

Diversifying crops improves system productivity and resilience for smallholder farmers in rainfed drylands

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Paired row lentil



Relay seeded quinoa in between lentil



Lentil harvested



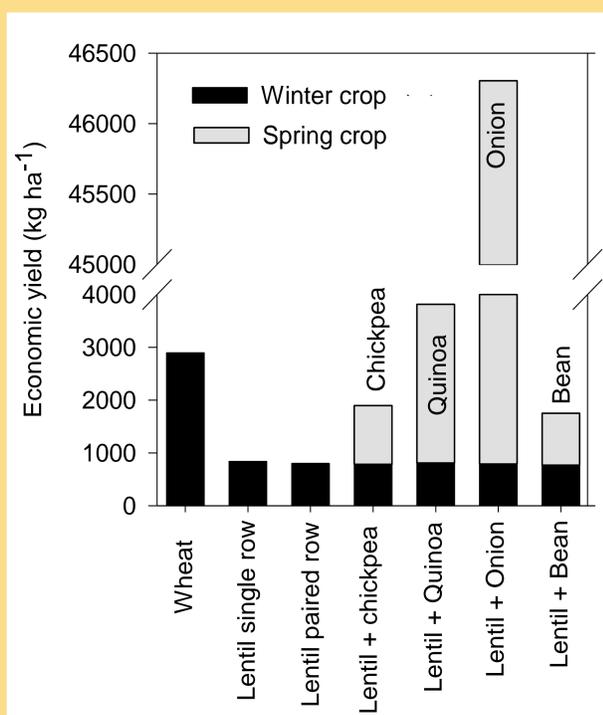
Quinoa after lentil harvest



Quinoa at maturity

More than 80% of cereal-based systems in the Middle East and North Africa (MENA) region are under monocropping. Increasing rainfall variability and declining land and water resources are having a high impact on crop productivity in rainfed drylands, leading to acute food scarcity among rural communities in the region.

ICARDA has explored options for diversifying cereal monocropping through better crop choices and agronomic innovation with the aim of improving crop productivity and farm profitability for smallholder farmers with limited land and water resources in the region.



Diversifying a wheat-based cropping system through relay seeding of a low water requirement high-value spring crops with early maturing lentil combined with supplementary irrigation (if needed), increased system productivity and farm income (+ \$410 to 10,295 ha⁻¹), family nutrition compared to a cereal monocrop in a Mediterranean rainfed environment in Morocco.

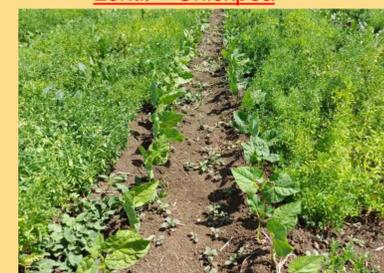
Figure. Economic yield under sole and relay-intercropping of different spring crops with winter seeded lentil in Merchouch, Morocco



Lentil + Onion



Lentil + Chickpea



Lentil + Bean



Water harvesting

Table: Economic benefit (US\$/ha) with sole & relay-intercropping of different spring crops with winter seeded lentil & grain yield of following wheat crop

Parameters	Wheat	Lentil sole		Lentil + Bean	Lentil + Chickpea	Lentil + Quinoa	Lentil + Onion
		Single row	Paired row				
Economic benefit (\$/ha)	809 ₊₉₃	658 ₊₂₇₄	608 ₊₂₈₁	1,219 ₊₄₈₁	1,391 ₊₁₉₁	10,726 ₊₁₂₁₇	11,104 ₊₁₃₂₇
#Grain yield wheat (kg/ha)	3764 ₊₅₃₁	4232 ₊₁₇₆	4128 ₊₂₂₉	4085 ₊₄₁₈	4134 ₊₁₈₁	4077 ₊₁₀₅	3994 ₊₁₃₂

Note: #Yield of following wheat crop after different pre-crop. Values are average yield and ± standard deviation

Benefits

- It provides opportunity to harvest two crops in one cropping season from the same piece of land in rainfed drylands
- Better utilization of rainwater both early and late-season rainfall
- It helps to improve farm income
- Diversified the crops in the field and also food on the table
- Helps to enrich biodiversity and soil health
- Creates more job opportunities



Currently there are very few policy and market incentive for adoption of diverse crop at scale.

Technological packages, policy support & market development helps fully utilize diversified cropping system benefits & promote them at scale.

Further reading:

1. Devkota, M. and V. Nangia. 2021. Diversified Cropping System: Relay intercropping of lentil with Quinoa (Morocco). WOCAT database. https://qcat.wocat.net/en/wocat/technologies/view/technologies_5967/
2. Devkota, M. and V. Nangia. 2022. Diversified Cropping System: Relay intercropping of lentil with Onion (Morocco). WOCAT database. <https://qcat.wocat.net/en/summary/5992/?as=html>