Intercropping of mungbean between orange trees on the mountainous area of Cambodia (Mr.Sok Pheak)

Intercropping of orange trees with mungbean in mountainous areas (柬埔寨)

Intercropping

描

Intercropping of mungbean between orange trees improves soil fertility and generates income before the orange trees bear fruit.

Agroforestry is a farming practice that can involve growing of a mixture of woody perennials like trees, shrubs, palms, bamboos, etc. with crops and/or animals, on the same land-management units. Agroforestry systems play an important role in ecological and economical interactions between the different land use components (Lundgren and Raintree, 1982). It represents an interface between agriculture and forestry, and encompasses mixed land-use practices. Agroforestry systems are composed of three attributes:
1. Productivity (improved tree products, yields of associated crops, reduction of cropping system inputs, and increased labor use efficiency);
2. Sustainability (beneficial effects of woody perennials);
3. Adoptability (MoE/Adaptation Fund/UNEP, 2016).

In Cambodia, mungbean grows throughout the whole year almost, depending on the moisture factor. Mungbean is short maturity crop which can be grown both in sloping upland and in lowland areas. In upland areas farmers usually plant their second crop in August and harvest it in October. Mungbean is a crop that can be grown on many soil types, but grows best on alluvial, sandy, and volcanic soils which well drained containing high levels of nutrients (incl. N, P, K, Ca, Mg) and organic matter (MAFF, 2005). Mungbean crop duration depends on the variety, with short-term, medium-term and long-term being harvested between 60-65 days, 65-75 days, and 75-80 days, respectively.

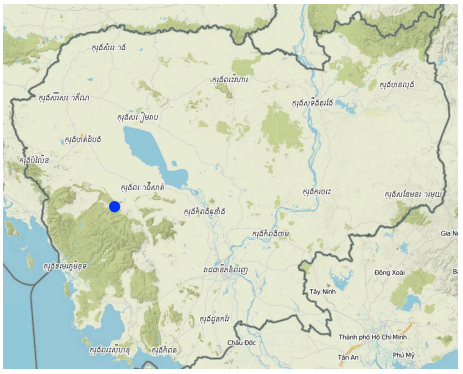
Mungbean residues can make an active contribution to improvement of soil quality through nitrogen fixation and subsequent incorporation of this nitrogen into the soil after root and nodule degeneration by Rhizobium bacteria. The incorporation of the organic root material also improves the soil structure (MAFF, 2005, Chadha, 2010, IRRI-CIMMYT Alliance, 2009). The taproot of the mungbean can penetrate the soil to a depth of 50-60 centimeters. Sometimes, some land users grow mungbean as a green manure crop specifically to improve soil quality (Tauch Ung, 2010).

Mr. Chea Sarith is one example of land user who practices intercropping of orange trees with mungbean since 2013. The main purpose is to improve soil fertility, to prevent soil erosion, and to generate income before the orange trees provide fruit. In addition, it eases the weed control. After the harvest the farmer leaves the plant residues on the soil to provide organic matter. With the objective not to harm the roots of the orange trees, he avoids tilling the soil. In general, mungbean grows twice a season depending on the rainfall distribution and soil moisture.

The average yield of direct seeded mungbean as an intercrop between orange trees is about 1,200 kg/ha (harvested 3 times per crop). If mungbean is grown as a single crop the yield is usually ranges from 1,300 to 1,400 kg/ha. The market price for mungbean grain is usually about 4,500 to 5,000 Riel/kg.

Before planting orange trees the soil requires two turns of ploughing. After first ploughing the soil should dry during 1-2 months, before it can be ploughed again by a wheel harrow. Orange trees then are planted in rows into pits of 1 m x 1 m, with a depth of 70-80 cm. The spacing between the trees, as well as between the rows is usually 6 meters. Before planting, the orange tree seedlings (bought from outside) are usually kept at the farm site for 15 to 20 days, which to allow them to adapt to the conditions of the growing environment. The farmer installed a water pipe in the underground to irrigate the fruit orchard. The nearby stream serves as water source. After the tree plantation, mungbean is sown by direct seeding on the remaining bare soil. This is done by putting 3 to 4 seeds into the seed holes (3 to 4 cm sowing depth at a plant spacing of 20 cm and a row spacing of 30 cm. After harvest the residues of the mungbean plants are squashed by machine and left to rot on the soil surface until is the next mungbean cycle starts by direct seeding.

地



地点: Phnum Kravanh of Cambodia., Ongkrong Village, Samrong Commune, Phnum Kravanh District, Pursat Province., 柬埔寨

分析的技术场所数量: 单一场所

选定地点的地理参考
- 103.58329, 12.3103

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？:

实施日期: 2013

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

Orange Trees (Mr. Sok Pheak)

Mungbean during maturity. (Mr. Sok Pheak)

技术分

主要目的

- [x] 改 产
- [x] 减少、 、恢复土地 化
- [ ] 保护 态
- [ ] 合其他技术保护 /下域 区域
- [ ] 保持/提 多 性
- [ ] 低 害
- [ ] 应 候变化 天 及其影响
- [ ] 减 候变化及其影响
- [x] 创 有 影响
- [ ] 创 有 会影响

土地利用

同一土地单元内 合使 是地农林业

农田

- 一年一作: - 和 子
- 乔木与 木 柑 属

年 : 1季 数

供水

- [ ] 养
- [x] 合
- [ ] 充分

土地退化相关的目的

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

解决的退化问题

土壤风蚀 - Et 土 失

化学性土壤退化 - Cn 力下 和有机 含 下

物理性土壤退化 - Pc 压实

生物性退化 - Bc Bl 土壤寿命损失

SLM组

- 农业林学
- 改 地

SLM措施

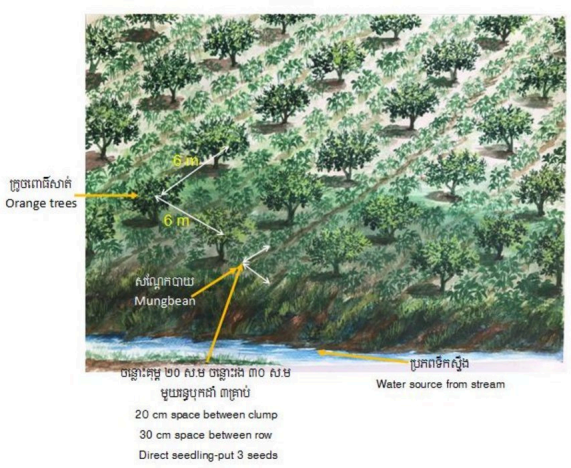
农艺措施 - A1 和土壤 A3 层壤 处

结构措施 - S7 /供 / 备

技术图

技术规范

The area of implementing this technology is 4 hectares with 1096 orange trees. The pit of planting orange trees is 1m x 1m, with a depth of 70-80 cm. The spacing between trees and between rows is usually 6 meters to get enough sunlight. The mungbean is planted by direct seedling by inserting 3 to 4 seeds per hole (the hole is 3-4 cm in depth). The spacing between the holes is 20 cm and the row spacing is 30 cm. The farmer of this farm also installed an irrigation system by setting up a pipe under the ground.



Author: Mr. Khoun Sophal

技术建□ 与□ 护□ □ 动、投入和□ □

投入和成本的计算

- □ □ □ 成本为□ □ 个技术区域□ □ 单位hectares□
- 成本□ □ 使□ □ KHR (Riel)
- □ □ □ 换□ 为1 □ 元元 4000.0 KHR (Riel)
- □ □ 劳工□ □ 日平均工2000成本□

影响成本的最重要因素

The establishment of an orange tree orachard requires a lot of money.

技术建立活动

1. Clear degraded forest (时□ /□ □ January)
2. Clear the termite mound to flatten the area (时□ /□ □ Dry season)
3. Drying the soil by sunlight (时□ /□ □ Dry season)
4. Buy orange trees and adapt them to the condition of the area (时□ /□ □ Dry season)
5. Planting orange trees (时□ /□ □ August)

技术建立的投入和成本 (per 4 hectares)

对投入进行具体说明	单位	数量	单位成本 (KHR (Riel))	每项投入的总成本 (KHR (Riel))	土地使用者承担的成本%
劳动力					
Clear the degraded forest soil	Person-day	80.0	2000.0	160000.0	100.0
Collect the residue of forest and then burn	Person-day	60.0	20000.0	1200000.0	100.0
Clear 40 termite mounds in 4 hectares	Person-day	48.0	20000.0	960000.0	100.0
Hire labor to carry the soil of termite mound to put in the hole of orange tree for planting	Person-day	180.0	20000.0	3600000.0	100.0
设备					
Grass cutting marchine	piece	2.0	1200000.0	2400000.0	100.0
Two wheel tractor	piece	1.0	12000000.0	12000000.0	100.0
植物材料					
Orange seedlings	seedling	1026.0	6000.0	6156000.0	100.0
施工材料					
Pumping machine	piece	1.0	1200000.0	1200000.0	100.0
Irrigation system such as big tube, small tube etc	set	1.0	8000000.0	8000000.0	100.0
其它					
Planting orange trees	Person-day	51.0	20000.0	1020000.0	100.0
Pesticide sprayer machine	piece	3.0	600000.0	1800000.0	100.0
Spraying pesticide hand pump sprayer	piece	1.0	280000.0	280000.0	100.0
技术建立所需总成本				**38'776'000.0**	
技术建□ 总成本□ □ 元				*9'694.0*	

技术维护活动

1. Watering during dry season in the first year of planting orange trees (时□ /□ □ Two times per day during dry season)
2. Spraying pesticides when there is present of insects on orange trees (时□ /□ □ Spray once time per season)
3. Pruning some branches of orange trees (时□ /□ □ When the orange trees 2 years (One year cut some branches once time))
4. Apply organic fertilizer for the orange trees (时□ /□ □ When the orange trees are 4 years)
5. Spray against weeds (时□ /□ □ Spray once time per half month.)
6. Spray pesticides on mungbean plants (时□ /□ □ When mungbean flowering)
7. Direct seeding of mungbean (时□ /□ □ August)

技术维护的投入和成本 (per 4 hectares)

对投入进行具体说明	单位	数量	单位成本 (KHR (Riel))	每项投入的总成本 (KHR (Riel))	土地使用者承担的成本%

劳动力					
Watering the orange trees	Person-day	11.0	20000.0	220000.0	100.0
Pruning some branches of orange trees	Person-day	100.0	20000.0	2000000.0	100.0
Hire labor to spray pesticides	Person-day	8.0	20000.0	160000.0	100.0
Hire labor to harvest mungbean when mature	Person-day	120.0	20000.0	2400000.0	100.0
植物材料					
Mungbean seed (1 hectare need 25 kg of mungbean) seeds)	hectare	4.0	312500.0	1250000.0	100.0
肥料和杀菌剂					
Pesticides for orange trees	bottle	4.0	40000.0	160000.0	100.0
Chemicals for improving of stem of mungbean	package	60.0	1500.0	90000.0	100.0
Pesticide to kill worms on mungbean	bottle	2.0	40000.0	80000.0	100.0
其它					
Direct seeding of mungbean	Person-day	56.0	20000.0	1120000.0	100.0
技术维护所需总成本				**7'480'000.0**	
技术 护总成本 元				*1'870.0*	

境

年平均降雨量

- < 250
- 251-500
- 501-750
- 751-1,000
- [x] 1,001-1,500
- 1,501-2,000
- 2,001-3,000
- 3,001-4,000
- > 4,000

农业气候带

- [x] 半
- 半干旱
- 干旱

关于气候的规范

以 为单位 年平均225.7
In 2015 the annual rainfall is 1225.7 mm, in 2014 is 1128.1 and in 2013 is 1316 mm.
ministry of water resources and meteorology, 2015

斜坡

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

地形

- 原平原
- 山
- [x] 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
- [x] 21-50厘
- 中 度50-80厘
- 81-120厘
- 常 > 120厘

土壤质地（表土）

- [x] 中 壤土、 土
- 土

土壤质地（地表以下>20厘米）

- [x] 中 壤土、 土
- 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

- [x] 好
- 中
- 匮乏/ 有

水质（未处理）

- [x] 好
- 不 处
- 仅供农业使
- 不可
- 参

盐度是个问题吗？

- 是
- [x] 否

洪水发生

- 是
- [x] 否

物种多样性

- [x] 中
- 低

栖息地多样性

- [x] 中
- 低

应 技术 土地使 征

市场定位

- 合 商业
- [x] 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 平
- 丰富
- 常丰富

机械化水平

- [x] 手工作业
- 力 引
- [x] 机 化 动

定栖或游牧
- [x] 定
- [ ] 半
- [ ]

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

性别
- [ ] 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
- [ ] 5-15公
- [x] 15-50公
- [ ] 50-100公
- [ ] 100-500公
- [ ] 500-1,000公
- [ ] 1,000-10,000公
- [ ] > 10,000公

规模
- [ ] 小
- [x] 中
- [ ] 大

土地所有权
- [ ] 州
- [ ] 公司
- [ ] 村庄
- [ ] 团体
- [ ] 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
- [x] 入 无
- [ ] 区 有
- [ ]
- [ ] 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
和卫 施	好
服务	好

影响

社会经济影响

作 产

增加

The soil fertility was improved, so that the crop production increased steadily. In addition, the farmer now doesn't grow only orange trees, but he also grows mungbean.

作

增加

The residues of mungbean contain many nutrients, which is suitable for getting good crop quality.

产故

增加 低

As the farmer plants more than one crop on the plot now, it reduces the production failure. This means that farmer get income from mungbeans before the orange trees provide fruits. The better weed control also reduces insects, which could be harmful to the crop.

产品多 性

增加

There are mungbean and orange trees, now.

农业投入

增加 低

Reduced chemical fertilizers on orange trees and mungbean, because after harvesting mungbean residues are kept on the soil which is very good green manure for soil.

农业收入

增加

The farm income increases considerably due the intercropping system, as both mungbean and orange trees provide yield. In addition, mungbeans provide yield two times per year. Last but not least , mungbean play a key role as green manure which reduces the input of chemical fertilizers and therefore cost.

工作

增加 低

The mungbean and orange tree cultivation does not consume much of labor force because he doesn't have to spend a lot of time for weeding (as instead of weed mungbeans cover the soil now). On the other hand, the farmer mentioned that the orange plantation is time consuming at the beginning, when the orange trees has to be planted. As well the mungbean need more time at the moment when the plot has to be prepared for first direct seedling. But the technology as a whole entails not a lot of maintenance workload as he uses machinery such as pesticide sprayer machine and mungbean squash machine to facilitate the labor.

社会文化影响

□ 品安全 □ □ □

减少 ✓ 改□

The diversification of the crops (oranges and mungbean) has considerably raised the income and therefore strongly prevent food insecurity situations.

健康□ 况

恶化 ✓ 改□

The reduction of chemical fertilizer and pesticides provides safer products that improves the health situation. In addition, mungbean and orange fruit deliver many nutrition benefits to human health.

□ 区机构

削弱 ✓ 加强

He has joined the orange trees community to sell the orange fruits. Many researches are convinced of his success and the tastiness of his oranges; as for example researchers from the District Office of Agriculture, Forestry and Fisheries, Phnum Kravanh, Provincial Department of Agriculture, Forestry and Fisheries, Pursat etc.”

SLM/土地□ 化□ □

减少 ✓ 改□

By doing the farmer learned that degraded soil can be rehabilitated by the mean of mungbean residues acting as green manure. And from the moment the soil is rehabilitated he can see that this green manure prevents soil degradation at high degree.

生态影响

土壤□ 分

□ 增加 ✓

Mungbean and orange trees keep the soil moisture, prevent the evaporation to the atmosphere.

土壤□ □ 层

减少 ✓ 改□

Orange trees and mainly the mungbean intercrop cover the soil almost entirely all year around.

土壤压实

增加 ✓ 减少

The residue of mungbean reduce soil compact by improving the soil structure through providing organic matter to the soil. The increased amount of soil organisms make the sol less compact.

土壤有机□ /地下C

□ 增加 ✓

The residues of mungbean left on the soil after harvesting are transformed to organic matter by the process of decay and therefore contribute essentially to increased soil organic matter.

□ □ □ □ 层

□ 增加 ✓

Orange trees and mungbeans are the vegetation cover to avoid bare land, so the sunlight will not come directly to the the soil.

□ □ 多□ 性

□ 增加 ✓

There is more than one crop (orange trees and mungbean).

有□ □ □ □ 捕□ □ 、□ □ 、传□ □ □

□ 增加 ✓

Now, the soil is somewhat richer in termites, ants, earthworms, crickets ect.

□ 息地多□ 性

□ 增加 ✓

Orange trees and mungbean cultivation promote soil organisms in the habitat.

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

When the orange trees grow bigger, it will provide very high income.

□ 候变化

渐变气候

年□ 度增加
季□ 性□ 增加
季□ 性□ 增加
年□ □ 增加
季□ □增加

□ 常不好 ✓ □ 常好
□ 常不好 ✓ □ 常好 季□□ 季 季
□ 常不好 ✓ □ 常好 季□早季
□ 常不好 ✓ □ 常好
□ 常不好 ✓ □ 常好 季□□ 季 季

□ □ 和□ 应

采用该技术的地区内土地使用者的百分比

- 单例/实□
- [x] 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%
- [x] 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？

- □ 候变化极□ □ 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

- Get income from the mungbean before orange trees provide fruit as a potential source of income.
- The residues from the mungbean plants help to improve soil fertility.
- The potential market of orange tree fruits is good, with traders buying directly from producers at the farm.

长处: 编制者或其他关键资源人员的观点

- Residues of mungbean improve soil fertility, reduce soil degradation and help rehabilitate the degraded land.
- In the initial 3 to 4 years of growth of orange trees it is important to grow short term crops like mungbean to provide an income source.

弱点/缺点/风险: 土地使用者的观点如何克服

- Orange trees require a lot of water. Grow near a water source such as a stream or river, or dig ponds to hold water. Land users need to consider a potential water source.
- When the soils become saturated due to excessive rain, the mungbean plant roots can degenerate and result in low grain yields and low grain price (due to poor grain quality). There is little that farmers can do to improve the performance of the mung bean crop in conditions of soil moisture saturation.

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

- As the orange trees grow bigger there is reduced opportunity for intercropping with mungbean. Grow intercrops that do not require much sunlight, such as ginger or galanga

参 文

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WOCAT数据库中的完整描述
https://qcat.wocat.net/zh/wocat/technologies/view/technologies_3146/

链接的SLM数据
不

文件编制者

机构
- Royal University of Agriculture (RUA) - 柬埔寨

- Scaling-up SLM practices by smallholder farmers (IFAD)

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