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The Cultural Ecology of India's Sacred Cattle

by Marvin Harris

In this paper I attempt to indicate certain puzzling inconsistencies in prevailing interpretations of the ecological role of bovine cattle in India. My argument is based upon intensive reading—I have never seen a sacred cow, nor been to India. As a non-specialist, no doubt I have committed blunders an Indianist would have avoided. I hope these errors will not deprive me of that expert advice and informed criticism which alone can justify so rude an invasion of unfamiliar territory.

I have written this paper because I believe the irrational, non-economic, and exotic aspects of the Indian cattle complex are greatly overemphasized at the expense of rational, economic, and mundane interpretations.

My intent is not to substitute one dogma for another, but to urge that explanation of taboos, customs, and rituals associated with management of Indian cattle be sought in "positive-functioned" and probably "adaptive" processes of the ecological system of which they are a part,¹ rather than in the influence of Hindu theology.

Mismanagement of India's agricultural resources as a result of the Hindu doctrine of *ahimsa*,² especially as it applies to beef cattle, is frequently noted by Indianists and others concerned with the relation between values and behavior. Although different anti-rational, dysfunctional, and inutile aspects of the cattle complex are stressed by different authors, many agree that *ahimsa* is a prime example of how men

will diminish their material welfare to obtain spiritual satisfaction in obedience to nonrational or frankly irrational beliefs.

A sample opinion on this subject is here summarized: According to Simoons (1961:3), "irrational ideologies" frequently compel men "to overlook foods that are abundant locally and are of high nutritive value, and to utilize other scarcer foods of less value." The Hindu beef-eating taboo is one of Simoons' most important cases. Venkatraman (1938:706) claims, "India is unique in possessing an enormous amount of cattle without making profit from its slaughter." The Ford Foundation (1959:64) reports "widespread recognition not only among animal husbandry officials, but among citizens generally, that India's cattle population is far in excess of the available supplies of fodder and feed . . . At least 1/3, and possibly as many as 1/2, of the Indian cattle population may be regarded as surplus in relation to feed supply." Matson (1933:227) writes it is a commonplace of the "cattle question that vast numbers of Indian cattle are so helplessly inefficient as to have no commercial value beyond that of their hides." Srinivas (1952:222) believes "Orthodox Hindu opinion regards the killing of cattle with abhorrence, even though the refusal to kill the vast number of useless cattle which exist in India today is detrimental to the nation."

According to the Indian Ministry of Information (1957:243), "The large animal population is more a liability than an asset in view of our land resources." Chatterjee (1960) calculates that Indian production of cow and buffalo milk involves a "heavy recurring loss of Rs 774 crores. This is equivalent to 6.7 times the amount we are annually spending on importing food grains." Knight (1954:141) observes that because the Hindu religion teaches great reverence for the cow, "there existed a large number of cattle whose utility to the community did not justify economically the fodder which they consumed." Das and Chatterji (1962:120) concur: "A large number of cattle in India are old and decrepit and constitute a great burden on

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The present article, submitted to CURRENT ANTHROPOLOGY 2 iii 64, was sent for CA★ treatment to 49 scholars of whom the following responded with written comments: Nirmal K. Bose, Morton Klass, Joan P. Mencher, Kalervo Oberg, Marvin K. Opler, Wayne Suttles, and Andrew P. Vayda. The comments written for publication are printed in full after the author's text and are followed by a reply from the author.

¹ The author (1960) suggested that the term "adaptive" be restricted to traits, biological or cultural, established and diffused in conformity with the principle of natural selection. Clearly, not all "positive-functioned," i.e., useful, cultural traits are so established.

² *Abimsa* is the Hindu principle of unity of life, of which sacredness of cattle is principal sub-case and symbol.

an already impoverished land. This is due to the prejudice among the Hindus against cow killing." Mishra (1962) approvingly quotes Lewis (1955:106): "It is not true that if economic and religious doctrines conflict the economic interest will always win. The Hindu cow has remained sacred for centuries, although this is plainly contrary to economic interest." Darling (1934:158) asserts, "By its attitude to slaughter Hinduism makes any planned improvement of cattle-breeding almost impossible." According to Desai (1959:36), "The cattle population is far in excess of the available fodder and feeds."

In the *Report of the Expert Committee on the Prevention of Slaughter of Cattle in India* (Nandra, et al. 1955:62), the Cattle Preservation and Development Committee estimated "20 million uneconomic cattle in India." Speaking specifically of Madras, Randhawa (1961:118) insists, "Far too many useless animals which breed indiscriminately are kept and many of them are allowed to lead a miserable existence for the sake of the dung they produce. Sterility and prolonged dry periods among cows due to neglect add to the number of superfluous cattle..." Mamoria (1953:268-69) quotes with approval the report of the Royal Commission on Agriculture: "...religious susceptibilities lie in the way of slaughter of decrepit and useless cattle and hence the cattle, however weak and poor are allowed to live... bulls wander about the fields consuming or damaging three times as much fodder as they need... Unless the Hindu sentiment is abjured altogether the Indian cultivators cannot take a practical view of animal keeping and will continue to preserve animals many of which are quite useless from birth to death." Despite his own implicit arguments to the contrary, Mohan (1962:54) concludes, "We have a large number of surplus animals." The National Council of Applied Economic Research (1963:51) notes in Rajasthan: "The scarcity of fodder is aggravated by a large population of old and useless cattle which share scant feed resources with working and useful cattle."

The Food and Agriculture Organization (1953:109) reports, "In India, as is well-known, cattle numbers exceed economic requirements by any standard and a reduction in the number of uneconomic animals would contribute greatly to the possibilities of improving the quality and condition of those that remain." Kardel (1956:19) reported to the International Cooperation Administration, "Actually, India's 180 million cattle and 87 million sheep and goats are competing with 360 million people for a scant existence." According to Mosher (1946:124), "There are thousands of barren heifers in the Central Doab consuming as much feed as productive cows, whose only economic produce will be their hides, after they have died of a natural cause." Mayadas (1954:28) insists "Large herds of emaciated and completely useless cattle stray about trying to eke out an existence on wholly inadequate grazing." Finally, to complete the picture of how, in India, spirit triumphs over flesh, there is the assertion by Williamson and Payne (1959:137): "The... Hindu would rather starve to death than eat his cow."

In spite of the sometimes final and unqualified fashion in which "surplus," "useless," "uneconomic," and "superfluous" are applied to part or all of India's cattle, contrary conclusions seem admissible

when the cattle complex is viewed as part of an *eco-system* rather than as a sector of a national price market. Ecologically, it is doubtful that any component of the cattle complex is "useless," i.e., the number, type, and condition of Indian bovines do not per se impair the ability of the human population to survive and reproduce. Much more likely the relationship between bovines and humans is symbiotic³ instead of competitive. It probably represents the outcome of intense Darwinian pressures acting upon human and bovine population, cultigens, wild flora and fauna, and social structure and ideology. Moreover presumably the degree of observance of taboos against bovine slaughter and beef-eating reflect the power of these ecological pressures rather than *ahimsa*; in other words, *ahimsa* itself derives power and sustenance from the material rewards it confers upon both men and animals. To support these hypotheses, the major aspects of the Indian cattle complex will be reviewed under the following heading: (1) Milk Production, (2) Traction, (3) Dung, (4) Beef and Hides, (5) Pasture, (6) Useful and Useless Animals, (7) Slaughter, (8) Anti-Slaughter Legislation, (9) Old-Age Homes, and (10) Natural Selection.

MILK PRODUCTION

In India the average yield of whole milk per Zebu cow is 413 pounds, compared with the 5,000-pound average in Europe and the U.S.⁴ (Kartha 1936:607; Spate 1954:231). In Madhya Pradesh yield is as low as 65 pounds, while in no state does it rise higher than the barely respectable 1,445 pounds of the Punjab (Chatterjee 1960:1347). According to the 9th Quinquennial Livestock Census (1961) among the 47,200,000 cows over 3 years old, 27,200,000 were dry and/or not calved (Chaudri and Giri 1963:598).

These figures, however should not be used to prove that the cows are useless or uneconomic, since milk production is a minor aspect of the sacred cow's contribution to the *eco-system*. Indeed, most Indianists agree that it is the buffalo, not the Zebu, whose economic worth must be judged primarily by milk production. Thus, Kartha (1959:225) writes, "the buffalo, and not the Zebu, is the dairy cow." This distinction is elaborated by Mamoria (1953:255):

Cows in the rural areas are maintained for producing bullocks rather than for milk. She-buffaloes, on the other hand, are considered to be better dairy animals than cows. The male buffaloes are neglected and many of them die or are sold for slaughter before they attain maturity.

Mohan (1962:47) makes the same point:

For agricultural purposes bullocks are generally preferred,

³ According to Zeuner (1954:328), "Symbiosis includes all conditions of the living-together of two different species, provided both derive advantages therefrom. Cases in which both partners benefit equally are rare." In the symbiosis under consideration, men benefit more than cattle.

⁴ The U.S. Census of Agriculture (1954) showed milk production averaging from a low of 3,929 pounds per cow in the Nashville Basin sub-region to 11,112 pounds per cow in the Southern California sub-region.

and, therefore, cows in rural areas are primarily maintained for the production of male progeny and incidentally only for milk.

It is not relevant to my thesis to establish whether milk production is a primary or secondary objective or purpose of the Indian farmer. Failure to separate ends from means (Harris 1964) contributes greatly to confusion surrounding the Indian cattle question. The significance of the preceding quotations lies in the agreement that cows contribute to human material welfare in more important ways than milk production. In this new context, the fact that U.S. cows produce 20 times more milk than Indian cows loses much of its significance. Instead, it is more relevant to note that, despite the marginal status of milking in the symbiotic syndrome, 46.7% of India's dairy products come from cow's milk (Chatterjee 1960: 1347). How far this production is balanced by expenditures detrimental to human welfare will be discussed later.

TRACTION

The principal positive ecological effect of India's bovine cattle is in their contribution to production of grain crops, from which about 80% of the human calorie ration comes. Some form of animal traction is required to initiate the agricultural cycle, dependent upon plowing in both rainfall and irrigation areas. Additional traction for hauling, transport, and irrigation is provided by animals, but by far their most critical kinetic contribution is plowing.

Although many authorities believe there is an overall surplus of cattle in India, others point to a serious shortage of draught animals. According to Kothavala (1934:122), "Even with... overstocking, the draught power available for land operations at the busiest season of the year is inadequate..." For West Bengal, the National Council of Applied Economic Research (1962:56) reports:

However, despite the large number of draught animals, agriculture in the State suffers from a shortage of draught power. There are large numbers of small landholders entirely dependent on hired animal labour.

Spate (1954:36) makes the same point, "There are too many cattle in the gross, but most individual farmers have too few to carry on with." Gupta (1959:42) and Lewis and Barnouw (1958:102) say a pair of bullocks is the minimum technical unit for cultivation, but in a survey by Diskalkar (1960:87), 18% of the cultivators had only 1 bullock or none. Nationally, if we accept a low estimate of 60,000,000 rural households (Mittra 1963:298) and a high estimate of 80,000,000 working cattle and buffaloes (Government of India 1962:76), we see at once that the allegedly excess number of cattle in India is insufficient to permit a large portion, perhaps as many as $\frac{1}{3}$, of India's farmers to begin the agricultural cycle under conditions appropriate to their techno-environmental system.

Much has been made of India's having 115 head of cattle per square mile, compared with 28 per square mile for the U.S. and 3 per square mile for Canada. But what actually may be most characteristic of the size of India's herd is the low ratio

of cattle to people. Thus, India has 44 cattle per 100 persons, while in the U.S. the ratio is 58 per 100 and in Canada, 90 (Mamoria 1953:256). Yet, in India cattle are employed as a basic instrument of agricultural production.

Sharing of draught animals on a cooperative basis might reduce the need for additional animals. Chaudhri and Giri point out that the "big farmer manages to cultivate with a pair of bullock a much larger area than the small cultivators" (1963:596). But, the failure to develop cooperative forms of plowing can scarcely be traced to *ahimsa*. If anything, emphasis upon independent, family-sized farm units follows intensification of individual land tenure patterns and other property innovations deliberately encouraged by the British (Bhatia 1963:18 on). Under existing property arrangements, there is a perfectly good economic explanation of why bullocks are not shared among adjacent households. Plowing cannot take place at any time of the year, but must be accomplished within a few daylight hours in conformity with seasonal conditions. These are set largely by summer monsoons, responsible for about 90% of the total rainfall (Bhatia 1963:4). Writing about Orissa, Bailey (1957:74) notes:

As a temporary measure, an ox might be borrowed from a relative, or a yoke of cattle and a ploughman might be hired... but during the planting season, when the need is the greatest, most people are too busy to hire out or lend cattle.

According to Desai (1948:86):

... over vast areas, sowing and harvesting operations, by the very nature of things, begin simultaneously with the outbreak of the first showers and the maturing of crops respectively, and especially the former has got to be put through quickly during the first phase of the monsoon. Under these circumstances, reliance by a farmer on another for bullocks is highly risky and he has got, therefore, to maintain his own pair.

Dube (1955:84) is equally specific:

The cultivators who depend on hired cattle or who practice cooperative lending and borrowing of cattle cannot take the best advantage of the first rains, and this enforced wait results in untimely sowing and poor crops.

Wiser and Wiser (1963:62) describe the plight of the bullock-short farmer as follows, "When he needs the help of bullocks most, his neighbors are all using theirs." And Shastri (1960:1592) points out, "Uncertainty of Indian farming due to dependence on rains is the main factor creating obstacles in the way of improvements in bullock labor."

It would seem, therefore, that this aspect of the cattle complex is not an expression of spirit and ritual, but of rain and energy.

DUNG

In India cattle dung is the main source of domestic cooking fuel. Since grain crops cannot be digested unless boiled or baked, cooking is indispensable.

Considerable disagreement exists about the total amount of cattle excrement and its uses, but even the lowest estimates are impressive. An early estimate by Lupton (1922:60) gave the BTU equivalent of dung consumed in domestic cooking as 35,000,000 tons of coal or 68,000,000 tons of wood. Most detailed appraisal is by National Council of Applied Economic Research (1959:3), which rejects H. J. Bhabha's estimate of 131,000,000 tons of coal and the Ministry of Food and Agriculture's 112,000,000 tons. The figure preferred by the NCAER is 35,000,000 tons anthracite or 40,000,000 tons bituminous, but with a possible range of between 35-45,000,000 of anthracite dung-coal equivalent. This calculation depends upon indications that only 36% of the total wet dung is utilized as fuel (p. 14), a lower estimate than any reviewed by Saha (1956:923). These vary from 40% (Imperial Council on Agricultural Research) to 50% (Ministry of Food and Agriculture) to 66.6% (Department of Education, Health and Lands). The NCAER estimate of a dung-coal equivalent of 35,000,000 tons is therefore quite conservative; it is nonetheless an impressive amount of BTU's to be plugged into an energy system.

Kapp (1963:144 on), who discusses at length the importance of substituting tractors for bullocks, does not give adequate attention to finding cooking fuel after the bullocks are replaced. The NCAER (1959:20) conclusion that dung is cheaper than coke seems an understatement. Although it is claimed that wood resources are potentially adequate to replace dung the measures advocated do not involve *ahimsa* but are again an indictment of a land tenure system not inspired by Hindu tradition (NCAER 1959:20 on; Bansil 1958:97 on). Finally, it should be noted that many observers stress the slow burning qualities of dung and its special appropriateness for preparation of *ghi* and deployment of woman-power in the household (Lewis and Barnouw 1958:40; Mosher 1946:153).

As manure, dung enters the energy system in another vital fashion. According to Mujumdar (1960:743), 300,000,000 tons are used as fuel, 340,000,000 tons as manure, and 160,000,000 tons "wasted on hillsides and roads." Spate (1954:238) believes that 40% of dung production is spread on fields, 40% burned, and 20% "lost." Possibly estimates of the amount of dung lost are grossly inflated in view of the importance of "roads and hillsides" in the grazing pattern (see Pasture). (Similarly artificial and culture- or even class-bound judgments refer to utilization of India's night soil. It is usually assumed that Chinese and Indian treatment of this resource are radically different, and that vast quantities of nitrogen go unused in agriculture because of Hindu-inspired definitions of modesty and cleanliness. However, most human excrement from Indian villages is deposited in surrounding fields; the absence of latrines helps explain why such fields raise 2 and 3 successive crops each year (Mosher 1946:154, 33; Bansil 1958:104.) More than usual caution, therefore, is needed before concluding that a significant amount of cattle dung is wasted. Given the conscious premium set on dung for fuel and fertilizer, thoughtful control maintained over grazing patterns (see Pasture), and occurrence of specialized sweeper and gleaner

castes, much more detailed evidence of wastage is needed than is now available. Since cattle graze on "hillsides and roads," dung dropped there would scarcely be totally lost to the *eco-system*, even with allowance for loss of nitrogen by exposure to air and sunlight. Also, if any animal dung is wasted on roads and hillsides it is not because of *ahimsa* but of inadequate pasturage suitable for collecting and processing animal droppings. The sedentary, intensive rainfall agriculture of most of the subcontinent is heavily dependent upon manuring. So vital is this that Spate (1954:239) says substitutes for manure consumed as fuel "must be supplied, and lavishly, even at a financial loss to government." If this is the case, then old, decrepit, and dry animals might have a use after all, especially when, as we shall see, the dung they manufacture employs raw materials lost to the culture-energy system unless processed by cattle, and especially when many apparently moribund animals revive at the next monsoon and provide their owners with a male calf.

BEEF AND HIDES

Positive contributions of India's sacred cattle do not cease with milk-grazing, bullock-producing, traction, and dung-dropping. There remains the direct protein contribution of 25,000,000 cattle and buffalo which die each year (Mohan 1962:54). This feature of the *eco-system* is reminiscent of the East African cattle area where, despite the normal taboo on slaughter, natural deaths and ceremonial occasions are probably frequent enough to maintain beef consumption near the ecological limit with dairying as the primary function (Schneider 1957:278 on). Although most Hindus probably do not consume beef, the *eco-system* under consideration is not confined to Hindus. The human population includes some 55,000,000 "scheduled" exterior or untouchable groups (Hutton 1961:VII), many of whom will consume beef if given the opportunity (Dube 1955:68-69), plus several million more Moslems and Christians. Much of the flesh on the 25,000,000 dead cattle and buffalo probably gets consumed by human beings whether or not the cattle die naturally. Indeed, could it be that without the orthodox Hindu beef-eating taboo, many marginal and depressed castes would be deprived of an occasional, but nutritionally critical, source of animal protein?

It remains to note that the slaughter taboo does not prevent depressed castes from utilizing skin, horns and hoofs of dead beasts. In 1956 16,000,000 cattle hides were produced (Randhawa 1962:322). The quality of India's huge leather industry—the world's largest—leaves much to be desired, but the problem is primarily outmoded tanning techniques and lack of capital, not *ahimsa*.

PASTURE

The principal positive-functioned or useful contributions of India's sacred cattle to human survival and well-being have been described. Final evaluation of their utility must involve assessment of energy

costs in terms of resources and human labor input which might be more efficiently expended in other activities.

Direct and indirect evidence suggests that in India men and bovine cattle do not compete for existence. According to Mohan (1962:43on):

... the bulk of the food on which the animals subsist... is not the food that is required for human consumption, i.e., fibrous fodders produced as incidental to crop production, and a large part of the crop residues or by-products of seeds and waste grazing.

On the contrary, "the bulk of foods (straws and crop residues) that are ploughed into the soil in other countries are converted into milk" (p. 45).

The majority of the Indian cattle obtain their requirements from whatever grazing is available from straw and stalk and other residues from human food-stuffs, and are starved seasonally in the dry months when grasses wither.

In Bengal the banks and slopes of the embankments of public roads are the only grazing grounds and the cattle subsist mainly on paddy straw, paddy husks and... coarse grass... (Mamoria 1953:263-64).

According to Dube (1955:84, "... the cattle roam about the shrubs and rocks and eat whatever fodder is available there." This is confirmed by Moomaw (1949:96): "Cows subsist on the pasture and any coarse fodder they can find. Grain is fed for only a day or two following parturition." The character of the environmental niche reserved for cattle nourishment is described by Gourou (1963:123), based on data furnished by Dupuis (1960) for Madras:

If faut voir clairement que le faible rendement du bétail indien n'est pas un gaspillage: ce bétail n'entre pas en concurrence avec la consommation de produits agricoles... ils ne leur sacrifient pas des surfaces agricoles, ou ayant un potentiel agricole.

NCAER (1961: 57) confines this pattern for Tripura: "There is a general practice of feeding livestock on agricultural by-products such as straw, grain wastes and husks"; for West Bengal (NCAER 1962: 59): "The state has practically no pasture or grazing fields, and the farmers are not in the habit of growing green fodders... livestock feeds are mostly agricultural by-products"; and for Andhra Pradesh (NCAER 1962: 52): "Cattle are stall-fed, but the bulk of the feed consists of paddy straw..."

The only exceptions to the rural pattern of feeding cattle on waste products and grazing them on marginal or unproductive lands involve working bullocks and nursing cows:

The working bullocks, on whose efficiency cultivation entirely depends, are usually fed with chopped bananas at the time of fodder scarcity. But the milch cows have to live in a semi-starved condition, getting what nutrition they can from grazing on the fields after their rice harvest (Gangulee 1935:17).

At present cattle are fed largely according to the season. During the rainy period they feed upon the grass which springs up on the *uncultivated* hillsides.... But in the dry season there is hardly any grass, and cattle wander on the *cropless* lands in an often halfstarved condition. True there is some fodder at these times in the shape of rice-straw and dried copra, but it is not generally sufficient, and is furthermore given mainly to the animals

actually *working* at the time (Mayer 1952:70, italics added).

There is much evidence that Hindu farmers calculate carefully which animals deserve more food and attention. In Madras, Randhawa, et al. (1961:117) report: "The cultivators pay more attention to the male stock used for ploughing and for draft. There is a general neglect of the cow and the female calf even from birth..."

Similar discrimination is described by Mamoria (1953: 263 on):

Many plough bullocks are sold off in winter or their rations are ruthlessly decreased whenever they are not worked in full, while milch cattle are kept on after lactation on poor and inadequate grazing... The cultivator feeds his bullocks better than his cow because it pays him. He feeds his bullocks better during the busy season, when they work, than during the slack season, when they remain idle. Further, he feeds his more valuable bullocks better than those less valuable... Although the draught animals and buffaloes are properly fed, the cow gets next to nothing of stall feeding. She is expected to pick up her living on the bare fields after harvest and on the village wasteland....

The previously cited NCAER report on Andhra Pradesh notes that "Bullocks and milking cows during the working season get more concentrates..." (1962: 52). Wisner and Wisner (1963: 71) sum up the situation in a fashion supporting Srinivas' (1958:4) observation that the Indian peasant is "nothing if he is not practical":

Farmers have become skillful in reckoning the minimum of food necessary for maintaining animal service. Cows are fed just enough to assure their calving and giving a little milk. They are grazed during the day on lands which yield very little vegetation, and are given a very sparse meal at night.

Many devout Hindus believe the bovine cattle of India are exploited without mercy by greedy Hindu owners. *Ahimsa* obviously has little to do with economizing which produces the famous *phooka* and *doom dev* techniques for dealing with dry cows. Not to Protestants but to Hindus did Gandhi (1954:7) address lamentations concerning the cow:

How we bleed her to take the last drop of milk from her, how we starve her to emaciation, how we ill-treat the calves, how we deprive them of their portion of milk, how cruelly we treat the oxen, how we castrate them, how we beat them, how we overload them... I do not know that the condition of the cattle in any other part of the world is as bad as in unhappy India.

USEFUL AND USELESS ANIMALS

How then, if careful rationing is characteristic of livestock management, do peasants tolerate the widely reported herds of useless animals? Perhaps "useless" means 1 thing to the peasant and quite another to the price-market-oriented agronomist. It is impossible at a distance to judge which point of view is ecologically more valid, but the peasants could be right more than the agronomists are willing to admit.

Since non-working and non-lactating animals are thermal and chemical factories which depend on waste lands and products for raw materials, judgment that a particular animal is useless cannot be supported without careful examination of its owner's household budget. Estimates from the cattle census which equate useless with dry or non-working animals are not convincing. But even if a given animal in a particular household is of less-than-marginal utility, there is an additional factor whose evaluation would involve long-range bovine biographies. The utility of a particular animal to its owner cannot be established simply by its performance during season or an animal cycle. Perhaps the whole system of Indian bovine management is alien to costing procedures of the West. There may be a kind of low-risk sweepstakes which drags on for 10 or 12 years before the losers and winners are separated.

As previously observed, the principal function of bovine cows is not their milk-producing but their bullock-producing abilities. Also established is the fact that many farmers are short of bullocks. Cows have the function primarily to produce male offspring, but when? In Europe and America, cows become pregnant under well-controlled, hence predictable, circumstances and a farmer with many animals, can count on male offspring in half the births. In India, cows become pregnant under quite different circumstances. Since cows suffer from malnutrition through restriction to marginal pasture, they conceive and deliver in unpredictable fashion. The chronic starvation of the inter-monsoon period makes the cow, in the words of Mamoria (1953:263), "an irregular breeder." Moreover, with few animals, the farmer may suffer many disappointments before a male is born. To the agriculture specialist with knowledge of what healthy dairy stock look like, the hot weather herds of walking skeletons "roaming over the bare fields and dried up wastes" (Leake 1923:267) must indeed seem without economic potential. Many of them, in fact, will not make it through to the next monsoon. However, among the survivors are an unknown number still physically capable of having progeny. Evidently neither the farmer nor the specialist knows which will conceive, nor when. To judge from Bombay city, even when relatively good care is bestowed on a dry cow, no one knows the outcome: "If an attempt is made to salvage them, they have to be kept and fed for a long time. Even then, it is not known whether they will conceive or not" (Nandra, *et al.* 1955:9).

In rural areas, to judge a given animal useless may be to ignore the recuperative power of these breeds under conditions of erratic rainfall and unpredictable grazing opportunities. The difference of viewpoint between the farmer and the expert is apparent in Moomaw's (1949) incomplete attempt to describe the life history of an informant's cattle. The farmer in question had 3 oxen, 2 female buffaloes, 4 head of young cattle and 3 "worthless" cows (p. 23). In Moomaw's opinion, "The three cows . . . are a liability to him, providing no income, yet consuming feed which might be placed to better use." Yet we learn, "The larger one had a calf about once in three years"; moreover 2 of the 3 oxen were "raised" by the farmer himself. (Does this mean that they were

the progeny of the farmer's cows?) The farmer tells Moomaw, "The young stock get some fodder, but for the most part they pasture with the village herd. The cows give nothing and I cannot afford to feed them." Whereupon Moomaw's *non sequitur*: "We spoke no more of his cows, for like many a farmer he just keeps them, without inquiring whether it is profitable or not" (p. 25).

The difficulties in identifying animals that are definitely uneconomic for a given farmer are reflected in the varying estimates of the total of such animals. The Expert Committee on the Prevention of Slaughter of Cattle estimated 20,000,000 uneconomic cattle in India (Nandra, *et al.* 1953:62). Roy (1955:14) settles for 5,500,000, or about 3.5%. Mamoria (1953:257), who gives the still lower estimate of 2,900,000, or 2.1%, claims most of these are males. A similarly low percentage—2.5%—is suggested for West Bengal (NCAER 1962:56). None of these estimates appears based on bovine life histories in relation to household budgets; none appears to involve estimates of economic significance of dung contributions of older animals.

Before a peasant is judged a victim of Oriental mysticism, might it not be well to indicate the devastating material consequences which befall a poor farmer unable to replace a bullock lost through disease, old age, or accident? Bailey (1957:73) makes it clear that in the economic life of the marginal peasantry, "Much the most devastating single event is the loss of an ox (or a plough buffalo)." If the farmer is unable to replace the animal with one from his own herd, he must borrow money at usurious rates. Defaults on such loans are the principal causes of transfer of land titles from peasants to landlords. Could this explain why the peasant is not overly perturbed that some of his animals might turn out to be only dung-providers? After all, the real threat to his existence does not arise from animals but from people ready to swoop down on him as soon as one of his beasts falters. Chapekar's (1960:27) claim that the peasant's "stock serve as a great security for him to fall back on whenever he is in need" would seem to be appropriate only in reference to the unusually well-established minority. In a land where life expectancy at birth has only recently risen to 30 years (Black 1959:2), it is not altogether appropriate to speak of security. The poorest farmers own insufficient stock. Farm management studies show that holdings below 2/3 of average area account for 2/5 of all farms, but maintain only 1/4 of the total cattle on farms. "This is so, chiefly because of their limited resources to maintain cattle" (Chaudhri and Giri 1963:598).

SLAUGHTER

Few, if any, Hindu farmers kill their cattle by beating them over the head, severing their jugular veins or shooting them. But to assert that they do not kill their animals when it is economically important for them to do so may be equally false. This interpretation escapes the notice of so many observers because the slaughtering process receives recognition only in euphemisms. People will admit that they "neglect" their animals, but will not openly accept

responsibility for the *etic* effects, i.e., the more or less rapid death which ensues. The strange result of this euphemistic pattern is evidenced in the following statement by Moomaw (1949:96): "All calves born, however inferior, are allowed to live until they die of neglect." In the light of many similar but, by Hindu standards, more vulgar observations, it is clear that this kind of statement should read, "Most calves born are not allowed to live, but are starved to death."

This is roughly the testimony of Gourou (1963:125), "Le paysan conserve seulement les veaux qui deviendront boeufs de labour ou vaches laitières; les autres sont écartés . . . et meurent d'épuisement." Wisner and Wisner (1963:70) are even more direct:

Cows and buffaloes too old to furnish milk are not treated cruelly, but simply allowed to starve. The same happens to young male buffaloes . . . The males are unwanted and little effort is made to keep them alive.

Obviously, when an animal, undernourished to begin with, receives neither food nor care, it will not enjoy a long life (compare Gourou 1963:124). Despite claims that an aged and decrepit cow "must be supported like an unproductive relative, until it dies a natural death" (Mosher 1946:124), ample evidence justifies belief that "few cattle die of old age"⁵ (Bailey 1957:75). Dandekar (1964:352) makes the same point: "In other words, because the cows cannot be fed nor can they be killed, they are neglected, starved and left to die a 'natural' death."

The farmer culls his stock by starving unwanted animals and also, under duress, sells them directly or indirectly to butchers. With economic pressure, many Indians who will not kill or eat cows themselves:

are likely to compromise their principles and sell to butchers who slaughter cows, thereby tacitly supporting the practice for other people. Selling aged cows to butchers has over the centuries become an accepted practice alongside the *mos* that a Hindu must not kill cattle (Roy 1955:15).

Determining the number of cattle slaughtered by butchers is almost as difficult as determining the number killed by starvation. According to Dandekar (1964:351), "Generally it is the useless animals that find their way to the slaughter house." Lahiry (n.d.:140) says only 126,900 or .9% of the total cattle population is slaughtered per year. Darling (1934:158) claims:

All Hindus object to the slaughter and even to the sale of unfit cows and keep them indefinitely . . . rather than sell them to a cattle dealer, who would buy only for the slaughter house, they send them to a *gowshala* or let them loose to die. Some no doubt sell secretly, but this has its risks in an area where public opinion can find strong expression through the *panchayat*.

⁵ Srinivas (1962:126) declared himself properly skeptical in this matter: "It is commonly believed that the peasant's religious attitude to cattle comes in the way of the disposal of useless cattle. Here again, my experience of Rampura makes me skeptical of the general belief. I am not denying that cattle are regarded as in some sense sacred, but I doubt whether the belief is as powerful as it is claimed to be. I have already mentioned that bull-buffaloes are sacrificed to village goddesses. And in the case of the cow, while the peasant does not want to kill the cow or bull himself he does not seem to mind very much if someone else does the dirty job out of his sight."

Such views would seem to be contradicted by Sinha (1961:95): "A large number of animals are slaughtered privately and it is very difficult to ascertain their numbers." The difficulty of obtaining accurate estimates is also implied by the comment of the Committee on the Prevention of Slaughter that "90% of animals not approved for slaughter are slaughtered stealthily outside of municipal limits" (Nandra, *et al.* 1955:11).

An indication of the propensity to slaughter cattle under duress is found in connection with the food crisis of World War II. With rice imports cut off by Japanese occupation of Burma (Thirumalai 1954:38; Bhatia 1963:309 on), increased consumption of beef by the armed forces, higher prices for meat and food-stuffs generally, and famine conditions in Bengal, the doctrine of *ahimsa* proved to be alarmingly ineffectual. Direct military intervention was required to avoid destruction of animals needed for plowing, milking, and bullock-production:

During the war there was an urgent need to reduce or to avoid the slaughter for food of animals useful for breeding or for agricultural work. For the summer of 1944 the slaughter was prohibited of: 1) Cattle below three years of age; 2) Male cattle between two and ten years of age which were being used or were likely to be used as working cattle; 3) All cows between three and ten years of age, other than cows which were unsuitable for bearing offspring; 4) All cows which were pregnant or in milk (Knight 1954:141).

Gourou (1963:124-25), aware that starvation and neglect are systematically employed to cull Indian herds, nonetheless insists that destruction of animals through starvation amounts to an important loss of capital. This loss is attributed to the low price of beef caused by the beef-eating taboo, making it economically infeasible to send animals to slaughter. Gourou's appraisal, however, neglects deleterious consequences to the rural tanning and carrion-eating castes if increased numbers of animals went to the butchers. Since the least efficient way to convert solar energy into comestibles is to impose an animal converter between plant and man (Cottrell 1955), it should be obvious that without major technical and environmental innovations or drastic population cuts, India could not tolerate a large beef-producing industry. This suggests that insofar as the beef-eating taboo helps discourage growth of beef-producing industries, it is part of an ecological adjustment which maximizes rather than minimizes the calorie and protein output of the productive process.

ANTI-SLAUGHTER LEGISLATION AND GOWSHALAS

It is evident from the history of anti-slaughter agitation and legislation in India that more than *ahimsa* has been required to protect Indian cattle from premature demise. Unfortunately, this legislation is misinterpreted and frequently cited as evidence of the anti-economic effect of Hinduism. I am unable to unravel all the tangled economic and political interests served by the recent anti-slaughter laws of the

Indian states. Regardless of the ultimate ecological consequences of these laws, however, several points deserve emphasis. First it should be recalled that cow protection was a major political weapon in Gandhi's campaign against both British and Moslems. The sacred cow was the ideological focus of a successful struggle against English colonialism; hence the enactment of total anti-slaughter legislation obviously had a rational base, at least among politicians who seized and retained power on anti-English and anti-Moslem platforms. It is possible that the legislation will now backfire and upset the delicate ecological balance which now exists. The Committee on the Prevention of Slaughter claimed that it

actually saw in Pepsu (where slaughter is banned completely) what a menace wild cattle can be. Conditions have become so desperate there, that the State Government have got to spend a considerable sum for catching and re-domesticating wild animals to save the crops (Nandra, *et al.* 1955:11).

According to Mayadas (1954:29):

The situation has become so serious that it is impossible in some parts of the country to protect growing crops from grazing by wandering cattle. Years ago it was one or two stray animals which could either be driven off or sent to the nearest cattle pound. Today it is a question of constantly being harassed day and night by herds which must either feed on one's green crops, or starve. How long can this state of affairs be allowed to continue?

Before the deleterious effects of slaughter laws can be properly evaluated, certain additional evolutionary and functional possibilities must be examined. For example, given the increasing growth rate of India's human population, the critical importance of cattle in the *eco-system*, and the absence of fundamental technical and environmental changes, a substantial increase in cattle seems necessary and predictable, regardless of slaughter legislation. Furthermore, there is some indication, admittedly incomplete but certainly worthy of careful inquiry, that many who protest most against destructiveness of marauding herds of useless beasts may perceive the situation from very special vantage points in the social hierarchy. The implications of the following newspaper editorial are clear:

The alarming increase of stray and wild cattle over wide areas of Northern India is fast becoming a major disincentive to crop cultivation . . . Popular sentiment against cow slaughter no doubt lies at the back of the problem. People prefer to let their aged, diseased, and otherwise useless cattle live at the expense of *other people's crops* (Indian Express, New Delhi, 7 February 1959, italics added).

Evidently we need to know something about whose crops are threatened by these marauders. Despite post-Independence attempts at land reform, 10% of the Indian agricultural population still owns more than ½ the total cultivated area and 15,000,000, or 22%, of rural households own no land at all (Mitra 1963: 298). Thorner and Thorner (1962:3) call the land reform program a failure, and point out how "the grip of the larger holder serves to prevent the lesser folk from developing the land . . ." Quite possibly, in other words, the anti-slaughter laws, insofar as

they are effective, should be viewed as devices which, contrary to original political intent, bring pressure to bear upon those whose lands are devoted to cash crops of benefit only to narrow commercial, urban, and landed sectors of the population. To have one's cows eat other people's crops may be a very fine solution to the subsistence problem of those with no crops of their own. Apparently, in the days when animals could be driven off or sent to the pound with impunity, this could not happen, even though *ahimsa* reigned supreme then as now.

Some form of anti-slaughter legislation was required and actually argued for, on unambiguously rational, economic, and material grounds. About 4% of India's cattle are in the cities (Mohan 1962:48). These have always represented the best dairy stock, since the high cost of feeding animals in a city could be offset only by good milking qualities. A noxious consequence of this dairy pattern was the slaughter of the cow at the end of its first urban lactation period because it was too expensive to maintain while awaiting another pregnancy. Similarly, and by methods previously discussed, the author calf was killed after it had stimulated the cow to "let down." With the growth of urban milk consumption, the best of India's dairy cattle were thus systematically prevented from breeding, while animals with progressively poorer milking qualities were preserved in the countryside (Mohan 1962:48; Mayadas 1954: 29; Gandhi 1954:13 on). The Committee on the Prevention of Slaughter of Cattle (Nandra, *et al.* 1955:2) claimed at least 50,000 high-yielding cows and she-buffaloes from Madras, Bombay, and Calcutta were "annually sent to premature slaughter" and were "lost to the country." Given such evidence of waste and the political potential of Moslems being identified as cow-butchers and Englishmen as cow-eaters (Gandhi 1954:16), the political importance of *ahimsa* becomes more intelligible. Indeed, it could be that the strength of Gandhi's *charisma* lay in his superior understanding of the ecological significance of the cow, especially in relation to the underprivileged masses, marginal low caste and out caste farmers. Gandhi (p. 3) may have been closer to the truth than many a foreign expert when he said:

Why the cow was selected for apotheosis is obvious to me. The cow was in India the best companion. She was the giver of plenty. Not only did she give milk but she also made agriculture possible.

OLD-AGE HOMES

Among the more obscure aspects of the cattle complex are bovine old-age homes, variously identified as *gowshalas*, *pinjrapoles*, and, under the Five-Year Plans, as *gosadans*. Undoubtedly some of these are "homes for cows, which are supported by public charity, which maintain the old and derelict animals till natural death occurs" (Kothavala 1934:123). According to Gourou (1963:125), however, owners of cows sent to these religious institutions pay rent with the understanding that if the cows begin to lactate they will be returned. The economics of at least some of these "charitable" institutions is, therefore, perhaps

not as quaint as usually implied. It is also significant that, although the 1st Five-Year Plan called for establishment of 160 *gosadans* to serve 320,000 cattle, only 22 *gosadans* servicing 8,000 cattle were reported by 1955 (Government of India Planning Commission 1956:283).

NATURAL SELECTION

Expert appraisers of India's cattle usually show little enthusiasm for the typical undersized breeds. Much has been made of the fact that 1 large animal is a more efficient dung, milk, and traction machine than 2 small ones. "Weight for weight, a small animal consumes a much larger quantity of food than a bigger animal" (Marmorio 1953:268). "More dung is produced when a given quantity of food is consumed by one animal than when it is shared by two animals" (Ford Foundation 1959:64). Thus it would seem that India's smaller breeds should be replaced by larger, more powerful, and better milking breeds. But once again, there is another way of looking at the evidence. It might very well be that if all of India's scrub cattle were suddenly replaced by an equivalent number of large, high-quality European or American dairy and traction animals, famines of noteworthy magnitude would immediately ensue. Is it not possible that India's cattle are undersized precisely because other breeds never could survive the atrocious conditions they experience most of the year? I find it difficult to believe that breeds better adapted to the present Indian *eco-system* exist elsewhere.

By nature and religious training, the villager is unwilling to inflict pain or to take animal life. But the immemorial grind for existence has hardened him to an acceptance of survival of the fittest (Wiser and Wiser 1963).

Not only are scrub animals well adapted to the regular seasonal crises of water and forage and general year-round neglect, but long-range selective pressures may be even more significant. The high frequency of drought-induced famines in India (Bhatia 1963) places a premium upon drought-resistance plus a more subtle factor: A herd of smaller animals, dangerously thinned by famine or pestilence, reproduces faster than an equivalent group of larger animals, despite the fact that the larger animal consumes less per pound than 2 smaller animals. This

is because there are 2 cows in the smaller herd per equivalent large cow. Mohan (1962:45) is one of the few authorities to have grasped this principle, including it in defense of the small breeds:

Calculations of the comparative food conversion efficiency of various species of Indian domestic livestock by the writer has revealed, that much greater attention should be paid to small livestock than at present, not only because of their better conversion efficiency for protein but also because of the possibilities of bringing about a rapid increase in their numbers.

CONCLUSION

The probability that India's cattle complex is a positive-functioned part of a naturally selected *eco-system* is at least as good as that it is a negative-functioned expression of an irrational ideology. This should not be interpreted to mean that no "improvements" can be made in the system, nor that different systems may not eventually evolve. The issue is not whether oxen are more efficient than tractors. I suggest simply that many features of the cattle complex have been erroneously reported or interpreted. That Indian cattle are weak and inefficient is not denied, but there is doubt that this situation arises from and is mainly perpetuated by Hindu ideology. Given the techno-environmental base, Indian property relationships, and political organization, one need not involve the doctrine of *ahimsa* to understand fundamental features of the cattle complex. Although the cattle population of India has risen by 38,000,000 head since 1940, during the same period, the human population has risen by 120,000,000. Despite the anti-slaughter legislation, the ratio of cattle to humans actually declined from 44:100 in 1941 to 40:100 in 1961 (Government of India 1962:74; 1963:6). In the absence of major changes in environment, technology or property relations, it seems unlikely that the cattle population will cease to accompany the rise in the human population. If *ahimsa* is negative-functioned, then we must be prepared to admit the possibility that all other factors contributing to the rapid growth of the Indian human and cattle populations, including the germ theory of disease, are also negative-functioned.

Abstract

The relationship between human and bovine population in India has hitherto been widely regarded as an important example of resource mismanagement under the influence of religious doctrine. It is suggested that insufficient attention has been paid to such positive-functioned features of the Hindu cattle complex as traction power and milk, dung, beef and hide production in relationship to the costs of ecologically viable alternatives. In general, the exploitation of cattle re-

sources proceeds in such a way as not to impair the survival and economic well-being of the human population. The relationship between the human and bovine population is symbiotic rather than competitive; more traction animals than are presently available are needed for carrying out essential agricultural tasks. Under existing techno-environmental conditions, a relatively high ratio of cattle to humans is ecologically unavoidable. This does not mean, that with altered techno-environmental conditions, new and more efficient food energy systems cannot be evolved.

Comments

By NIRMAL K. BOSE★

Calcutta, India. 30 iii 65

I find myself very much in agreement with Professor Harris' thesis. Cattle serve many purposes for the Indian peasant, and the sacredness ascribed to the cow springs from its utility rather than from the tradition of *ahimsa*. According to Rājendralāla Mitra (1881:354-88), beef-eating was common in ancient India. It was only in later times that a firm tabu was established against this as food and cattle began to be regarded as extraordinarily sacred.

There is perhaps 1 point at which I can possibly make a useful comment. On p. 58, Harris says: "... it should be recalled that cow protection was a major political weapon in Gandhi's campaign against both the British and the Moslems." This is perhaps not quite correct.

Cow protection was as much a part of Gandhi's "constructive programme" as, say, the removal of untouchability. This was not a political demand. There was much to be done for the improvement of the cow; and if it had to be protected against useless slaughter, it had to be made once more a real part of our economic wealth, so that those who slaughtered cattle for meat would also find it reasonable to "protect" the cow. This was a call for internal reform, rather than a political demand directed either against the British or Moslems.

But this is no more than a minor slip. Harris breaks substantially new ground, and I congratulate him on that account.

By MORTON KLASS★

New York, N.Y., U.S.A. 1 iv 65

Many Indianists may find it necessary to correct or amend some of Harris' interpretations. I would doubt, for example, whether the concept of *ahimsa*—in either its traditional religious or contemporary political usage—can adequately account for the Hindu reluctance to kill and eat representatives of the subfamily *Bovinae*. Such questions, however, have no bearing on Harris' thesis, with which I find myself in agreement, that the Indian ecosystem provides, in principle and in fact, for adaptive and efficient utilization of cattle power and products.

Implicit, of course, is a question of considerable importance to contem-

porary anthropological theorists. Is it possible for a culture to exist and perpetuate itself with a dysfunctional ecosystem—in which beliefs and practices directly inhibit an efficient and economic utilization of resources? Those who would argue for such a possibility have now been deprived, by Harris, of their Indian "sacred cow" example. And if the utilization of the cow is indeed eufunctional, then it would be difficult not to conclude that the Indian ecosystem *in toto* is inherently eufunctional: it must provide for maximal utilization of resources available in the given cultural context, in all aspects of production, distribution, and consumption. How could it be otherwise, indeed, given the duration of the culture, the extent of the civilization, and the density of the population?

On the other hand, can we reject all the expert testimony of Indianists (many of them in fact Indians) to the effect that the contemporary Indian ecosystem exhibits a high degree of inefficiency and even economic "irrationality"? I believe that Harris is correct in his analysis and others in their observations, but that there is no necessary paradox. The observers are concerned with present-day India, with an ecosystem that reflects a millenium or more of massive culture contact, including conquest and the forcible imposition of alien principles of sociopolitical and economic organization, as well as the more subtle infiltration of alien values and alternatives. Harris, however, is analyzing the classic ecosystem, the socioeconomic practices as they once were—and, perhaps, still are, if we could but see beyond the contemporary trauma and dislocation.

Thus, for example, protein deficiency is a very real problem in India today, and it would be easy to argue that Indian dietary beliefs and practices only aggravate the problem. But Harris directs our attention, by implication, to the classic ecosystem wherein protein was provided for all, in the form of milk for those at the very top and in the form of carrion beef for those at the very bottom. Many factors may have contributed to the present condition of economic inefficiency; not the least of the factors, however, was the acculturation of new values. In the past, high caste Hindus may have found the eating of carrion at least as repugnant as the eating of beef *per se*, but such repugnance would not normally lead to actual interference with the beliefs and practices of lower-caste people. It would seem, therefore, that some of the current under-utilization of available beef in India reflects the imposition of European-derived beliefs and values: specifically, the belief that if a prac-

tice (e.g., carrion-eating) is wrong, then it is wrong for *all*. Similarly, Harris notes the importance of human excrement—traditionally deposited, by village-folk, in the fields—for agriculture in India. Today, community development workers, who claim to be concerned primarily with the improvement of agricultural production, make enormous efforts to introduce latrines into reluctant villages. The impetus—a feeling that all human excrement must be decently interred—would appear to be of European derivation. As in the case of the Northwest Coast Amerindian potlatch, the intrinsic eufunctionalism of the Indian ecosystem has become obscured by the dislocations of massive contact, and the appearance presented is one of un-economic inefficiency.

Is it, however, also an "irrational" ecosystem? The concept "rational ecosystem" is an unrewarding one to work with: the underlying criteria are often vague or culture-bound. It would appear to be true, however, that most of the processual interrelationships within the Indian ecosystem are unrecognized—frequently even evaded or rejected—by those who participate directly in the system. Harris, for example, notes that "the slaughtering process receives recognition only in euphemism," and that some Indian writers appear to avoid the obvious implication of "neglect": i.e., that in this ecosystem unwanted cattle are disposed of by starving them to death. I noted instances of similar "euphemistic" avoidance of process during my own fieldwork in Bengal. A dead cow or bullock is delivered by the farmer to a low-caste scavenger with instructions to "bury it." The farmer is perfectly aware that the scavenger sells hides and eats carrion beef, but still he can report, in all honesty, that he "buries" his dead cattle. Press him, and the farmer will declare plaintively that he does not associate with low-caste people and is not responsible for their misdeeds.

The same farmer explains that he would never castrate a bull calf or permit any of his employees to perform the act. He buys bullocks in the market when he requires them for agriculture. Of course, he sells his unwanted bull calves in the same market! He cannot see—does not want to see—that farmers such as himself provide the bullocks that farmers such as himself require. Thus, if the Indian ecosystem is eufunctional in its utilization of cattle, as Harris argues, its functioning must be termed *latent* rather than *manifest*.

All of the foregoing arise out of reflections on Harris' paper, for I find his argument not only cogent but stimulating. I expect it will lead to much meaningful discussion and research.

Ithaca, N.Y., U.S.A. 29 iii 65

This article by Dr. Harris makes a most important contribution to the study of the interrelationship between ecological and socioreligious systems in complex societies, as well as to Indian studies in general. In the course of my 3½ years of work in India, I have always been struck by the common sense and practicality of the Indian farmer despite the tendency on the part of many educated city dwellers to deplore the "rule of religion over economics."

I would certainly agree that the cattle complex in India has been adaptive to the ecological system of which it is a part, and that "the degree of observance of taboos against bovine slaughter and beef-eating reflect the power of ecological pressures." I should like to confine my discussion to 2 points. I should like, on the one hand, to present certain data in support of Harris' main argument and, on the other hand, to comment on certain of the difficulties arising today in relation to the cattle complex because of the changes in the ecosystem during the past 200 years.

In his discussion of milk production and traction, Harris notes that there is often a shortage of draught animals. He also discusses what happens to useless cattle and how laws about slaughter operate. The following data, admittedly limited, from Chingleput District, in the northern part of Madras State, which is said to have a larger amount of cattle than other parts of the State (National Council of Applied Economic Research 1962 1:35-36) seems to support many of his contentions. For 1 Firka in this District in 1946, of 6,171 oxen over the age of 3 years, 95% worked in the fields as draught animals, .7% were used primarily as stud animals, and an additional 4% worked in the fields as well as being used as stud animals. Only .3% of the males were not used for either purpose. On the other hand, among the cows, 68% had calves, and an additional 31% had had calves during the previous 3 or 4 years. Of those which had calves more than half were still giving milk. It is striking that the ratio of males to females under the age of 3 years was 945:856, whereas among the total cattle population the ratio of males to females was 7,116:4,362. Clearly, something must have happened to the females who stopped having calves and yet were unfit for agricultural work. It is interesting that for buffaloes, whose economic worth is judged primarily by milk production, though males are occasionally used to draw a plow if a farmer has no bullocks, the total proportion of males to females was 1,436:

1,766. Obviously, excess males must have somehow been eliminated.

For 1 village in this Firka for which more data is available, in 1946 and also in 1963 there was not a single male ox over 3 years of age which did not work in the fields. In this village, in 1946 there were 298 working oxen and 49 working male buffaloes. This was exactly 9 more than had been in the same village in 1912. The number of cows increased by 10 during this 33-year period, but the number of female buffaloes decreased by 30. In 1912, there were 187 plows in the village for 1,103 acres of paddy land. If each man owning a plow also owned 2 bullocks, then there would have been 374 bullocks in the village. According to the 1895 *Statistical Atlas for the Madras Presidency*, the number of acres tilled by 1 team of cattle in the relatively flat Conjeevaram Taluk to which this village then belonged was 8 acres. It is striking that the number of bullocks and male buffaloes came to 338, or only 38 more than the optimum that would have been employed if a team of bullocks was used for no less than 8 acres. Obviously, at least in this village, many small cultivators who owned plows had to borrow someone else's bullocks for plowing or else had to join with other men in some sort of informal cooperative endeavor if they were to get their plowing done. It is significant that in this village, despite the increase in partition of property and, therefore, in the number of small landowners, there was only an increase of 9 in the number of working animals. Even today, during the plowing season as well as during the harvest when they are needed to pull the carts from the fields, there is a clearly expressed shortage of draught cattle. (There is some indication that this is not the case throughout the District, because the 1962 Atlas lists 45 draught animals per 100 acres for Chingleput District; however, this includes the rockier areas as well as the suburbs of Madras City, where a larger number of draught animals are used for bullock carts.)

It has been stated by 1 historian that the increase during the past 200 years in the amount of land under cultivation has been accompanied by a decrease in the cattle herds. Thus Habib says in his discussion of the agrarian system of Mughal India 1963: (53-57)

Where the 17th century peasant enjoyed a distinctly superior position to his descendant of today was in respect to cattle and draught animals. From what we know about the extent of cultivation during that period, it is obvious that the land available for grazing... was far greater in extent than now... The larger number of working cattle per head of population is...

better demonstrated by the obvious plentitude of... ghi... the reckless encroachments on grazing and forest lands, in the environment of a moribund economy, have caused a dangerous crisis in animal husbandry, which in a country, where cattle power is used to drag the plough and work the waterlift, must be regarded pre-eminently as a pillar of agriculture.

In this connection, I would hasten to say that plow bullocks are not underemployed; during the periods when plowing can be done, they may often be overworked. I have seen farmers try to vary the time of plowing slightly by taking as much advantage as possible of slight differences in the soil, in the slope of the land, and the type of seed to be sown.

During the past 200 years, and particularly during the past 50 years, the traditional ecosystem has started to change radically. Public health practices have greatly altered the demographic picture. Settlement on former "waste" and forest lands and DDT spraying have made changes in the system. However, they still have not been sufficient to cause any basic changes in the human-bovine symbiotic relationship. True, the large increase in the human population and decrease in grazing lands might be 1 cause of the greater malnutrition among present-day cattle, but still, cattle remain essential for modern Indian agriculture. I remember 1 middle-class farmer who had bought a tractor for paddy cultivation. He used it 1 season, but found that it was less reliable on many accounts and, significantly, cost him more to operate and maintain than bullocks. Still, he tried it out for 1 more year. Now the tractor sits in splendor in his courtyard while his fields are cultivated by traditional means. It is clear that other changes in the agricultural system must precede any change in the basic ecological adaptation, if they are to be successful.

From this point of view, one might say that the religious concept of *ahimsa* plus the veneration of the cow as a sacred animal is functionally interrelated with the traditional ecological system. The parts are certainly interwoven into a complex texture, but it belies common sense to expect a change in the ideology as long as the traditional ecosystem remains functional.

By KALERVO OBERG

Ithaca, N.Y., U.S.A. 29 iii 65

Professor Marvin Harris has presented an important paper, not only by analysing the pertinent pragmatic aspects of the traditional Hindu cattle complex as an integrated ecological

system, but also by indicating the significance of this approach for the interpretation of certain aspects of culture. Not being an Indianist nor an expert concerning Hindu cattle-keeping, I have to accept his factual data as correct.

First, he shows the inappropriateness of judging Hindu cattle-keeping in terms of the commercialized cattle industry of the West, where cattle are raised to produce dairy products and beef, enterprises in which input or cost is for the purpose of maximizing productivity in terms of pounds of milk or pounds of beef per animal. When the yield in milk begins to decline or when the beef animal has reached maximum weight with a given feed input, the animals are disposed of at a maximum profit. To the Hindu peasant, in contrast, the cow plays a central role in his household economy, crop production being well-nigh impossible without the cow and its products.

Harris then goes on to show that in Hindu peasant economy, a cow is a multipurpose animal. Among its positive contributions he lists milk, traction power in the form of bullocks, fuel, fertilizer, hides, and beef. Milk, although important, is secondary to traction power upon which cereal production depends. Instead of cattle being surplus and useless, there is actually a shortage of bullocks. His most telling point is in stressing the ecological relationship between cattle and man. The relationship is symbiotic instead of competitive. Cattle live on the by-products of cereal production, such as straw, hulls, and stubble, and graze on non-arable hills and along roadsides. American livestock specialists call this kind of low cost or practically no cost cattle-keeping a "scavenger operation." Just like the Western cattle-keeper, the Hindu peasant maximizes output in relation to input, but he does it in a different way; for the longer a cow lives, the more bullocks, fuel, and fertilizer it will produce, and when the cow ultimately dies the owner gets the hide and the untouchables eat the meat. To the Westerner, short-lived cattle are high cost consumer goods produced for maximum money profit; to the Hindu peasant, a cow is more of a capital asset which, once acquired, continues to pay necessary material dividends to the end of its life at a very low maintenance cost.

If this is true, the ban on killing and eating cattle is an ideological device to protect a capital asset, a measure which can be understood in ecological and economic terms. This measure, sanctioned by religion, can be considered as emphasizing the great value of cattle in Hindu life and the manner in which they must be used. The

Bahima cattle-keepers of western Uganda, while having no taboo against eating beef, have an injunction against killing cows. This can readily be understood as a device to protect the calf-producing capacity of cows in a pastoral economy where, in the past, diseases and animal and human raiders took a heavy toll of cattle herds.

In every traditional society, religion sanctions the age-old ways. In India, religion sanctifies the family and the caste system as well as agricultural and cattle-keeping practices. But religion does not explain their form as adaptive mechanisms to living conditions. The Hindu philosophical concept of the unity of life and the proscription against killing any animal or eating any kind of meat belong, I think, to a different level of human adjustment to the external world. By personally diminishing struggle, pain, and death, the devout Hindu strives to make peace with his environment, tries to break the tension between self and non-self with the ultimate aim of reaching complete unity in the absolute. This is a commendable aspiration, but in its ultimate form it takes man away from society and makes a devout Hindu a holy man, a holy beggar divorced from economic and political activities.

I think Harris has opened up a new and rewarding approach to the study of economic and social relations by stressing the need for an intensive study of the concrete measurable factors of positive adaptive processes. In his *Patterns of Race in the Americas* (1964) I think he was successful in showing that the different forms in which race relations in the Western world have developed relate to the central problem of labor supply which faced the European settlers of the New World rather than to the Iberic soul or the inherent racism of the Anglo-Saxon. Similarly he has been able to explain the Indian cattle complex without deriving it from *ahimsa*.

By MARVIN K. OPLER*

Buffalo, N.Y., U.S.A. 27 ii 65

My comment might be titled "Cultural Ecology Reflects Cultural Evolution," because Harris links this specific study of cultural ecology with his brilliantly perceptive paper of 1959, *The Economy Has No Surplus?* with one the year following on biological and cultural adaptations (1960), and with his recent book analyzing the "emic" and "etic" considerations (1964a). I happen to have a personal preference for avoiding such terms as "ecosystem," or "emic" and "etic" controversy, or even the term, "cultural ecology," when the latter is used without evolutionary modifiers, be-

cause to my mind the evolutionary modifiers are the whole point of the theoretical discussion. Besides this, I find that ecology has unfortunate spatial and geophysical connotations, and as Harris himself concludes: "...with altered techno-environmental conditions, new and more efficient food energy systems" would be *evolved*.

In short, I am profoundly grateful for each of the previous 3 contributions of Harris, and for the present one in particular. Were he commenting on land use, rather than Indian cattle usage, I imagine he would find as does Kusum Nair's *Blossoms in the Dust* (1961) that land development projects in this country do not usually find people thinking in terms of expanded acreage in anything resembling the extent of Western technicians. Nair subtitled her book "The Human Factor in Indian Development" which more correctly might be the cultural factor. Like Harris I wish area specialists and anthropological theoreticians would more often base economic analyses on human energy computations (considering technology), on biophysical realities, on assessments of the social organization of production, or in sum, on knowledge of the conditions under which technological and economic factors operate, with due regard for these *cultural conditions of existence*. Harris is to be commended for his efforts in this direction, for his quantitative and realistic documentation of economics cross-culturally as essentially "cultural things."

Having paid homage to the tough-minded and discerning scholarship in Harris' economic anthropology, let me point out that this paper, and that on surplus 6 years earlier, add to energy utilization theory the idea that *how* items in economy are used depends on interplay between 1 item, in this instance cattle, and other aspects. Just as technology and its efficiency varies, so also do agriculture and animal husbandry. I recall, as a student, hearing that Kwakiutl were merely fishing and hunting level, yet had chiefs, commoners, and slaves; and then noting in Diamond Jenness that the salmon spawning was like a seasonal crop rising in the waters to be gathered by clubs. To accounts of fierce rivalry between chiefs was added, even in Boas' account of the *numaym* of chiefs, commoners, and slaves, a picture of economic and social in-group cooperativeness; and Boas himself indicated that rivalry in potlatching had been historically preceded by actual warfare between chiefs for favorite coastal and riverine fishing sites. Not merely a crop, but relatively stable methods of preservation (smoking) were involved in this fishing industry, plus occasional surpluses of candlefish

oil and sea mammals. By the time the quantities of yams rotting in Trobriand yam-houses were added to the "conspicuous waste" version of Kwakiutl economics, I reacted not only as Harris did in the paper on surplus, but added the search through Malinowski's many-volume prose which netted the information that richer districts of Kiriwina not only had greater activity in the coastal and inland trade, not only related to overseas *kula* trade more vigorously, but had chiefly lines which varied clanship and mother's brother authority to frankly patrilineal descent.

These are instances of micro-evolution, for which Paiute-Ute, Hopi, and Aztec; or Eastern Apache, Western Apache, Navajo, etc., stand as historically attested evolutionary series on a more macroscopic level. As in the example of India, technology is important and with it the relationship of 1 item in the economy to others. Similarly, social control of productive resources must be considered, along with degrees of development of total forces of production. What Harris specifies as degrees of control over climatic, seasonal, and other ecological forces I should prefer to trace through into a system of socioeconomic control, removing ecology from the usual geophysical or crudely environmental connotations which play so limited a role. In view of his rich socioeconomic and cultural documentation, I should recommend he drop the word "ecology" or add the cultural modifier, best labeled "evolutionary."

For Harris' central criticism of the claim that India's animal or agricultural resources have been "mis-managed" for doctrinal or philosophico-religious reasons, no anthropologist, in this day and age, could have reasonable objection. We hasten to add that Henry Zimmer's studies of the sensuous and wordly in Hindu art (see Opler 1956), the philosopher Dale Riepe's more recent work on the materialistic and rational concerns in India's traditional philosophies (1961), or the historical mathematician's genuine respect for Indian contribu-

tions and sophistication suffice to place art and ideology in a more correct perspective. Ideology is a part of cultural adaptation and is, therefore, responsive to socioeconomic factors. "Mismanagement" is an individually aimed, pejorative term. My own statement (1960) is: "However, the approach through the individual is not, statistically, the study of normative culture or necessarily a study of its characteristic ranges of behavior. Even more important, in anthropology, the material conditions under which a culture operates constitute the setting and the *binding conditions* affecting this *range of behavior*."

By WAYNE SUTTLES*

Reno, Nev., U.S.A. 30 iii 65

Harris' paper may surely stand as a model for the balanced ecological approach, which seeks to examine all activities and all their consequences—advantageous and disadvantageous—for all participants in the eco-system. It is also commendable in that it clearly rejects the implication that if a practice is "positive-functional" (or "adaptive") then it must be perfect—the best possible solution to the problem. As Mayr (1959:3-4) has pointed out, natural selection is not an "all-or-none phenomenon." The positive functions (adaptive consequences) of *ahimsa* need only slightly outweigh the negative ones for *ahimsa* to be favored by natural selection. Harris has shown that they very likely do. He has not, of course, asserted flatly that *ahimsa* must have been diffused and established throughout the Hindu population by the process of natural selection, though this does seem likely. Perhaps present and future experiments in Indian agriculture will eventually give us the data we need to make such an assertion. Finally, I do not see any claim in Harris' paper that environment or economy *produced* the doctrine of *ahimsa*. Thus he is not, in any sense that I can see, taking a position of environmental

determinism or economic determinism. Presumably the doctrine arose, as all do, out of human speculation and human emotion, and presumably it has always been in competition with other doctrines. What Harris has shown is how in the Indian setting the doctrine may have won out in that competition because behaviors motivated by it have more often than not had consequences promoting human survival.

By ANDREW P. VAYDA*

New York, N.Y., U.S.A. 26 iii 65

Harris provides us with good grounds for questioning conventional judgments of the management of food resources in India, and I am very much in sympathy with his attempt to view the Indian use of cattle as a product of "Darwinian pressures." It seems unfortunate to me, however, that Harris is at pains to dismiss the influence of *ahimsa* instead of inquiring whether the doctrine itself has adaptive value. It is, at the very least, a reasonable hypothesis that part of the selective process in human evolution is the emergence of beliefs and moral valuations conducive to behavior that helps populations to survive and, at times, to expand. In line with such a hypothesis, anthropological research can be directed to ascertaining whether beliefs that are irrational by the ethnocentric standards used by market-price-oriented agronomists are less so by the biological standards of survival and differential reproduction.

I add 1 small point: there does not seem to be much warrant for the adjective "cultural" in Harris' title. His paper discusses organisms (human, bovine, etc.) in interaction with one another and with their non-living environments. This is just plain ecology, and the general concepts and principles to which Harris has recourse are for the most part as applicable to other species as they are to culture-bearing man.

Reply

By MARVIN HARRIS

Although Klass appears to support the view that the Indian cattle system is "eufunctional," he nonetheless remains unconvinced that existing dietary beliefs and practices do not aggravate the protein deficiency which all would agree is one of India's major problems. To resolve this contradiction, Klass suggests that in former times, milk and meat utilizations were more nearly

optimal than at present. Diffusion, especially of new values, has diminished the economic efficiency of the system, bringing about an "under-utilization" of available beef. I cannot readily accept this explanation of the inconsistencies exposed by my paper, since the arguments presented all add up to a denial of the proposition that cattle are in general under-utilized. I should want to examine Klass's evidence for the under-utilization of cattle as a source of meat protein, keeping in view

the many additional and sometimes contradictory functions which must also be fulfilled by the bovine population. It would also be interesting in this respect to compare the patterns of utilization of beef cattle in other under-developed countries. Brazil for example, has no taboo against beef-eating (not even on Fridays) and has one of the world's largest cattle populations, but there is a protein deficiency in the lower classes which is as bad as that suffered by lower caste Indians.

This suggests to me that mere removal of the negative values surrounding beef-eating might not make much of an improvement in the Indian diet. Indeed, it is explicit in my argument that if beef-eating were to be encouraged, a decrease rather than an increase in the over-all efficiency of protein utilization should be expected.

It is most interesting that Mencher also points out that in former times—possible as recently as 50 years ago—the ecological balance in India was more favorable to the welfare of both men and cattle. Unlike Klass, however, Mencher explains the changes without appealing to an “acculturation of new values.” Instead, she emphasizes the changing demographic picture brought about by the filling up of former waste and grazing lands and the consequent failure of the cattle population to keep pace with the growth in the human population. Her opportune data help to support my hunch that cow protection is the ideological issue it is today precisely because the human population has increased faster than the cattle population. Going back in time, we should expect less and less overt concern with cow protection until finally we reach the situation alluded to by Bose, when a higher ratio of cattle per capita made beef-eating a commonplace.

I should like to make it clear that the ecologically positive contribution of the beef-eating taboo is not emphasized in the text under discussion, because in the larger issue before us, namely the role of ideology in socio-cultural evolution, the majority of anthropologists need no convincing that values are important for understanding economic systems. Indeed, many appear to be firmly convinced that the crucial differences between Northern European and Indian agriculture are mainly under the control of differences embodied in the contrast between Hinduism and Protestantism. It has not hitherto seemed feasible to offer explanations of the Indian cattle complex which would relegate Hindu theology to an importance consistent with neo-materialist premisses. In arguing for the positive-functioned and possibly adaptive significance of the Indian cattle complex, my ultimate concern was to show how the material conditions of technology and habitat possibly suffice to explain the principal features of the productive processes characteristic of contemporary Indian agriculture. Klass, judging from his appeal to the possible effect of diffused values, remains unimpressed by the analytic advantages of neo-materialism.

More difficult to comprehend is the reaction of Vayda who, despite a pre-

dilection for stressing techno-environmental phenomena, asserts that I have “dismissed the influence of *ahimsa*” instead of enquiring about its “adaptive” value. This opinion cannot derive from careful reading of my paper since it is obvious therein that *ahimsa* or related values make positive-functioned, if not “adaptive” contributions in at least 5 respects: (1) safeguarding milking and traction breeds; (2) preservation of temporarily dry or barren but still useful animals; (3) prevention of growth of energy-expensive beef industry; (4) protection of cattle which fatten in public domain or at landlord’s expense; (5) protection of herd’s recovery potential during famines. Although I did fail to suggest explicitly that these positive effects are to some extent products of *ahimsa*, it is self-evident that in so far as one regards cattle protection as useful, one must also regard as useful the ideology which supports cattle protection. Oberg experienced none of Vayda’s difficulties as evidenced by his clearly stated conclusion that “the ban on killing cattle is an ideological device to protect a capital asset.”

To claim that *ahimsa* makes positive contributions to the ecosystem is not to be confused with the claim that this doctrine in all of its unique Hindu elaboration is an essential feature of the basic productive system. On the contrary, I have tried to show that the major features of the ecosystem are derived from the interaction of a given type of technology with a given type of habitat. In my opinion there were and are relatively few viable alternatives to the observed ratio of men to cattle; on the other hand, it would appear that an ideology appropriate to the maintenance of such a ratio need not be restricted to the content furnished by the ritual and belief of Hinduism.

It is perhaps this picture of a rather loose relationship between the basic techno-environmental formula and the specific creeds known as *ahimsa* which provides the basis for Suttles’ observation that my position is not that of “environmental determinism or economic determinism.” In so far as I propose that culture, (especially technological equipment and productive processes) is as important as habitat, I clearly wish not to be associated with any strictly geographical environmentalism. On the other hand, I would definitely prefer not to be removed from the ranks of economic determinism. The notion of socio-cultural causality which I believe both Suttles and I would recommend is epistemologically more sophisticated than the old, perfectly predictable causality of the Laplacian world view. It is in

vulgar terms, a matter of probabilities whether a given techno-environmental base will “cause” or determine a given type of ideology. Naturally, this probability diminishes in proportion to the degree of detail with which the content of the ideology is specified. One may cease on this account to be a determinist in the old sense, perhaps to become a “probabilist.” If so, then it is economic probabilism which first and foremost appears to me worthwhile. That is, I share with all economic determinists the conviction that in the long run and in most cases, ideology is swung into line by material conditions—by the evolution of techno-environmental and production relationships. The recent history of the social sciences demonstrates that to reverse this relationship, or to lose sight of it in the forest of positivistic eclecticism is, in effect, to abandon the search for the lawful processes which govern socio-cultural evolution.

Vayda’s 2nd suggestion, namely that I dispense with the word “cultural” in “cultural ecology,” does not necessarily deserve a fuller response than space permits. I agree that the understanding of a given ecosystem involves anthropological and non-anthropological ecologists in an examination of the same set of factors and relationships. However, man does not play an important role in all ecosystems. Perhaps the phrase should be “human ecology”; but it still seems useful to emphasize for the benefit of non-anthropologists that as man interacts with his environment, his cultural conditioning constitutes an immensely more significant parameter than is true of other organisms. Vayda, however, must surely be more puzzled than I am over Opler’s suggestion that we drop the word “ecology” rather than “cultural.” Opler’s point made with what I take to be courteous indirection, is that there is little new in the method which I advocate, since the conditions emphasized in the name of cultural ecology have always been important in cultural-evolutionary studies. To this I would rejoin, “Yes, but not enough.”

Finally, a comment on Bose’s proposal for removing Gandhi’s interest in cow protection from the political realm, where I had suggested it played a role in anti-British and anti-Moslem activities. If necessary, Gandhi may thus be protected from irreverence, without, however, diminishing the exploitation of the cow theme for political purposes by many other Hindu politicians. This, of course, does not deny the element of purely technological and economic “reform” which both Bose and I would emphasize in cow protection.

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