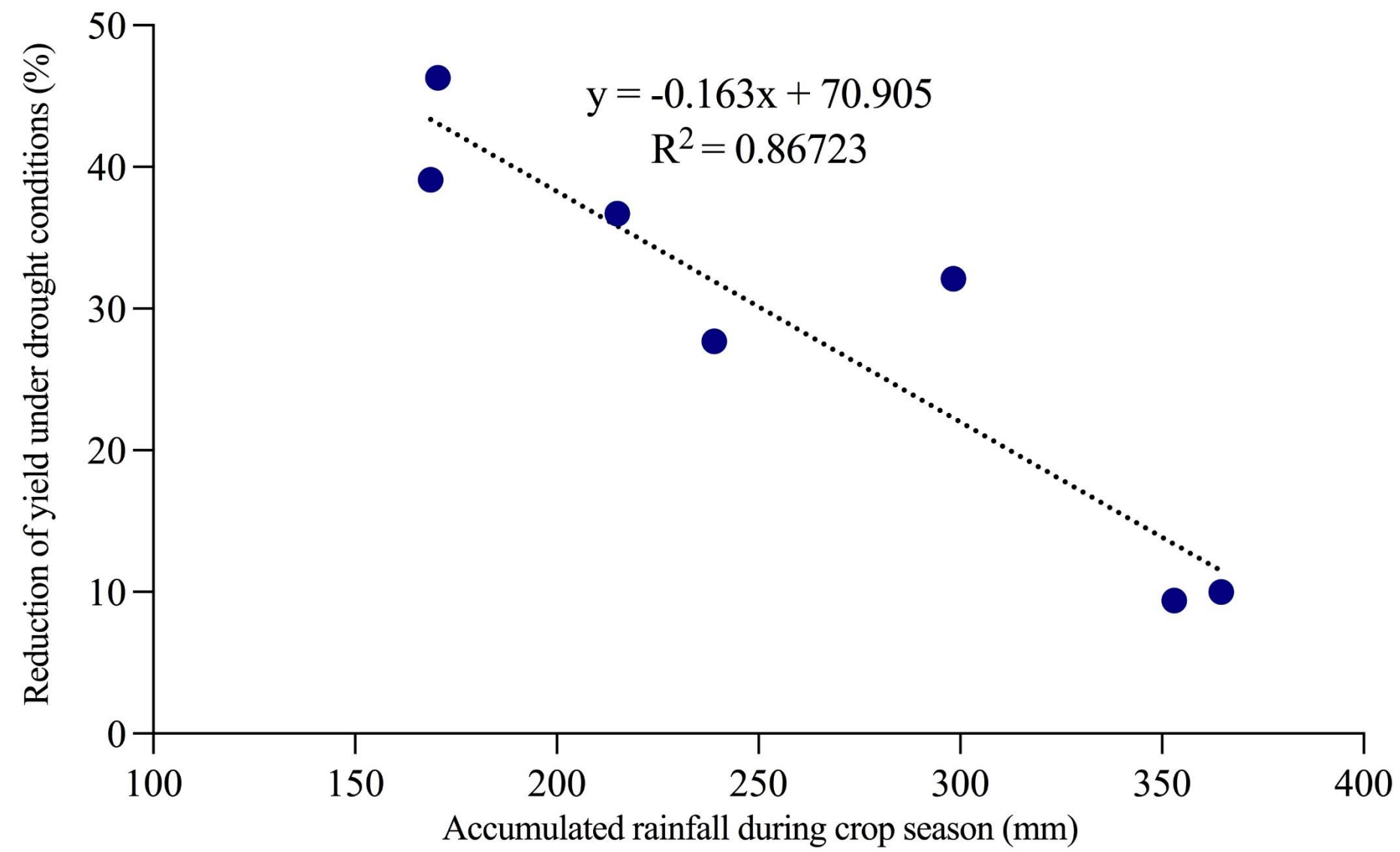


Farmer's utilization

PERFORMANCE OF A SELECTED NATIVE BROME GRASS CULTIVAR, COMPARED TO PERENNIAL RYEGRASS DURING THREE GROWING SEASONS

■ Period with water deficit and higher temperatures
■ Period with no water deficit and moderate temperatures





Martinez et al. 2021. Evaluating the drought tolerance of seven potato varieties on volcanic ash soils in a médium-term trial. Frontiers in Plant Science, DOI: 10.3389/fpls.2021.693060.

FINAL REMARKS

- **Plant breeding is essential for adaptation to climate change.**
- **For this purpose, it is fundamental to strengthen national breeding for local adaptation.**
- **Even with the incorporation of new techniques, “breeding time” requires a medium to long term vision and budget.**