Biodiesel co-products – Glycerol in ruminant diets

- **Glycerol:** 15% of the diet (recommended inclusion)
  - In dairy cow diets as an energy source (often shortly after calving)
  - or as a preventative for ketosis.

- In beef cattle, feed value of glycerine is greatest at ≤ 10%.

⚠️ Glycerine (similar to starch) has a deleterious effect on fibre digestion on high-grain diets.
Biodiesel co-products – Glycerol in pig & fish diets

• Glycerine contains energy similar to that of corn for pigs.

• If affordable, diet can contain glycerine up to:
  • Sow diets 9%
  • Weaners 6%
  • Finishers 15%

• Use of glycerin in fish diet is less clear, and further research needed
Palm oil and palm kernel oil = ~30% of the total global production of oils & fats

<table>
<thead>
<tr>
<th>Co-products</th>
<th>CP</th>
<th>ME (MJ/kg)</th>
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<tbody>
<tr>
<td>Palm kernel cake (PKC)</td>
<td>17.2</td>
<td>11.13</td>
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Limiting AA: Lys, met, try

- a good energy and protein sources – ruminant & non-ruminants

- Recommended levels of PKC feeding
  - Growing beef cattle: 30–80%
  - Goats: 20–50%
  - Lactating dairy cattle: 20–50%
  - Poultry and freshwater fish: < 10%
Kernel meal (58 % protein of 90% digestibility & excellent amino acid composition)
Antinutritional and toxic factors in Jatropha meal

- **Trypsin inhibitor**: 18 – 27 TIU/g
- **Phytase**: 50 – 102 U*
- **Phytate**: 8.2 – 10.1%
- **Phorbol esters**: 1-3 mg/g

*U*: 1 mg of meal that produced haemagglutination per ml assay medium. *(Source: Makkar and Becker, 2009)*
Histopathological & biochemical studies

Biochemical parameters:
Normal range

Fig. 3
Common carp (*Cyprinus carpio* L.) diet:
Crude protein – 38% and lipid – 10%

Rainbow trout (*Oncorhynchus mykiss*) diet:
Crude protein – 45% and lipid – 24%

Nile tilapia (*Oreochromis niloticus*):
Crude protein – 36% and lipid – 8%

White leg shrimp (*Penaeus vannamei)*:
Crude protein – 35% and lipid – 9%

50% replacement of fishmeal on protein basis

Jatropha kernel meal in fish, pig and turkey diets

50% replacement of soymeal on protein basis
Non-toxic Jatropha

Jatropha platyphylla (non-toxic)  Jatropha curcas (non-toxic)