# NEW STRATEGY IN ANIMAL HUSBANDRY*

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I consider it a distinct honour to have been given this opportunity by the Indian Society of Agricultural Statistics to deliver Dr. Rajendra Prasad Memorial Lecture this year. Dr. Rajendra Prasad was amongst the most illustrious sons of India and throughout his long and colourful political career he was a great advocate of rural development. His concern for the welfare of the peasants is well known. As Food Minister of India, Dr. Rajendra Prasad visited the Indian Veterinary Research Institute, Izatnagar. I had the privillege then, as Head of the Animal Genetics Division, to show him round the various laboratories of the Division and to discuss with him the problems and prospects of livestock development in India. He showed great interest in the ongoing programmes of the Division which were likely to create impact on the improvement of the farm animals of the country. His insight into the problems of livestock development was deep and he fully appreciated its role in bringing economic and social justice to the downtrodden rural community in India. To pay homage to this great leader I have, therefore, considered it appropriate to develop in course of my lecture a theme in the field of animal husbandry which has a great bearing on the attainment of the objectives that were so dear to him.

2. Agriculture as traditionally practised in our country till very recently was a part of the nonchalant way of rural life which provided, by and large, only a means of bare subsistence. There was hardly any consideration of development of the commercial possibilities of agriculture to derive therefrom maximum financial benefits and change thereby the life-style of the peasants.

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3. Fortunately, a welcome change has been taking place. Science and technology have touched the village life. The application of science and technology has brought about a spectacular success in crop production. The use of high yielding dwarf varieties of wheat along with other necessary inputs has ushered in the Green Revolution which has transformed the rural life and the outlook of farmers. It has given rise to new hopes. What commercialisation of agriculture means is being realised now by the farmers as never before. The spectacular achievement in wheat production has demonstrated that the success in agricultural development lies in placing the inputs and services required for production in a 'basket' and providing the incentive of greater profit and income.

4. The Green Revolution has, however, been attained at a social cost not wholly desirable. The pressing food problem demanded achievement of a breakthrough in crop production within as short a period as possible. Though the technology adopted for achieving the objective was neutral to scale, yet relatively the affluent farmers because of their bigger land holdings, irrigation facilities and financial resources derived maximum benefits from the programmes, whereas its adoption by the poor farmers in general was hampered because of paucity of resources. Responsible public opinion has since claimed that the Green Revolution has made the rich farmers richer and the poor ones poorer. This assertion is not without substance. That the application of scientific knowledge and new technology for development has caused rapid rise in the affluence of the richer farmers is quite obvious. It is also not difficult to see that the benefits of development have not been shared to any considerable extent by the small and mariginal farmers. Tension in rural areas has been the consequence. Social justice and harmony demand absence of disparity and imbalance but not at the cost of slackening or hindering the process of development.

5. In the past, agricultural development usually implied improvement in cereal and cash crop production only. There is now a progressively greater appreciation of the fact that agriculture means the optimal exploitation of soil-water-plant-animal-man relationship. The realisation has gradually but steadily grown that agriculture has to be diversified and that the new strategy of agricultural development should include a simultaneous and parallel development of the livestock wealth of the country.

6. Before presenting the new strategy to be followed for livestock development, I would like briefly to mention the present

status of livestock rearing in the country. Livestock rearing in India is almost exclusively a rural occupation and a large percentage of the people engaged in raising cattle, buffaloes, sheep, goats, pigs, poultry etc. belong to the poorer section of the rural community—the small and marginal farmers and agricultural labourers.

7. According to 1970-71 agricultural census, there were around 70 million farm units in the country and one-half of these were of less than one hectare in size. The sizes of nearly one-third of the holdings were less than 0.5 hectare. Most of the farmers would have less than one hectare of land, one or two cows or buffaloes, 6 to 10 birds and a few of them may have one or two goats. Sheep rearing is mostly in the hands of nomadic people whereas pig breeding is the job of the weakest section of the community. The members of the rural families remain mostly unemployed or underemployed during the greater part of the year. The burden of poverty in many cases has been made more arduous owing to a condition of perpetual indebtedness. The poor farmers have thus no spare resources which would enable them to take advantage of modern technology to improve their economic lot. All that they possess is a small land holding quite often only marginally profitable and a few animals of low productivity. Many do not possess even that small land holding. Therefore. in any attempt for development of livestock in the country, this section of the farming community must not be left out.

8. Numerically, the livestock wealth of the country is highly impressive. In 1972, according to the eleventh livestock census, there were about 179 million cattle, 58 million buffaloes, 40 million sheep, 68 million goats, 6 million pigs and 3 million other livestock. In addition, there were 137 million poultry. But when one takes a realistic look, the picture is rather gloomy. For instance, the annual average milk yield of the Indian cow is 157 kg. and that of the buffalo 504 kg. whereas the improved cows in Denmark, U.S.A., U.K., Switzerland and Israel produce milk more than 20 times that of the Indian cow and over seven times that of the buffalo. The indigenous fowl produces in a year around 60 eggs of small size against the annual production of over 200 eggs of large size by the improved fowls of exotic breeds. The average annual production of wool from indigenous sheep is about 1.4 kg. while in countries like Australia, New Zealand and U.K., 5 to 6 kg. of wool is obtained from the fine wool breeds of sheep. Not only is the quality of the wool from indigenous sheep poor but the yield of mutton also is low. The rams of Indian breeds weigh between 27 and 36 kg. and ewes

between 18 and 27 kg. whereas purebred rams of many exotic breeds weigh between 60 and 113 kg. and ewes between 54 and 74 kg. respectively. The much higher productivity obtained in developed countries is the result of nothing but a deliberate application of science and technology.

9. Initiation of progammes with somewhat systematic adoption of science and technology for the improvement of livestock production was made in the country as a part of post-war developmental drive. Greater emphasis was placed on this aspect of agricultural development with the start of the Plan era. Among the notable development programmes which were launched during the Plan periods are Key Village Scheme, Intensive Cattle Development Projects, Crossbreeding of Cattle in Hilly and Heavy Rainfall Areas, Intensiye Sheep Development Projects, Sheep and Wool Extension Centres, Establishment of Bacon Factories and Piggery Development Blocks, Intensive Poultry Development Projects and Coordinated Poultry Breeding Programmes.

10. Most of these programmes were excellent in concept but the success has been limited. For instance, the production of milk is estimated to have gone up to 23.2 million tonnes in 1973-74 as compared with 20.4 million tonnes in 1961; the production of eggs has increased to 7,700 million in 1973 from 2,500 million in 1961. However, because of rise in human population, the increase in per capita availability of eggs is only marginal, and in the case of milk, there is even a slight decrease. It has been estimated that demand for livestock products during the last decade has been increasing at the rate of 4-5 per cent per year but the production is not catching up with the demand. The gap is widening resulting in price rise of these commodities.

11. Whatever attempts have been made so far in adopting science and technology in improving the livestock production in the country suffer from various deficiencies. Generally, the developmental programmes lacked an integrated approach and were marred by the absence of some vital inputs and services. For example, the Intensive Cattle Development Project which was undertaken to enhance milk production in the milksheds of the established dairy plants failed to provide a good genetic material so essential for the success of the programme. Further, the inputs and services like forage crops, better feeds, proper health protection measures and suitable marketing channels were made available only partially. As a result, this most important programme which was full of promise foundered at

the rock of faulty implementation. A study on the Intensive Cattle Development Projects by the Programme Evaluation Organisation of the Planning Commission revealed that there was considerable delay in preparing the organisational structure required for the execution of the programmes. Timely supply of various inputs to the extent stipulated in the Plan was not assured. The progress was hampered as in the early stages of implementation of the programmes, the Projects were transferred to the State Sector with resultant curtailment of financial support from the Centre. As a consequence of this change there was failure to provide inputs and services like fodder production, better breeding, marketing, financial support for extension and expertise of technical staff which were required in greater measure in the subsequent stages.

12. Let me take another example. Crossbreeding in cattle was taken up in many places in isolation, without making any real effort to improve feeds and fodder production, health service and husbandry practices. Similar was the picture with sheep and pig development. Whatever little was achieved in the laboratory and the experimental farms, very little of that was transferred to the field. In the case of poultry, significant improvement in total egg production has been made because of proper adoption of science and technology but most of it has been in the urban and peri-urban areas; the benefits have largely been reaped by the affluent elites but none has percolated to the rural massess.

13. The demand for various livestock and livestock products is expected to increase manifold in the years to come. According to one estimate, the demand in 1985 based on income elasticity would be as follows :

| *Commodity* | *1971* | *1985* | |
|---|---|---|---|
| | *Base Year* | *Low* | *High* |
| Milk (million tonnes) | 21.71 | 33.37 | 44.17 |
| Meat (million tonnes) | 0.60 | 0.92 | 1.22 |
| Eggs (million numbers) | 6,040 | 10,217 | 15,972 |

To meet the above demands a new strategy must be evolved for planning and implementation of livestock development programmes.

14. At this point, I would question the validity of adopting the technology of developed countries in our developmental pro-

grammes. To consider this let us have a brief look into the system generally being followed in livestock production in the developed countries.

15. Most of the improved livestock breeds in developed countries have usually a hierarchal structure, *i.e.*, the stock comprises elite herds and multiplier and commercial animals. The breeding goal is mostly determined and/or directed by the market demand. Artificial insemination is followed as a rule in dairy cattle breeding as a component of progeny testing. The size of commercial operation is large and is still enlarging. In some cases like poultry breeding, it has become a part of multi-dimensional industrial establishment. A great sophistication has been reached in poultry breeding where the nucleus stock is produced by the breeding organization without being involved in commercial production of eggs and meat. The commercial birds are disseminated through a system of franchise hatcheries. In most of the developed countries, for breeding, feeding management and marketing one form of integration or the other, *i.e.*, either vertical or horizontal, is at present the rule rather than an exception. In many countries the livestock industry is mainly controlled and managed by the private sector. Livestock farming is thus an industrialised and specialised operation.

16. When we consider the prevailing condition of livestock industry in the country which I have briefly portrayed earlier, it is not difficult to see that it is neither feasible nor desirable to adopt the technology and the systems of livestock production in developed countries as such in India. As tne vast majority of the livestock assets are in the villages, owned by the poorer sections of the farming community, it is essential that the main emphasis in livestock development should be given on improvement of their animals. This approach to the developmental efforts, however, should not preclude the participation of the relatively prosperous rural and peri-urban livestock owners in the production enhancement programmes. One of the most important requirements of the strategy for a comprehensive livestok development in our country would essentially be the effective participation of the vast number of poor rural livestock owners. The strategy should further aim at improving the economic status of the producers and creating greater avenues of gainful employment of the unutilised labour available in the families of livestock owners particularly of womenfolk. The strategy of development must also avoid the mistake and deficiencies that foiled the past programmes, namely, lack of an integrated approach. Failure

to ensure a remunerative market was another deficiency. Nothing acts as a greater incentive than a remunerative market for progressively higher production.

17. The poverty of the livestock owners in the villages is a serious constraint in the way of their meaningful participation in the livestock development programmes. Under the strategy, ways and means should be devised to support their endeavour with institutional finances. Finally, the strategy must ensure that the benefits of development are equitably shared both by the poor and the relatively more affluent farmers participating in the programme.

18. Let us now consider the prospects of success in developing the desired strategy that I have outlined. The National Commission on Agriculture, as you may be aware, examined the possibilities of milk production and rearing of poultry, sheep and pigs through small and marginal farmers and landless agricultural labourers for enhancing production and in the process improving their economic status. The examination showed that there was very good scope for effective involvement of the small and marginal farmers and agricultural labourers in the livestock development programmes. For augmenting milk production rapidly there are excellent possibilities of harnessing and developing the available facilities with the small and marginal farmers and agricultural labourers.

19. Cattle and buffaloes are at present the most important livestock in the country. Seventy to seventy-five per cent households owning cattle fall under the category of small farmers, marginal farmers and landless labourers. As I have mentioned earlier, the cattle stock owned by these people are generally of poor quality. But all the same these farmers have some capital in the form of a few milch animals, generally one or two, and are in a position to derive benefits from a well planned programme of milk production through application of modern technology and provision of necessary inputs and services.

20. An investigation carried out by the Institute of Agricultural Research Statistics on profitability of different system of farming has shown that dairy farming and mixed farming, if properly practised, could be more profitable than arable farming. The average net return per Rs. 100 invested was found to be Rs. 16.6 in the dairy farming unit, Rs. 16.4 in the mixed farming unit and Rs. 13.3 in the arable farming unit, a unit being 2 hectares of holding. Another study conducted by the Agro-Economic Research Centre at Vallabhai Vidyanagar has shown that the proportion of income from dairying

to the total farm income was higher in the case of farmers with small holdings. A similar observation was made from the socio-economic study of a village in Valassan in Kaira district. The dairying contributed about 49 per cent of the total income from agricultural and allied pursuits. These studies show that there is enormous scope for development of dairying through small farmers in the country.

21. For ensuring economic milk production by the small and marginal farmers and agricultural labourers the milch stock will have to be genetically improved. Crossbreeding using exotic breeds is to my mind the only method available for bringing about a quick genetic improvement in the Indian cow leading to increased milk production. If an exotic dairy breed with an average yield of 4,000 kg per lactation is used for crossbreeding with improved local cattle having an average production of 1,000 kg per lactation, the first generation could be expected to produce 2,500 kg if the inheritance is purely additive. If the inheritance is multiplicative, the expected production would be 2,000 kg. In the first generation itself the production can be doubled in the progeny compared with the indigenous parent stock showing thereby that we can achieve by crossbreeding in about 5 years as much as we would achieve in 80 years by selection within the indigenous breed.

22. As many of you may know, I have been a staunch advocate of crossbreeding with exotic cattle for solution of our milk problem right from the very beginning of my association with animal husbandry activities in the country. I am glad that the old cattle breeding policy was changed and crossbreeding had its acceptance before I retired from service. I have, however, heard questions about the wisdom of this policy. I see no other way of solving the acute problem of scarcity of milk in the country within a reasonably short period of time and no body has so far offered an alternative practical solution. I must, however, make it clear that to enable the crossbred cow to have its normal growth and to fully portray its milk production potential, optimum environment in the shape of proper feeding, adequate health coverage, and better husbandry practices must be provided. The higher cost involved in making these inputs available for genetically superior animals will be more than offset by higher milk production.

23. In the Interim Report of the National Commission on Agriculture on Milk Production Through Small and Marginal Farmers and Agriculture Labourers it has been shown that for a small farmer

a dairy animal to be economic it should produce at least 1,800 to 2,000 kg per lactation. Only then would the return from milk be enough to enable the cattle owners not only to pay back the loans that they may be taking initially for procuring the crossbred animals and for their maintenance but also leave a reasonable income.

24. I have just mentioned that crossbreeding is the quickest method of genetic improvement of production potential of our indigenous cattle. In the past the attempts in crossbreeding did not measure up to the expection because of the negligence in the planning of fodder production. Lack of adequate attention to fodder crop production was one of the main factors for the failure in achieving success to the desired extent in the Key Village Scheme and Intensive Cattle Development Projects. It would not be wrong to say that successful dairying and an efficient fodder production programme are inseparable. More than 60 per cent of the cost of milk production is accounted for in feeding the cows. Practically under all conditions milk production is profitable when good quality forages make up the larger part of the ration and the fodder is grown by the farmer himself. A strong well planned national fodder development programme in both irrigated and rainfed areas is very vital to support the present cattle breeding policy. Further, the exotic germplasm has not been exposed to certain diseases. The countries from which the exotic cattle would be derived are free from several diseases to which the indigenous cattle are relatively resistant because of continued exposure to the causal agents. Hence, any crossbreeding venture will have to be supported by a strong programme of health protection. We have to bear in mind that better breeding is no substitute for good management practices. Necessary services, therefore, will have to be provided and inputs arranged by the extension agencies for replacing the present peasant husbandry by technically sound practices. Arrangement of institutional finances and proper marketing organization are the essential elements in motivating a farmer to take advantage of modern technology. I need not overemphasise the fact that the vast majority of our rural masses are at present illiterate. Thus, if a programme is aimed at improving the economy of this poor community, the technology should be delivered at the door of these farmers. The farmers should be provided with high producing animals, ready-made balanced feed, adequate veterinary aid, financial credit on the basis of personal surety, and marketing of products. All these can be well arranged through an effective cooperative organization of the farmers. I shall come back to this point later.

25. For the success of the strategy for animal husbandry development, assurance of remunerative prices to the producers would be essential. This is particularly important for the success of development of the cow for milk. The present policy followed in most of the dairies based on fat discriminates against the cow. What would be fair is to pay both on the basis of fat and solids-not-fat. The two-axis formula recommended in 1972 by a Committee set up by the Ministry of Food and Agriculture would be rational.

26. A large number of small and marginal farmers and agricultural labourers keep buffaloes. It is, therefore, important that the genetic quality of buffaloes must be improved and necessary inputs should be provided for the development of the buffalo.

27. The best milch buffaloes in the world are in our country. As such, their genetic improvement can be achieved by selective breeding based on progeny testing in areas of high producing buffaloes, and by grading up with superior bulls of breeds like Murrah, Surti, etc., in areas of low yielding local stock Greater attention for enhancement of milk production of the buffalo should also be a part of the developmental strategy.

28. That modern scientific knowldege can be applied effectively in rural India by the small farmers is well exemplified by the success of the Kaira District Cooperative Milk Producers Union Ltd. Twenty-five years ago the life of the farmers in the Kaira district was not in any way different from that of the millions in other villages. The income from one or two buffaloes maintained by the Kaira farmers was very negligible. The establishment of the Milk Producers' Cooperative and its progressive development over the last two and a half decades have brought about a basic change in the rural structure of the district and the benefits of the development have gone to the small farmers.

29. Analysis of the causes of the sucess of this Cooperative reveals that the development of an efficient marketing structure proved to be the catalytic agent for creating the necessary motivation of the farmers for increasing milk production and thereby their income. Further, the Cooperative Union has been successful in delivering the necessary inputs and services like better breeding, feeding, management and disease control measures in a package at the farmer's door. For bringing about a rapid improvement of the boffalo stock, the Cooperative Union has a well equipped Bull Station with facilities for AI service. The Station has also taken up recently a programme

of progeny testing of young Surti bulls. This is commendable as the use of proven sires would ensure genetic gain from generation to generation. The Union has a well knit veterinary health service organisation to expeditiously attend to animal health problems in the area. To make balanced feed available for the milch animals the Union has established a large feed mixing plant. Fodder production campaign has been launched by the Union and as a result where such a practice was non-existent before, a large number of farmers are now growing lucerne. Encouraged by the success of the Kaira Union, many other dairy cooperatives like Mehsana, Baroda, Surat, Banaskantha, Sabarkantha have sprung up in Gujarat and all of them are reported to be doing very well. The cooperative movement has also made a debut in other States like Rajasthan, Haryana, Punjab, West Bengal under the Operation Flood Project.

30. The National Commission on Agriculture in its Interim Report mentioned earlier has recommended the adoption of the Kaira pattern in 113 destricts including 57 districts under Operation Flood. This would involve about 5.5 million cattle and buffaloes and help in providing subsidiary income to about 4.3 million farm families to take them above the poverty line.

31. While recommending the formation of the milk organisation on cooperative basis, the Commission has suggested that in areas where the cooperative movement is not strong enough, the function of the District Union could be, to begin with, taken up by a corporation. The management of the organization should be handed over to the cooperative as soon as it is working satisfactorily. At the village level there should, however, be a cooperative society of the producers from the very beginning. In each district at least two-thirds of the producers supplying milk to the plant should belong to the category of small and marginal farmers and landless labourers and the rest to others. I am of the view that the recommendations of the Commission should be the guiding policy for milk production, collection, processing, handling and marketing in all major milk projects. The system which includs all activities from production to marketing of milk in one organisation is more conducive to better and quicker development of the milk industry than different organisations being responsible for different activities.

32. So far I have spoken only of the milk production aspect of cattle development. The importance of cattle in India is not only for milk but also for providing the motive power for agriculture.

In India, cattle were maintained till recently primarily for production of bullocks and not for production of milk. Dr. M.S. Swaminathan in his Sardar Patel Memorial Lecture of 1973 had pointed out that "animals contribute over 28 million H.P. of energy per day for agricultural operations" in India and "that to produce an yield of 2 tonnes per hectare the average power requirement would be about 0.75 H. P. per day". According to his estimate, "the current power availability including those provided by man, animals, tractors and power tillers comes to only 0.30 H. P. per hectare". In his opinion one of the basic causes of our inability to improve the efficiency of farming through timely agricultural operations is the inadequacy of available power.

33. There is thus a definite need to give due attention to the development of bullock power while considering cattle improvement. We have a number of excellent draught breeds of cattle. No serious organised attempt has in recent times been made to preserve and develop these draught breeds. With the introduction of crossbreeding programme in cattle, a question has been raised from some quarters whether the crossbred bullocks would be suitable for work. While expressing this doubt the critics of the crossbreeding policy appear to forget that although we have 26 distinct breeds of cattle in the country 75 per cent of the cattle population comprises nondescript and puny cattle. The crossbred bullocks cannot be inferior draught animals to these nondescript animals. I admit that the crossbred bullocks cannot be as strong as bullocks of specialised draught breeds like, say, Nagor But then, it is not possible to meet the entire requirement of bullock power in the country from the specialized draught breeds.

34. While on the subject of cattle and buffalo development, I would like to mention one other aspect which demands attention. I am referring to the practically untapped great potentiality of developing the buffalo for meat. In the search for alternative source of good quality meat to meet the unsatiable demand of the meat hungry world, buffalo has now attracted international attention as an excellent potential source. In the past, buffalo meat was considered much inferior in quality to beef or other meats. This was not because the product was inherently poor in quality but perhaps because it was obtained from old or decrepit animals. The butchering of animals and handling of meat were also very unsatisfactory.

35. Several research studies in different countries including one at the Indian Veterinary Research Institute, have shown that when buffaloes are bred and reared as beef animals, meat of as high a

quality as choice beef can be obtained from these beef animals. The results of some investigations have revealed that buffalo meat is not second best to cattle beef but is its equal in quality. Organoleptic properties of buffalo meat are the same as that of beef irrespective of the method of cooking. Interest is now growing in a number of buffalo rearing countries for developing the buffalo as a food animal. Several countries like Australia, Bulgaria, Italy, USSR, Pakistan are developing the buffalo meat industry. Let us not be conservative and left behind.

36. We possess about 50 per cent of the world's buffalo population and some of the finest breeds of this species. Among these breeds there are some which are likely to prove to be excellent meat animals. An analysis of the trend of buffalo population in the country during the last seven census periods has revealed that there has been a progressive increase in the number of buffaloes despite the fact that no special development programmes have been taken up for multiplying this species during the successive plans. The rise in buffalo population is from about 43 million in 1951 to about 58 million in 1972, i.e., an increase of about 35 percent during this period. This species offers an excellent scope for building up a promising export meat trade. The Middle East countries provide a good export market which India can immediately take advantage of. At present, only a small quantity of buffalo meat is exported. If the surplus stock of buffaloes in the country could be slaughtered and their meet exported, a good amount of foreign exchange could be earned. A large percentage of male buffalo calves is at present allowed to starve to death, as it is considered uneconomical by the breeders to raise them. I call this just throwing away of a valuable resource. If these 'unwanted' male calves are fattened quickly on cheap feeds with supplements of molasses and urea, their meat could be exported with great advantage. I am of the view that intensive efforts should be made to develop this trade. If properly organised, preferably through the cooperative of the breeders, this export trade will fetch more money for the producers and thus provide additional incentives for the development of quality buffalo meat.

37. Sheep rearing for wool and mutton is another important sector of livestock farming. Till recently, sheep farming was entirely the occupation of small and marginal farmers, landless labourers and nomads in the rural community. India is one of the leading countries of the world in sheep population; but, as I have mentioned earlier, the average wool and mutton production of Indian sheep is low. The

estimated wool production in the country was 30.10 million kg in 1973-74 whereas the sheep population was round 41 million.

38. History tells us that the earliest attempt to improve the wool quality of sheep dates back to the time of the East India Company. Though attempts have been made by the Research Institutes and other organisations to evolve suitable fine wool and high yielding mutton breeds of sheep, it cannot be said we have achieved all that is required. Further, as the sheep raising is almost entirely in the hands of the weaker sections of our community, no significant improvement is expected unless ways and means are found to make these people beneficiaries of the development programmes.

39. The results of researches carried out in various Institutions in India indicate that introduction of 50 per cent exotic inheritance from fine wool varieties like Merinos and Rambouillet into the fine wool indigenous varieties would immediately double the yield of wool production. Depending on the nature of the tract, the amount of exotic inheritance can be increased to 75 per cent. The crossing of some of the indigenous breeds like Deccani, Bellary and Coimbatore with Corriedale is expected to bring about an improvement in both quality and quantity of wool and mutton. Thus, for improving the genetic potential of low yielding indigenous sheep, crossing them with exotic breeds is probably the most effective technique available. However, instead of following unplanned breeding, a well-planned programme of crossbreeding depending on the type of indigenous varieties and climatic conditions, availability of pasture land etc. in the area should be followed. As the production potentiality of the sheep increases, proper technology should be adopted to improve the quality of grasses and leguminous forage crops for better feeding of the stock. Provision of concentrates should be made wherever necessary. Adequate arrangements for health cover would be essential.

40. For development of sheep through the small farmers the National Commission on Agriculture has recommended in one of its Interim Reports that each small farmer should be supplied with 20 improved ewes and one improved ram. The farmers desirous of taking up sheep farming on mixed farming basis should be provided with only 10 ewes in the initial year with provision for increasing the flock strength to 20 in the subsequent years. A unit of 20 improved ewes and one ram is likely to fetch a farmer's family an additional income of about Rs. 580.00 per annum. I have no doubt that this

will have a great impact on the life of sheep raising poor families of our rural community. However, the key to success will be the ability of the implementing agencies to supply all the necessary inputs and services including proper arrangements for marketing and credit. I am sure the farmer will enthusiastically participate in this programme as he is sure to get benefit out of it.

41. In recent years, a few industrial houses have taken up sheep farming mainly to feed their own woollen mills. The scope of earning foreign exchange through export of woollens is increasing steadily. The values of exported woollens was Rs. 45.17 crores in 1973-74 as against that of Rs. 17.64 crores in 1969-70. To increase the volume of export, organised sheep farming by large farmers should also be encouraged.

42. Some efforts were made to introduce pig farming on modern lines with the setting up of bacon factories in the country as a part of Special Development Programmes towards the end of the Third Five Year Plan. There are at present eight bacon factories. It was originally envisaged to set up pig breeding farms attached to bacon factories with the twin objective of breeding nucleus exotic stock for distribution of improved boars to the villagers for upgrading the indigenous stock and to feed the bacon factories with the surplus stock. The intention was to create a zone of intensive swine production in and around each bacon factory. This expectation, unfortunately, has not been realised due to more or less the same reasons as in the case of cattle and sheep development programmes.

43. The bacon factories were established in the first instance without proper market survey. The factories have failed to provide any price incentive to create a motivation for taking up pig farming. Traditional pig raising is entirely in the hands of the weakest sections of the community. They are as such not eligible for institutional credit and are the worst victims of money lenders. An investigation in Bihar has indicated that almost three-fourths of the profit of pig raising are reaped by the money lenders. This is a striking example of exploitation of the helpless poor producers. If scientists, technologists and the society cannot protect these underprivileged farmers from such nefarious exploitation, even at the present time, any economic programme of doing social justice will just remain a dream.

44. The immediate need is to make the pig farmers creditworthy and to amend the financial rules in such a manner that the credit is provided to these people on a personal surety. The traditio-

nal method of pig raising needs to be modified by providing the necessary inputs and services. In the case of pigs, the best method of improving indigenous nondescript pigs would be by introduction of superior exotic inheritance. The farmers' sows should be supplanted by superior crossbred ones either by direct supply or by producing the crossbred out of their own sows. This should be supported by supply of balanced mixed feeds at economic price and provision of adequate health coverage. Arrangements should be made for proper marketing system. The pig farming would be remunerative for the small farmers if the intensive pig production areas are linked up with the bacon factories and to the important market centres in large cities.

45. Pig raising is popular with many tribal people. It is very popular in almost all the North Eastern States and in some areas like Darjeeling in West Bengal and Goa. I would recommend that an aggressive programme of pig development with provision of a package of practices and proper marketing system as recommended for other species should be taken up for helping the poorer sections of the community for supplementing their income.

46. In the sector of livestock production, poultry farming has to an extent taken the shape of an industry during the last decade and a half. The analysis of factors responsible for providing motivation for commercial poultry production indicates that the adoption of modern science and teehnology is the main reason for the success. As we all know, the idea of taking up poultry production as a means of earning a livelihood could not even be conceived prior to the sixties. The whole concept changed with the introduction of modern technology of deep litter housing system, availability of genetically superior hybrid chicks disseminated through franchise hatcheries set up in collaboration with foreign-based breeding farms, nutritionally balanced mixed poultry feed, better health coverage and indigenously made modern appliances and equipment.

47. The boom in poultry production in the sixties was due to the availability of all necessary inputs and services including institutional finances as well as incentive granted by the Government in the form of income-tax holiday. Many industrial houses adopted poultry farming as one of the sectors in their multidimensional business organisation. Poultry farms having more than one lakh layer capacity is no longer a novelty in India. While all these developments have taken place in urban and peri-urban areas and the benefits have been reaped mostly by the rich and elite classes of the community, the weaker

sections have received very little benefit or none at all from the development of poultry industry. We have thus failed to render distributive justice.

48. Even today more than two-thirds of the poultry stock are non-descript and are in the villages. Experience shows that intensive poultry rearing by the rural community is possible provided the technology can be modified and transformed properly. The technique of poultry farming needs to be modified according to the level of husbandry conditions that can be provided. If all the necessary inputs and services like balanced mixed feed, adequate health coverage and organised marketing system can be provided, then poultry farming can be effectively adopted utilizing the genetically superior hybrid chicks even by the rural farming community.

49. It has been suggested by the National Commission on Agriculture that where all the inputs are provided a 50-bird unit would be suitable for a farmer's family. I have heard people questioning the wisdom of having such a small unit. Their fear is that when even a large farm with 2,000 to 3,000 layers is not adequately remunerative now-a-days, how can a 50-bird unit be of any help. In this connection, it will have to be realized that the programme suggested by the Commission was not meant for providing livelihood to the farmers exclusively from this programme. It was meant only to help in supplementing their income. A 50-bird unit can be effectively managed by surplus family labour without difficulty. Further, such a plan for poultry production would distribute the benefits to a large number of farm families.

50. The programme as recommended is to involve 3,000 families in a compact area. In my view this, for all practical purposes of operation, should be treated as a unit of 1.5 lakh layers rather than a unit of 50. I am informed that the manure obtained from a deep litter house of 40 birds amounts to one tonne per year which is adequate for satisfying the need of fertiliser of an acre of land for most of the crops. More than the amount of grain used in feeding 40 birds a year is returned in the form of increased crop production as a result of use of poultry manure. Thus, the 50-bird unit fits in a comprehensive manner within the overall unit of operation of a small farmer. The multiple benefits expected to be derived from this type of popultry farming are in the shape of subsidiary income from sale of eggs and poultry, improvement in nutritional status of the farmer's family because of home consumption of poultry products and deep litter manure of high fertilizer value. However, to make

this programme successful, a strong formers' cooperative capable of arranging necessary inputs and services is essential. Organization of suitable marketing system, which has been the missing link in the whole poultry development programme so far in the country should be done on priority basis.

51. The technology of poultry farming should, however, be modified where all the inputs like balanced mixed feed cannot be provided. In those areas crossbred birds should be advocated for popultry production under semi-range condition, as these birds are adaptable to relatively adverse rural conditions. For the remote villages which are not easily accessible and where the husbandry conditions are in a primitive stage, a programme of crossing 'desi' hens with exotic crossbred males should be followed. Such a practice would help in doubling egg production in one generation without any provision of modern technology except health coverage.

52. Lest I should be misunderstood, I would like to mention here that while advocating ths need for involving more actively the small and marginal farmers and landless labourers in livestock development, I am not unmindful of the important role which the large farmers can play in building up our livestock industry to a healthy stature. The financial, land and other resources available with the relatively more affluent section of the farming community and of large commercial institutions will also have to be harnessed for building up a robust industry which would be of benefit to the nation.

53. It is a happy coincidence that I am delivering this lecture in the capital city of Rajasthan. The natural endowment of the State is highly conducive to livestock rearing. The vast resources, however, remain almost untapped. You will be glad to know that the Rajasthan Government is conscious of this fact and is taking increasingly greater interest in the development of livestock. If the strategy and approaches I have discussed so far are effectively adopted for the improvement of the stock, I am confident it will not only improve the economy of the State but will also make the life of the millions of the farmers happier and more purposeful.

54. I have spoken so long on the mechanics of enhancement of livestock production primarily through the involvement of the weaker sections of the rural community. I would now like to say a few words about a scientific discipline which can materially assist in achieving the objective. I am referring to the importance of the application of statistics in animal science. There is still very indequate

appreciation in the country of the usefulness of application of statistics in the field of animal husbandry. From my experience lasting over a period of three and a half decades in the field of animal husbandry, I can say that the need of application of statistics in livestock development cannot be overemphasized. A first hand knowledge of statistical tools is essential for investigation into problems of animal science to draw valid conclusions. The need of statistics will be all the greater in the context of the developmental programmes embracing a large number of small farmers. The massive data on milk yield, reproductive performance, feed intake, incidence of diseases etc. which will flow from the implementation of the developmental programmes, will need to be systematically collected and analysed. This is necessary to enable a proper assessment and valuation of the impact of the programme and to take mid-course corrective action wherever necessary.

55. It is disappointing to note that sufficient attention has not been paid by the planners and livestock administrators to take effective steps for collecting reliable statistics on state, regional and all India basis pertaining to livestock and livestock products. So far, very little information is available on the comparative economics of different kinds of livestock farming. The Institute of Agricultural Research Statistics has been developing the methodology necessary for conducting surveys for estimation of livestock numbers and their products as also for estimation of the cost of production of various livestock commodities. The Institute has also developed measurement and assessment techniques for studying the impact of developmental programmes such as milk supply schemes and Intensive Cattle Development Projects. But these efforts are futile unless the methodologies which have been developed with care and hard labour and over along period of time are utilised in different States.

56. Dependable data base in the field of animal husbandry is at present extremely weak. I would, therefore, take this opportunity to draw the attention of the livestock statisticians as well as of others concerned with livestock development to the need of building up a strong data base in the field. With the computer technology available in the country it is now possible to computerise livestock statistics for creating a reliable data bank. This would be of great help for conducting integrated studies on various aspects of animal husbandry and for decision making and planning for development. The Statistical Cells in the Central as well as in the State Governments concerned with animal husbandry should be strengthened for collect-

ing basic data and for conducting necessary sample surveys. State Animal Husbandry Departments which have no statistical units at present should take immediate steps to remove this deficiency.

57. Development of appropriate statistical methodology relevant to animal science is a responsibility of the Institute of Agricultural Research Statistics and the Statistical Departments of Agricultural Universities. Along with increase in the pace of livestock development there is a growing demand for the services of livestock statisticians. To meet this requirement the Institute of Agricultural Research Statistics and the Universities should strengthen their training facilities.

58. The Indian Society of Agricultural Statistics can provide an important platform for stressing the role of statistical principles in the field of animal husbandry. I understand they have been organising symposia and lectures to this end. I consider it a commendable effort.

59. Before I finish, I feel tempted to quote Homi Bhabha: "What the developed countries have and the under-developed lack is modern science, and an economy based on modern technology. The problem of developing the the under-developed countries is, therefore, the problem of establishing modern science in them, and transforming their economy to one based on modern science nnd technology." What Homi Bhabha said so succinctly is very appropriate to the livestock situation in the country. The application of science and technology is undoubtedy vital to livestock development as it would help in transforming our rural economy.

60. Allow me to close by saying that let the new strategy in animal husbandry be application of science and technology with provision of all necessary inputs and services in one 'basket'. The triple objectives of the strategy should be enhancement of production; economic upliftment of the producers, particularly those belonging to the weaker section of the community; and increasing the employment opportunities.