

# **Projected protein requirements for animal consumption in South Africa**

Project 2021



*Project for the Protein Research Foundation*

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## **1. Introduction**

The Protein Research Foundation (PRF) has as its main objective the replacement of imported protein with domestically produced protein for animal feed. After many years of investigating numerous protein sources, the PRF decided to focus its research on soybeans and canola, believing that these would make the largest impact on its objective.

Growth in the domestic production of oilcake is the best measure by which the PRF can ascertain the extent to which it is achieving its objectives, by way of supporting the industry with research, new technology and technology transfer. For the PRF to continue to emulate the great progress that has been made to date, targets need to be defined, for which projections need to be made of future oilcake demands, what will be required to obtain self-sufficiency, and when this goal is likely to be met.

To measure this progress accurately, various models have been developed and used over the years. Recently, a new model has been developed which considers changes in *per capita* consumption of meat, milk and eggs as projected by BFAP, as well as population growth. The quantity of meat, milk and eggs that are predicted to be imported and exported are also considered. Incorporated into the model are projected future prices and availability of major raw materials, mainly those that are derived as by-products from various agricultural processing industries. The model calculates the quantity of feed required as well as the raw material breakdown for these feeds.

The genetic improvement of animals has a substantial impact on productivity, therefore the change in animal performance is an important factor considered by the model.

There are several animal species, such as dogs and cats, that are not producers of meat, milk and eggs but which nevertheless consume substantial amounts of animal feed, including protein. The feed and protein consumption of these animals also needs to be accounted for.

Making use of least cost linear programming and considering transport costs of raw materials across various regions of the country, the model formulates the actual feed required by all animals in South Africa given the constraint of the quantity of raw materials that are domestically available. The result is an accurate prediction of current and projected protein requirements both domestically and imported.

## **2. Results**

### **2.1 Current scenario**

Based on the current *per capita* consumption of animal products it is estimated (using the APR Model) that the requirement for animal feed in South Africa is as shown in Table 1:

**Table 1: National animal feed production 2021**

| <b>Feed Type</b>    | <b>National feed consumption (ton)</b> |
|---------------------|----------------------------------------|
| <b>Aquaculture</b>  | 5 125                                  |
| <b>Broiler</b>      | 3 326 392                              |
| <b>Cattle Beef</b>  | 2 920 558                              |
| <b>Cattle Dairy</b> | 2 600 809                              |
| <b>Horses</b>       | 127 310                                |
| <b>Layer</b>        | 1 305 565                              |
| <b>Ostriches</b>    | 88 014                                 |
| <b>Pets</b>         | 368 287                                |
| <b>Pigs</b>         | 1 086 174                              |
| <b>Sheep</b>        | 258 888                                |
| <b>Various</b>      | 10                                     |
| <b>Grand Total</b>  | <b>12 087 124</b>                      |

Soya oilcake remains the most consumed oilcake in South Africa, followed by sunflower oilcake (Table 2).

**Table 2: Oilcake usage for 2021**

| <b>Oilcake type</b>      | <b>National consumption (ton)</b> |
|--------------------------|-----------------------------------|
| <b>Cotton Full Fat</b>   | 9 000                             |
| <b>Soya Full Fat</b>     | 155 000                           |
| <b>Canola Oilcake</b>    | 74 000                            |
| <b>Soya Oilcake</b>      | 1 444 193                         |
| <b>Sunflower Oilcake</b> | 381 804                           |
| <b>Palm Kernel Meal</b>  | 5 700                             |
| <b>Total</b>             | <b>2 069 697</b>                  |

On the local market, South Africa progressed in terms of substituting imported soya oilcake with local oilcake. Currently South Africa produces 73 % of the total requirement in 2022, whereas in 2009 this was only 16 % (Table 3). The projection for 2024 is 81 % and will increase to 100 % in 2030. However, the substitution is highly dependent on efficient infrastructure and logistical support, providing internal raw materials to coastal areas at competitive prices. The usage of oilcake is also sensitive in terms of price and competition for raw materials containing protein. For instance, an increase in lucerne production or wet-milled by-products directly affects the usage of oilcakes.

**Table 3: Historical usages of soya oilcake (Local and imported soybeans processed in South Africa)**

| <b>Year</b> | <b>Local soya oilcake (ton)</b> | <b>Total soya oilcake (ton)</b> | <b>Local %</b> |
|-------------|---------------------------------|---------------------------------|----------------|
| <b>2001</b> | 121 140                         | 598 070                         | 20             |
| <b>2002</b> | 141 520                         | 616 593                         | 23             |
| <b>2003</b> | 120 000                         | 705 352                         | 17             |
| <b>2004</b> | 119 280                         | 616 596                         | 19             |
| <b>2005</b> | 92 080                          | 740 558                         | 12             |
| <b>2006</b> | 210 000                         | 849 678                         | 25             |
| <b>2007</b> | 303 280                         | 1 115 280                       | 27             |
| <b>2008</b> | 253 200                         | 1 261 791                       | 20             |
| <b>2009</b> | 181 600                         | 1 111 172                       | 16             |
| <b>2010</b> | 251 840                         | 1 083 640                       | 23             |
| <b>2011</b> | 301 600                         | 1 291 069                       | 23             |
| <b>2012</b> | 347 760                         | 1 271 341                       | 27             |
| <b>2013</b> | 469 360                         | 1 197 978                       | 39             |
| <b>2014</b> | 565 280                         | 1 232 687                       | 46             |
| <b>2015</b> | 765 287                         | 1 254 120                       | 61             |
| <b>2016</b> | 768 800                         | 1 218 001                       | 63             |
| <b>2017</b> | 836 285                         | 1 267 098                       | 66             |
| <b>2018</b> | 766 795                         | 1 150 521                       | 66             |
| <b>2019</b> | 820 000                         | 1 218 000                       | 67             |
| <b>2020</b> | 849 700                         | 1 213 700                       | 70             |
| <b>2021</b> | 1 073 682                       | 1 444 193                       | 73             |

In terms of total oilcake, the local share in consumption increased from 34 % in 2009 to 79 % in 2020, and kept constant at 79 % in 2021 (Table 4). It is projected that the local share will increase to 85 % in 2024 and 99,7 % in 2030.

**Table 4: Historical usages of Total oilcake (Local and imported oilcake)**

| Year | Local Oilcake (ton) | Total Oilcake (ton) | Local % |
|------|---------------------|---------------------|---------|
| 2001 | 454 192             | 1 021 862           | 44      |
| 2002 | 482 448             | 1 149 224           | 42      |
| 2003 | 472 312             | 1 210 396           | 39      |
| 2004 | 489 413             | 1 121 460           | 44      |
| 2005 | 416 736             | 1 212 593           | 34      |
| 2006 | 572 231             | 1 414 338           | 40      |
| 2007 | 608 370             | 1 635 525           | 37      |
| 2008 | 494 557             | 1 758 185           | 28      |
| 2009 | 565 181             | 1 664 927           | 34      |
| 2010 | 701 030             | 1 743 137           | 49      |
| 2011 | 624 912             | 1 857 391           | 34      |
| 2012 | 766 927             | 1 856 360           | 41      |
| 2013 | 760 321             | 1 877 671           | 40      |
| 2014 | 913 356             | 1 889 979           | 48      |
| 2015 | 1 197 604           | 1 914 330           | 63      |
| 2016 | 1 238 120           | 1 965 291           | 63      |
| 2017 | 1 300 865           | 1 798 372           | 72      |
| 2018 | 1 441 527           | 1 649 498           | 87      |
| 2019 | 1 434 660           | 1 875 738           | 76      |
| 2020 | 1 485 183           | 1 885 663           | 79      |
| 2021 | 1 643 916           | 2 069 697           | 79      |

### 3.1. Growth in requirements for animal products

To calculate the consumption figures of the different species it is important to determine the demand for their products. This was calculated using the following macro variables in combination with animal feed conversion ratios and growth projections:

- Population growth
- Per Capita consumption growth
- Imported animal products
- Exported animal products

**Table 5: Projected feed and oilcake requirements for the year 2024 and 2030**

| Year | Feed (ton) | Oilcake (ton) | Soya Oilcake (ton) |
|------|------------|---------------|--------------------|
| 2021 | 12 087 124 | 2 069 697     | 1 444 193          |
| 2024 | 12 803 849 | 2 147 953     | 1 515 659          |
| 2030 | 13 631 093 | 2 202 461     | 1 537 560          |

As explained earlier, soya oilcake remains the dominant protein source in South Africa. This dominance has increased over time and will continue to do so. Future consumption of soya oilcake is highly influenced by feed conversion ratios (FCR), which, if these continue to improve, will stabilise future consumption. However, exports of beef, sheep and the prospect of chicken being exported will increase the consumption of animal feed and will have an impact on the end consumption figures for 2030.

## 2.2 Local Soya Oilcake Production

The increase in local oilcake production from locally produced soybeans will make South Africa increasingly self-sufficient in protein requirements.

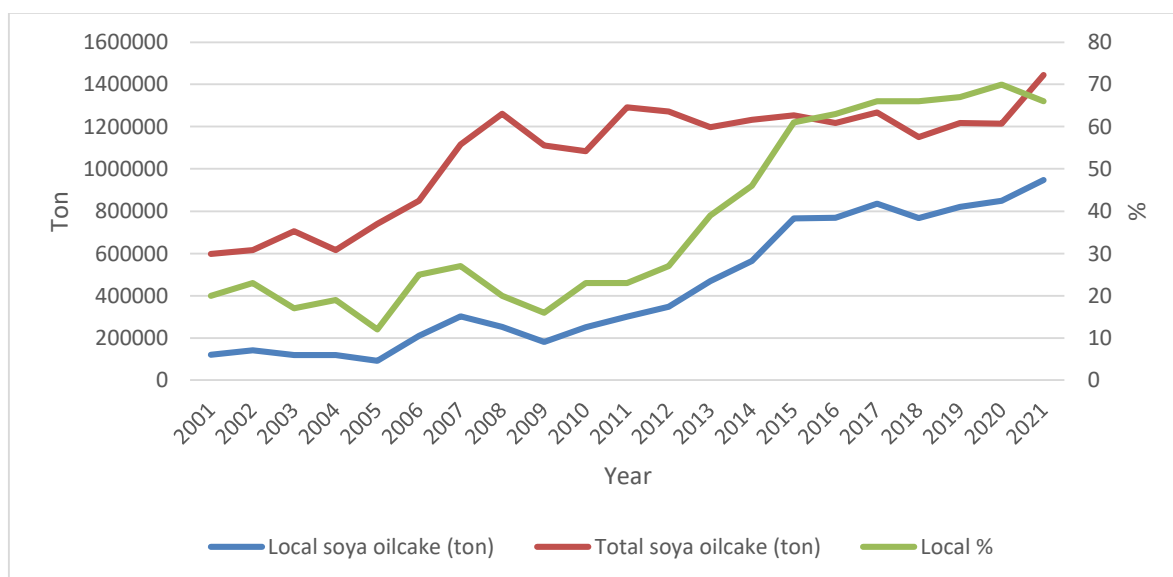
Total oilcake requirements in South Africa are estimated at 2 069 697 tons in 2022 versus a local production of 1 518 123 tons locally produced, or 73 % of requirements (Table 4). The soybean requirement of 1 925 590 tons excludes full fat soybeans and those used for human consumption. This production is needed to obtain 1 444 193 tons of oilcake.

Soya oilcake produced in South Africa in 2021 provided 74 % of the country's soya oilcake requirements (Table 6). This is forecast to increase to 100 % in 2030. Logistics remains a challenge and, to be competitive against imports, must be kept in consideration if these levels are to be reached. Most of the oilcake is produced inland and needs to be transported to the coastal regions. To satisfy local demand 1 925 590 tons of soybeans is needed.

According to the model, feed requirements will increase to 12 830 849 tons in 2022 and to 13 631 093 tons in 2030. Soya oilcake requirement will be 1 515 659 tons by the year 2024 and 1 537 560 by 2030 (Table 6).

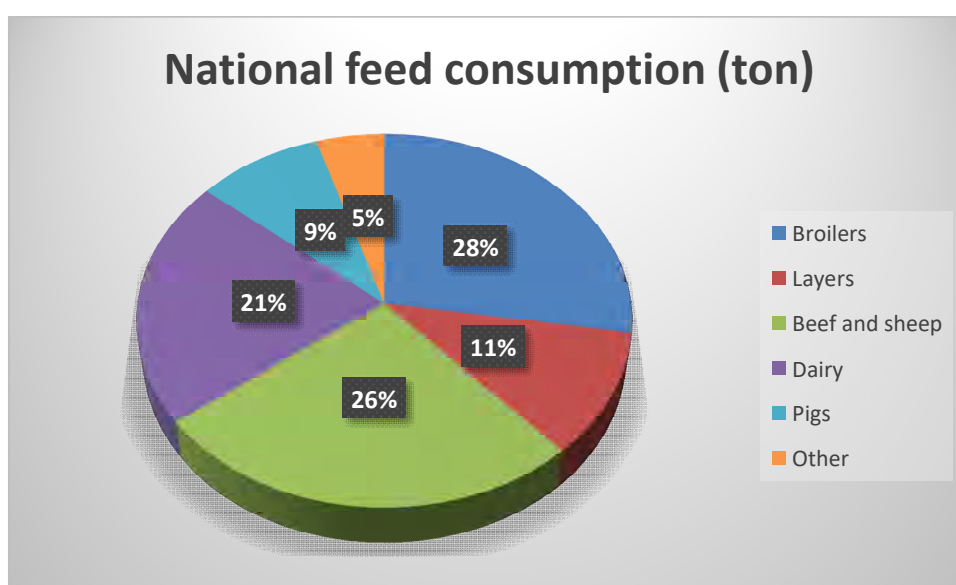
**Table 6: Projected local vs imported soya oilcake usage**

|      | Local Soya<br>Oilcake<br><br>(From local<br>soybeans) ton | Local Soybean<br>Production<br>(required) ton | Total Soya<br>Oilcake<br>Requirements<br>ton | Local Soya<br>Production<br>(required) ton<br>self-sufficiency | % Local |
|------|-----------------------------------------------------------|-----------------------------------------------|----------------------------------------------|----------------------------------------------------------------|---------|
| 2021 | 1 073 682                                                 | 1 264 000                                     | 1 444 193                                    | 1 925 590                                                      | 74      |
| 2024 | 1 238 659                                                 | 1 651 545                                     | 1 515 659                                    | 2 020 879                                                      | 81      |
| 2030 | 1 537 560                                                 | 2 050 080                                     | 1 537 560                                    | 2 050 080                                                      | 100     |



**Figure 1: Growth in self-sufficiency of soya oilcake**

Feed for broilers and laying hens plays an enormous role within the industry. Therefore, growth and sustainability in the poultry industry will play a major role in oilcake requirements in the future and it is good news to see that this is part of the recent Masterplan submitted to government. However, implementation is slow, and the impact of import replacement and export expansion is yet to be seen. After poultry, the next important role-players are the beef and sheep industries: in order to sustain growth in feed consumption in these industries it is critical that biosecurity be managed efficiently in South Africa. Other than for normal population growth figures, the largest increase in animal feed consumption is due to exports of animal products such as mutton, beef and chicken.



**Figure 2: Feed consumption of different species, 2021**

**Table 7: National animal feed production 2024 and 2030**

| Feed Type             | National feed consumption (ton) |                   |                  |
|-----------------------|---------------------------------|-------------------|------------------|
|                       | 2021                            | 2024              | 2030             |
| <b>Broilers</b>       | 3 326 393                       | 3 471 168         | 3 503 856        |
| <b>Layers</b>         | 1 305 565                       | 1 360 878         | 1 450 431        |
| <b>Beef and sheep</b> | 3 179 437                       | 3 505 158         | 3 757 427        |
| <b>Dairy</b>          | 2 600 810                       | 2 688 817         | 2 914 832        |
| <b>Pigs</b>           | 1 086 174                       | 1 147 061         | 1 308 938        |
| <b>Other</b>          | 588 746                         | 630 767           | 695 610          |
| <b>Total</b>          | <b>12 087 124</b>               | <b>12 803 850</b> | <b>13 31 094</b> |

### 3 Conclusions

The prospect of South Africa in the future becoming independent of imported protein for animal feed looks increasingly promising. However, this is dependent on several factors. With increasing efficiencies in FCR, if animal numbers remain the same the demand for animal protein may stabilise, in which case it would be important for the soybean industry to increase demand elsewhere. This additional demand could occur in exports of animal products. Currently this is the focus of the different Masterplans being discussed which, if successful, will play an important role in sustainability. However, the outcome and positive outlook is yet to be seen.

Another factor of importance is the price and competition for raw materials. To sustain the projected local consumption levels, raw material prices tend towards export parity. This implies that much work will be needed to increase the feasibility of producing the raw materials at these levels. Sensitivity is specifically related to the price of protein sources, one of these ratios being the maize to soybean price ratio.

Given the production of raw materials, the question is whether there will be opportunities in the future for exports. Some of the commodities can be exported but there may be better opportunities to export processed product.

The protein raw material basket is complex, and any change in price or availability of one raw material will affect the utilisation of oilcake, specifically soya oilcake. If the production or importation of an alternative protein source increases, this will have a direct impact on the consumption of soya oilcake.

Logistics and biosecurity will play an important role in the future. If inland products cannot be delivered price competitively to coastal consumers, imports will continue. If the exports of animal products do not increase, due, for example, to biosecurity lapses, there will be pressure

on the utilisation of soybean oilcake in South Africa and this will have a direct impact on production.

If all of the above fall into place, South Africa could soon become totally self-sufficient in oilcake production (Table 8) and there may even be some space to increase soyabean production.

**Table 8: Projected self-sufficiency in total oilcake and soya oilcake**

|               | 2021 | 2024 | 2030   |
|---------------|------|------|--------|
| Total Oilcake | 73 % | 85 % | 99,7 % |
| Soya Oilcake  | 66 % | 82 % | 100 %  |