



Environmental assessment of biofuels

Document Version

Final published version

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Citation for published version (APA):

Gallego Schmid, A., Hospido, A., González-García, S., Moreira, M. T., Feijoo, G., & Azapagic, A. (2016). *Environmental assessment of biofuels: The case of alfalfa*. Poster session presented at UK-Malaysia Workshop on "Bioenergy, Biorefinery and Bioeconomy: Promoting innovation, multidisciplinary collaboration and sustainability", Pahang, Malaysia.

Citing this paper

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UK-Malaysia Workshop
Bioenergy, Biorefinery and Bioeconomy
30 May - 3 June 2016
Kuala Lumpur, Malaysia

Environmental assessment of biofuels: The case of alfalfa

MANCHESTER
1824

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Context

Alfalfa stems are a potential source for second-generation bioethanol production:

- 50% of the crop biomass
- Least digestible/protein content than leaves
- High content of cellulose and hemicellulose

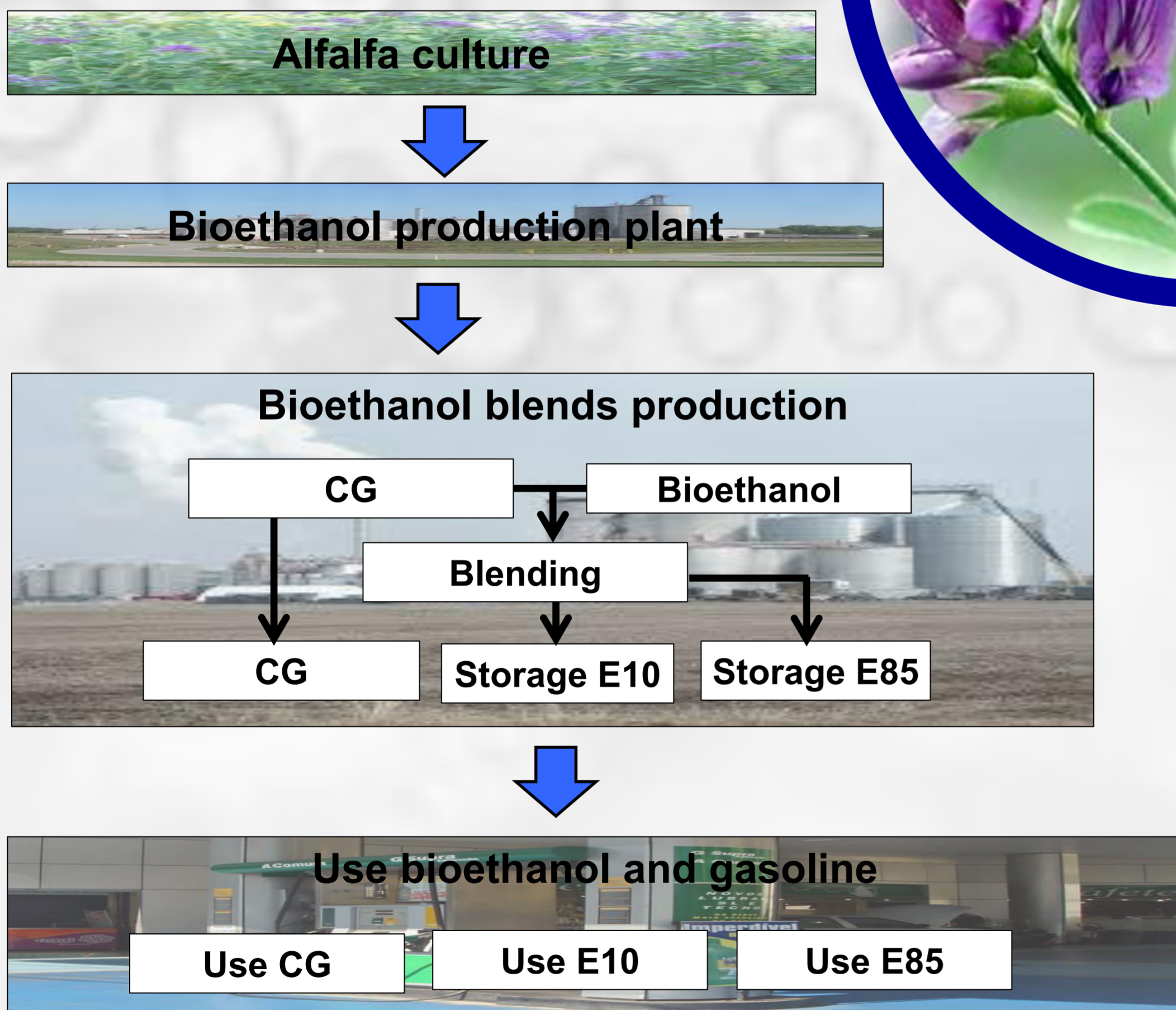
Methodology

Life cycle assessment (LCA) has been carried out taking into account ISO 14040/14044 standards
Comparative functional unit: 1 km distance driven

Impact categories measured

- Global warming (GWP)
- Acidification (AP)
- Eutrophication (EP)
- Photochem. oxidant formation (POCP)

System boundaries



Aim and scope

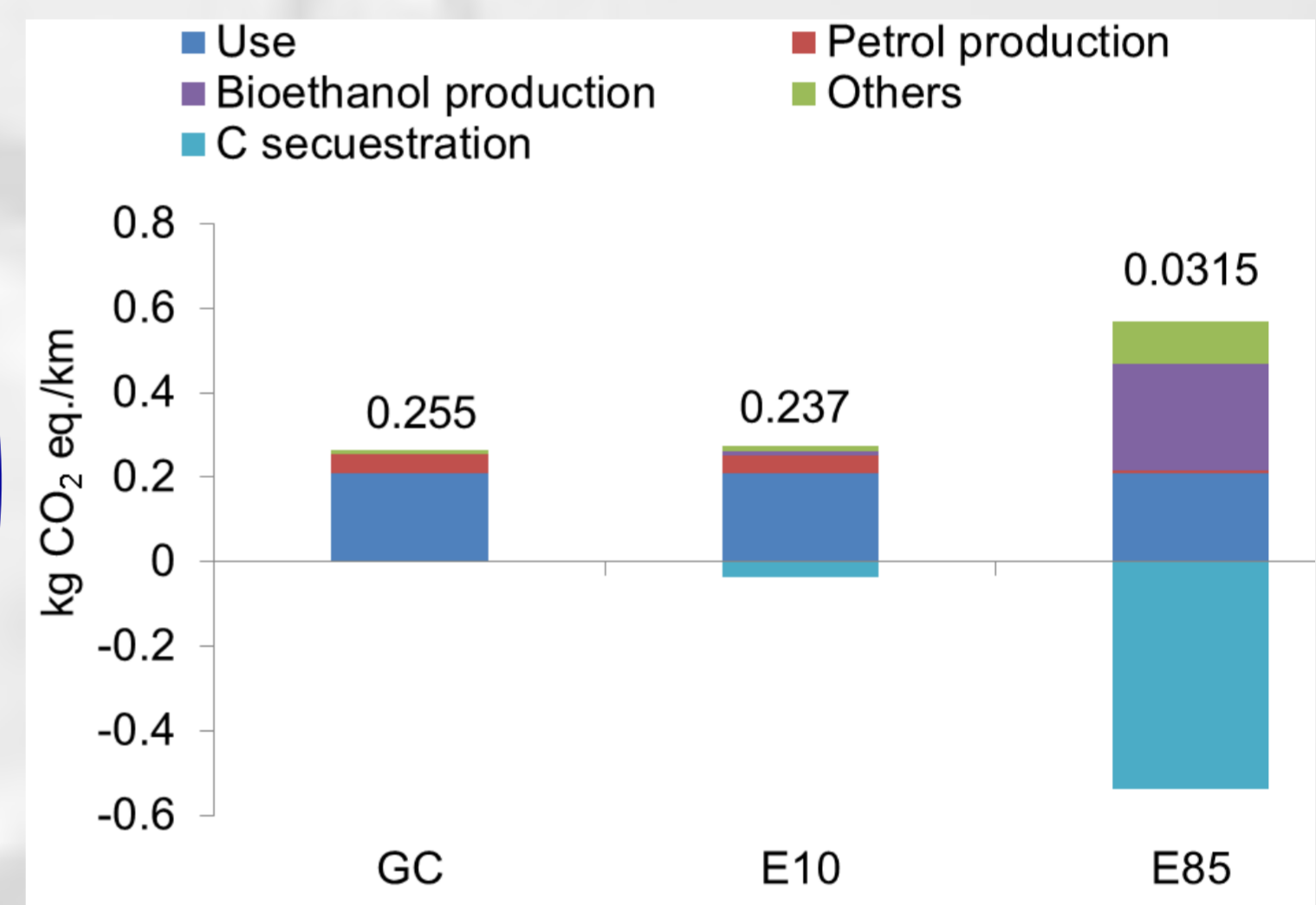
To compare the environmental performance of using conventional gasoline (CG) and mixtures of gasoline with 10% and 85% of bioethanol from alfalfa stems (E10 and E85)

Results

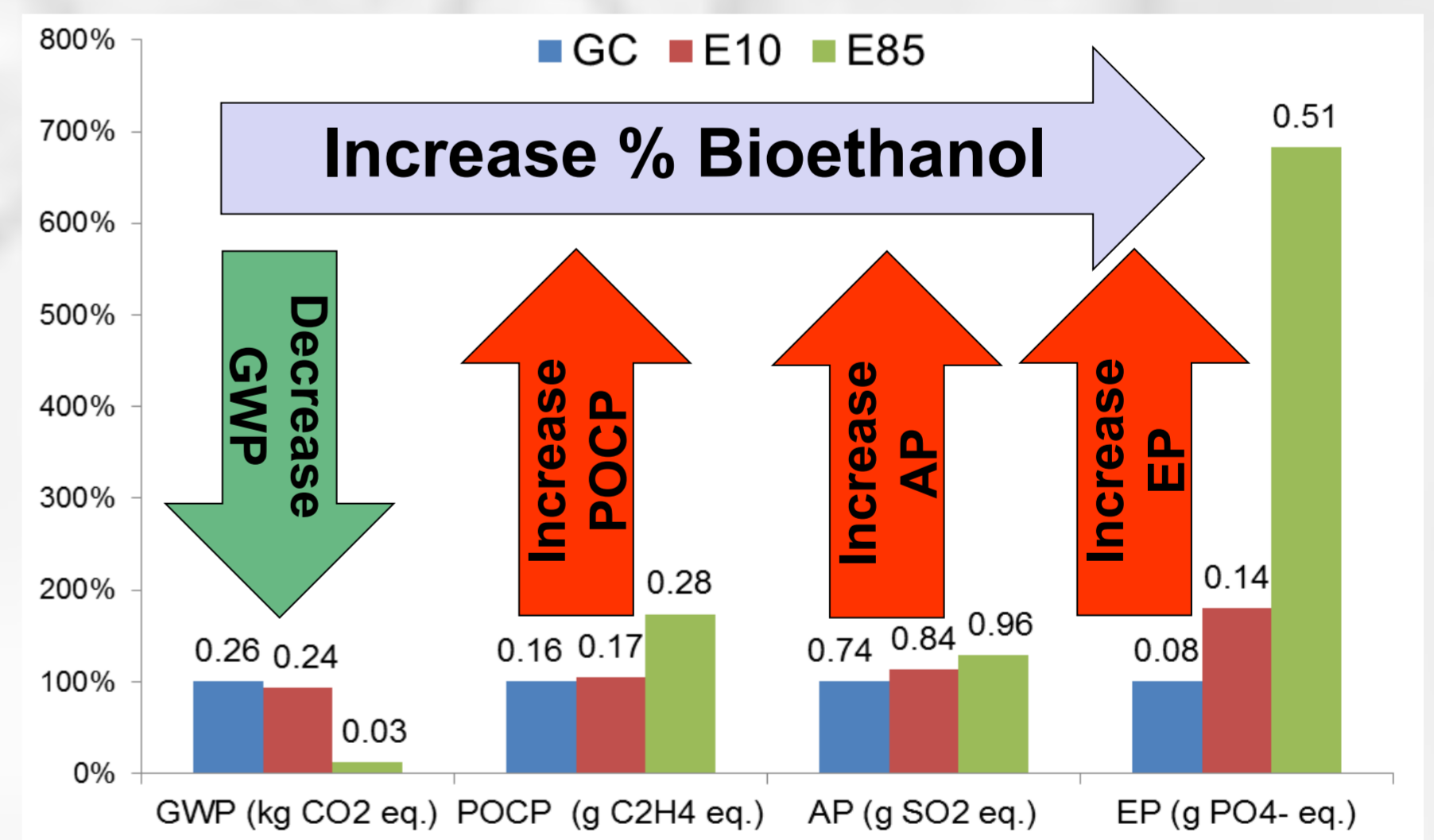
Main contributors to GWP

CG and E10
Use and CG production

E85
Bioethanol production, use and C sequestration



Comparative results for GWP, AP, EP and PO



Decrease GWP: C sequestration

Increase POCP: CO and NMVOC (diesel agriculture)

Increase AP: SO₂ (production fertilizers)

Increase EP: NO₃⁻ and PO₄⁻ (application fertilizers)

Conclusions

- Alfalfa stems are a potential source for second-generation bioethanol production (high biomass generation and content of cellulose and hemicellulose and less protein content than leaves)
- The use of bioethanol produced from alfalfa will lead to a decrease in GWP, and an increase in POCP, AP and EP mainly due to agricultural activities

Source of alfalfa flower photo: <http://www.cuidarlasalud.com/alfalfa/>



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