AgriSun Solutions pty ltd

PEAR APPLICATION GUIDE

Reflective Orchard Ground Film

Research-informed guidance for red/blushed and green pear cultivars

1. PURPOSE OF THIS GUIDE

Reflective orchard ground covers have been studied directly in commercial pear orchards.

Published pear research has examined reflective materials in relation to:

- canopy light,
- fruit yield,
- fruit size,
- fruit quality,
- pest management,
- and commercial orchard performance.

Recent commercial pear research has included **metallised polyethylene film** as well as reflective fabric systems.

However, pear application should not simply copy a red-apple pre-harvest programme.

The correct objective depends on the cultivar.

This guide therefore separates pears into:

RED / BLUSHED PEARS

Forelle
Rosemarie

and

GREEN PEARS

Packham’s Triumph
Williams Bon Chrétien

The two groups should be approached differently because the commercial reason for increasing reflected light is not necessarily the same.

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2. WHAT PEAR RESEARCH TELLS US

Reflective ground-cover research in pears confirms that the technology can change the orchard light environment and has been evaluated under commercial conditions.

Washington State research has included commercial pear orchards planted to **Bartlett and Anjou**, using metallised polyethylene film and reflective fabric.

Earlier Washington Tree Fruit Research Commission work also included pears among more than 50 replicated reflective-ground-cover field trials across tree-fruit crops.

This means:

PEARS ARE A RESEARCHED APPLICATION.

But it does **not** mean:

EVERY PEAR CULTIVAR SHOULD RECEIVE THE SAME TIMING OR HAVE THE SAME PRODUCTION OBJECTIVE.

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3. WHY RED AND GREEN PEARS SHOULD BE SEPARATED

In red or blushed pears, skin colour can itself be commercially important.

In green pears, increasing red colour is generally **not** the production objective.

Therefore the question changes.

For a blushed pear the grower may ask:

“Can additional reflected light improve blush development or colour distribution?”

For a green pear the question may instead be:

“Can changing canopy light influence fruit size, canopy performance, fruit quality or another clearly defined orchard objective?”

That distinction is fundamental.

AgriSun should **not** take a programme developed for Gala or another red apple and automatically apply it to Packham’s Triumph or Williams Bon Chrétien.

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4. RED / BLUSHED PEARS

FORELLE

WHAT RESEARCH TELLS US

Forelle is a South African-relevant blushed pear cultivar in which skin colour is commercially important.

South African pear research has directly investigated colour development in Forelle and Rosemarie, including work on environmental and orchard-management factors affecting blush colour.

That specific South African work was **not a reflective-ground-film timing study**, so it should not be used to claim that AgriSun has already been proven in Forelle.

However, it establishes that blush colour is an important cultivar-specific quality characteristic and that orchard environment matters.

Broader pear research confirms that reflective ground-cover systems can alter canopy light and have been used commercially in pear orchards.

WHERE REFLECTIVE FILM MAY BE RELEVANT

A Forelle grower may consider a controlled trial where:

- blush development is uneven,
- shaded fruit develops less colour than exposed fruit,
- fruit deep within the canopy is commercially downgraded for colour,
- canopy density restricts light,
- or protective netting changes the orchard light environment.

PUBLISHED TIMING

No verified Forelle-specific AgriSun timing should currently be published.

The available research supports the **concept of pear reflective-ground-cover use**, but we do not have a sufficiently strong Forelle-specific timing study to say:

“Install reflective film X weeks before harvest.”

WHAT TO MEASURE

At installation:

- current blush colour,
- fruit-development stage,
- anticipated harvest date,
- canopy position,
- canopy density,
- netting if present,
- fruit exposure,
- sunburn history.

At harvest:

- percentage blush coverage,
- colour intensity,
- fruit weight,
- fruit diameter,
- firmness,
- soluble solids,
- maturity,
- sunburn,
- external defects,
- pack-out category.

SOUTH AFRICAN TRIAL REQUIRED

VERY HIGH PRIORITY

Forelle is one of the strongest pear candidates for local AgriSun trials.

The main questions should be:

Does reflective ground film improve blush colour in shaded fruit?

How long before harvest should the treatment begin?

Does canopy position affect the response?

Does increased reflected light affect fruit temperature or sunburn?

Does the response improve commercial pack-out?

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5. ROSEMARIE

WHAT RESEARCH TELLS US

Rosemarie is another blushed pear cultivar relevant to South African production.

South African research has directly examined blush-colour management in Rosemarie together with Forelle.

Again, that work concerned blush management and evaporative cooling rather than a validated AgriSun reflective-ground-film programme.

It is therefore useful for understanding the **commercial importance and physiology of blush colour**, but it does not establish a reflective-film timing.

WHERE REFLECTIVE FILM MAY BE RELEVANT

Potentially where:

- interior fruit colours less strongly,
- blush coverage varies greatly within the tree,
- dense canopy limits fruit exposure,
- or the grower is trying to improve colour uniformity before harvest.

PUBLISHED TIMING

No cultivar-specific reflective-ground-film timing should currently be published for Rosemarie.

WHAT TO MEASURE

- blush percentage,
- colour intensity,
- canopy position,
- maturity,
- soluble solids,
- firmness,
- fruit size,
- fruit-surface temperature,
- sunburn,
- external defects,
- commercial grade.

SOUTH AFRICAN TRIAL REQUIRED

VERY HIGH PRIORITY

A Rosemarie trial should establish:

- practical pre-harvest timing,
- response by canopy position,
- blush development,
- film placement,
- fruit-temperature response,
- and pack-out.

6. WHAT A RED / BLUSHED PEAR TRIAL SHOULD ASK

The trial should not simply ask:

“Does reflective film work?”

It should ask something measurable, for example:

“Does reflective ground film increase blush coverage in shaded Forelle fruit?”

or:

“Does reflective film reduce the difference in blush colour between outer- and inner-canopy Rosemarie fruit?”

This makes the trial commercially useful.

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7. RED / BLUSHED PEAR TRIAL DESIGN

TREATED AREA

AgriSun Reflective Orchard Film.

CONTROL AREA

Comparable trees managed normally without reflective ground film.

Where practical, record fruit from:

OUTER CANOPY

and

INNER / LOWER CANOPY.

This is especially useful because a ground-reflective treatment may not affect all canopy positions equally.

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8. WHAT TO MEASURE IN RED / BLUSHED PEARS

COLOUR

Record:

- percentage blush coverage,
- intensity of red/blush,
- treated vs untreated,
- canopy position.

Objective colour measurements are preferable where appropriate equipment is available.

FRUIT SIZE

Measure:

- diameter,
- weight,
- commercial size class.

SOLUBLE SOLIDS

Record:

°Brix / TSS

FIRMNESS

Use the same method for treated and control fruit.

MATURITY

Use normal cultivar-specific harvest criteria.

FRUIT-SURFACE TEMPERATURE

Measure where practical, particularly under high-radiation conditions.

SUNBURN

Record:

- incidence,
- severity,
- canopy position.

PACK-OUT

Compare commercial grades wherever possible.

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9. GREEN PEARS

Green pears require a fundamentally different approach.

The colour-management argument used for Gala, Fuji or Forelle should **not** automatically be transferred to:

PACKHAM’S TRIUMPH

or

WILLIAMS BON CHRÉTIEN.

The question is not:

“Can we make the fruit redder?”

Instead, a grower must first define the orchard objective.

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10. PACKHAM’S TRIUMPH

WHAT RESEARCH TELLS US

Packham’s Triumph is a green pear cultivar.

There is extensive horticultural research on Packham’s Triumph orchard management under South African and international conditions, but the evidence we have reviewed does **not** establish a cultivar-specific AgriSun reflective-ground-film pre-harvest timing.

Broader pear research does show that reflective ground covers have been investigated for effects including yield and fruit quality in commercial pear orchards.

However, those findings cannot simply be converted into a Packham’s Triumph recommendation.

WHERE REFLECTIVE FILM MAY BE RELEVANT

Only where a clearly defined light-management question exists.

Examples could include investigation of:

- lower-canopy light,
- canopy productivity,
- fruit size,
- fruit quality,
- or performance beneath protective netting.

The production objective should be agreed **before installation**.

PUBLISHED TIMING

No universal Packham’s Triumph reflective-film timing established.

AgriSun should not prescribe:

“X weeks before harvest”

without cultivar-specific evidence.

WHAT TO MEASURE

Depending on the trial objective:

- canopy PAR/light,
- fruit size,
- fruit weight,
- soluble solids,
- firmness,
- maturity,
- fruit-surface temperature,
- sunburn,
- external quality,
- yield where the trial design allows,
- and pack-out.

SOUTH AFRICAN TRIAL REQUIRED

YES — BUT OBJECTIVE MUST BE DEFINED FIRST

Unlike Forelle, the immediate commercial case is not blush colour.

The trial should begin with a specific question such as:

“Does reflective ground film alter lower-canopy light and fruit-size distribution?”

rather than installing film simply because reflective technology has worked in red apples.

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11. WILLIAMS BON CHRÉTIEN

WHAT RESEARCH TELLS US

Williams Bon Chrétien, also known internationally as Bartlett, is a green pear cultivar.

This is important because a recent commercial pear reflective-ground-cover study in Washington included **Bartlett and Anjou** orchards.

The study evaluated:

- metallised polyethylene film,
- reflective fabric,
- and untreated control.

This makes Williams/Bartlett particularly interesting because there is **direct cultivar-family relevance** to reflective-ground-cover research.

However, the purpose of that research included pest and fruit-quality management rather than a simple short pre-harvest red-colour programme.

WHERE REFLECTIVE FILM MAY BE RELEVANT

Potentially where growers want to investigate:

- canopy light,
- fruit quality,
- fruit-size distribution,
- pest-management interactions,
- or broader orchard performance.

It should **not** be sold as a red-colour treatment.

PUBLISHED TIMING

No universal short pre-harvest Williams Bon Chrétien timing should be published by AgriSun.

The Washington research demonstrates direct pear use, but not a single cultivar-wide pre-harvest timing appropriate for South African orchards.

WHAT TO MEASURE

Depending on the trial objective:

- canopy light,
- fruit weight,
- diameter,
- firmness,
- soluble solids,
- maturity,
- sunburn,
- external defects,
- yield,
- pest observations where relevant,
- commercial grade.

SOUTH AFRICAN TRIAL REQUIRED

HIGH PRIORITY

Williams Bon Chrétien is worth trialling because Bartlett has appeared directly in modern commercial reflective-ground-cover research.

A South African trial could determine whether the technology has practical value under local Williams production systems.

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12. WHY GREEN PEARS SHOULD NOT RECEIVE A RED-APPLE PROGRAMME

This distinction should be very clear in the guide.

RED APPLE PROGRAMME

In Gala research, reflective film was used during final fruit development primarily to influence red skin coloration.

That is a specific production objective.

GREEN PEAR PROGRAMME

In Packham’s Triumph or Williams Bon Chrétien, red skin development is not normally the target.

Therefore:

Do not automatically copy Gala's four-week timing.

Do not automatically install film just before harvest.

Do not assume improved red colour is the objective.

Instead ask:

WHAT LIGHT-RELATED PRODUCTION PROBLEM ARE WE TRYING TO SOLVE?

Possible objectives may involve:

- canopy light distribution,
- fruit size,
- fruit quality,
- yield,
- protected-orchard light conditions,
- or another measurable outcome.

Only then should the trial design and timing be chosen.

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13. WHAT MODERN PEAR RESEARCH FOUND

A 2023 commercial pear study evaluated reflective ground covers in Bartlett and Anjou orchards.

The trial included:

METALLISED POLYETHYLENE FILM

and

WHITE REFLECTIVE GEOTEXTILE FABRIC.

The researchers examined horticultural responses as well as pear psylla management.

This is particularly useful for AgriSun because metallised polyethylene film is much closer in concept to the AgriSun material than studies using unrelated reflective technologies.

However, AgriSun should still not assume that results from Bartlett or Anjou automatically apply to Forelle, Rosemarie or Packham’s Triumph.

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14. WHAT PEAR RESEARCH DOES NOT ALLOW US TO CLAIM

The existing literature does **not** justify saying:

“Reflective film should be installed X weeks before harvest in all pears.”

It also does not justify universal claims that AgriSun will:

- increase pear yield,
- increase fruit size,
- improve blush,
- increase Brix,

- reduce sunburn,
- reduce pests,
- improve pack-out,
- or improve profitability.

Individual experiments may report particular responses.

Those results remain specific to the study conditions.

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15. QUICK PEAR APPLICATION SUMMARY

Cultivar	Main potential objective	Timing status
Forelle	Blush colour / canopy light	South African cultivar-specific timing trial required
Rosemarie	Blush colour / canopy light	South African cultivar-specific timing trial required
Packham's Triumph	Define light-management objective first	No universal pre-harvest timing
Williams Bon Chrétien	Canopy light / quality / broader orchard performance	Direct Bartlett reflective-ground-cover research exists, but local timing trial required

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16. SOUTH AFRICAN PEAR TRIAL PRIORITIES

PRIORITY 1 — FORELLE

Main question

Can reflective ground film improve blush coverage in shaded fruit?

Measure:

- blush,
- maturity,
- Brix,
- firmness,
- fruit size,
- fruit temperature,
- sunburn,
- pack-out.

PRIORITY 2 — ROSEMARIE

Main question

Can reflective film improve blush uniformity without creating undesirable heat or maturity effects?

Measure:

- blush,
- canopy position,
- fruit temperature,
- maturity,
- Brix,
- firmness,
- pack-out.

PRIORITY 3 — WILLIAMS BON CHRÉTIEN

Main question

Does reflective ground cover produce a useful horticultural response under South African Williams production systems?

Possible measurements:

- canopy light,
- fruit size,

- quality,
- yield,
- temperature,
- pack-out.

PRIORITY 4 — PACKHAM’S TRIUMPH

Main question

Is there a clearly measurable commercial benefit from altering the orchard light environment?

This trial should only proceed once the production objective is defined.

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17. TRIAL STRUCTURE

For each cultivar use:

AGRISUN TREATED AREA

Reflective ground film.

CONTROL

Normal orchard management without reflective ground film.

Where practical, also separate fruit by:

OUTER CANOPY

and

INNER / LOWER CANOPY.

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18. CORE PEAR MEASUREMENTS

Depending on cultivar and objective:

☐ Colour / blush coverage
☐ Canopy position
☐ Canopy PAR where available
☐ Fruit weight
☐ Fruit diameter
☐ Soluble solids
☐ Firmness
☐ Maturity
☐ Fruit-surface temperature
☐ Sunburn
☐ Yield where appropriately measured
☐ External defects
☐ Pack-out classification

Record both positive and negative findings.

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19. IMPORTANT INTERPRETATION RULE

PEARS ARE NOT ONE APPLICATION.

Forelle and Rosemarie may justify a **colour-focused trial**.

Packham’s Triumph and Williams Bon Chrétien may justify a **different light-management question altogether**.

That is why AgriSun does not recommend simply copying an apple application programme into a pear orchard.

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20. SELECTED RESEARCH

COMMERCIAL REFLECTIVE GROUNDCOVERS IN PEARS

Orpet, R.J. et al. (2023).

Evaluation of Reflective Groundcovers for Pest and Fruit Quality Management in Commercial Pear Orchards.

Journal of Applied Entomology.

DOI: **10.1111/jen.13123**.

The study included commercial Bartlett and Anjou pear orchards and evaluated metallised polyethylene film and reflective geotextile fabric.

BROADER APPLE & PEAR REFLECTIVE-GROUNDCOVER RESEARCH

Hanrahan, I., Schmidt, T.R., Castillo, F. & McFerson, J.R. (2011).

Reflective Ground Covers Increase Yields of Target Fruit of Apple and Pear.

Acta Horticulturae 903.

DOI: **10.17660/ActaHortic.2011.903.152**.

SOUTH AFRICAN BLUSH-PEAR RESEARCH

Wand, S.J.E., Steyn, W.J., Holcroft, D.H., Mdluli, M.J., van den Dool, K. & Jacobs, G.

Use of Evaporative Cooling to Improve 'Rosemarie' and 'Forelle' Pear Fruit Blush Colour and Quality.

Published in the *IX International Pear Symposium* proceedings.

Important: This work concerns blush-colour management and evaporative cooling. It is relevant to understanding Forelle and Rosemarie colour physiology, but it is **not evidence for reflective ground film performance**.

21. IMPORTANT USE NOTICE

Published pear research confirms that reflective ground-cover technologies have been investigated in commercial pear production.

However, the studies involve specific cultivars, reflective materials, climates, production systems and research objectives.

Therefore:

Forelle and Rosemarie require South African cultivar-specific reflective-film trials.

Packham's Triumph should only be trialled against a clearly defined light-management objective.

Williams Bon Chrétien has useful direct relevance through Bartlett research, but still requires local validation.

No universal pre-harvest AgriSun timing should currently be published for these four cultivars.

AGRISUN REFLECTIVE SOLUTIONS

Better Light. Applied With Evidence.

For red and blushed pears, colour may be the question.

For green pears, the question must first be defined.

Published research gives us the foundation. South African trials determine the locally useful application.