

Living Lab of Siliana - Crop Rotation Scenario

i. Small Scale Farm Type

The crop rotation scenario introduces legumes into the existing monoculture farming system through a biannual rotation of cereals and legumes. Currently, most farmers rely on durum wheat monoculture. The proposed rotation follows a three-year pattern: Year 1 — Cereal (durum wheat, barley, or oat), Year 2 — Legumes (faba bean), Year 3 — Cereal (durum wheat, barley, or oat). Pesticide use drops sharply, about 66%, due to the breaking of pest and disease life cycles. Chemical fertilization needs decrease as soil nitrogen content improves. Total farm income is approximately ~\$2,942/year, a 47% decrease compared to the baseline (~\$5,616), largely driven by the market hypothesis that legume crops must be sold at 1.75 TND/kg to incentivise adoption. Nitrogen leaching is reduced by 70% compared to the baseline.

Land Use

Main crops	Durum Wheat Monoculture (~0,12 ha), Oat (~0,17 ha), Fababean (~0,9 ha), Durum Wheat Rotation (~0,86 ha), Legume Rotation (~0,86 ha)
Total Area	
Crop diversity	

Farm Activities

Fertilizer use	
Pesticide use	~17,8 kg/year –66% decrease compared to baseline (~53 kg)
Labor demand	

Economic

Annual income	~\$2,942/year –47% decrease compared to baseline (~\$5,616)
Variable costs	

ii. Large Scale Farm Type

At large scale, the crop rotation scenario introduces legume crops (faba bean, chickpea, fenugreek) into a predominantly cereal system spanning 60 ha. The rotation pattern alternates cereals and legumes biannually. Total farm income is approximately ~\$88,127/year, about 8.88% below the baseline mean. Pesticide use is approximately halved (3,369 kg vs. ~7,289 kg baseline). Nitrogen leaching drops by 46% (232 kg/year vs. 432 kg/year baseline). Adoption remains conditional on market availability of legumes at a viable price point.

Land Use

Main crops	Durum Wheat Monoculture (~1,51 ha), Oat (~9,61 ha), Chickpea (~22,23 ha), Fababean (~1,48 ha), Fenugreek (~8,46 ha), Durum Wheat Rotation (~18,2 ha), Legume Rotation (~18,2 ha)
Total Area	
Crop diversity	

Farm Activities

Fertilizer use	Decreased; soil N content increases after legume years, reducing chemical N fertilization need
Pesticide use	~3,369 kg/year –54% decrease compared to baseline (~7,289 kg)
Labor demand	

Economic

Annual income	~\$88,127/year –8.88% below baseline mean
Variable costs	