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ECONOMICS OF WHEAT "BHUSA"

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"Bhusa" is finely chopped straw of any cereal or pulse. Wheat *bhusa* is made from wheat straw with little additional cost, as straw is a by-product of wheat grain production. Grain is entirely consumed by human beings and straw goes for making *bhusa* which is a convenient bulk-feed for cattle in North India. In the western countries, especially in Canada and in the United States of America, where mechanical harvesting by combines is practised, straw is left in the fields to increase the organic matter content of the soil. Also, by limiting the amount of straw that goes into the machine, the efficiency of the machine is increased. Since most of the Indian soils lack organic matter and nitrogen, it is thought (and even advocated) that the Indian farmer should follow the technique of the West and leave a considerable portion of the straw in the field to enrich the soil. While this may be done in government and institutional farms where maximum profit is not the criterion for decision, can the Indian farmer afford to do this ?

India has a large number of livestock and the common bulk-feed is straw : wheat and barley straw in the North, rice straw in the South, West Bengal and the coastal regions, and stover (dried stalks) of millets elsewhere. Just for bulk, as a filler, straw is probably the cheapest feed. Stover is undoubtedly a better feed than straw, on the basis of feed value considering total digestible nutrients. However, as long as the village cow produces little milk, and the bullock does not need exacting nutritional requirements, *bhusa* can do well as a feed when supplemented by concentrate feeds like groundnut cake, linseed cake, *chuni*, etc. While one may not recommend the use of *bhusa* as feed for maximum production and scientific care of livestock, economics of minimum production may justify its use as a feed. *Bhusa* is also used in small quantities for other purposes, such as for making mud plaster for houses, for making bricks, etc. Apart from this consideration of utility, the Indian farmer, like his kind everywhere, bases his decisions on the immediate gain rather than possible increase in his income in the distant unknown future **unless** he is well convinced. It is therefore difficult to convince him, with the present level of production, that he should give up *bhusa* in anticipation of higher yield of grain which might result due to the addition of straw in the soil. His counterpart in the West produces wheat grain cheaply and gets a good profit for each unit of production, whereas the Indian farmer, because of several factors, produces wheat grain more expensively with the result his returns on wheat grain alone are small. The question therefore, arises whether under the present level of production he can rely on the income from the sale of grain only and discard part or all of the straw.

The following is a study of 14 years (1944-45 to 1957-58) of wheat production in an institutional farm in the U. P. While the data may not be applicable to the small farm of the Indian farmer, it raises certain broad issues. The average area under wheat for this period was 82.4 acres. It is generally believed that the ratio of wheat grain to straw is about 1:2 ; however, under actual field conditions several factors influence this ratio. The variety of the crop, fertility of the soil, the proportion of nitrogen to other elements of plant food like phosphorus and potash, moisture in the soil during the plant growth period, other climatic factors, method of harvesting wheat and the method of making *bhusa* will all affect

the ratio. Naturally one should expect a variation in the grain-*bhusa* ratio from year to year, even though the same variety of wheat is grown and the cultural practices are more or less uniform. For the 14-year period, out of the total production (in maunds), on the average 36 per cent was grain and 64 per cent was *bhusa*. That is, for every maund of grain raised, 1.78 maunds of *bhusa* was also produced. In the first five-year period under study, the production of *bhusa* was approximately two and three-fourth times that of grain, and for the rest of the period about one and a half times only. The average yield of grain for the first five years was 7.3 maunds, and for the rest of the period 15.3 maunds. It would appear, therefore, that the ratio might have been affected by the high yield of grain. Within these periods, however, there was no significant (linear) correlation between yield and the grain-*bhusa* ratio. It is therefore presumed that the change in the ratio might have been due to introduction of new varieties of wheat from 1949-50 and to other factors.

The yield of crop has an important bearing on the cost of production and returns. Generally speaking, the higher the yield per unit of production, the cheaper it is to raise one unit of the product. The average yield of grain for the 14-year period was 12.5 maunds per acre, and 21.8 maunds of *bhusa*. There was a greater variation in the yield of grain than that of *bhusa* : the coefficient of variability was 50.4 and 37.6 respectively. One would expect the yields of grain and *bhusa* to be related. For the 14-year period, the linear correlation coefficient "r" was 0.8 and the coefficient of determination, "r^2", was 0.6. In other words, there was only 60 per cent of association between the yield of grain and *bhusa*.

RECEIPTS

In contrast to production, when the receipts from grain and *bhusa* were considered, the ratio was almost reversed : 70 per cent of the receipt was obtained from grain, and only 30 per cent from *bhusa*. The average receipt from grain was Rs. 14.93 per maund, and from *bhusa*, Rs. 3.48 per maund. The maximum receipt for any one year was Rs. 18.50 per maund, and the minimum, Rs. 13.00 per maund. The maximum receipt received for *bhusa* was Rs. 5.10 per maund, and the minimum Rs. 2.00 per maund. Again, unlike production, the variation in the price received for grain was much less than that for *bhusa* : the coefficient of variability was 10.4 for grain as against 24.4 for *bhusa*. This relationship of receipts from grain and *bhusa* may be more vividly stated as follows : for every maund, if one rupee was received for grain, 23 naye Paise was received for *bhusa*. However, since for every one maund of grain produced, on the average 1.78 maunds of *bhusa* was also produced, it would be correct to say that for *every unit of production* (grain and *bhusa* taken together), if Rs. 1.00 was received for grain, 41 naye Paise was obtained in addition from *bhusa*. For many Indian farmers a good market for *bhusa* may not be available within marketable distance. It exists in all towns and cities where fodder is scarce and *bhusa* has the advantage of storability in quantity. Where no market for *bhusa* exists, it forms the main bulk-feed of the farmers' own cattle. Under such conditions, can the farmer afford to give up this additional income ? In the absence of *bhusa*, the farmer will have to incur additional expense for feed, or find alternate sources. Again will that be economical ?

COST OF PRODUCTION AND RETURNS

In the production of wheat grain and *bhusa* costs have been incurred jointly. In order to estimate costs and returns for grain and straw separately, certain assumptions are necessary. If *bhusa* is considered a by-product and no part of the cost is assigned to it, as is done in the United Kingdom, then the entire cost of production, except that incurred for chopping straw to make *bhusa*, should be charged to grain. On the above basis, the average cost of grain was Rs. 16.21 per maund. As the average receipt for grain was only Rs. 14.93 per maund, this would mean a loss of Rs. 1.28 per maund. It would appear that without the income from *bhusa*, grain did not pay for itself.

Since *bhusa* had a market, we may follow a second method, namely the market price of *bhusa* could be deducted from the total cost to obtain the net cost of production of grain. In other words, *bhusa* would be considered a by-product which reduces the cost of production of the main product, namely grain, by an amount for which it sells in the market. If this reasoning is followed, the average cost of production of grain was Rs. 12.72 per maund, resulting in a net return of Rs. 2.21 per maund for grain. The average credit from *bhusa* was Rs. 3.48 per maund. This amount would not be available for reducing the cost of production of grain, if straw were to be discarded.

Thirdly, recognizing the market for the two products, grain and *bhusa*, total costs may be apportioned according to the market value of these products. Using this method, which is commonly followed by many, the average cost of production of grain was Rs. 11.27 per maund, and of *bhusa*, Rs. 2.61 per maund. Accordingly the average net return for grain was Rs. 3.65 per maund and for *bhusa* Rs. 0.87 per maund. This return is 32 per cent of the cost for grain, and 33 per cent of the cost for *bhusa*. In other words, the return from *bhusa*, the by-product was equally good !

So far the discussion was based on "average" returns; however, fluctuations also must be considered. The coefficient of variability for the return from grain was 60 and that for *bhusa* 40. This means that the income from *bhusa* is not only considerable, as was stated earlier, but also dependable. The question therefore arises whether with such a good return from *bhusa* and with less fluctuation in profits, the Indian farmer can overlook *bhusa* and leave wheat straw in the field to enrich the soil.

This study has its limitations. The farm under study was located close to a city where there is a great demand for good quality *bhusa*. Also, quality grain was produced and most of it was sold to the Agriculture Department of the State as 'seed-wheat'; for which the price was based on harvest prices quoted at *Tahasil* headquarters, several miles away. This accounted for the rigidity in receipts. This peculiar situation may not exist to farmers located far away a marketable town. Further, in the discussion we have perhaps given an importance to *bhusa* as a feed which it does not deserve, although as indicated earlier *economics of minimum production* might justify our reasoning. Also it must be noted that with the present technique and levels of production, it is expensive to produce grain, and therefore, the farmer has to depend on additional income from subsidiary

products. If wheat grain could be produced cheaply as in the West, much of the argument for *bhusa* will not hold good. Lastly, if the primary consideration is to enrich the soil so as to boost the yield of grain, we have to consider also the question of *bhusa* applied **directly** to the soil, as against applying it **"through livestock"** in a converted form as manure. In this process of conversion, manure is probably enriched by other feed, especially concentrates. This, however, is another aspect of the problem which has to be carefully considered. In spite of these limitations, this study indicates the importance of *bhusa* in the present economy, and the need for further careful study before advocating the technique of the West to discard straw all together.

COSTS AND RETURNS FROM WHEAT AND "BHUSA"

1944-45 to 1957-58

No.	Year	Receipts		Cost of Production of Wheat Grain				Returns			
				Charging entire cost to Grain	Deducting receipts from *Bhusa*	Pro-rating costs on the basis of market value		1st Method Grain	2nd Method Grain	3rd Method Grain	
		Grain	*Bhusa*			Grain	*Bhusa*				*Bhusa*
		Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.
1.	1944-45	14.33	2.00	17.62	15.62	12.79	1.77	—3.29	—1.29	1.54	0.23
2.	1945-46	13.00	2.25	15.77	13.52	10.47	1.79	—2.77	—0.52	2.53	0.46
3.	1946-47	14.00	2.55	19.28	16.73	13.79	2.53	—5.28	—2.73	0.21	0.02
4.	1947-48	16.00	3.21	20.03	16.82	12.34	2.42	—4.03	—0.82	3.66	0.79
5.	1948-49	14.49	3.70	14.86	11.16	8.48	2.06	—0.37	3.33	6.01	1.64
6.	1949-50	15.00	5.10	17.81	12.71	11.45	4.11	—2.81	2.29	3.55	0.99
7.	1950-51	15.50	4.08	20.96	16.88	14.73	3.87	—5.46	—1.38	0.77	0.21
8.	1951-52	15.00	3.94	21.51	17.57	14.82	4.22	—6.51	—2.57	0.18	—0.28
9.	1952-53	18.50	3.79	18.38	14.59	14.46	2.83	0.12	3.91	3.94	0.96
10.	1953-54	15.00	3.47	14.79	11.52	11.11	2.57	0.21	3.68	3.89	0.90
11.	1954-55	12.00	2.73	8.98	6.26	6.77	1.54	3.02	5.75	5.23	1.19
12.	1955-56	14.26	4.13	11.06	6.93	8.13	2.35	3.20	7.33	6.13	1.78
13.	1956-57	15.50	3.86	10.57	6.71	7.59	1.90	4.93	8.79	7.91	1.96
14.	1957-58	16.50	3.95	15.28	11.33	10.82	2.60	1.22	5.17	5.68	0.35
	Average	14.93	3.48	16.21	12.72	11.27	2.61	—1.28	2.21	3.65	0.87
	St. Dev.	1.55	0 85			2.73	0.88			2.41	0.35
	Coeff. of Var.	10.4	24.4			24.2	33.7			66.0	40.2

Data from an institutional farm in the U.P.