



Soil-biodegradable mulch film: an interesting crop management tool for early fresh potatoes

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Outlook

- 1) Introduction
- 2) Fresh potato mulching: agricultural results
- 3) Fresh potato mulching: financial results
- 4) Conclusions
- 5) (Potential new) applications for soil-biodegradable mulch film

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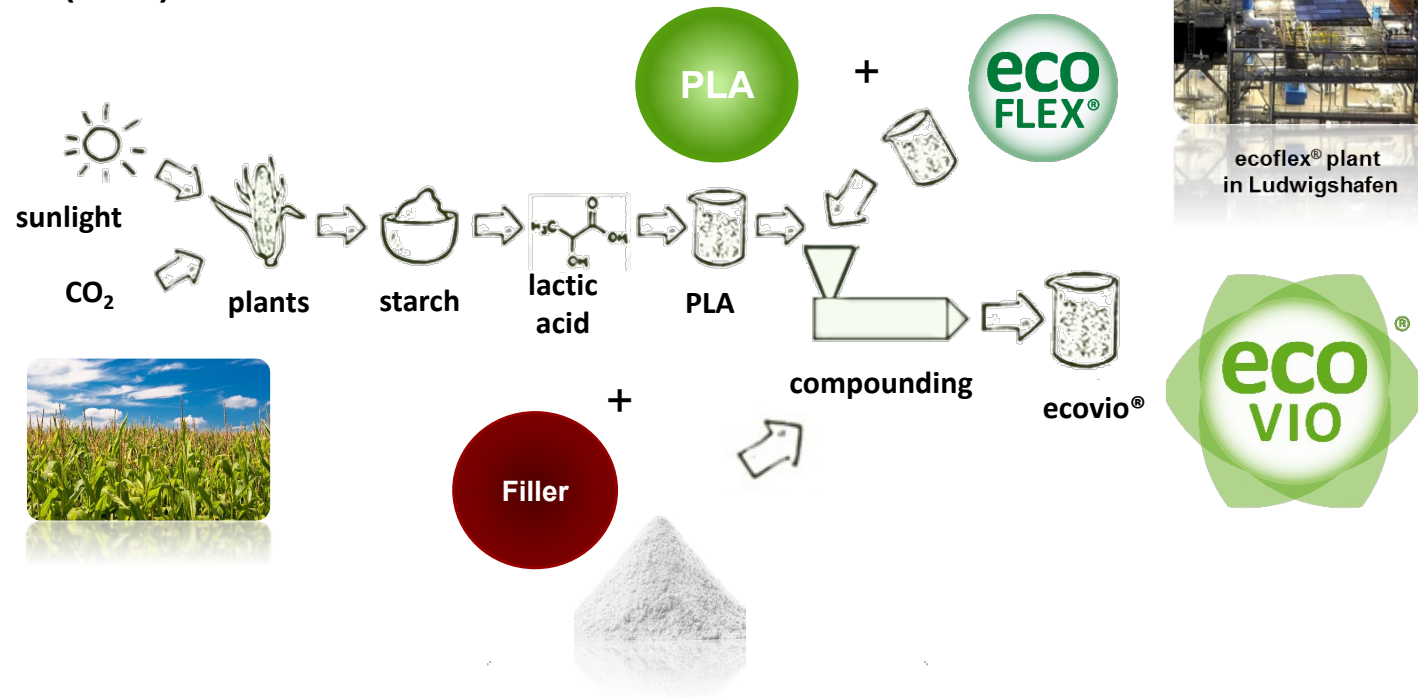
Mulching early fresh potatoes with soil biodegradable mulch film

- ✓ **Very profitable application in early fresh potatoes**
- ✓ **Allows mechanical harvest**
- ✓ **Sustainable crop cultivation application**

What is soil-biodegradable mulch film made of ecovio®?

ecovio® is a compound consisting of:

- Biodegradable (and partly bio-based) BASF polyester ecoflex®
- Bio-based polylactic acid (PLA)
- Mineral fillers



Certified Soil Biodegradable Mulch film made of ecovio®

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Laying out of soil-biodegradable mulch film made of ecovio®



Russia, 17-6-20, 35 DAP
Hand lay out, hand slitted
Mulch gives faster development



France, 17-2-20
Well laid out mulch;
Evenly distributed sharp slits



France, 45 DAP
Mulch gives faster development

BASF experience with mulch film made of ecovio® for potatoes

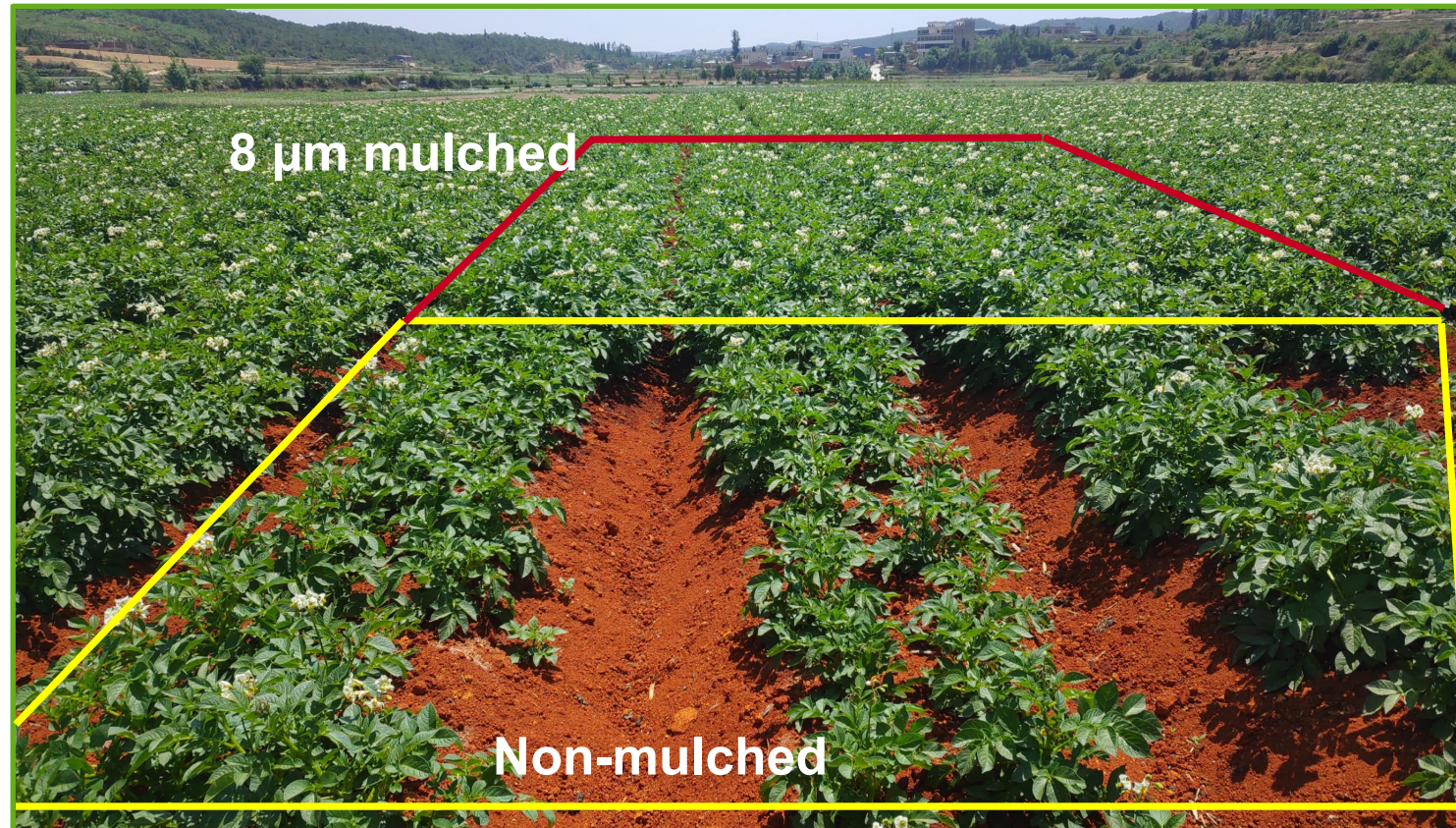
Comparison ecovio® based mulch film – bare soil

- Machine laying out gives best ratio exposed-buried film: max 10 cm at each side buried; film tightly covering the ridge: less/no chimney effect
- As early as possible laying out after planting takes maximum profit of heating effect of film:
 - Earlier germination
 - Much better early vigor
 - More shoots per plant → more tubers
- Make sufficient, regularly spaced good slices: emerging shoots can easily find the light; no growth slow down
- Thickness depending on radiation intensity: 15 µm south France – 10 µm Russia – 8 µm Canada, China
- Experience is that mulched rows show fewer green tubers
- Less/no herbicides required
- Better water and nutrient use efficiency



Potato mulch film trial Yunnan province, China 2021

- 6 & 8 µm ecovio®
- 10 µm PE
- Hand laying out
- Only PE sliced
- Double rows/bed

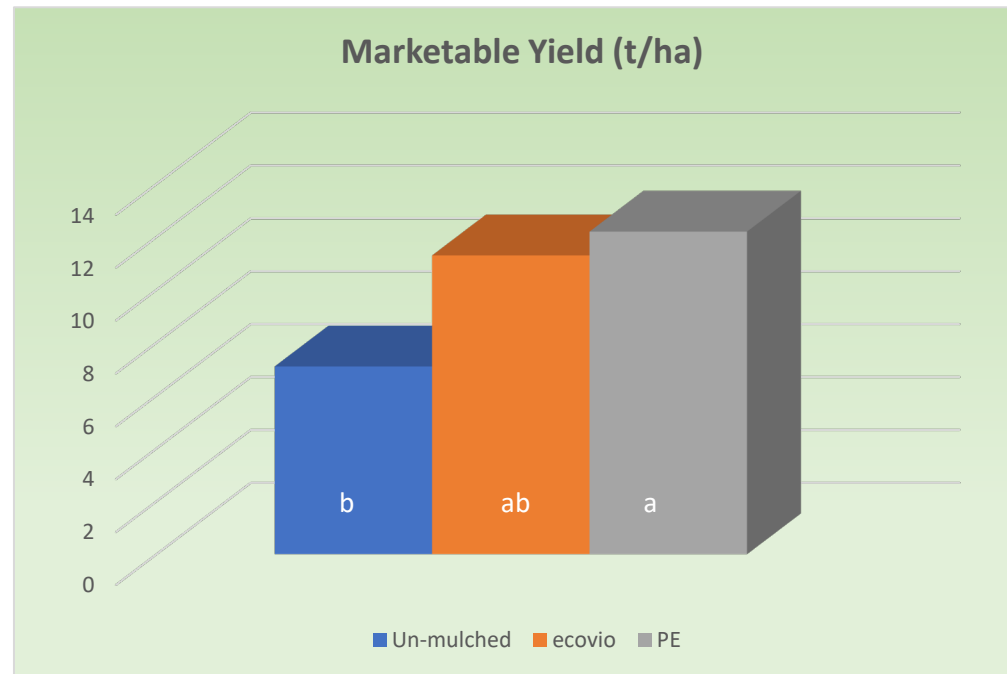


With mulch film made of ecovio®: earlier and better crop development

Early fresh potato trial, South France 2020

Comparison of 15 µm ecovio® based film – bare soil

- Earlier germination
- More shoots (+6%)
- More vigor
- Higher average tuber weight (+58%)
- Bigger sized tubers
- Higher marketable yield (+59%)
- Slightly lower dry matter and starch content (ns) (higher than with PE ($p=0.05$))
- Higher financial result (+3,000 €/ha = +30%)



Early potato trial, Russia 2019: # and % germinated plants

germinated plants during germination period

Treatment / Date	20.05	22.05	24.05	11.06	25.06	Before harvesting
Control (bare soil)	0.38	9.63	27.38	60.13	60.13	60.13
ecovio 12 µm mulch	3.25*	10.88	36.38	58.50	58.50	58.50

* : underestimated because shoots not immediately visible

% germinated plants during germination period

Treatment / Date	20.05	22.05	24.05	11.06	25.06	Before harvesting
Control (bare soil)	0.63	16.02	45.53	100	100	100
ecovio 12 µm mulch	5,56*	18,60	62,19	100	100	100

* : underestimated because shoots not immediately visible



Mulching promotes early germination

Early potato trial, Russia 2019: marketable yield

Variety	Treatment	Average Yield (t/ha)	± to Control	
			t/ha	%
Zhukovskij Early	Control (bs)	18.6	0	0
	Mulch 12 µm	20.7	2.1**	11.3**
Luck	Control (bs)	18.4	0	0
	Mulch 12 µm	23.2	4.8**	26.3**

** p=0,05



Significantly higher marketable yield

Early potato trial, Russia 2020: marketable yield

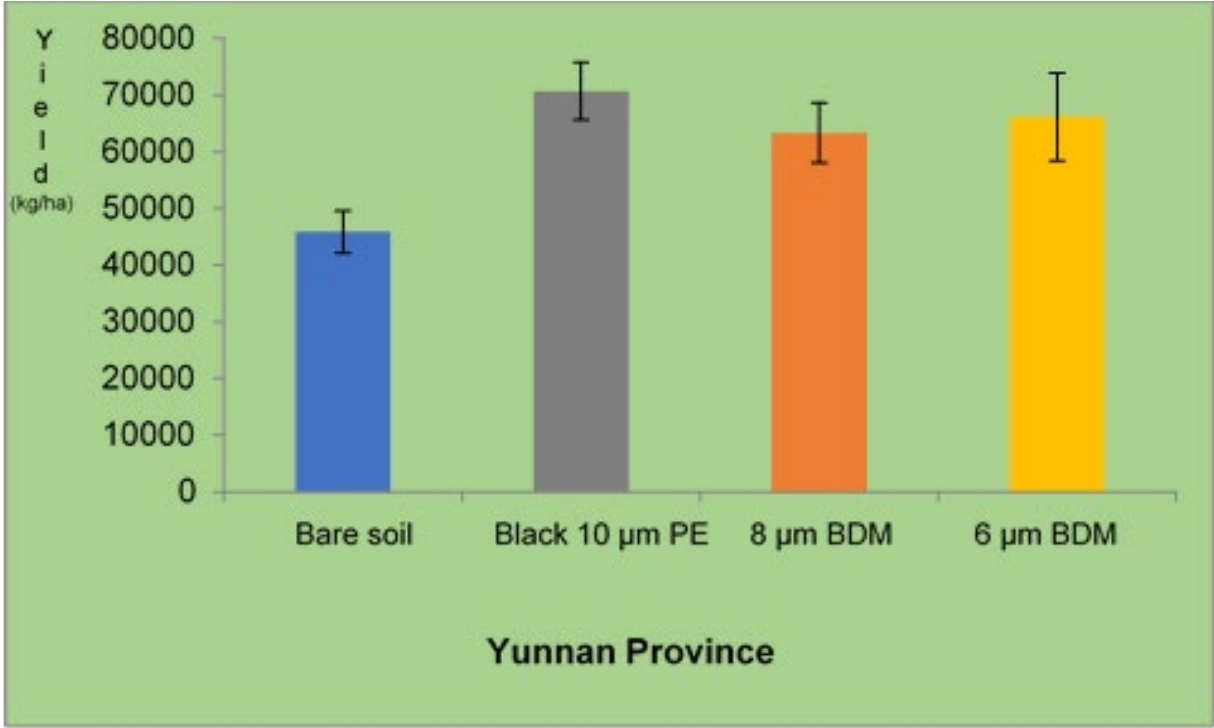
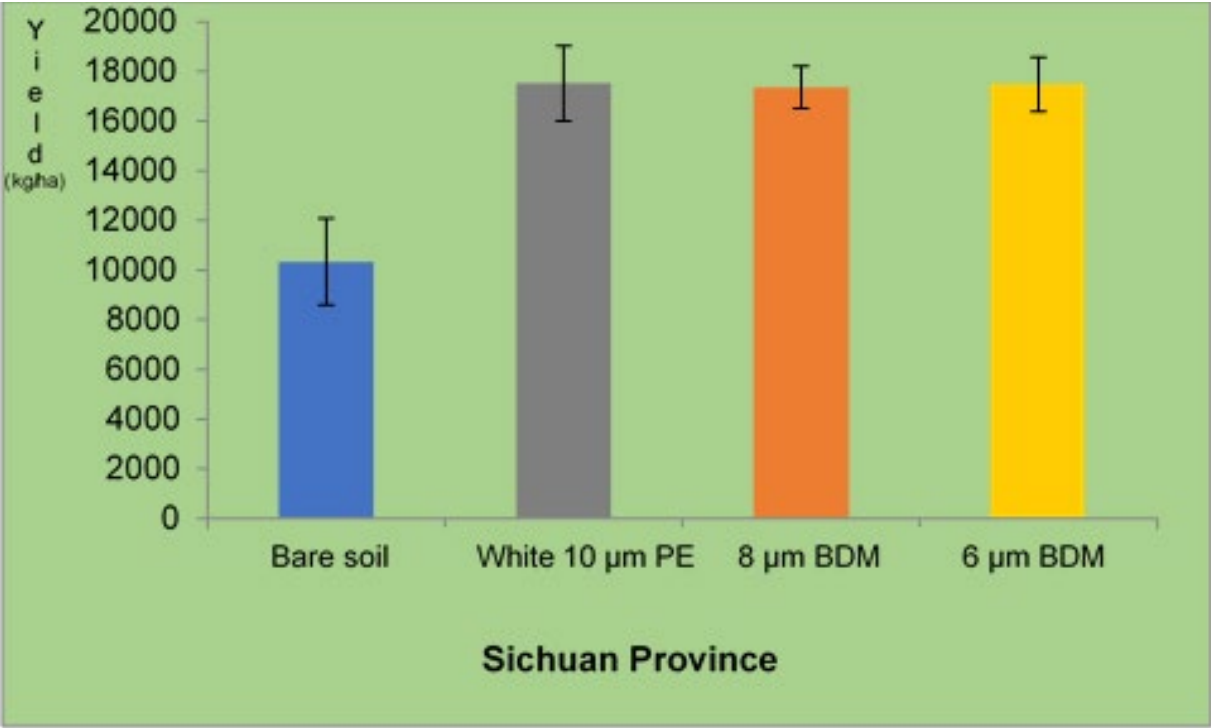
Variety	Treatment	Average Yield (t/ha)	± to Control	
			t/ha	%
Zhukovskij Early	Control (bs)	22.0	0	0
	Mulch 10 µm	32.2	10.2**	46**
	Mulch 12 µm	28.3	6.3**	29**
Udacha	Control (bs)	22.7	0	0
	Mulch 10 µm	28.8	6.1**	27**
	Mulch 12 µm	27.4	4.6**	20**

** p=0,05



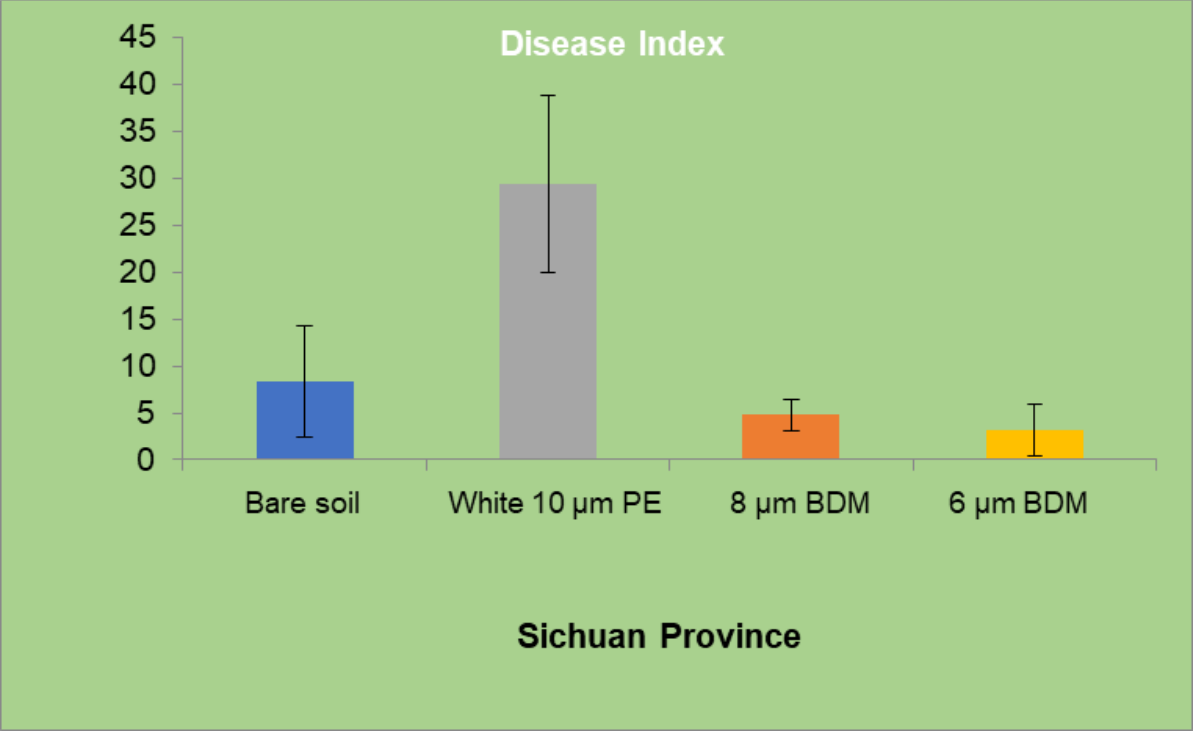
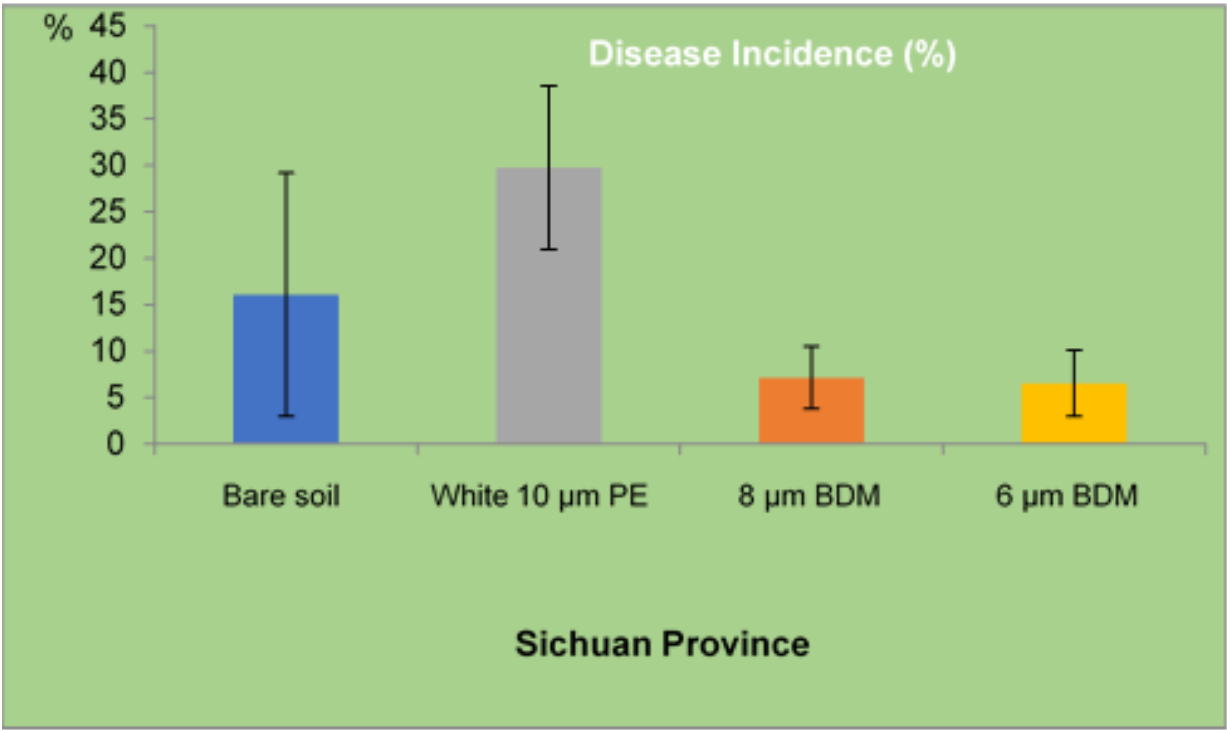
Comparable results with 2019

Marketable yield in two trials in China 2021



Significantly higher yields with mulch film

Late Blight (*Phytophthora infestans*) infection, Sichuan, China 2021



Significantly higher Late Blight index for PE

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Financial results trial, France 2020

Per hectare	No mulch	20 µm PE	15 µm ecovio
Roll length (m)		1,500	1,500
Roll width (m)		1.20	1.20
Weight/roll (kg)		33.5	37
Weight/ha (kg)		268	296
Film costs (8 rolls/ha)		1,232	2,352
Laying out		100	100
Weed control	125	50	50
Collection film (50 hrs; excl shipping and recycling)		750	
Total costs	125	2,132	2,502
Marketable yield (kg/ha)	7,100	12,200	11,300
Financial yield (€/ha)	10,712	17,574	16,304
Total gross income (€/ha)	10,587	15,442	13,802



Assumptions: 15 €/hr for labor; small tuber size à 2.04 €/kg, bigger size à 1.41 €/kg.

Very positive result compared to bare soil, comparable to PE

Financial results potato trials, China 2021 (RMB/ha)

Location	Treatment	Potato Sales	Film Cost	Herbicides	Weeding	Slicing	Labor irrigation	Ridge building	Film Recovery	Gross Income	Delta Income (%)
Chong-ming Island	Bare soil	9667	0	0	7200	0	0	0	0	2467	
	Black 10 µm PE	19317	1250	0	0	2700	0	0	1800	13567	450
	10 µm BDM	35600	4488	0	0	0	0	0	0	31112	1161
Sichuan	Bare soil	26556	0	750	3000	0	1500	0	0	21306	
	White 10 µm PE	49040	1250	750	1500	2250	500	0	1500	41290	94
	8 µm BDM	47401	3510	0	0	0	500	0	0	43391	104
	6 µm BDM	47773	2610	0	0	0	500	0	0	44663	110
Yunnan	Bare soil	53307	0	0	4500	0	6000	9000	0	33807	
	Black 10 µm PE	84850	1250	0	0	2250	1500	3000	1500	75350	123
	8 µm BDM	70417	3510	0	0	0	1500	3000	0	62407	85
	6 µm BDM	73156	2610	0	0	0	1500	3000	0	66046	95

Very positive results compared to bare soil, variable to PE

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Conclusions

- ✓ **Very profitable application in early fresh potatoes:**
 - **Earlier development → earlier harvest (higher price)**
 - **More shoots**
 - **Higher marketable yield**
 - **Water & herbicide saving**
 - **Less diseases**
 - **No collection and recycling of film needed like for PE**
- ✓ **Allows mechanical harvest**
- ✓ **Sustainable crop cultivation application**

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(Potential new) applications for soil-biodegradable mulch film made of ecovio®

- ✓ **Processing tomato**
- ✓ **Transplanted, flooded rice / direct drilled rice under drip irrigation**
- ✓ **Vineyards and fruit tree plantations**
- ✓ **Vegetables & fruits (lettuce, zucchini, melons, sweet potato, watermelon,)**
- ✓ **Pineapple, cassava, sugar cane, etc.**
- ✓ **Nursery bags (rubber, oil palm, ornamentals, etc.)**
- ✓ **Twines, clips**
- ✓ **.....**



Vielen Dank!



Potato trial South
China, 29 May 2018
Left: PE
Right: black mulch film
made of ecovio®



We create chemistry

BASF – We create chemistry

- Our chemistry is used in almost all industries.
- We combine economic success, social responsibility and environmental protection.
- Sales 2020: €59.1 billion
- EBIT before special items 2020: €3.6 billion
- Employees (as of December 31, 2020): 110,302
- 6 Verbund sites and 241 other production sites
- Around 90,000 customers from various sectors in almost every country in the world



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Petrochemicals
Intermediates



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Performance Materials
Monomers



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Performance Chemicals



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Catalysts
Coatings



Nutrition & Care

Care Chemicals
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BASF worldwide: sites

