



A field where the technology is applied, Tonle Sap river in the background. (Christoph Kaufmann (Centre for Development and Environment CDE))

Mulching with water hyacinth (*Eichhornia crassipes*) after the monsoon floods.

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(Khmer)

Water hyacinth (*Eichhornia crassipes*) is collected during the monsoon floods, attached to poles on the flooded fields, chopped when the water recedes and used as mulch to plant different crops.

This mulching technique is used at the riverside of the Tonle Sap River. The area is flooded during the late rainy season (September to November), and alluvial mud is deposited on the fields, which enhances the soil fertility. The deposition of sediments depends on the extent of the yearly flood, and is threatened by the construction of hydropower dams on the upper Mekong River (Thomas et al. 2012:49), as well as climate change (floods tend to be smaller or more extreme). During the dry season (approximately from January to June, depending on precipitation patterns) the land dries and due to high temperatures and very low precipitations, crops can be harmed.

At first, the farmer gathers the water hyacinth with his boat during the wet season. He surrounds them with a net and pulls them to his fields, where he prepares fences with bamboo poles and iron wires. He fills the fenced area with the water hyacinth. Once the water recedes, he sprays glyphosate on the water hyacinths and chops them by using a hand tractor. He plants his first crop, watermelon, as soon as the soil is dry enough (start of dry season). The crop residues of the watermelon are left on the fields, and he can plant a crop of corn and a crop of cucumber before the next flood enters.

The analyzed area is flat (slope < 2%), tropic (dry and wet season), and the soils are mostly loamy. The groundwater table is rather high with 1-2 m during the dry season (November to May). The area is flooded during and after the wet season (August-September to November). The floods bring sludge and thus nutrients to the fields.

Due to climate change, the rainfalls are more erratic, temperatures rise and droughts are more recurrent. Chili is the cash crop predominantly grown in the flooded area, with floating rice as second crop.

Agricultural activity in this region is confronted with high migration rates (garment industry, cities, or other countries). This is detrimental for the farmers, since there is less labour force available. Also, the presented technology requires a rather high initial investment (especially when a tractor is bought) and an increase of physically strenuous labour. Therefore, the interviewed land user stated that most farmers are reluctant to do high investments on their farm. This is aggravated due to the fact that taking up credits might increase the dependency of the farmer.

: Kampong Os, Kampong Chhnang,

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: (0.02 km²)

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() : 10

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(> 50)

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Top Right: during the flooded season, water hyacinths are gathered and attached over the fields.

Bottom right: after the floods, the water hyacinths are killed with herbicides (1) and chopped with a hand tractor (2).

Bottom and top left: Different crops follow each other, in this case water melon (3), corn (4) and cucumber (5). The crop residues are always left on the fields.

Kampong Chhnang

Date: 2014

Technical knowledge required for field staff / advisors: moderate

Technical knowledge required for land users: moderate

Main technical functions: improvement of ground cover, increase in organic matter, increase / maintain water stored in soil

Secondary technical functions: control of raindrop splash, improvement of surface structure (crusting, sealing), increase in nutrient availability (supply, recycling,...)

Mulching

Material/ species: Water hyacinths

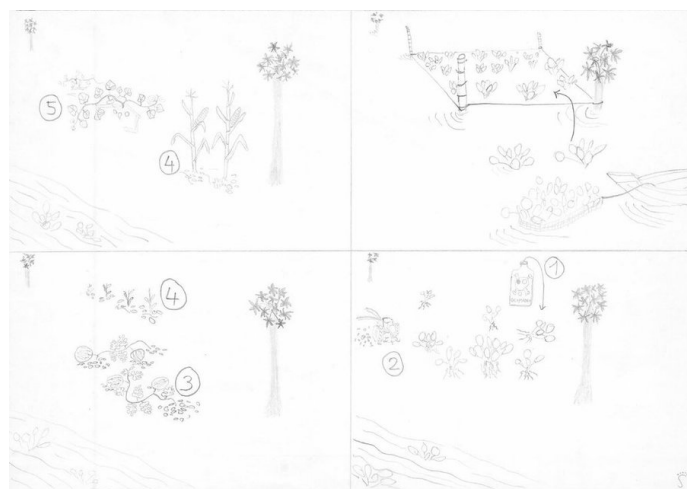
Quantity/ density: n/a

Remarks: As much as the land user can keep with the bamboo poles and wires.

Minimum tillage

Quantity/ density: n/a

Remarks: Sometimes, the land user tills before the yearly floods due to time issues.



Author: Stefan Graf, Switzerland

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- () 1 USD = 5.00
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The factor affecting the costs the most is the availability of cheap equipment. For the recurrent activities the labour costs were calculated as if he hired someone, but he does all by himself. The work is strenuous, as he has to walk in water and through the water hyacinths.

n.a.

			()	()	%
tools	ha	1,0	130,0	130,0	100,0
boat	ha	1,0	1000,0	1000,0	100,0
hand tractor	ha	1,0	1500,0	1500,0	100,0
biocides	ha	1,0	4,5	4,5	100,0
wires and bamboo poles	ha	1,0	30,0	30,0	100,0
				2'664.5	
				2'664.5	

1. Collecting water hyacinth and put poles (/ : During the floods each year (Oct-Nov))
2. Spraying herbicide on the water hyacinth (/ : After floods)
3. Chopping the sprayed water hyacinth with the hand tractor (/ : After spraying herbicide)

			()	()	%
labour	ha	1,0	35,0	35,0	100,0
machine use	ha	1,0	10,0	10,0	100,0
				45.0	
				45.0	

Thermal climate class: tropics. 27-35°C

- ☐ < 250
- ☐ 251-500
- ☐ 501-750
- ☐ 751-1,000
- ☒ 1,001-1,500
- ☐ 1,501-2,000
- ☐ 2,001-3,000
- ☐ 3,001-4,000
- ☐ > 4,000



- ☒ (0-2%)
- ☐ (3-5%)
- ☐ (6-10%)
- ☐ (11-15%)
- ☐ (16-30%)
- ☐ (31-60%)
- ☐ (>60%)



- ☒ 0-100
- ☐ 101-500
- ☐ 501-1,000
- ☐ 1,001-1,500
- ☐ 1,501-2,000
- ☐ 2,001-2,500
- ☐ 2,501-3,000
- ☐ 3,001-4,000
- ☐ > 4,000



- ☐ (0-20%)
- ☒ (21-50%)
- ☒ (51-80%)
- ☐ (81-120%)
- ☐ (> 120%)



- ☐ (> 20%)
- ☐ /
- ☐ /
- ☐ /

- ☒ (>3%)
- ☐ (1-3%)
- ☐ (<1%)

- ☒ < 5
- ☐ 5-50
- ☐ > 50



- ☐ ()
- ☒ ()
- ☐ ()
- ☐ ()

- ☐ ?
- ☐ /
- ☐ /
- ☐ /



SLM

- ☐ ()
- ☐ () /
- ☒ /

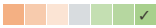
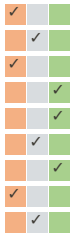
- ☒ 10-50%
- ☐ 10%
- ☐ 50%



- ☐ < 0.5
- ☐ 0.5-1
- ☐ 1-2
- ☒ 2-5
- ☐ 5-15
- ☐ 15-50
- ☐ 50-100
- ☐ 100-500
- ☐ 500-1,000
- ☐ 1,000-10,000

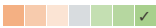


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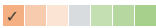
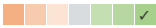


SLM: 50
SLM: 100

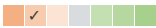
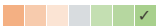
According to the farmer the yield doubled.



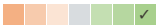
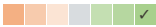
Grows other cash crops than the other farmers in the area.



However, there is less irrigation work needed.



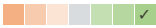
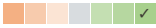
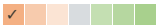
Herbicide is used in the river.



Problems with insects



Herbicide goes into the river



A hand tractor could be rented instead of bought

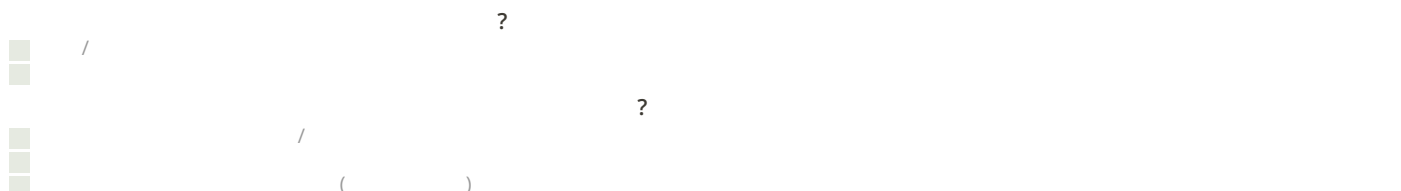
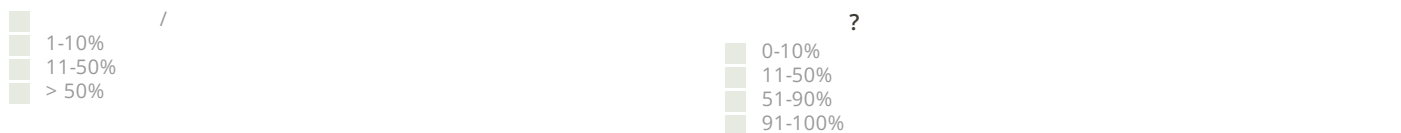


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- It is easy to keep the water hyacinth on the fields after the floods
- The soil keeps the water, less loss due to evaporation. He uses less water for irrigation
- The plants grow better and have higher yields
- The soil is covered, so it needs less irrigation.
- The land user needs less fertilizer as the soil fertility, biological activity and carbon content is higher.
- The profit is not in relation to the work. Plant more profitable cash crops; share the machines with other farmers.
- The soil is too wet after the floods because the mulch stops the evaporation. Grow a water loving plant as first cash crop.
- Only physically strong people can do the work. Build simplified water hyacinth harvesting structures.
- Herbicides are used in an aquatic environment. Find a chopping device that is sufficient to kill the water hyacinth on its own.
- The initial investments are high. Tractor bank could be implemented (share the cost of the machines amongst members.)

Editors

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https://qcat.wocat.net/km/wocat/technologies/view/technologies_1223/

SLM
Approaches: Model farmer https://qcat.wocat.net/km/wocat/approaches/view/approaches_2498/

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- Thomas, T.S., Ponlok, T., Bansok, R., et al. 2012. Cambodian Agriculture: Adaptation to Climate Change Impacts. A Report for USAID.: cgiar.org; free

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