

THE FEED MILLING INDUSTRY IN DEVELOPING COUNTRIES

by

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1. Introduction

1.1 Due to the increased production of meat from monogastric animals, the use of concentrate feeds in animal feeding has increased twice as fast as that of roughages: + 2.6 percent per year over the last decade against 1.2 percent for roughages during the same period (FAO, 1984). However, the share of roughages in total feed resources still represents about three quarters of the total, with large differences between countries: on an average, concentrate feeds represent 40 percent of total feed intake in developed countries and only 15 percent in developing countries. On-farm use of these concentrate feeds is relatively large and mixed feeds represent only a small part of total feed consumption in developing countries (Table 1).

1.2 The proportion of concentrate feeds in the diet depends largely on the animal species involved. On a statistical basis, this is 15 percent for cattle and buffaloes, only 6 percent for goats and sheep, 83 percent for pigs and 91 percent for poultry (FAO, 1984). For monogastric animals, cereals and oil meals are the main sources of concentrates (60 percent of the diet for pigs and 80 percent for poultry).

1.3 Usually, industrial feedmills are mainly intended for grinding, dosing, mixing and pelleting compound feeds from cereals and oil meals and, to a more limited extent, from alternative sources of concentrates or roughages. The feed industry is thus much more involved in the feeding of pigs or poultry than of ruminants.

2. Animal feed production targets

The forecasting of increased production of meat, milk or eggs for a large population often produces very high figures and leads to the setting-up of ambitious projects for animal feed production in a given area.

As shown in Table 2, an increase of 1 g animal protein intake capita/day for a population of one million people requires, in a reasonably efficient system, 9 000 t of balanced compound feeds for broilers or 14 000 t in the case of pigs. This assumption is confirmed in the case of Mauritius. In Vietnam, the "requirement"

would be 2.6 million t of feeds for a daily increase of 3 g protein consumption for pig meat (compared to the present figure of 7 g capita/day). This ambitious target is much higher than the installed capacity (0.3 million t) and actual production (0.083 million t) in that country.

3. Installed capacity and actual production

Installed capacity of feedmills is usually expressed in t/hour. This figure gives a fairly good idea of the investing cost of plants built in a given area. Potential annual feed production is calculated on the basis of 2 000 working hours at nominal capacity. On this basis, it is possible to quote actual production in percentage of potential production. Taken from some individual case studies these percentages are quite different and, in some cases, very low (Table 3).

The percentage of utilization is calculated on an estimated basis of 2 000 h work per year. In fact, greater feed production can be obtained without additional investment by only increasing the working hours per day or per week in the plant. In this respect, the calculation of the working hours at nominal capacity, obtained by dividing actual production during a given period (week or year) by the installed capacity (in t/hour), gives a good idea of the efficiency of the investment. Compared to the maxima of 6 000 h/year or 120 h/week, data obtained from this calculation (Table 3, columns 4 and 5) show the severe under-utilization of costly investments in some countries.

4. Causes of low production of existing capacity

The main reasons why existing capacities are not used efficiently are the low availability of ingredients, inadequate storage capacity, wrong localization of the plant and various technical limitations.

4.1 Availability of ingredients

Large plants require a high amount of some main components of the formula and a large variety of micronutrients (vitamins, minerals, additives) not often available at the plant level.

Specific problems facing the manufacturer of premixes, e.g. selection of ingredients, proper mixing, conservation, bagging and transportation, are usually solved in specialized units at the national level or within large groups of compound feed manufacturers.

The major components of the formula (grains, oil meals, industrial byproducts) are not always available at the right time and at the right place, and various limitations may arise from:

- lack of currencies for importing ingredients
- delays in unloading ships at harbours
- insufficient storage capacity of annual crops or byproducts produced seasonally.

4.2 Localization

Feeds, animals and consumers of animal products are usually concentrated in large urban communities, near harbours or in regions of intensive agricultural production. In these regions, large feedmills and integrated poultry or pig operations are able to meet a large consumer demand for animal products.

On the other hand, animal production from ruminants - meat, milk, wool - is scattered over large areas where high concentrations of animals are not possible. To ensure the efficient utilization of low quality roughages and to minimize the cost of supplements needed to balance the animal diet, mixed feed units should be built at places where transportation costs of ingredients and compound feeds can be kept as low as possible. The feedmills best adapted to these requirements should be properly planned, avoiding overcapacity and overinvestment in equipment not required immediately providing sufficient storage capacity of ingredients.

4.3 Technical factors

Technical limitations of feed production are often underestimated. Limitations in power supply and lack of spare parts for maintaining existing equipment are among the most frequent causes of low output or insufficient quality of feed produced by the feedmill industry.

5. Need for adapted processing equipment

Feedmill designs usually include storage of ingredients, grinding, dosing and mixing, and, in some cases, pelleting. Special attention should be given to the adaptation of the process and equipment to local resources and working conditions:

- calculation of storage capacity should take into account the availability of the most important ingredients. The supply of protein resources is often scarce and discontinuous. Ample capacities, corresponding to several weeks of production, are frequently seen in properly managed feedmills.

- grinding is not limited to grains and oil meals. The grinding equipment should be able to reduce the average particle size of a large variety of ingredients, agricultural byproducts and roughages, frequently available at the farm level or in small agricultural "refineries".

- proper technology (mixing and, if necessary, drying) should be set up to allow for the efficient use of wet agricultural products or industrial byproducts, which could be valuable as sources of proteins and/or energy in animal feeding, if these ingredients are really available in the vicinity of the plant.

Conclusion

Forecasting the development of the feed industry in a given country should take into account not only the production target but the present production in the country. Even if the demand for animal products is strong, compound feed production is only possible when several conditions are met: easy access to ingredients and existence of a market for the products, ability to build and maintain adapted (and sometimes sophisticated) equipment and experience in least-cost feed formulation for efficient animal production.

Overcapacity is frequently encountered in the compound feed industry in developing countries, even if, in some situations, existing equipment is efficiently used. In order to avoid exorbitant investments, a simple rule could be applied to define plant capacity: a new plant should not work initially less than 20 hours per week at nominal capacity. The building of a 10 t/h plant is uneconomical if at least 200 tons of feed cannot initially be marketed weekly within a radius of less than 50 km from the plant.

Laboratory and field trials are strongly needed to evaluate the feeding value of locally available resources. Information and education may help in developing knowledge in feed formulation adapted to local conditions of animal production and increasing the technological skill of feedmill operators.

REFERENCES

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FAO Changing patterns and trends in feed utilization. FAO
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Table 1: Total feed intake

	Developed countries %	Developing countries %
Total feed	100	100
Roughages	60	85
Concentrates	40	15
Mixed feeds	20	3

Table 2: Computation of feed production targets

	Consumption/person:			Human population	Feed required
	Protein	Meat	Feed	(10 ⁶)	(t/year)
	g/ per capita/day				
Poultry	1	5	25	1	9 000
Pigs	1	6	40	1	14 000
Applications to:					
Mauritius (poultry)	2	10	50	1	18 000
Vietnam (pigs)	3	18	120	60	2 600 000

Table 3: Installed capacity and actual production

Country	Installed capacity t/h (1)	1000 t/year (2)	Actual production 1000 t/year (3)	Percent utilization (2) x 100 (3)	Working hours at nominal capacity per year (4) = (3) (1)	Working hours per week (5) = (4) (52)	Ref
Arab Nations	5 000	10 000	7 100	71 (38-105)	1 420	27	(a)
Colombia	600	1 200	1 516	126	2 530	49	(b)
Kenya	247	494	114	24	460	9	(c)
Vietnam	150	300	85	27	570	11	(e)
Mauritius	32.5	65	30	44	920	18	(d)

Source: - FAO, 1985 (this volume); El Shazly (pp 224-236); Llano (pp 183-188);
Said and Mbugua (pp 198-209); Fanchette (pp 210-223)

- Delort-Laval et Dumont, 1985

* for 2000 h/year