



PPP Project Annual Report 2018

The PPP-projects that have been established under the direction of the top sectors must submit an annual report on their technical and financial progress. This format is to be used for reporting the technical progress. A separate format ('PPP final report') is available for PPP-projects that have been completed in 2018.

The annual reports will be published in full on the websites of the TKIs/top sector, excluding the blocks 'Approval coordinator/consortium' and 'Planning and progress'. Please ensure that no confidential matters are left in the remaining blocks.

The PPP Project Annual Reports must be submitted by 15 February 2019 to Hans van der Kolk

| General information | |
|---|---|
| PPP number | TKI-AF-16165 |
| Title | Biobased, biodegradable and sprayable cover material for horti- and agriculture |
| Theme | Advanced Products, Biobased Economy/ "Bioraffinage voor de Circulaire Economie – Koepel PPS" (AF 16083) |
| Executive knowledge institution(s) | Wageningen Food & Biobased Research (WFBR) Wageningen Plant Research (WPR) |
| Research project leader (name + e-mail address) | Frits de Wolf (frits.dewolf@wur.nl) (former project leader was Hans Mooibroek, until his retirement, June 15, 2018) |
| Coordinator (on behalf of private parties) | Nitto Denko Corporation, 1-1-2, Shimohozumi, Ibaraki, Osaka 567-8680, Japan, represented by its Director, Deputy CTO Mr. Hironori MOTOMURA |
| Government contact person | Jan van Esch (j.w.j.vanesch@minez.nl) |
| Total project size (k€) | 480 k€ (originally proposed: 520 k€) |
| Address project website | http://agri.coolcowboys.nl/project/biobased-biodegradable-and-sprayable-cover-material-for-horti-and-agriculture/ |
| Start date | 01-02-2017 |
| End date | 31-02-2019 |

Approval coordinator/consortium

The annual report should be discussed with the coordinator/the consortium. The TKIs appreciate being informed of possible feedback on the annual report.

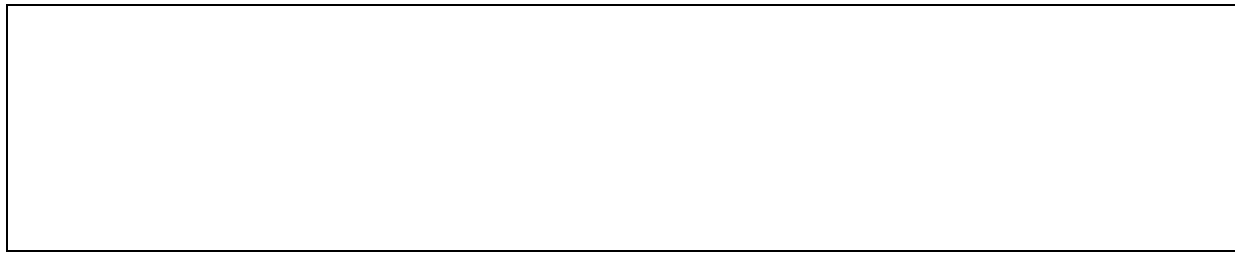
| | |
|---|---|
| The coordinator has assessed the annual report on behalf of the consortium: | <input checked="" type="checkbox"/> approved <input type="checkbox"/> rejected |
| Possible feedback on the annual report: | n/a |

Short content description/aim PPS

What is going on and how is this project involved?

What will be delivered by the project and what is the effect of this?

The project objective is to develop a sprayable mulch formulation to be used for weed control and acceleration of plant growth. This liquid formulation should be able to form a polymer network that is impenetrable for weeds but permeable for moisture and is biodegradable with time in/on soil following EU standards currently under development. The main biodegradable raw materials to be used for the sprayable mulch formulation are lignin, polyhydroxyalkanoate and mixture thereof. Main project focus is the optimization or modification of these materials to make them suitable for the targeted application.



| Planning and progress (if there are changes to the project plan, please explain) | |
|---|--|
| Is the PPP going according to plan? | <p>The PPP is more or less finished according to plan. Only the originally planned field tests have not been carried out in the framework of the present project, due to circumstances beyond control (technical performance of the materials developed was as yet insufficient to justify the scale of field tests*; farmers / horticultural nurseries required for the field tests could eventually not yet be engaged). The decision to skip the field tests was taken in good agreement with all project partners, and is in accordance with the above-mentioned budget reduction.</p> <p>*Indoor tests on soil were performed to evaluate the material in a relevant model setting.</p> |
| Have there been changes in the consortium/project partners? | <p>Yes.</p> <ul style="list-style-type: none"> The facilities at Nitto Denko Europe Technical Centre Sàrl, EPFL Innovation Park, Bâtiment G, Sud, CH-1015 Lausanne, have been closed. Under coordination by Tetsuo Inoue of Nitto Denko Japan, the project activities are being taken over by Nitto Belgium NV, having its office at Eikelaarstraat 22, 3600 Genk, Belgium, Director Kenichi Shibata. Dutch nurseries and Swiss farmers could not be engaged |
| Is there a delay and/or deferred delivery date? | <p>There is no delay in the amount of work delivered. In 2018, Nitto even delivered a larger in-kind contribution than originally planned, by performing laboratory tests on 270 different formulations consisting of 12 different ingredients.</p> |
| Are there any substantive bottlenecks? | <p>Bottlenecks absolutely prohibiting the development of sprayable mulching films were not encountered. On the other hand, further research is still needed to develop formulations directly suitable for commercial application, because it appeared as yet difficult to come up with prize-competitive formulations, and also, to combine in one formulation all of the following features: (1) a high content of biobased components, (2) good film formation, (3) good water resistance and (4) good mechanical properties.</p> |
| Are there any deviations from the projected budget? | <p>Yes</p> <ul style="list-style-type: none"> As mentioned above, cash and in-kind contributions from farmers and nurseries were eventually not obtained. Accordingly, field tests were not performed. For these reasons, the overall budget was reduced by 40 k€ The reduction consists of 10 k€ cash and 10 k€ in-kind contribution from farmers / nurseries, and a corresponding 20 k€ public funding. |

Results in 2018/ so far

Give a short description of the high-lights and (most important) project deliverable in 2018 / so far and their target group

A large number of formulations were tested by using

- unwashed and washed lignin,
- polyhydroxyalkanoate (PHA) latex, biosynthetically derived from tall oil fatty acids,
- modified starch, and/or
- (for comparison, or as compatibilizers): a number of non-biobased components, such as polyvinyl-alcohol (PVAol) or -acetate (PVAc).

While unwashed lignin was the cheapest component used, good films could not be prepared from pure lignin. Reasonable film-forming properties were obtained with mixtures of unwashed lignin, PHA, and PVAc. Spraying this mixture on cotton wool, or on various types of soil indeed resulted in the formation of films on top of those substrates. However, relatively large amounts of material had to be sprayed for film formation. Moreover, the water resistance and mechanical properties were still insufficient. Indoor tests with germinating garden cress seeds in pots showed that films covering the soil in the pots could hardly prevent the growing seedlings from piercing the films. In several formulations, the mutual interaction between the various (bio)polymers appeared to be non-optimal, which could result in leaching out of some components such as lignin. While good sprayability, better film properties and better water resistance were obtained with mixtures containing more than 50 % PVAE (polyvinyl acetate-co-ethylene), or with mixtures containing PVAE + PVAol, high contents of PVAE diminish the biodegradability. As far as lignin and PHA are to be used, a careful choice of the type of ingredients and conditions for emulsion formation, and possibly some chemical modification of lignin, might eventually lead to a sufficiently performing and cost-effective material. Preliminary tests with modified lignin, carried out during the last months of the project, did not yet result in the the desired material properties. Obviously, further research is needed.

| Number of delivered products in 2018 / so far (in an appendix, please provide the titles and/or description of the products or a link to the products on public websites) | | | |
|--|--|----------------------|-------------------------|
| Academic articles | Reports | Articles in journals | Introductions/workshops |
| n/a | (no external reports, only internal reports & presentations) | n/a | n/a |

Appendix: Names of the products or a link to the products on a public website

<http://agri.coolcowboys.nl/project/biobased-biodegradable-and-sprayable-cover-material-for-horti-and-agriculture/>

<https://www.wur.nl/nl/Onderzoek-Resultaten/Topsectoren/show/Biobased-biodegradable-and-spray-able-cover-material-for-horti-and-agriculture-1.htm>