Drip Irrigation in a Lentil-Onion production System (Mina Devkota)

Diversified Cropping System: Relay Intercropping of Lentils with Onions (摩洛哥)

描

A Diversified Cropping System (DCS) results in more resilient and intensive cropping. In this case, the cash crop of onions was introduced as an intercrop for lentils. The yield of lentils is not reduced; hence the system becomes more productive, profitable and resilient with the introduction of onions.

In the semi-arid regions of Morocco agricultural production is increasingly unstable as consequence of changing climate, variable rainfall and more frequent extreme weather events. There is a need, where possible, to intensify agricultural systems while improving food security - and increasing the resilience of the overall system.

Cultivating lentils in cereal-based systems is common practice in rural Morocco. To intensify this cropping system, taking into account the effects of climate change, the International Centre for Agricultural Research Dry Areas (ICARDA) introduced onions into the common lentil production system. This was a part of research trials to find suitability and economic profitability of crop rotation systems. The introduction of onions as a relay intercrop within lentils has multiple benefits and advantages. Firstly, with two crops are harvested from the same piece of land, thus overall farm profit increases. Secondly, the cultivation of two crops creates a more resilient overall system because the farmer is not dependent on one single crop. Thirdly, as onions are harvested later than lentils, the soil is covered for a longer period, consequently protecting it from degradation, hence soil quality is improved. Fourthly, lentils are leguminous, fixing nitrogen in the soil, thus improving soil fertility. Lastly, the market linkage for onions is very good in Morocco because it is a commonly cultivated crop with high cultural and culinary value: indeed, onions are a cash crop.

However, the technology has potential drawbacks. Firstly, onions require supplementary irrigation if there is not enough late season rainfall. Highly efficient irrigation systems (e.g. drip) require initial investment. In this case the Moroccan government supports 80% of the investment cost for installing drip irrigation. This establishment activity is thus a one-time cost. Secondly, if planted in small plots there may be risks of free grazing livestock as well as pest and insect infestations. This can be overcome by community farming and pest control.

In 2020 and 2021, ICARDA tested this Diversified Cropping System on a trial field of half a hectare, in an area with average annual precipitation of 400 mm. DCS is implemented in the following order of activities. The field is prepared by ploughing. In December, lentils are mechanically seeded. Two rows of lentils are planted 15 cm apart. The spacing between each two-row pair is roughly 95 cm. Compound fertilizer is applied during the seeding. In January, a single spray of herbicide is applied to control grassy weeds. The field is mechanically weeded twice, in mid-January and then again in February.
Onion seedlings are raised in January. These are then transplanted in March: also in paired lines (two rows at 20 cm apart). Compound fertilizer is applied before transplanting. Each pair-row of onion seedlings is planted between two pair-rows of lentils. Because the onions are planted within an already growing crop of lentils, this form of intercropping is termed "relay planting".
The onions are manually weeded in March-April. In April, the lentils are manually harvested and mechanically threshed. Finally, in June, the onions are manually harvested.
During a period from March until May, the onions are irrigated three times. Because the irrigation is just partial, it is termed "supplementary irrigation". The average irrigation amount per event was 15 millimetres. This is done through drip irrigation.

地

地点: Merchouch, 摩洛哥

分析的技术场所数量: 单一场所

选定地点的地理参考
- -6.68688, 33.56218

技术传播: 均匀地分布在一个区域 (approx. < 0.1 平方千 10 公)

在永久保护区？: 否

实施日期: 2020

介绍类型
- 土地使 创新
- 作为传 >50 年分
- ☑ 在实 / 期
- ☑ 外 干

Onions growing in a field after the lentils were harvested. (Mina Devkota)

Lentils growing before the onions were seeded (Mina Devkota)

技术分

主要目的

- [x] 改 产
- [ ] 减少、 、恢复土地 化
- [ ] 保护 态
- [ ] 合其他技术保护 /下或 区域
- [ ] 保持/提 多样性
- [ ] 低 害
- [x] 应气候变化/极 天气及其影响
- [ ] 减 气候变化及其影响
- [x] 创 有 影响
- [ ] 创 有 会影响

土地利用

农田

- 一年一作: legumes and pulses - lentils, - 根
  卜、洋 、
  每年 季 数
  作制度:是吗

供水

- [ ] 养
- [x] 合 水
- [ ] 充分

土地退化相关的目的

- [ ] 止土地 化
- [x] 减少土地 化
- [ ] 修复/恢复严 化 土地
- [ ] 应土地 化
- [ ] 不

解决的退化问题

土壤水蚀 - Wt 土/地 失 侵

土壤风蚀 - Et 土 失

SLM组

- 改 /植

SLM措施

农艺措施 - A1 植 和土壤 层

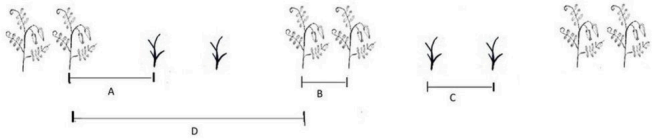
植物措施 -

管理措施 - M2 改变 /强度 别M4 动时 安排

技术图

技术规范

The technical drawing relates to the following quantification:
A: Spacing between a row of lentils and a row of onions = 35 centimetres
B: Spacing between two rows of lentils in the same pair = 15 centimetres
C: Spacing between two rows of onions in the same pair = 20 centimetres
D: Spacing between two rows of lentils bordering a pair of onions = 90 - 95 centimetres



Author: Joren Verbist

技术建□ 与□ 护□ □ 动、投入和□ □

投入和成本的计算

- □ □ □ 成本为□ 每个技术区域和□ □ 单位hectare□
- 成本□ □ 使□ □ MDH 币□
- 汇□ □ 换□ 为□ 1 元□ 元8.92 MDH
- □ □ 劳工□ 每日平均工□ 75成本□

影响成本的最重要因素

不□ □

技术建立活动

1. Set-Up Drip Irrigation System (one time) (时□ /□ □ None)

技术建立的投入和成本 (per 1 Hectare)

对投入进行具体说明	单位	数量	单位成本 (MDH)	每项投入的总成本 (MDH)	土地使用者承担的成本%
其它					
Total Cost for Drip Irrigation	Total	1.0	40000.0	40000.0	20.0
技术建立所需总成本				**40'000.0**	
技术建□ 总成本□ □ 元				*4'484.3*	

技术维护活动

1. Field Ploughing (时□ /□ □ Prior of seeding)
2. Lentils: Seeding (时□ /□ □ December)
3. Lentils: Fertilizer Application (时□ /□ □ December)
4. Lentils Herbicide Application (if needed) (时□ /□ □ January)
5. Lentils: Mechanical Weeding (时□ /□ □ Mid-January)
6. Lentils: Mechanical Weeding (时□ /□ □ Mid-February)
7. Lentils Fungicide Application (if needed) (时□ /□ □ February-March)
8. Onions: Seedling raising (时□ /□ □ January)
9. Onion: Transplanting (时□ /□ □ March)
10. Onions: Fertilizer Application (时□ /□ □ March)
11. Lentils: Harvesting (时□ /□ □ April)
12. Onions Manual Weeding (时□ /□ □ March-April)
13. Onions: Irrigation (时□ /□ □ March-May)
14. Onions: Harvesting (时□ /□ □ June)

技术维护的投入和成本 (per 1 Hectare)

对投入进行具体说明	单位	数量	单位成本 (MDH)	每项投入的总成本 (MDH)	土地使用者承担的成本%
劳动力					
Onion Seedling Planting	Person-Days	15.0	75.0	1125.0	100.0
Onion Seedling raising	Person-Days	20.0	75.0	1500.0	100.0
Weeding	Person-Days	30.0	75.0	2250.0	100.0
Harvesting	Person-Days	20.0	75.0	1500.0	100.0
设备					
Lentil Seeding	Machine-Hours	1.0	150.0	150.0	100.0
Lentil Weeding	Machine-Hours	2.0	100.0	200.0	100.0
Threshing of Lentils	Machine-Hours	2.0	150.0	300.0	100.0
Herbicide Application	Machine-Hours	1.0	60.0	60.0	100.0
Fungicide Application	Machine-Hours	1.0	60.0	60.0	100.0
植物材料					
Lentil Seeds	Kilogram	45.0	8.0	360.0	100.0
Onion Seeds	Kilogram	4.0	600.0	2400.0	100.0
肥料和杀菌剂					
Fertilizer (NPK 10-20-20) for Lentil	Kilogram	100.0	3.0	300.0	100.0
Fertilizer (NPK 10-20-20) for Onion	Kilogram	100.0	3.0	300.0	100.0
Herbicide for Lentils	Liter	0.5	100.0	50.0	100.0
Fungicide for Lentils	Liter	0.5	150.0	75.0	100.0
其它					
Irrigation Costs	Per Event	3.0	200.0	600.0	100.0
技术维护所需总成本				**11'230.0**	
技术□ 护总成本□ □ 元				*1'258.97*	

□ □ □ 境

年平均降雨量

- ☐ < 250毫□
- ☑ 251-500毫□
- ☐ 501-750毫□
- ☐ 751-1,000毫□
- ☐ 1,001-1,500毫□
- ☐ 1,501-2,000毫□

农业气候带

- ☐ □ □ □
- ☐ 半□ □
- ☑ 半干旱
- ☐ 干旱

关于气候的规范

不□ □

- [ ] 2,001-3,000毫
- [ ] 3,001-4,000毫
- [ ] > 4,000毫

斜坡
- [ ] 水平（0-2%）
- [x] （ ）3-5%）
- [ ] 平（ 6-10%）
- [ ] 坡（11-15%）
- [ ] 崎岖（ 16-30%）
- [ ] 峭（31-60%）
- [ ] 常（ 峭（>60%）

地形
- [x] （ ）高原
- [ ] 山
- [ ] 山坡
- [ ] 山地斜坡
- [ ] 坡
- [ ] 底

海拔
- [ ] 0-100 m a.s.l.
- [x] 101-500 m a.s.l.
- [ ] 501-1,000 m a.s.l.
- [ ] 1,001-1,500 m a.s.l.
- [ ] 1,501-2,000 m a.s.l.
- [ ] 2,001-2,500 m a.s.l.
- [ ] 2,501-3,000 m a.s.l.
- [ ] 3,001-4,000 m a.s.l.
- [ ] > 4,000 m a.s.l.

.....应用的技术
- [ ] 凸形情况
- [ ] 凹（ 情况
- [x] 不（ 关

土壤深度
- [ ] （ 常（ 0-20厘（ （
- [ ] （ （21-50厘（ （
- [x] 中（ （ 度（51-80厘（ （
- [ ] （ （81-120厘（ （
- [ ] （ 常（ > 120厘（ （

土壤质地（表土）
- [ ] （ （粘（ （ （ （ （
- [x] 中（ （ 壤土、（ 土（
- [ ] （ （粘（ （ （ （ 土（

土壤质地（地表以下>20厘米）
- [ ] （ （粘（ （ （ （ （
- [x] 中（ （ 壤土、（ 土（
- [ ] （ （粘（ （ （ （ 土（

表土有机质含量
- [ ] （ （>3%）
- [x] 中（ 1-3%）
- [ ] 低（ <1%）

地下水位
- [ ] （ （ 上
- [ ] < 5（
- [x] 5-50（
- [ ] > 50（

地表水的可用性
- [ ] （ （
- [ ] 好
- [ ] 中（
- [x] 匮乏/没有

水质（未处理）
- [ ] （ 好（ （ 水
- [x] 不（ （ （ 水（ （ （ 处（
- [ ] 仅供农业使（ （ （ （ （
- [ ] 不可（

水（ （ 参（地下水

盐度是个问题吗？
- [ ] 是
- [x] 否

洪水发生
- [ ] 是
- [x] 否

物种多样性
- [ ] （
- [ ] 中（
- [x] 低

栖息地多样性
- [ ] （
- [ ] 中（
- [x] 低

应（ （ 技术（ 土地使（ （ （ （ 征

市场定位
- [ ] （ （ （ （ （ （
- [x] （ 合（ 商业（
- [ ] 商业/市场

非农收入
- [x] 低于全（ 收入（10%
- [ ] 收入（ 10-50%
- [ ] > 收入（ 50%

相对财富水平
- [ ] （ 常（ （
- [x] （ （
- [ ] 平均水平
- [ ] 丰富
- [ ] （ 常丰富

机械化水平
- [ ] 手工作业
- [ ] （ 力（ 引
- [x] 机械化/（ 动

定栖或游牧
- [x] 定栖（
- [ ] 半（ （ （
- [ ] （ （ （

个人或集体
- [x] 个人/家庭
- [ ] 团体/（ 区
- [ ] 合作（
- [ ] 员工（ 公司、政府（

性别
- [x] 女人
- [x] （ 人

年龄
- [ ] 儿（
- [ ] （ 年人
- [x] 中年人
- [ ] （ 年人

每户使用面积
- [ ] < 0.5 公（
- [ ] 0.5-1 公（
- [ ] 1-2 公（
- [ ] 2-5公（
- [x] 5-15公（
- [ ] 15-50公（
- [ ] 50-100公（
- [ ] 100-500公（
- [ ] 500-1,000公（
- [ ] 1,000-10,000公（
- [ ] > 10,000公（

规模
- [x] 小（ 模（
- [x] 中（ （ 模（
- [ ] 大（ 模（

土地所有权
- [ ] 州
- [ ] 公司
- [ ] （ 区村庄
- [ ] 团体
- [x] 个人（ 未命名
- [x] 个人（ 有命名

土地使用权
- [ ] （ （ （ 入（ 无（ （ （
- [ ] （ 区（ 有（ （ （
- [ ] （ （
- [x] 个人

用水权
- [ ] （ （ （ 入（ 无（ （ （
- [ ] （ 区（ 有（ （ （
- [ ] （ （
- [x] 个人

进入服务和基础设施的通道

健康	（ （	好
教（	（ （	好
技术援助	（ （	好
就业（ 例如（ 农（	（ （	好
市场	（ （	好
（ （	（ （	好
（ （ 和交（	（ （	好
（ （ 水和卫（ （ 施	（ （	好
（ （ 服务	（ （	好

影响

社会经济影响

作□ □ 产 □ 增加
作□ □ □ □ 增加
□ 产故□ □ □ 增加 □ 低
产品多样性 □ 增加
□ 产区域□ 使□□ 中□ 新土地□ □ 增加
土地□ □ 妨□ □ 化
□ □ □ 水□ 求 增加 □ 低
农业收入 □ 增加
工作□ 增加 □ 低

社会文化影响

□ 品安全 □ □ □ 减少 改□
SLM/土地□ 化□ □ 减少 改□

生态影响

土壤水分 □ 增加
土壤□ □ 层 减少 改□
土壤□ 失 增加 □ 低
养分循□ /□ □ □ 增加

场外影响

成本效□ 分析

与技术建立成本相比的效益

□ 期回报 □ 常□ □ 常□ 极
□ 期回报 □ 常□ □ 常□ 极

与技术维护成本相比的效益

□ 期回报 □ 常□ □ 常□ 极
□ 期回报 □ 常□ □ 常□ 极

气候变化

渐变气候

年□ 度增加 □ 常不好 □ 常好
季□ □增加 □ 常不好 □ 常好 季□夏季

□ □ 和□ 应

采用该技术的地区内土地使用者的百分比

- [x] 单例/实□
- [ ] 1-10%
- [ ] 11-50%
- [ ] > 50%

在所有采用这种技术的人当中，有多少人在没有获得物质奖励的情况下采用了这种技术?

- [ ] 0-10%
- [ ] 11-50%
- [ ] 51-90%
- [ ] 91-100%

最近是否对该技术进行了修改以适应不断变化的条件？

- [ ] 是
- [x] 否

什么样的变化条件？

- [ ] 气候变化/极□ 气候
- [ ] 不断变化□ 市场
- [ ] 劳动力可□ 性□ 例如□ □ 于□ □ □

□ □ 和吸取□ 教□

长处: 土地使用者的观点

- Improved farm income and cropping intensity
- Better utilization of available rainwater
- Cultivation of a cash crop

长处: 编制者或其他关键资源人员的观点

- Improved resilience due to diversified crops
- Reduces fallow period which help to improve soil quality

弱点/缺点/风险: 土地使用者的观点如何克服

- Irrigation is required Implementing supplementary irrigation
- Spreading variety of lentils makes it difficult to plant onions and inhibits their early crop growth Selecting suitable lentil varieties

弱点/缺点/风险: 编制者或其他关键资源人员的观点如何克服

- Insect infestation may occur especially if a small area is planted, as there is not much greenery in the surroundings at the end of onion season Using adequate pest control, improved biodiversity, and/or increased area under cultivation
- Open grazing animal may occur especially if a small area is planted, as there is not much greenery in the surroundings at the end of onion season, bordering the filed Improved fencing and/or greenery

参 文

编制者
Joren Verbist

Editors

审查者
William Critchley
Rima Mekdaschi Studer

实施日期: Sept. 7, 2021

上次更新: Jan. 25, 2022

资源人
Mina Devkota - Agronomist
Vinay Nangia - Research Team Leader - Soils, Waters and Agronomy

WOCAT数据库中的完整描述
https://qcat.wocat.net/zh/wocat/technologies/view/technologies_5992/

链接的SLM数据
不

文件编制者

机构
- International Center for Agricultural Research in the Dry Areas (ICARDA) - 巴嫩
- ICARDA Institutional Knowledge Management Initiative

链接到网络上可用的相关信息
- Mina Devkota Wasti, Vinay Nangia. (13/10/2021). Diversified Cropping System: Relay Intercropping of Lentil with Quinoa (Morocco). Global: WOCAT.: https://hdl.handle.net/20.500.11766/66329 / https://qcat.wocat.net/en/summary/5967/?as=html