

## HOW MUCH OF OUR FOODGRAIN IS FED TO LIVESTOCK AND POULTRY?\*

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I am honoured to be invited by the Indian Society of Agricultural Statistics to deliver this year's Panse Memorial Lecture. It has indeed provided me an ideal opportunity to pay tribute to a pioneer in the development of methodology and applied research in agricultural and animal husbandry statistics.

I had the good fortune to be associated with Dr. Panse for more than fifteen years, from the early fifties to the mid-sixties when I was, so-to-say, the link between the Directorate of Economics and Statistics in the Ministry of Agriculture and the Indian Agricultural Statistics Research Institute under the Indian Council of Agricultural Research.

Dr. Panse always emphasized the need for a sound statistical base for agricultural planning. He was a purist in his approach to the design of sample surveys and field experiments, and uncompromising in his standards for rigorous statistical analysis. In the heated debates in the early 1950s about the methodology to be adopted in the cost of cultivation studies, it was Dr. Panse who insisted that the cost accounting method would be superior to the survey method. In the first round of farm management investigations, both methods were tried; and the overwhelming evidence favoured the cost-accounting approach.

The subject that I have chosen for today, namely, the need for data on the utilization of cereals and pulses for livestock and poultry feed, is, I believe, one that would have been of great interest to him. While several measures have been taken to improve crop and animal husbandry statistics, an important lacuna has been the statistics on what I shall henceforth term as feedgrains. With growing family incomes, the demand for livestock and poultry products<sup>□</sup> increases, resulting in higher demand for feedgrains. Having reliable information on their use has an important bearing on assessments about the current—as well as the future—supply and demand for foodgrains in India.

In the developed countries, the share of feed in total cereals is more than 75 percent. In fact, in the United States, in the mid-eighties, the use of grains

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□ Livestock products include milk, beef and veal, buffalo meat, mutton and lamb, goat meat and pig meat. Poultry products include eggs and poultry meat.

for feed formed as much as 87 percent of food and feed use. The corresponding figure for developing countries as a group is only 13 percent. However, the newly industrializing countries of Asia which witnessed high rates of economic growth in the sixties and seventies, experienced a rapid increase in the demand for livestock products. This was reflected in high rates of growth in the derived demand for feed. For instance, in the Republic of Korea, there was a more than ten-fold increase in cereals used as feed in the fifteen years ending in late 1970's. In Taiwan, cereal feed use rose by more than 3.5 times between the sixties and eighties. This in turn resulted in a sharp increase in the imports of feedgrains in both countries.\* Will a similar development take place in India as income growth accelerates under the new economic order?

Some people believe that the experience of the newly industrializing countries of Asia will not be repeated in India. Firstly, a large number of people are vegetarian and these habits do not change easily. Secondly, demand for meat and poultry is constrained by inadequate infrastructure and high prices of these products. Thirdly, the meat industry is not organized along Western lines, and there is no systematic fattening of calves for meat production. Furthermore, as the late Dr. D.S. Tyagi (1990) noted, "The phenomenon observed in some Asian economies ... is unlikely to be repeated in India, since feed constitutes only a small portion of the total demand for foodgrains. It needs to be stressed that in those economies, feed requirement at the beginning of the rapid growth period itself was much higher" (p. 163).

Even with respect to milk, Indian dairying is traditionally based on small holders and the landless with one or two animals raised largely on crop residues and by-products. The inadequacy of the quality and quantity of feeds in India has resulted in low productivity animals and in the deterioration of milk yield potential of improved and cross-bred animals.

On the other hand, recent evidence suggests that high rates of growth have begun to be experienced in dairying and poultry. Under Operation Flood, milk production increased at a rate of 5.3 percent per annum during the period 1980/81 to 1991/92. The output of poultry meat and eggs exhibited even faster rates of growth of 11 and 7 percent per year respectively during the same period (see Table 1).

Unfortunately, a thorough assessment of the growth in meat output other

\* In the Republic of Korea, grain imports increased eight-fold from 734,000 tonnes in 1961-65 to 5.7 million tonnes in 1979-81. About half of the later imports consisted of coarse grains for livestock feed. In Taiwan, coarse grain imports increased from 18,000 tonnes to 3.6 million tonnes between the 1960s and 1980s.

Table 1. Output of Livestock Products, All India

Year	All Meat <sup>□</sup>	Poultry	Milk	Eggs
	—(thousand tonnes)—		(million tonnes)	(no. in billions)
1980/81	802	120	31.6	10.06
1985/86	1,106	180	44.0	16.13
1986/87	1,261	193	46.1	17.31
1987/88	1,630	225	46.7	17.80
1988/89	2,974	289	48.4	18.89
1989/90	3,596	334	51.4	20.20
1990/91	3,710	362	53.9	21.11
1991/92	3,769	382	55.7	21.98
Growth rates (%) <sup>@</sup>	15.1	11.1	5.3	7.4

Notes: <sup>□</sup> Includes beef and veal; buffalo meat; mutton and lamb; goat meat; pig meat and poultry meat. Data relate to animals slaughtered within national boundaries irrespective of their origin.

<sup>@</sup> Compound rates of growth between 1980/81 and 1991/92

Sources: All meat and poultry figures are from the FAO Production Yearbook as reported in Government of India, Ministry of Agriculture, Department of Animal Husbandry and Dairying, *Report of the Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics*, (Delhi 1994). Milk and Eggs figures are from Government of India, Ministry of Agriculture, Directorate of Economics and Statistics, *Agricultural Statistics at a Glance* (Delhi, 1995).

than poultry is not possible for lack of official data: the available data quote the FAO Production Yearbook as their source.\* According to these figures, total meat output (including poultry) increased from 802,000 tonnes in 1981 to 3.77 million tonnes in 1992, implying an annual growth of 15 percent, far greater than what is generally believed.

Another source, the National Sample Survey Organization has reported figures for the per capita quantity of meat consumed for one year: namely in

\* *Report of the Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics*, (Department of Animal Husbandry and Dairying, Ministry of Agriculture, 1994).

1987/88 (43rd round). In this year, the average consumption per capita per month was 100 grams in rural areas, and 210 grams in urban areas, or 127.5 grams overall. This translates into an annual estimate of 1.25 million tonnes, as compared to output of 1.26 million tonnes for 1987 and 1.63 million tonnes for 1988 as reported by the FAO. Unfortunately, similar figures on the quantity of meat consumed are not available for subsequent years.

### **Estimating Current Feedgrain Utilization**

Livestock feed consists of several components, such as: green fodder, cultivated and uncultivated; straw and other dry roughage; and concentrates (including coarse grains, pulse and byproducts, fishmeal, oilcakes, and brans). The adequacy of livestock feeds can also be analyzed in terms of Digestible Crude Protein and Total Digestible Nutrients. But in this talk, I will confine my attention to the feedgrains alone.

I have consulted various studies undertaken so far with a view to deriving all-India estimates on feedgrain utilization. I found this a difficult—indeed, impossible—task. It is helpful to categorize the various studies I have consulted as follows:

- i. Cost of production surveys on livestock products, which provide information on the amount of grain fed to different categories of animals and birds.
- ii. National Sample Survey results on the livestock economy.
- iii. Information on the feeding ratio (which is the grain used for producing one unit of livestock products).
- iv. Derived as a residual when calculating net availability of foodgrains after appropriate allowance for seed and wastage.
- v. Specially commissioned surveys.

Most of the evidence is fragmentary—inevitably. Let me however summarize whatever I was able to glean:

Pilot studies on the Cost of Production of Livestock Products were carried out between 1963 and 1983 in various states, under the technical supervision of the Indian Agricultural Statistics Research Institute, so as to evolve appropriate methodologies. These studies provided data on the average consumption by type of feed (including coarse cereals), and the total intake per day per animal. These were collated by Drs. J.P. Jain and Shivtar Singh as recently as 1990. But the information provided by them (extracted in Table 2) cannot be used to derive all-India aggregate utilization. This is because the

**Table 2. Average Cereal Feed Consumption in India**  
(grams per day per animal)

	Cattle	Buffalo
In Milk	14	39
Dry	1	9
Adult males	55	—
Young male stock	9	—
Young female stock	1	5

*Note*: The data are based on pilot studies on the cost of production of livestock products carried out by the Indian Agricultural Statistics Research Institute in different states between 1963 and 1983.

*Source*: Extracted from J.P. Jain and Shivtar Singh, "Quantitative and Qualitative Insufficiency of Livestock Feeds by 2001 AD and Possibilities of Bridging the Gap" *Indian Journal of Animal Sciences*, vol. 60, no. 10, 1990.

data reported are averages for various, non-comparable years during which the pilot studies were carried out in different states. I understand that despite efforts by the Ministry of Agriculture, these surveys are being carried out only by a few states at present. Clearly, the need to extend these surveys to cover all states cannot be overemphasized.

Another source for feed data is the National Sample Survey Organization, which carried out a survey on the Livestock Economy in 1975/76 (30th round). This survey provided information on the use of grain feed per enterprise only in respect of dairying and poultry production. Given its limited focus, and somewhat dated nature, the results of this survey cannot be used in deriving current aggregate feed use. However, the Central Statistical Organisation is reported to be using these data in national income estimation after making suitable adjustments.

The National Council of Applied Economic Research conducted a special study of the socio-economic profile of rural households in the milksheds of Operation Flood in the year 1988/89. Commissioned by the National Dairy Development Board, it reports the average consumption of cereal feeds separately for crossbred cows, indigenous cows and buffaloes (Table 3).<sup>\*</sup> The

<sup>\*</sup> Based on the note published in the *Report of the Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics*, (Ministry of Agriculture, 1994).

**Table 3. Feeding of Milk Animals**  
(kilograms per day per animal)

	Cross-bred cows	Indigenous cows	Buffaloes	Overall
East	0.27 (16)	0.19 (62)	0.31 (22)	0.23 (100)
North	0.40 ( 9)	0.35 (28)	0.44 (63)	0.41 (100)
South	0.06 (23)	0.05 (29)	0.05 (48)	0.05 (100)
West	0.16 (10)	0.18 (29)	0.28 (61)	0.24 (100)
All India	(14)	(30)	(56)	0.25

*Note* : The data relate to the milkshed areas of Operation Flood only. Figures in brackets represent the percentage to total in each region.

average amounts of grain fed to milch animals vary widely: from 50 grams a day to buffaloes and cows in the South, to 440 grams to buffaloes in the North. Among the regions, the North had the highest feed use overall: 411 grams. Using the corresponding animal population figures as weights, the average feed is about 0.25 kilograms per animal per day. Applying this to the 52.8 million animals in milk (including milkshed and non-milkshed areas) as per the 1987 Livestock Census, the total works out to about 4.8 million tonnes of feedgrain. Because this average feed figure applies only to the milkshed areas of Operation Flood, it is likely that the total use overestimates the cereals fed to bovines in milk all across the country.

While I was at IFPRI, I looked at the feed question at the global level from another angle: what is the feedgrain requirement or the actual quantity used for producing one unit of output of livestock product? (This is different from the feeding rate, which is the quantity fed to an animal per day). Since livestock products are not homogeneous, the problem of aggregation arises. This may be resolved by defining Livestock Output Units (or LOU) as the sum of one-tenth of liquid milk, meat output, and the weight of eggs (using appropriate conversion factors). The amounts of grain used as feed were taken from the FAO Food Balance Sheets/Supply Utilization Accounts. These, divided by the Livestock Output Units yielded the Feeding Ratios.\* In 1980, the average

\* The labour output of draught and transport animals is not included in the LOU, though the quantity of grain fed to them is included in the numerator.

feeding ratio in developing countries (2.4) was only two-thirds that in developed countries. Within developing countries, the ratios ranged from 0.9 in Sub-Saharan Africa to 3.8 in North Africa and the Middle East (Table 4).

**Table 4. Livestock Feeding Ratios, 1980**  
(Cereal feed / Livestock Output Units)

Developing Countries	2.4
Asia	2.6
North Africa & Middle East	3.8
Sub-Saharan Africa	0.9
Latin America	2.2
Developed Countries	3.6
World	3.2

*Note:* Livestock Output Units are obtained by adding one-tenth of fluid milk, output of meat and the weight of eggs.

*Source:* J.S. Sarma, *Cereal Feed Use in the Third World: Past Trends and Projections to 2000* (Research Report no. 57, International Food Policy Research Institute, Washington, D.C., 1986).

For India, the total output of livestock and poultry products in 1987/88 works out 6.95 million tonnes in terms of LOUs (using the FAO meat output figures). The break-up is as follows:

	<i>Output</i>	<i>LOU</i>
Milk (million tonnes)	46.10	4.61
Meat (million tonnes)	1.63 <sup>n</sup>	1.63
Eggs (billion no.)	17.80	0.71(million tonnes)
Total in terms of LOUs		6.95(million tonnes)

*Note:* <sup>n</sup> relates to the calendar year.

Using an illustrative feeding ratio of 2, the total feed comes to 14 million tonnes in 1987/88, which would have formed 10 percent of the foodgrains output in that year.

It is interesting to compare this with what would be obtained using the conventional method of estimating feed use. Typically, an overall invariant factor of 12.5 percent of gross output is used as allowance for seed, feed and wastage. Thus, the net production of foodgrains is calculated as 87.5 percent

of total domestic output each year; and net availability is worked out after allowing for net imports/exports and changes in stocks with the government.

Conventionally, the overall allowance of 12.5 percent is supposed to comprise 5 percent for seed, 5 percent for feed and 2.5 percent as the allowance for wastage.\* Though crop-specific netting factors based on marketing surveys were in use in the 1940s, the convention of using 12.5 percent seems to have started in the 1950's. In the 1990s, however, it is hard to justify the unquestioned application of these percentages.

For instance, the utilization of grain for seed is determined by the area under different crops and the respective seed rates. These can be calculated easily. Changes over time occur when large diversions of area take place into, out of, or within the foodgrains (from coarse grains with lower seed rates to rice and wheat, which have higher seed rates). Even when technological developments result in the doubling or tripling of yields, the seed rate does not go up commensurately, if at all. Thus, in absolute terms, the amounts utilized for seed do not vary widely from year to year; to this extent the allowance for seed is today likely to be much smaller than 5 percent. Similarly, it is reasonable to expect that the allowance for wastage as a percentage of output has also been declining over time, with improvements in handling, transport and storage. With an invariant aggregate of 12.5 percent, the residual, representing the share of feed, would correspondingly increase.

In the early 1960s, 12.5 percent of a gross production of about 80 million tonnes would imply a seed-feed-wastage allowance of 10 million tonnes. Of this, 4 million tonnes would be accounted for by seed, 2 million tonnes by wastage, and 4 million tonnes for feed. By the early 1990s, 12.5 percent of 180 million tonnes would amount to 22.5 million tonnes. By the arguments given above, of this, perhaps not more than 5 million tonnes (2.8 percent) would be accounted for by seed (largely because of increased area under foodgrains), 4 to 5 million tonnes (2.2 to 2.8 percent) for wastage, leaving nearly 12 to 13 million tonnes as allowance for feed. This is close to the 14 million tonnes derived earlier using an alternative method.

However, both these approaches involve good measures of "gues[s]timates." Even a one million tonne difference in feedgrain utilization can have significant consequences. For example, each additional one million tonne of availability would have raised the per capita availability by 1.2 kilograms at the 1990's level of population.

\* Another source indicates the break up as 5.2 percent for seed, 2.3 percent for feed and 5 percent for wastage.



After a careful examination of the netting factors in use, Tyagi (1990) concluded that not more than 3 percent of the total production of foodgrains in the country was being used as feed. This would place the consumption at about 5 to 5.5 million tonnes at the most in the latter half of the eighties, far below the 12 to 14 million tonnes estimated above. He also worked out adjusted figures of per capita availability after correcting for the seed factor and improvements in rice milling. The adjusted figures are higher than unadjusted ones by 14 to 21 grams per day, or 5 to 7.5 kilograms per year from 1986 to 1988.

A study was conducted by the Techno-Economic Research Institute, on behalf of the Planning Commission, to investigate the feed, seed, and wastage rates in foodgrains in the region comprising Punjab, Haryana and Western Uttar Pradesh in 1986/87. According to their figures, not more than 3.4 percent of foodgrains output is fed to cattle and poultry in this region. The overall allowance for seed, feed and wastage was 10.3 percent (as distinct from the 12.5 percent generally used at the all-India level). The study was unfortunately not extended to the other states; and there is no basis for evaluating a priori whether the percentage of grain output fed to cattle and poultry in other states is higher or lower than 3.4 percent.

The only other data that are regularly available are those on the output of compound cattle and poultry feed which are published in the Annual Reports of the Compound Livestock Feed Manufacturer's Association of India. These data show a very rapid increase in output from about 210 thousand tonnes in 1970 to 2.16 million tonnes in 1990, a growth of about 12 percent a year (vide Table 5). During the next three years, output hovered around 2.2 to 2.4 million

Table 5. Output of Compound Concentrate Feeds  
(thousand tonnes)

Year	Cattle feed	Poultry feed	Total
1965	53.3	25.4	78.7
1970	125.4	84.3	209.7
1975	275.3	143.9	419.2
1980	549.9	350.2	900.1
1985	867.3	502.8	1370.1
1990	1327.5	833.7	2161.2
1991	1479.2	942.8	2422.0
1992	1454.2	805.6	2259.8
1993	1370.8	876.5	2247.3

Source : Annual Reports of the Compound Livestock Feed Manufacturer's Association of India and Dairy India Yearbook.

tonnes, a development attributed to high prices of maize. The cereal content of compound feed varies depending on the relative prices of the constituents. Separate data on these constituents are not published, but it is believed that coarse grains account for about 40 percent of poultry feed and about 10 percent of cattle feed.\* This would imply that over half a million tonnes of feedgrain were being used in the manufacture of these feeds alone. Further, these data relate to the output from the factories owned by members of the Association. In 1990, total output, including that of others was reported at about 4 million tonnes (Pandey, 1995).

### **Demand Projections for Feedgrain**

We are now in February 1996 and the twenty-first century is just five years ahead. It is time to look at what is likely to happen in the feedgrain sector in the next 5 to 15 years.

Demand projections for foodgrains for 2000 or beyond typically include a component of non-food uses. The demand for direct human consumption is worked out by estimating income elasticities of demand for various commodities, and by making alternative assumptions regarding per capita income growth and income distribution. Refinements in the estimation of elasticities are made by introducing elements such as calorie content, variety and taste explicitly into the estimated demand system. But when it comes to estimating non-food domestic demand including feed, the procedure taken is simply a short cut; only a fixed percentage allowance is made.

For instance, in the Eighth Five Year Plan, the human (direct) demand for foodgrains is obtained from "a two-stage nested behaviouristic consumption model where demand for foodgrains is estimated separately for rural and urban areas and within each area for people living below and above the poverty line using respective expenditure elasticities" (Planning Commission, 1995). To convert this into gross demand, the conventional netting factor of 12.5 percent is used, resulting in seed, feed and wastage demand amounting to 26 million tonnes in 1996/97.

Other authors, including Radhakrishna and Ravi, follow a similar practice. In a recent paper, Radhakrishna and Ravi (1990) estimated the demand for food in 2000 and 2010 based on a theoretically consistent model: the hierarchical Linear Expenditure System. However even they use a grossing factor of 1.143 to account for non-household demand. This is equivalent to a 12.5 percent

\* The National Commission on Agriculture recommended a 50 percent share for poultry feed and 25 percent share for cattle feed.

allowance for seed, feed and wastage applied to gross production. Their projections for 2000 thus amount to 205 million tonnes for household demand and 30 million tonnes for non-household demand.

Recognizing that the continued use of 12.5 percent for projecting the demand for future years would be inappropriate, the National Commission on Agriculture (1976), attempted to estimate the demand for seed, feed and wastage separately for the year 2000. With regard to feed, the numbers of different categories of animals and birds were first projected to 2000. Using the recommended feeding schedules, the requirements of concentrates, green fodder and dry fodder were then arrived at for each species of animals and birds, and then aggregated. The quantity thus computed was 82.81 million tonnes of concentrates. Of this the grain component was estimated at 24 million tonnes in 2000. It is important to emphasize that these are in the nature of normative figures, based on balanced and nutritious feeds for the animals and birds to achieve optimum efficiency. The National Commission on Agriculture made no claim that the feeding schedules were based on actual utilization data.

In 1990, Vasant Gandhi and I also had occasion to study the demand figures for seed, feed and wastage for the year 2000. The method we adopted consisted of estimating the growth in demand for livestock products under alternative income assumptions, and making the further assumption that the entire demand would be met from domestic production. The base year (1984/85) feeding ratio, that is, the quantity of feedgrains needed to produce one unit of livestock products was determined as 2.0. This was projected to rise to 2.4 in 2000 which is the average for developing countries in the eighties. The projected output of livestock products in 2000 in terms of LOUs was multiplied by the projected feeding ratio. Related to the projected income growth of 5 percent per annum, the demand for feedgrains in 2000 worked out to 27 million tonnes. Adding to this the demand for seed (5 million tonnes), allowance for waste (7.5 million tonnes) and industrial use (5 million tonnes), the aggregate works out to 44 million tonnes. Excluding the amount for industrial use, this would account for 18 percent of the projected output of 220 million tonnes for that year, far in excess of the 12.5 percent currently in use. The annual rate of growth in feed use worked out to around 6 per cent between 1985 and 2000.

Last year, Kumar, Rosegrant and Bouis (1994) basically followed the same approach except that they utilized the quantitative information on per capita consumption of meat and meat products obtained from the 43rd round of the NSS in estimating the total livestock output units. Further, they assumed that the feeding ratio applied to the concentrate feeds as a whole, of which the

share of grains was 51 percent. On this basis, their estimate of the demand for feedgrains in 2000 is 12.6 million tonnes. Adding to this the estimated demand for seed and allowance for wastage etc. the non-direct human demand works out to 27.3 million tonnes in 2000, or 13 percent of the projected gross output. G.S Bhalla considers these to be underestimates, and feels that the requirement for seed, feed and wastage would be in the neighbourhood of 35 to 37 million tonnes by the year 2000 or about 14.4 percent of gross output. Of this the feed requirements would be 20 to 22 million tonnes.

Even though I have presented only a few studies, it is clear that the demand projections for feedgrains vary widely: from 12.6 to 27 million tonnes. While my considered view is that the projected requirement may be nearer the higher figure, the wide range further serves to highlight the consequences of an inadequate statistical base.

The question that still remains to be answered is whether in India, the utilization of foodgrains as feed will rise as fast as in the newly industrializing economies of Asia. The answer appears to be: initially no—say during the next five or six years or so —, because as noted earlier, unlike those countries, the base level feed consumption is far too low in our country. But eventually, the situation will change, as the proportion of grain used as feed goes up.

Much depends on the income elasticities of demand. It is useful to think of the income elasticity of demand of total grains as a weighted average of those for food- and feed-grains, assuming that the elasticity of demand for the latter is identical to that of livestock products. As per capita incomes go up, while the elasticity of demand for foodgrains for direct consumption declines, that for feedgrains rises, and subsequently declines at higher incomes, but less rapidly. Though the base level share of feedgrains in the total food plus feedgrains is low, with sharply different elasticities, the combined weighted average elasticity changes—at first declining, then rising and eventually declining again. In the period when the average elasticity rises, the additional demand for feedgrains will go up rapidly (Mellor, 1982).

The available evidence suggests that even now the income elasticity of demand for livestock products is high—and higher in rural areas than in urban areas for most expenditure groups. For instance, as shown in Table 6, the income elasticity for milk in rural areas exceeds 2 for the poorer strata, and declines for richer people. Even in urban areas, the milk elasticity is greater than unity for three of four expenditure strata. The income elasticity for meat, eggs and fish is similarly greater than unity for all except the richest group. This implies

Table 6. Expenditure Elasticities of Demand

	Very Poor	Moderate Poor	Non-Poor Middle	Non-Poor Higher
<b>Rural</b>				
Milk & Milk Products	2.04	2.36	1.85	0.56
Meat, Eggs & Fish	1.16	1.47	1.20	0.62
Cereals & Cereal Substitutes	0.81	0.52	0.28	0.17
<b>Urban</b>				
Milk & Milk Products	1.76	1.83	1.17	0.64
Meat, Eggs & Fish	1.32	1.26	1.09	0.68
Cereals & Cereal Substitutes	0.88	0.36	0.07	0.07

Source: Government of India, The Planning Commission, Perspective Planning Division, *Report of the Study Group on Parameters of Consumption Sub-Model* (Delhi, 1991).

that the derived demand for feedgrains will increase rapidly with income growth, especially among the poorer sections of the population.

### Implications for Policy

Two factors constrain the demand for livestock products. Firstly, their perishability: because large areas of the country are in the tropical zone, development of proper infrastructure for refrigerated transport and storage is a pre-requisite for the development of the industry. Some progress has been made in this respect: for example, in the case of dairy products under Operation Flood, and to some extent with poultry. Added emphasis on infrastructure development is necessary in the subsequent five year plans.

The other factor that constrains the development of livestock products is relative prices. Feed costs account for a major share of the cost of production of meat and poultry products. As a consequence of the green revolution and the absence of appropriate technology for coarse grains, area under coarse grains declined, production rose more slowly, and relative prices increased, resulting in higher feed costs.\* The ratio of the Wholesale Price Index for poultry meat

\* Although there have been successes in some areas for maize, bajra and sorghum, their development has not been widespread.

with respect to that of poultry feed declined steadily over the decade ending in 1992/93.\* Appropriate steps are necessary to arrest the decline in relative prices. Put another way, if the demand for meat and related products increases rapidly, and if it is to be met from indigenous production, then more serious efforts will have to be made for the development of coarse grains, particularly maize, or else feedgrains will have to be imported—perhaps in exchange for rice and wheat.

Let me now turn to data needs, the issue most of interest to this audience. Indian agricultural statistics witnessed a golden era when Dr. Sukhatme and Dr. Panse did pioneering work in developing the methodology for carrying out large scale sample surveys on the output and costs of production of crops and livestock products. The Directorate of Economics and Statistics and the Animal Husbandry Statistics Unit in the Ministry of Agriculture took steps to ensure that these methods are adopted by the States. The National Sample Survey Organization was also entrusted with providing supervision and technical assistance to the states for the crop surveys. I am sorry to say that today, the overall situation regarding agricultural statistics seems to have deteriorated somewhat. The problems with crop surveys and rural development statistics were presented by Shri V.R. Rao (1993) at the Bhubaneswar session of the Society. However, action still remains to be taken on his suggestions.

In the sphere of livestock statistics, while sample surveys for estimating the production of milk and eggs are being organized in several states, the position with regard to meat is not satisfactory. Also, cost surveys on livestock and poultry products are being carried out only in a few states. The deterioration in the Indian Livestock Census is more glaring. Four states, Bihar, Punjab, West Bengal and Delhi, did not conduct the 1987 Livestock Census. The reference dates were delayed in many states: of the 31 states and union territories, only 13 had a reference date of 15-10-87 as prescribed; another 11 delayed the Census by one year and the remaining three conducted it only in 1989. Consequently, the finalization of the results was delayed, and the report was published only in 1992. The position of the Livestock Census due in 1992 seems to be even worse. The importance of ensuring complete coverage with a common reference period and speedy tabulation of results is obvious.

Urgent steps are necessary to determine the quantity of feeds used, and in particular, the amount of grain fed to livestock and poultry. There are several possibilities. First, surveys on cost of production of livestock and poultry

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\* Data taken from *Report of the Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics*, (Ministry of Agriculture, 1994).

products should be extended to cover the entire country so that data on feed rates could be used for determining total feed use. Secondly, feed data could be obtained periodically through the household surveys on the Livestock Economy as part of the National Sample Surveys. These data need to be supplemented with information on the feed use by non-household dairy and poultry enterprises. Thirdly, the information on feeds could also be obtained through the Comprehensive Scheme for cost of cultivation of crops by secondary tabulations and supplementary questionnaires, if necessary. These may have to be supplemented with information relating to feed use by animals and birds raised by landless livestock owners. Fourthly, special surveys and case studies should be undertaken for determining seed, feed and wastage rates on an all-India scale periodically.

Some of these approaches may take time to materialize; to meet immediate needs, however, I suggest that the Research Unit of the Indian Society of Agricultural Statistics take up a special project to collate the information that is already available to try and estimate more up-to-date percentage allowances for seed, feed and wastage. The project should also address itself to the methodological problems and the data gaps that need to be overcome.

A growing economy requires institutions capable of meeting its changing needs. This is as true of the agricultural statistics system as of other fields. We should not hide behind the excuse of inadequate financial or organizational constraints. The need is well-established; but things are not getting done. Perhaps we need crusaders of the calibre and vision of Dr. Panse to achieve this.

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