

Processing cottonseed into biodegradable materials for agriculture as an alternative to synthetic polymers in Latin America

CONCLUSION

Catherine Marquié

Project Coordinator

The COTONBIOMAT project challenge

To produce competitive biodegradable materials directly from raw cottonseed derivatives by usual industrial technologies

Product : COTPROT (a new cottonseed protein concentrate)

Expected uses : biodegradable RESIN to produce films, thermoformed objects, composites and seed coatings

Positive points

Optimized COTPROT formulation at pilot industrial scale

Good knowledge about chemical and physical properties of COTPROT

Knowledge about COTPROT gel behavior in relation with crosslinking and processing treatments

Easy technology

Competitive product / PE e PP

Control of microbiological stability

Chemical tools to analyze the product

To be improved and/or developed

Storage behavior tests

Test the impact of variability within the components composition

Validation tests at industrial scale

Biodegradability tests under real conditions

Exploration of new applications such as encapsulation, textile technology, cosmetic applications,

...

Product : COTPROT by product (dried residue of the COTPROT process)

Expected uses : animal feeding, fertilizing applications

Positive points

Protein content : 10 to 22.5 %

(nutritional study on rats)

Good nutritional value

No toxicological problem

**To be improved and/or
developed**

**Acceptability by
animals/casein**

Test other food formulations

Product : COTPROT film coating

Expected uses :commodity film coating

Positive points

COTPROT is not phytotoxic

Good binding capacity

**Good filmcoating stability
under industrial conditions**

**To be improved and/or
developed**

Discoloration

Not yet competitive

**Other industrial tests to
adjust the formulation
(interactions between
components)**

Product : COTPROT film coating

Expected uses : film coating with adjustable release properties

Positive points

**Adjustable release capacity
proved at lab scale**

**COTPROT alone reduces the
chemical release**

Would be competitive

**To be improved and/or
developed**

**Other industrial tests to
adjust the formulation or the
coating technologies**

Product : Bio-composite materials

Expected uses : film for mulching, cups of culture, civil construction, the motor-car industry

Positive points

Cottonseed protein associated to natural fiber gives a good cohesion to composites. The tensile strength of films can be enhanced 4 times and the tensile modulus 7 times by this mean.

An adapted spread coating equipment and technology at pilot industrial scale (semi-continuous process)

To be improved and/or developed

Film elongation

Drying conditions

Test a continuous process at industrial scale

Competitiveness of cottonseed protein spray dried ?

Product : EMACOT (thermoplastic extruded biomaterial)

Expected uses : film for mulching, packaging, cups for agriculture

Positive points

**Technical feasibility of cottonseed
delipidated flours extrusion**

**Technical feasibility of cottonseed
cakes extrusion with 10 % of PCL**

**Technical feasibility of EMACOT
calendaring and thermomoulding**

**Knowledge about the influence of
non proteinic compound on
processability**

**Price competitiveness / PLA,
Mater-Bi, PCL.**

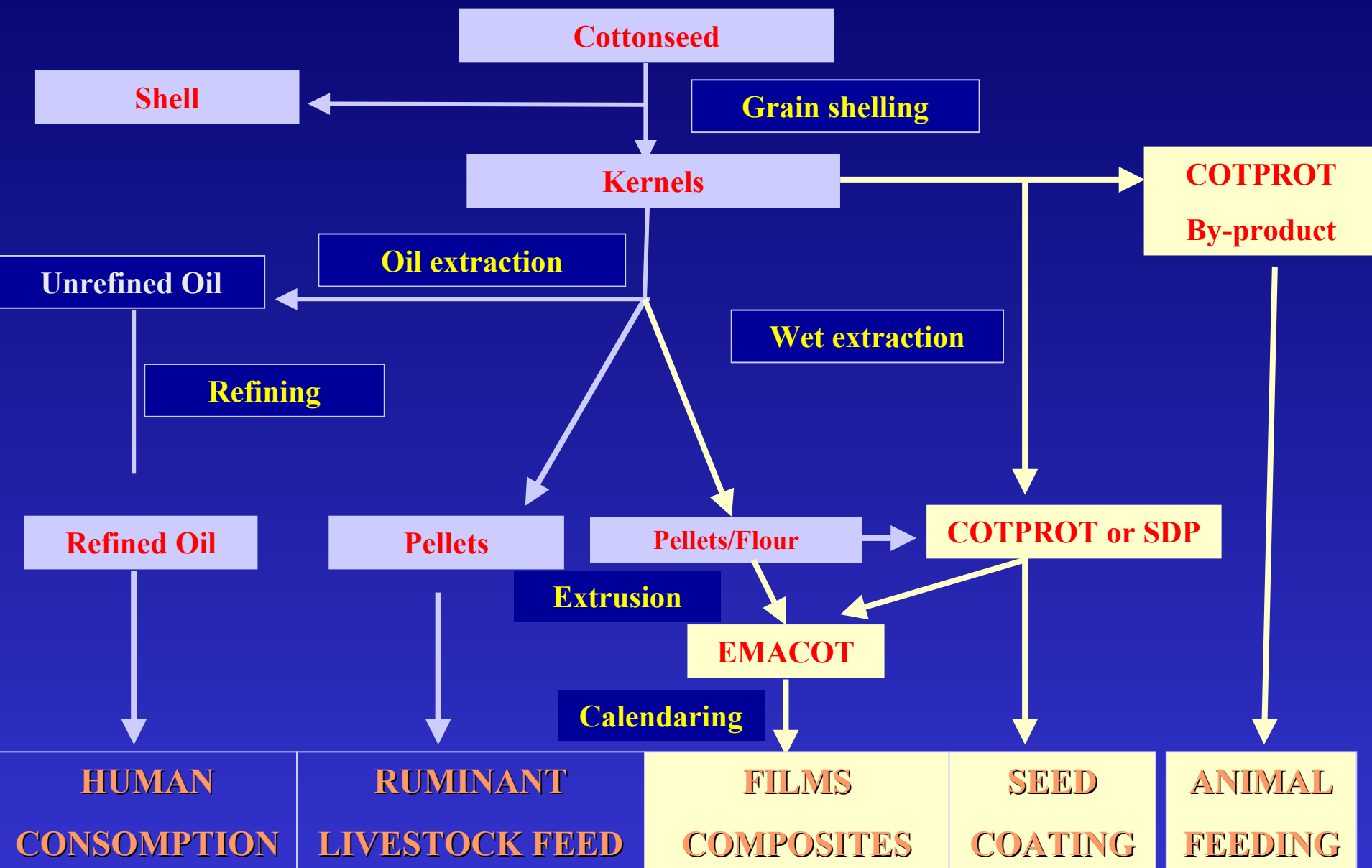
To be improved and/or developed

Mechanical properties of film

Decrease the water sensitivity

**Biodegradability tests under real
conditions of use**

Cottonseed processing



Most of the objectives of the project are reached:

COTPROT and EMACOT products could substitute for a part of the plastic goods

In spite of promising results, more industrial development is required to compete in seed coating industry

The processing of cottonseed derivatives could both call for stakeholders yet involved in agro-industries (ginners or oilseeds crushers) and for plastics industry players



National market for biodegradable polymers :

Biodegradable films and bags : 22000 and 50 000 t

Extruded materials : 13 000 t

The production of cotton in Argentina and in Brazil makes it possible to answer these markets.

Research for biodegradable materials has still a long way ...

- Must be based on existing technologies
- Must produce competing materials
- Many difficulties due to the complexity and the diversity of raw natural materials,...

A yellow starburst graphic with multiple points, used to highlight the word "Challenge".

Challenge

Production of competitive biodegradable material,
stable, able to exert their functional properties
during a limited life, without environmental risk

Research for biodegradable material must still continue its efforts

To overcome difficulties related to the control of polymers and natural matters,

To invent new functionalities for these materials

The results of this project advanced the state of our knowledge in this field.

We hope

These results will lead to a real and new industrial development of biodegradable material from cottonseed derivatives.

**Thank you very much for your attention
and your contribution**

The discussion is open