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ECONCMICS OF MIXED FARMING IN WESTERN U.P. AND PUNJAB REGION*

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The transition of human society from savage to a civilised state was marked by the ownership of cattle for the production of milk, milk products and meat. The early nomadic stage of agricultural evolution was followed by shifting type of cultivation which, due to force of circumstances, soon developed into settled agriculture, combining crop production with the rearing of cattle. This profitable combination generally known as mixed farming continued, till recently, to occupy a place of prominence in the Indian agricultural set up. However, now mixed farming is being practised only in name. The combination of subsistence arable farming and a still less commercialised livestock enterprise signifying a way of life and an apologia for sub-marginal existence can hardly qualify to be called mixed farming; and, this is exactly the case with a majority of farms in India. There has been a gradual and general deterioration in the health and breed of livestock which has led to an all-round deficiency of good workstock and in the availability of milk and milk products as also to the depletion of soil fertility. This has created a vicious circle; weak, low producing animals are competing with hungry people for the products obtained from a progressively despoiled and deteriorating soil. Animals, naturally, are the losers.

How mixed farming is faring in Western U. P. and Punjab—under ordinary conditions as well as when creation of ideal conditions was attempted for purposes of experimentation—is discussed in this paper, dividing the subject matter into seven sections. The first section deals with the concept and defines mixed farming; the second gives the results of mixed farming experiments along with their shortcomings; the third gives the findings of farm management studies in regard to milk-economy; the fourth contains some suggestions regarding improvements to be made in the design of experiments with a view to yielding relatively more useful data; the fifth highlights the importance of livestock enterprises other than milch-cattle and their suitability for small farms; the sixth gives a picture of the comparative advantage that Western U. P. and Punjab enjoy over other parts of India, so far as mixed farming of the conventional type is concerned; and the summary and conclusions are given in the last (seventh) section.

I

Mixed farming is a system of farming under which crop growing is combined with the keeping of livestock for profit. Fodder crops, particularly legumes, are included in the crop rotation which, while giving cattle feed, also help in the maintenance of soil fertility. Farmyard manure obtained from livestock builds up soil productivity and enable high crop yields to be realised. The main requirement for a farm to be classified as 'mixed' is that profits should be realised from the livestock products, such as, milk, ghee, butter and cheese, eggs, by rearing

* The ideas contained in the paper are personal and do not necessarily represent the views of the National Council of Applied Economic Research.

cattle, etc., in addition to the profits made from crop products. Crop and livestock enterprises should not be regarded as separate components but should ideally be welded together for mutual benefit. "In India, mixed farming implies dovetailing of crop production and animal husbandry to the best advantage of the farmer. This relationship of the two may be expressed as a complementary use of livestock and crops. This enables a full utilisation of the by-products of crops and their conversion into valuable animal products. Thus, farmyard manure becomes available, and the spare time of the cultivator and his family is fully utilised."[1]

It is felt by some that combination of goats, sheep, pigs and poultry with arable farming, if not accompanied by keeping of cattle, does not constitute mixed farming. In other words, cattle keeping is regarded as a *must* on a mixed farm. While there may be a point in defining mixed farming on the basis of complementarity in the utilisation of main products and by-products of one set of enterprises by another (use of crop by-products, like straw, as cattle feed and the usefulness of cattle by-products like dung towards increasing soil-fertility for raising crop yields, and so on), complementarity in most input requirements—from the point of view of timeliness, quantity and quality of resources (using surplus labour of the farmer and his family all-round the year, or in seasons slack for crop-enterprises, using extra barn space, say, for a chicken house, and so on), should be the main consideration. This liberal interpretation would allow for the inclusion of other livestock enterprises like, sheep and goat keeping, pigs and poultry, and even bee-keeping, fish rearing and vegetable growing, etc., in a scheme of mixed farming. It would be seen later that for very small farmers it is the enterprises in this latter category which hold out a promise of optimisation of resource use and maximisation of returns from farming.

There seems to be a misunderstanding regarding the self-sufficiency aspect of mixed farms. It is stated by D. N. Singh, for example, that "a mixed farm should produce the required quantity of food, including fruits and vegetables as well as sufficient fodder for the livestock kept on the farm besides such cash crops as will yield the largest profit to the farmer."[2] This is stated more explicitly by another person: "Its (mixed farming) ultimate aim is a self-sufficient unit where all primary needs of the rural family will be met."[3]

There is nothing so sacrosanct about the idea of self-sufficiency and the question of buying food items and disposal of output, and buying of some inputs and utilisation of home grown or owned ones, should be decided on the basis of economic criteria—maximisation of returns on the basis of marginal concepts—and self-sufficiency in regard to consumption items or input-resources should not be insisted upon.

II

Very few studies have been made in this Region of India (as also in other parts) to assess the economics of mixed farming. During 1941-46, the Indian

1. D. N. Singh: Mixed Farming in India, Farm Bulletin No. 40, Indian Council of Agricultural Research, New Delhi, November, 1957, pp. 7-8; see also, M. R. Pannikar and J. S. Srivastava, "Mixed Farming," *Gosamvardhana*, Vol. IV, No. 9, December, 1956.
2. *Ibid.*, p. 8.
3. Editor's Page, *Indian Farming*, Vol. VIII, No. 12, March, 1959.

Council of Agricultural Research conducted a scheme for simultaneous investigation and demonstration of mixed farming. The scheme was operated in four provinces of undivided India—United Provinces (now Uttar Pradesh), Central Provinces and Berar (now part of Madhya Pradesh) and North West Frontier Province and Sind (now in Pakistan). The findings for Western U.P. are of interest here and are discussed below.[4]

Comparable mixed farming units were located in the districts of Meerut, Bareilly, Lucknow, Bara Banki, Gorakhpur and Deoria. Six double blocks, each of two mixed farming and four control holdings were established. The size of the holdings varied from eight to ten acres and each holding had two working bullocks. In four blocks, two Murrah buffaloes were added on each mixed farm; in the fifth, a Hissar cow was added over and above two Murrah buffaloes; and in the sixth, two Sahiwal cows were added. Services of pedigree bulls were available. Sugarcane, wheat, gram, maize and rice were the main crops grown. Mixed farms produced enough fodder for the additional livestock. Most of the farmyard manure produced by livestock probably went to sugarcane.

Details of the profits obtained from mixed farming units compared to the control units are given in Table I.

TABLE I—AVERAGE PROFITS PER ACRE OBTAINED IN WESTERN U.P. DISTRICTS DURING 1941-46

Year	Meerut				Bareilly			
	Mixed Farming		Ordinary Farming		Mixed Farming		Ordinary Farming	
	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.
1st Year	66	8	42	1	4	10	5	14
2nd Year	229	2	136	10	54	14	39	8
3rd Year	179	8	86	0	128	0	2	8
4th Year	211	4	78	4	68	3	13	3
5th Year	316	0	117	0	150	0	60	0

The figures show that mixed farming increased earnings significantly. It is claimed that the increased profit was possible as a result of the production of milk, greater employment of the family labour and extra yields of cash, fodder and grain crops.

An evaluation of the results of mixed farming trials, however, showed that it would not be wise to uncritically assume that all differences in profits and yields between mixed farms and controls were the result of the introduction of mixed farming.[5] The profits seem to have been inflated due to the operation of the following facts and the errors of omission and commission.

4. S. Ibne Ali, "Mixed Farming in Uttar Pradesh," *Indian Farming*, Vol. XI, No. 8, 1956.

5. D. J. Finney and M. R. Pannikar, "Experimental Tests of Mixed Farming in India," *Indian Journal of Agricultural Science*, Vol. XXIII, Part IV, 1953; R. O. Whyte: The Grassland and Fodder Resources of India, I.C.A.R. Science Monograph No. 22, Chapter XV—Mixed Farming, pp. 319-324.

Holdings for mixed farms were admittedly chosen because of a good management level and suitability to act as demonstration units for neighbourhood. So the selected holdings almost certainly had an advantage to begin with.

The Departments of Agriculture provided greater assistance and supervision to mixed farms as compared to control farms. These opportunities to benefit from technical advice must have been availed of to a greater extent by mixed farming units because of the relatively progressive nature of management.

The grants to cultivators did not enter into profit-accounting. The grant is roughly equal to the nominal profits attributed to livestock over the years; the additional profit even in early years came largely from crops, the small amount attributed directly to livestock being practically balanced by the special grants to cultivators.

Fairly numerous records of yields for the major crops kept for the holdings under study, give no support to any belief in increasing fertility of land under mixed farming.

The differences in yield rates and the intensity of cropping were as great in the early years as in later. This suggests that the primary causes were initial differences between farms assigned to 'mixed' and 'control' series.

According to Finney and Pannikar, "the true explanation of the differences found between records from the mixed farms and those from the controls appears most probably to lie in factors inherent in the planning and conduct of the investigation and not in mixed farming itself. To say this is in no sense to deny that mixed farming can be beneficial. Benefits to soil fertility, and thereby to farm profits, cannot appear quickly and would be unlikely to be demonstrated by an investigation of this character in three or four years."[6]

III

Some farm management investigations conducted in recent years throw some light on the profitability (or otherwise) of milk production in respect of the farms chosen for study. For U. P. (western districts of Meerut and Muzaffarnagar were selected) the relevant details are given in Table II for the two types of samples studied.[7]

It would be seen from Table I. that milk production, by and large, is not commercialised and the enterprise results in loss for all size groups. The average yield per animal (both cow and bufalow) was 34 mds and 27 mds. for Cost Accounting and Survey Samples, respectively, between 1st June, 1954, and 31st May, 1955. It was found that even when family labour is not charged, milk production shows loss on all the holdings.[8]

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6. *Op. cit.*, pp. 279-280.
7. Studies in Economics of Farm Management in U.P.—Report for the Year 1954-55, Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India, New Delhi, 1957, p. 154.
8. *Ibid*, p. 63.

For Punjab (Amritsar and Ferozepur districts were selected) almost the same state of affairs obtains as would be clear from Tables III and IV.[9]

TABLE II—INPUT-OUTPUT AND PROFIT OR LOSS PER HOLDING AND COST OF PRODUCTION PER MAUND OF MILK ON HOLDINGS OF DIFFERENT SIZES IN U.P., 1954-55.

(In Rupees)

Particulars	Size-Group (Acres)					All Holdings
	Less than 5	5—10	10—15	15—20	20 & above	
			A—Cost Accounting Sample			
Input	446	578	602	666	1,163	605
Output	378	449	388	498	666	452
Net Profit or Loss	−68	−129	−214	−168	−497	−153
Cost of Production per maund	15.3	16.4	20.2	17.4	22.2	17.9
Cost of Production per maund Average for 1955-56 and 1956-57.*	17.4	17.5	17.0	15.5	16.3	16.7
			B—Survey Sample			
Input	418	578	644	826	1,013	610
Output	261	312	339	468	594	345
Net Profit or Loss	−157	−266	−305	−358	−419	−265
Cost of Production per maund	20.9	24.1	24.7	23.5	22.2	23.1

* G. D. Agrawal, "Economy of Milk Enterprise," September, 1960 approved for publication in *Gosamvardhana.*

TABLE III—INPUTS AND OUTPUT FROM MILK PRODUCTION IN PUNJAB

(In Rupees per Acre Held)

Sample	Input	Output	Profit
Cost Accounting	29	29	—
Survey	44	38	—6

TABLE IV—QUANTITY AND COST OF MILK PRODUCTION ON HOLDINGS OF DIFFERENT SIZES IN PUNJAB

Particulars	Size Group (Acres)					All Holdings
	Less than 5	5—10	10—20	20—50	50 & above	
			A—Cost Accounting Sample			
Milk production per annum (In maunds)	15.0	12.3	20.9	19.0	15.5	18.3
Cost of production of milk per maund † (In Rupees)	10.2	15.5	10.7	13.9	17.8	12.8
Cost of production of milk per maund : Average for 1954-55 to 1956-57.‡	11.1	13.4	12.5	14.4	17.8	—
			B—Survey Sample			
Milk Production per annum (In maunds)	13.2	18.4	17.7	21.5	24.2	19.3
Cost of production of milk per maund (In Rupees)	15.3	13.8	14.9	15.9	15.4	14.9

† In interpreting cost of production figures, it should be remembered that the quality of cattle on small farms is not as good as on the large farms. The difference in depreciation charges on good and poor quality animals on account of an appreciable difference in their price partly explains the difference in the cost of production of milk on different sized farms.

‡ G. D. Agrawal, *Op. cit.*

9. Studies in Economics of Farm Management in Punjab—Report for the Year 1954-55, Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India, New Delhi, 1957, pp. 58, 133.

These studies show that milk production is not a business proposition. But it should be kept in mind that the studies were not designed to assess the economics of mixed farming and no comparisons were made with holdings without livestock.[10] Actually the results reflect the present state of affairs in regard to milk enterprise and not what would happen if mixed farming is practised on desired lines.

Data on the economics of other livestock enterprises (as units on a mixed farm), such as, pigs, poultry, etc., are conspicuous by their absence.

IV

In spite of the shortcomings of data discussed in the above two sections, the findings do show that the notion of the profitability of mixed farming has yet to be conclusively established; more work needs to be done in the various agro-climatic complexes of the Region (and the country) to determine the type of mixed farming and the extent to which it would be profitable in respect of the various size-groups characterised by varying resource-mix situations. This is particularly important because the Third Five-Year Plan has earmarked some resources to the development of mixed farming. A scheme for the establishment of mixed farming units in River Valley Projects has been included in the Plan proposals for Animal Husbandry. Completion of the River Valley Projects in India has brought vast tracts of land under cultivation. In addition, areas which were already cultivated, will now be under more intensive cultivation. To encourage mixed farming in these areas, it is proposed that in selected areas, 20 to 30 per cent farmers will be encouraged to keep cattle for the production of milk, utilisation of crop residues and to yield other advantages of mixed farming. In each of the Projects, a certain number of units will be operated for *experimentation* and *demonstration* by the Government. To the other farmers, who agree to abide by the specified conditions, loans, subsidies, advice and other help will be given to provide extra capital needed.[11] And, of course, the outlay on Animal Husbandry and Dairying and part of the outlay on general agriculture would directly help the cause of, and promote the introduction of mixed farming.

The investigations referred to above and any other studies that may be conducted should take into account the following:

(1) The demonstration objective of the experiments, based on a pre-conceived opinion that mixed farming is advantageous, should be compromised in the interests of an unbiased assessment.

(2) To isolate the effect on incomes of mixed farming alone, a set of farms with arable system but receiving technical advice and guidance from the extension agencies of the similar magnitude as available to mixed farms, should also be taken up in addition to a control set without any interference in the normal arable routine; this will mean three types of farms for study.

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10. Besides, the studies suffer from other limitations, *e.g.*, the possibility of some shortcomings in the first year's work and the farmer's hesitation and difficulty in supplying data on milk enterprise.

11. S. Harbans Singh, "Mixed Farming : A Balanced System of Agriculture," *Gosamvardhana*, Vol. VIII, No. 3, June, 1960.

It should be ensured that the selected farms in the above three categories are roughly comparable at the start of the investigations. The sample should be selected on the basis of standard statistical procedures.

(3) The level of addition of livestock on a set of similar holdings should be varied to give an idea of the economic size of the unit and to yield data for scale of size analysis.

(4) Advantage of the investigations should be taken to try various inputs, their doses and substitution amongst them to provide data for marginal analysis. It is not enough merely to find out that mixed farming is paying (or not); how profits can be increased by taking the best advantage of changing resource situations should also be determined. The best practices for mixed farming—in respect of feeding the cattle, fertilization, etc.—can be tried on some of the experimental holdings.[12]

(5) The duration of the experiments should be at least five years.

(6) Proper costing and accounting procedures should be followed.

(7) The participants should conform to the standard pattern laid down.

(8) If possible, complete accounts on all holdings under investigation (including controls) should be kept for a preliminary year before mixed farming is introduced in order to supply base-year data and information on initial differences.

V

It was pointed out earlier that, besides milch animals, other livestock enterprises, such as goats, sheep, pigs and poultry, and even bee-keeping and fish-rearing would be a good supplement to arable farming, particularly on small farms. This aspect of mixed farming has not received enough attention here and, wherever there is a talk of mixed farming, it is assumed that milch cattle should be added on the farm. In Japan, also a country of small farms, livestock enterprises other than milch-cattle play an important role. The numbers of the various types of livestock on Japanese farms are given in Table V.[13]

It will be seen from the table that poultry and pigs are important livestock enterprises on Japanese farms.

In India also, for small farms, the emphasis has to be placed on livestock other than milch cattle. For Northern India, the economic size of farm for successfully carrying on mixed farming of the conventional type (arable farming plus milch cattle) has been placed fairly high. "It has been found that the minimum size of the

12. Some work of this type has been done ; see for example, C. H. Parr, "The Role of Phosphate in Mixed Farming," *Indian Farming*, Vol. VII, No. 11, November, 1946 ; S. Sen, and S. S. Bains, "Role of Legumes and Green Manuring in Mixed Farming Holdings," *Indian Journal of Agricultural Science*, Vol. XXII, No. 1, 1952, pp. 33-38, and "Role of Phosphate Manured Legumes in Mixed Farming Holdings," *Indian Journal of Agronomy*, Vol. 1, No. 1, 1956, pp. 15, 24.

13. Survey of Farm Household's Economy, Ministry of Agriculture and Forestry, Tokyo, Japan, 1956 (based on a survey of 5,452 households, conducted during 1954).

TABLE V—NUMBER OF LIVESTOCK ON JAPANESE FARMS

(Average per Farm)

Size-Group (Acres)	Bullock	Horse	Milk-cow	Goat	Sheep	Pig	Chicken
Below 1.25	0.24	0.01	0.03	0.11	0.07	0.10	9.54
1.25—2.50	0.60	0.06	0.11	0.13	0.14	0.19	14.58
2.50—3.75	0.74	0.16	0.13	0.15	0.16	0.22	13.35
3.75—5.00	0.78	0.32	0.15	0.18	0.22	0.21	14.48
Above 5.00	0.69	0.48	0.19	0.11	0.34	0.33	14.25
Average	0.57	0.13	0.10	0.12	0.15	0.18	13.03

holding would be 8-10 acres near the towns in Northern India. In the rural areas the minimum size of the holding which has the capability of maintaining a family, working for a frugal living, would be about 12-15 acres. If the rainfall is below 25 inches but is quite assured, the size of the holding would be in the neighbourhood of 25 acres..... Such holdings would have the capability of maintaining frugally a family consisting of five members, three adults and two minors, one pair of bullocks, one cow, one buffalo and two young stock."[14] Of course, within the Region, the economic size of holding for purposes of mixed farming would vary considerably depending upon the physical nature of the soil and its fertility status, facilities of water, labour availability, market facilities, etc. Small farms can hardly make a go of mixed farming of the conventional type because the unit of livestock enterprise has to be economic. "On the basis of figures (given by Farm Management Studies) of Punjab and U. P. if a guess can be hazarded, a unit of five animals yield an income just sufficient to maintain a family."[15]

For small farms, therefore, the emphasis has to be shifted to livestock enterprises other than milch-cattle. And, of course, a great majority of farms in the Region come in the category of small farms uneconomic for adopting mixed farming of the conventional type.

Nevertheless, on medium and large size farms, the future of mixed farming of the conventional type seems to be bright, if action in the right direction is taken. Such farms, though small in number, account for a larger portion of area under cultivation as compared to small farms.

VI

The Region is quite suitable for mixed farming; it has a large number of cattle on farms and the enterprise of milk production contributes a high proportion to the total output. The breeds of cattle are good and the farmers are, by and

14. P. C. Raheja and S. R. Obhrai, "Why Practise Mixed Farming," *Indian Farming*, Vol. III, No. 3, June, 1953.
15. G. D., Agrawal, *Op cit.*

large, conversant with animal husbandry. While laying down priorities for the encouragement of mixed farming under the Third Five-Year Plan, the suitability of this Region was taken into account. It emerged from discussions with the officials in the Ministry of Food and Agriculture, Government of India, that about one-fourth of the total area intended to be covered under mixed farming proposals included in the Third Plan, lies in the Region.

A picture of the comparative advantage that the Region has over most parts of India so far as mixed farming of the conventional type is concerned, may be had from Table VI.

TABLE VI—ECONOMY OF MILK ENTERPRISE IN DIFFERENT STATES

State	Figures relate to		No. of Milch-Animals per Farm	Relative Contribution of Milk to Total Output (Per cent)	Annual Yield per Animal (Mds.)	Cost of Production per Maund (Rs.)
	District	Year				
U. P. ..	Meerut and Muzaffarnagar	Average of 1955-56 and 1956-57	3.0	15.3	16.6	16.7
Punjab ..	Amritsar and Ferozepur	Average of 1954-55 to 1956-57	6.8	16.8	19.2	13.7
Madras ..	Salem and Coimbatore	Average of 1955-56 and 1956-57	—	6.5	7.4	13.7
Andhra ..	West Godavari	1957-58	1.6	5.4	5.5	34.0
Orissa ..	Sambalpur	1957-58	1.2	3.8	1.7	23.0

Source : Adapted from data in G. D. Agrawal, *Op. cit.*

The annual milk yield per animal in U. P. and Punjab is the highest of all the regions for which data are available and the cost of production is the lowest except in the case of Madras where the cost of production per maund registers the same figure as observed for Punjab. The relative contribution of milk towards total output for this Region varies from more than two to four times the figure for other regions covered under farm management studies.[16]

For quite some time to come, the problem of an 'over-supplied' market seems improbable for any of the supplementary enterprises suggested for inclusion in the mixed farming system; the reasons for this are too obvious to need any elaboration.

The Region is also widely suited for a lding pigs and poultry and vegetable enterprises on the farms.

On the basis of the foregoing discussion, it seems fair to conclude that in the Region there is a good scope for the reorganisation of agriculture on mixed farming lines.

16. It should be borne in mind that the abc /e evidence cannot be regarded conclusive as the sample selected for farm management studies is not fully representative of the various States or regions of India.

VII

Mixed farming is a combination of livestock enterprises (milch cattle, sheep, goats, pigs, poultry and the like), bee-keeping, fish rearing, etc., with arable farming; much more than a combination of diverse enterprises, it is an integration of the variegated components to secure optimum resource use and yield maximum incomes to farm families. Self-sufficiency need not necessarily be laid down as an objective of mixed farming and economic considerations should be taken into account by the farmer while deciding about the use of various inputs—their quality and levels of application — and in determining the quantum of production of individual commodities and of the intermediate products.

The experiments on mixed farming conducted in the Region so far do not provide uncontrovertible evidence regarding the superiority of this system of farming. Nor do the data on milk enterprise contained in farm management studies prove the profitability of milk production ; actually milk enterprise was mostly found to be a losing proposition in the districts for which data are available. These findings, however, do not, by themselves, deny the beneficial nature of mixed farming. Further experimentation needs to be done in this direction ; future investigations should avoid the pitfalls of past studies and, further, should yield data on some additional aspects which would enable the decision-maker to have all facts regarding the economics of mixed farming and the variations possible within the system.

The indications are that, for a large number of cultivators with small farms, milk production and cattle rearing will not be economic and they should turn to other livestock enterprises and to bee-keeping, fish rearing, etc.

The Region is endowed with resources needed for making a success of mixed farming and offers good scope for intensification of the system and its extension to uncovered areas.

ECONOMICS OF MIXED FARMING IN DIFFERENT REGIONS

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The main purpose of this article is to give a clear and scientific exposition of the term mixed farming which we are accustomed of thinking as a loose combination of crop and livestock enterprises on a farm without any consideration of the valid claims of the livestock on its cropping scheme. Scientifically, the term mixed farming denotes a well designed proportion between arable and ley farming in relation to the units of the animals that could profitably be maintained on the farm consistent with the good rules of husbandry. In any mixed farming scheme, livestock enterprise is *complementary* to crop production programme so as to provide a balanced and productive system of farming.

At this point it would be necessary to set out some efficiency standards to judge whether a combination of crop and livestock enterprises really constitutes a mixed farm. The arable/ley ratio is one criterion. The other is to calculate the gross profit for each of the enterprises and to ascertain the contribution of the livestock sector to the total gross income of the farm. On the basis of these measures, it is possible to judge whether a crop and livestock farm comes within the scope of mixed farming.

The following account has been worked out from the data provided by a practical and educated farmer of village Adhiyapur in the district Etawah, U. P. in 1957-58 which usefully serves to identify the principles and methods involved in mixed farming. The area of the farm is 10 acres and the soil is light loam. The land is irrigated by canal and a well. A Persian wheel is used for lifting water from the well.

Capital Investment

Livestock		*Value*	*Dead Stock*
Cow	1	Rs. 250	*Kachcha* sheds, implements — ploughs, chaff cutter, bullock cart, spades, etc. Rs. 935
Buffalo	1	Rs. 400	
Calves	2		
		Rs. 650	
Bullocks (on crop account)	1 pair	Rs. 750	
		Rs. 1,400	

Total capital investment Rs. 2,335.00

CROP ACCOUNT

Cropping Scheme					*Remarks*
1.2	acres	*Chari* (320)	— Berseem (580)		Intensity of cropping—130 per cent
0.8	,,	*Chari* (200)	— Gram (8)		*Chari* — Juar as green fodder
1.0	,,	Juar and (1.8)	*Arhar* (9.5)	(mixed)	Figures in brackets show total yield in maunds of the main produce.
3.0	,,	Green Manuring	— Wheat (36.4)		
1.0	,,	Maize (12.2)	— Potato (120)		
2.0	,,	Late Paddy (26.5)	— Fallow		
1.0	,,	Sugarcane (310)			

Gross Receipts			*Gross Expenditure*	
Main product	Rs.	3,479.00	Upkeep of the bullocks, depreciation, rent, cost of seed and manure, interest on capital and repairs to dead stock.	
By-products	Rs.	438.00		
Total	Rs.	3,917.00		Rs. 2,815.00

Net profit on the holding Rs. 1,102.00

MILCH CATTLE ACCOUNT

Receipts			*Expenditure*		
1. Milk 52 mds. @ 8 seers per day for 260 days	Rs.	1,040.0	1. Feed & Fodder 300 mds.	Rs.	300
2. Calves 2	Rs.	100.0	2. Dry fodder 75 mds.	Rs.	200
3. Manure 10 cartload @Rs. 4	Rs.	40.0	3. Concentrates 45 mds.	Rs.	450
			4. Salt 2 mds.	Rs.	12
			5. Depreciation on milch cattle @ Rs.10 per cent	Rs.	65
			6. Interest on the above @6 per cent	Rs.	39
			7. Depreciation of buildings @ 10 per cent	Rs.	15
			8. Misc. charges — ropes, medicine, etc.	Rs.	5
Total	Rs.	1,180.0	Total	Rs.	1,086

Net Profit = Rs. 94.0

Note :

The interest on working capital is not calculated as the receipts from milk are obtained soon after the harvest of fodder crops.

SUMMARY STATEMENT

Particulars	Gross profit	Total expenditure	Net profit	Net profit per acre
	Rs.	Rs.	Rs.	Rs.
I. Grains and cash crop account ..	3,917	2,815	1,102	110.2
II. Dairy Account	1,180	1,086	94	9.4
Total of the crop and dairy enterprises	5,097	3,901	1,196	119.6

Utilisation of Human Labour Days

1.	Farm work	598
2.	Milch cattle	118

Note 1. The net profit per acre in crop enterprise is Rs. 110.2 which is higher than what would have been obtained by following a purely grain and cash crop enterprise. The receipt side of crop account has gone up due to the inclusion of *chari* and berseem fodders which gave a gross receipt of Rs. 900 per acre. Under grain and cash crop farming, it would have ranged between Rs. 80 and Rs. 100 per acre.

2. The net income by following mixed farming went up by Rs. 94 as a clear contribution of the milch cattle to the total receipt of the farm. The net profit per acre on the mixed farming thus comes to Rs. 119.6.

From the above tables, it will be seen that the contribution of dairy farming to the gross receipts is 23 per cent and the utilisation of human labour days between farm work and milch cattle is approximately in the ratio of 5 : 1. The cropping scheme is related to the family and livestock needs of the farmer. It will thus be noted that, on the whole, the livestock sector is playing a complementary role in the farm organization. Besides, the pattern of mixed farming shows that the rotation of crops alternates cereals and other crops with legumes to build up soil fertility and helps to even out the demand for labour throughout the year. Further, it is helpful in spreading risks and in providing continuous income throughout the year. The by-products are also profitably utilised.

Judged by the above concept of mixed farming, let us examine how far the crop—livestock enterprise as followed in India, meets the requirement of a mixed farm. A farmer generally keeps a large number of animals but the proportion of fodder area to the total cropped area is negligible. The figures cited in the following table have still relevance to the general farming conditions obtaining in the country.*

Province	Fodder crop as % of total cropped area
Punjab	16.1
Bombay	7.6
U. P.	3.2
C. P.	1.7

* *Source :* Report on the Work of I. C. A. R. (1939), p. 43.

In the light of the above figures, how can one justify the statement that the common pattern of farming in India is that of mixed farming ? Except in the greater portion of the Punjab, Western U. P., part of the former Bombay State and in certain pockets of other States, the type of farming can scientifically be termed as 'cattle neglected mixed farming.'

MIXED FARMING IN DIFFERENT REGIONS

The data presented below were collected by the post-graduate students of Agricultural Economics, Government Agricultural College, Kanpur, and relate to 1956-57. The results of the investigation are as follows :

WESTERN U.P.

Village Bopara, District Muzaffarnagar

Size of the holding	5.6 acres
Soil	Loam
Source of Irrigation	Well with Persian wheel
Investment on fixed capital excluding land:	Rs. 1,445 out of which Rs. 680 on milch cattle

Livestock		Value		Cropping Scheme	
Bullocks	1 pair	Rs. 750	1 acre	Fallow	Wheat (11.8)
Buffalo	1	Rs. 420	1.2 „	Maize (15.1)	Wheat (10.6)
Cow	1	Rs. 260	1.1 „	*Chari* (300)	Gram (11.8)
Calves	2		1.2 „	Cotton (6.1)	*Metha* (200)
	Total	Rs. 1,430	1.1 „	Sugarcane (410)	

Intensity of cropping—162 per cent.

Note : Figures in the brackets indicate total yields in maunds.

Utilisation of Human Labour Days

1.	Farm work	592
2.	Milch cattle	125

SUMMARY STATEMENT

Particulars	Gross profit	Total Expenditure	Net profit	Net profit per acre
	Rs.	Rs.	Rs.	Rs.
Grain and cash crop account ..	2,074	1,570	504	90.0
Dairy account	950	815	135	24.1
Total of crop and dairy enterprises	3,024	2,385	639	114.1

EASTERN U.P.

Village Hafepara-Apdaria, District Azamgarh

Size of the holding 5.3 acres

Soil clay-loam

Source of irrigation Well with *dhekuli*

Investment on fixed capital excluding land — Rs. 1,080 out of which Rs. 210 on milch cattle.

Livestock			Value		Cropping Scheme		
Bullock	1		Rs. 125	1.6 acre	Fallow		Wheat (13.8)
Cows	3		Rs. 210	0.5 „	*Sawan* (6.1)	+	*Arhar* (6.2)
Calf	1		—	1.0 „	Maize (11)		Barley (6.2)
		Total	Rs. 335	0.5 „	*Chari* (105)		Gram (8.3)
				1.7 ,	Paddy (20.6)		Fallow

Intensity of cropping—128 per cent.

Note: Figures within brackets indicate total yield in maunds.

Utilisation of Human Labour Days

Farm work	465
Milch cattle	105

SUMMARY STATEMENT

Particulars	Gross profit	Total expenditure	Net profit	Net profit per acre
1. Grain and cash crop account ..	1,277	1,021	256	48.3
2. Dairy account	161	149	12	2.3
Total of crop and dairy enterprises	1,438	1,170	268	50.6

Note : In Western U. P. the roughages given to the cattle are *chari* and *metha* as green fodder and *bhusa* as dry fodder; whereas in Eastern U. P. paddy and *sawan* straw with nominal supply of *chari* constitute the roughages. Consequently, the milk supply position at the farm management level is relatively very strong in the former region resulting in a higher net return per acre on the farm.

The two farms in the above study clearly indicate the sharp contrast in which the two types of farming business are carried on. The Muzaffarnagar farmer keeps only two milch animals and has 2.3 acres of the total cropped land under green fodder supplemented by *agola* (sugarcane tops) as green fodder. The contribution of the milk amounted to 31.4 per cent of the gross income of the farm. The human labour days between farm work and milch cattle are in the ratio of 4.7 : 1. The farm, on the whole, is a fairly good example of mixed farming. The Azamgarh farmer has only half an acre of cropped land under fodder and the inquiry showed that he was keeping two unproductive cows on sentimental grounds. The dairy produce shared 11.2 per cent only of the total farm receipt. This farm is a typical example of the crop and dairy enterprises largely obtaining in the country.

DISCUSSION

The analysis of the business affairs of the two farms shows that the farm in the Western U. P. presents essential virtues of mixed farming both in the acreage under fodder and legumes and in the complementary role of livestock production to gross receipts of the farm as a unit. The farm in the Eastern U. P. cannot scientifically be treated as a mixed farm. Its cropping scheme does not present a balanced combination of crop and ley farming. The animals raised are mostly unproductive and beyond the maintenance capacity of the farm.

Under Indian conditions, a farm to be scientifically termed as 'mixed farm' must have a minimum of 20 per cent of its gross receipts from the milch cattle. This percentage is the minimum necessary to cover risks involved in the loss of an animal or other calamities, which the dairy receipts must pay. So far as acreage is concerned, the minimum fodder area should be one acre cropped land for two

animals. The number of animals raised on the farm should be such as would most profitably utilise the by-products without putting undue burden on the cropping scheme. It may be noted here that we are not discussing other types of livestock that are maintained on a mixed farm under different socio-economic conditions.

Basically, mixed farming is of great economic importance to India where the majority of the people are vegetarian and ill-nourished and the fertility status of the soil is very low. The ever growing pressure of the population on the land coupled with the sentiments and tradition attached to keeping a disproportionately large herd of productive and unproductive animals have upset the balance between arable and forage area within the farm and between the cultivated land and grazing area in the village. The notion of the farmer that a large herd is an asset to him in providing fuel to kitchen and dung to his fields is scientifically wrong, because a given quantity of feed and fodder fed to a relatively fewer number of animals results in the production of more manure than fed to a larger number.

The remedy to restore the balance between crop and livestock enterprises lies in the elimination of useless and unproductive cattle maintained on a farm through a sustained educational programme on the part of extension workers. The intensity of cropping should be raised for inclusion of required fodder area through intensification of irrigation schemes, more particularly in the direction of minor irrigation works. The existing grazing areas which have been reduced to the level of an exercise ground should be better managed through a system of rotational grazing. On the whole, the whole farm management outlook has to be changed in relation to the adoption of mixed farming practices on a scientific basis. A balanced combination between crops and livestock maintained on a farm is bound to increase the farm income through the building up of soil fertility and more production per acre at a relatively low cost.

ECONOMICS OF MIXED FARMING IN BIHAR*

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While reviewing the history of agriculture as it developed with the growth of civilization it has been observed that at one stage as the cattle needed for agricultural works could not provide enough manure to get the best out of the land, the cultivators thought of rearing milch cattle also, so that besides meeting their requirements of manure, they could obtain milk, milk products, and meat to supplement their grain diet and a continuous supply of young draught animals to replace the old ones. This is the system which now generally goes by the name of mixed farming.

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* The views expressed are in personal capacity.

It may thus be observed that mixed farming occupies the highest place in the evolution of farming and is indispensable for a successful intensive cultivation. Though mixed farming is an old practice in our country, due to several reasons there has been a gradual deterioration in this type of farming and in the health and breed of domestic animals. This has resulted in an all-round deficiency of good bullocks, cows and buffaloes and consequently, of milk and milk products and manure and above all, in the depletion of the fertility of our land.

A review of the progressive farmers reveals that the most flourishing farmers of the Punjab, Delhi, Western Uttar Pradesh and Charotar tract of Gujarat, go in for mixed farming. On an average, they rear two milch animals, mostly buffaloes, for every pair of draught bullocks maintained for cultivation. The milk and milk products thus obtained from their milch cattle supplement their incomes and also provide them with a more varied and wholesome diet. Cow dung and farmyard manure thus obtained naturally go to enrich the fields. The improved diet of the farmers gives them a sturdy physique, suited to agricultural work. It is in mixed farming, therefore, that the key to prosperous agriculture lies.

DIFFERENT CONCEPTS OF MIXED FARMING

In England, the term mixed farming is generally applied to a farm consisting of both grass and arable fields. A farm without livestock does not exist in that country.

The Nigerian Agriculture Department employs the term somewhat differently. A mixed farm in Nigeria consists of at least two separate, and not logically interdependent, parts. It comprises considerable proportions of both permanent grass and arable lands. It also implies that the basis of the manuring of the arable land is farmyard manure produced on the farm by cattle standing on a straw bed.

A grass farm, whether the grass is used for sheep rearing or dairying, is not a mixed farm, because only a small proportion of its land is under the plough and is growing food for the livestock. Nor is an arable farm a mixed farm if sheep folding is the basis of the manuring of the arable land. Besides, no one can describe as a mixed farm a farm on which practically no stock is kept and from which everything — straw and roots as well as grain — is sold off and where, consequently, the farmer relies on the purchase of artificial and of stable manure from elsewhere for the maintenance of the fertility of the soil.

The normal characteristic of a mixed farm is that profits are realised by selling animal products such as milk, butter and cheese and by rearing or fattening cattle, or from all these, as well as from grain. Certain farms where the preparation of farmyard manure is as much an essential feature as is the mixture of arable and grass land are known as mixed farms; but the sale of animal products is not quite one of their essential features.

In India, mixed farming implies dovetailing of crop production and animal husbandry to the best advantage of the farmer. This relationship of the two may be expressed as a complementary use of livestock and crops. This enables a full utilisation of the by-products of crops and their conversion into valuable animal products. Thus, farmyard manure becomes available, and the spare time of the cultivator and his family is fully utilised.

In addition to maintaining cattle and buffaloes, the mixed farmer may also keep with advantage some sheep, goats, pigs, and poultry as an additional source of income. Where water reservoirs, tanks and ponds are available on a farm fish-rearing may also be profitably introduced.

A mixed farm should produce the required quantity of food, including fruits and vegetables as well as sufficient fodder for the livestock kept on the farm besides such cash crops as will yield the largest profit to the farmer. In order that the farmer may be able to use the entire farmyard manure for compost making, he should also grow fuel and fodder trees such as *babul* and *shishan* on the sides of the roads, along the farm boundary and in other convenient places.

Mixed farming means a combination of dairying and animal-raising with crop production to the best advantage of both. For this reason, therefore, there are people who do not favour rearing of sheep and goats on a mixed farm, unless the area is extensive. Though poultry and honey-bees are sources of additional income, they cannot utilise the by-products of the arable farm, nor can they supply manure to enrich the soil as the draught and milch animals do. People of conservative outlook in India, therefore, feel that mixed farming should have the combination of arable farming and dairying limited to the rearing of milch cattle like cows and buffaloes.

ECONOMICS OF MIXED FARMING

For finding out the economics of mixed farming an investigation was conducted during the year 1959-60 in village Mainpura, district Patna. The basic data were obtained from six holdings, three following arable farming and the remaining three maintained some milch cattle also in addition to arable farming. Thus in case of present investigation mixed farming consists only tending of cattle in addition to ordinary farming. The comparative data relating to the net profit per acre of cultivated area, earnings per man-day worked, utilisation of human labour, intensity of cropping, percentage of cash income to gross income and the percentage of income derived from cattle-rearing to total income in case of mixed farmer have been studied. Table I shows the comparative economics of the two types of farmers in respect of items mentioned above.

TABLE I—COMPARATIVE ECONOMICS OF MIXED AND ARABLE FARMING IN SELECTED HOLDINGS DURING 1959-60

Serial No.	Particulars	Types of Farming	
		Mixed Farming	Arable Farming
1.	Average size of holding in acres	6.35	3.92
2.	Net profit per acre in rupees	259.0	130.0
3.	Earnings per man-day worked in rupees ..	4.01	1.75
4.	Man-day worked per worker during the year	205.0	125.0
5.	Percentage of human labour used to total available labour	65.37	40.06
6.	Intensity of cropping	177.03	163.62
7.	Percentage of cash income to total income ..	31.29	7.80

Profit and Earnings

The net profit per acre was about twice in holdings following mixed farming when compared to the holdings following only arable farming. On an average it amounted to Rs. 259 and Rs. 130 per acre of cultivated area in holdings following mixed farming and arable farming respectively. The average earnings per man-day worked were Rs. 4.01 and Rs. 1.75 in cases of mixed farmer and arable farmer respectively.

Employment

The employment is worked out in terms of percentage which means a relationship between the total available labour force and the amount of labour actually utilised. Since it is not possible to work on all days of the year, a working year was taken as 312 days making an allowance for holidays of one day in each week. Further as far as available days are concerned only working members of the family as well as permanently employed labour force have been taken into consideration.

It may be observed from Table I that the total man-days worked per worker accounted for 205 and 125 in the case of farmers following mixed farming and arable farming respectively. It reveals that a worker utilised properly 65.37 per cent of his total available time in the former case while the percentage of employment during a year was 40.06 per cent in the latter.

The intensity of cropping also was higher amounting to 177.03 per cent in case of mixed farmer. While in case of arable farmer it was 163.62 per cent. Incidentaly it may also be stated that due to sale of milk and milk products mixed farming brings more cash income than arable farming. The same is evident from the data which revealed that cash income accounted for 31.29 per cent of total income in case of mixed farming. In case of arable farming it amounted to 7.80 per cent of gross income. It has also been observed that the income derived from the sale of milk and milk products accounted for 13.36 per cent to total income in holdings following mixed farming. It clearly shows that in addition to other advantages accruing to a mixed farmer, namely, more net profit per acre, larger earnings per worker, more gainful employment to farm worker, etc, the cultivators practising mixed farming could earn an extra income varying from Rs. 400 to Rs. 550 by sale of milk and milk products. The supply of manure was increased thereby increasing the fertility of soil; yield per acre was also higher on holdings following mixed farming than in the arable one. Mixed farming enabled the farmers to consume more milk and milk products and provided the additional nutrition to the family.

The above results and discussions conclusively show that mixed farming has the following advantages over arable farming.

(1) The cultivator and his family find an extra remunerative employment in their homestead. The subsidiary occupation of tending cattle absorbs a considerable portion of their idle time usefully.

(2) The fertility of the land improves by extra manuring and production of leguminous and other fodders for the cattle. This reduces the necessity for keeping

the land fallow to help the soil to restore its fertility. The leguminous fodder grown in rotation with other crops and manured with the extra manures now available enables the farmer to produce more from the land for himself and his cattle.

(3) It helps to increase the intensity of cropping to meet the fodder and feed requirements of the cattle in addition to domestic requirements of grains, vegetables, etc.

(4) The by-products of crops are more profitably consumed by animals to produce milk. The members of the family get more nourishing food in form of milk and are able to maintain better physique so that they can put in better work and increase agricultural production.

(5) The natural growth of grasses in form of weeds during monsoon season provides useful forage for the animals when maintained on the farm. This forage otherwise is sometimes not weeded out, which practice contributes to the lowering of crop yields, the forage itself going waste.

(6) In times of stress, when prices of grains are low and it pays less and less to work on an arable farm, the subsidiary occupation supports the family. In unirrigated tracts, milk production provides a support to the family when rains fail and crop yields are low.

(7) The farmer is able to raise his draught animals on the farm and does not have to invest capital from his pocket. The dry stock is usually maintained on the fodder and the forage available on the farm without any much extra drain on the farm resources.

Consequently it may be stated that considering the net remuneration per acre of the land held and earnings per man-day worked, mixed farming is definitely superior to arable farming.

ESSENTIALS OF SUCCESSFUL MIXED FARMING

The mixed farmer should keep only as many animals as he can conveniently maintain without taking recourse to purchasing food and fodder from the market. It is essential that draught and milch animals when old are sent to *pinjrapoles* instead of being kept on the farm. The sentiment of the society in which the farmer has to live has to be respected, but not to the extent of coming in the way of his progress. He could conserve the maximum quantity of dung and urine available on the farm, turning them into good farmyard manure and compost. Only then he will be able to practise intensive farming and obtain high yields from his crops. If he does not do so, his income from the food and cash crops get reduced. To engage the family fully all the year round, he should supplement his income with poultry-keeping, fish culture and bee-keeping.

To summarise, mixed farming implies: (*a*) A diversified farming of food and cash crops; (*b*) Rearing suitable dairy stock over and above the work animals;

(*c*) Adequate provision for cultivation of suitable forage crops in the cropping schemes; and (*d*) An optimal use of cattle manure and other farm wastes.

The cropping of the unit naturally becomes intensive and at the same time flexible within this broad objective. But it is self-sufficient and self-contained both in crop and animal produce insofar as the primary requirements of the rural family are concerned. It is the best system of diversified farming that can be adopted in the limited small-holding economy.

SCOPE OF MIXED FARMING

The above conclusions reveal that mixed farming is one of the useful measures for increasing productivity of both livestock and farm crops. It can easily be adopted on a nation-wide scale not only in regions where the practice is well known (such as Punjab, Delhi, the western districts of Uttar Pradesh, and the Charotar tract of Gujarat) but also where a developed livestock industry is existing side by side with intensive farming practices.

In Bihar also the presence of livestock industry side by side of arable farming makes it feasible to practice mixed farming in practically all the tracts of the State. During the Third Five-Year Plan of the State it has been proposed to bring 5 lakh acres under mixed farming. For the purpose of adopting mixed farming the State may conveniently be divided into four distinct regions. (i) Purnea and Saharsa districts of North Bihar (Kosi belt area), (ii) the remaining districts of North Bihar, (iii) South Bihar and (iv) Chotanagpur plateau. The Saharsa district and western parts of Purnea district being a victim of Kosi floods every year provide an opportunity to develop the mixed farming side by side of ordinary farming for the economic development of the region. Besides, North East Khagaria (a sub-division of Monghyr district falling in North Bihar) and North-East of Darbhanga district being flooded during rainy season may be very well developed under mixed farming. At times due to long duration of floods people of the area have to remain without any crop during the whole year. Under such circumstances the developed livestock industry side by side of arable farming may be of immense help to improve the economic conditions of the cultivating population. In the remaining parts of North Bihar as well as in South Bihar we find the existence of livestock industry side by side of arable farming. Mixed farming, therefore, can be adopted on a large scale to improve the economic conditions of the farmer. In Chotanagpur plateau with a plenty of pasture land, the mixed farmer may keep with advantage some sheep and goat as an additional source of income.

DIFFICULTIES IN MIXED FARMING

In spite of the various advantages accruing to a mixed farmer, we find that the system of mixed farming is not very well developed in the State. The following are the obstacles responsible for its limited progress.

(1) *Small Size of Holding*

The average size of holding in Bihar is 3½ acres. One half of the total holdings are of a size not exceeding one acre. Only about one fifth of the entire holdings are of a size exceeding 5 acres. It has been estimated that one acre of land in the

tropical and sub-tropical regions with favourable climatic conditions and capable of multiple cropping is required per head of the population for a reasonable level of sustenance. Assuming that there are about 5 persons per family, there is hardly any scope on an average holding to grow fodder crops for milch cattle maintained under mixed farming. We lack basic data to determine the lowest limit of size of holding suited to adopt mixed farming economically. However in order to restrict the demand on land for fodder growing, mixed farming in small sized holding may include poultry instead of dairying and animal husbandry.

(2) *Adaptability of Farmer*

Certain farmers lack the art of tending cattle. It is, therefore, essential to train them in this direction before introducing mixed farming in their holdings. Behaviour of the farmer towards his milch cattle is one of the factors determining the milk yield of a cattle.

(3) *Economy of Alternative Cash Crops*

A mixed farmer withdraws some area from cash crop to grow fodders for his milch cattle. It is, therefore, essential to determine the alternative economies of mixed farming in relation to cash crops ceased to be grown on account of mixed farming. Definitely a farmer would like to get maximum returns from his existing acreage. In case mixed farming is not more paying than growing cash crops, he perhaps may not take to mixed farming. Unfortunately we lack basic data to decide on such issues.

(4) *Lack of Marketing Facilities*

Lack of marketing facilities for the new products obtained as a result of following mixed farming may also stand in the way of rapid expansion of mixed farming. Before changing to mixed farming it is essential to ensure that the marketing centres of new products are within easy reach of mixed farmer. He is also sure of disposing off his products from mixed farming at a reasonable price. The marketing facilities may include better means of transport and communications, storage facilities, better bargaining capacity and reasonable share in the price paid by consumer for the commodity.

(5) *Lack of Basic Data*

Lack of basic data is also one of the most important factors standing in the way of rapid expansion of mixed farming. The basic data are required in respect of income, expenditure, net profit, human and bullock labour utilisation, family labour income, farm business income and input-output relationship of different enterprises followed on arable and mixed farms. Similar data are also required in respect of arable and mixed farming taking them as one single enterprise. This information is essential in advance to determine the relative profitability of mixed and arable farming as well as to ensure the different profitable combinations in both cases.

ECONOMICS OF MIXED FARMING IN COIMBATORE REGION

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Introduction

Farming in India is essentially a combined venture with livestock enterprise, as the farms in India depend on livestock for motive power and organic manures. Mechanisation has not made much headway in Indian agriculture, so much so that the dependence on livestock can hardly be over-emphasised. The organic mixed farm depends on the reciprocal interaction of mutually supporting and complementary branches. The advantages of mixed farming to the farmers are manifold. When one branch suffers, the mixed farmer can still find profit and refuge in a branch which escapes adversity. The combination of arable farming and livestock are also inter-related. The farmer is enabled to put to better utilisation the by-products of the crops, *viz.*, fodder in return for motive power, manure and milk from livestock. The advantage of the modern mixed farm, therefore, is not its capacity of self-supply, but rather its higher competitive power which, by virtue of co-ordination, its different branches acquire. Where the specialised farm succumbs, the mixed farm still stands, but to do so, it must be built organically so that its component branches support and complement each other.

In India mixed farming assumes special significance. Dairying, practised independently as a separate branch, suffers on account of lack of better feeding, better breeding and better management, often resulting in uneconomic returns. But when such enterprises are connected with other branches, they are mutually strengthened, one complementing and strengthening the other. Hence it is necessary to study the proper combination of such enterprises which will maximise the profit of the farmer. Rationalising the number of animals in a farm by culling out the unproductive animals, which amounted to 10 per cent of total cattle population in India, according to 1951 census, would require positive steps. Though the causes appear to be exogenous, the human factor is the pivot of entire farming, and as such personal preferences and sentimental disposition do enter into the process of decision-making. Rationalisation of cattle population on the marginal productivity basis, therefore, has to be duly weighted with the attitudes of the Indian farmers.

The dairy cow is the foundation of a sound system of mixed farming, especially in India where farms are small and farming is the main source of employment for members of the farm families. However, production of milk and milk products for family consumption and for off-farm sales is influenced by the level of income, the income elasticity of demand for milk, market factors and cropping patterns adopted in the farm.

This paper attempts to study such factors to assess the level of production and to seek some of the possible indicators based on which the production efficiency could be stepped up in Coimbatore region of Madras State.

Scope and Method

The results of a study of this nature would surely reveal the nature and efficiency of mixed farming practised in Coimbatore region, which might also serve as a starting point for subsequent studies in this direction in other regions.

With a view to study the problems of mixed farming, a case study of ten farms, which are distributed in different directions of the city within a radius of 7 miles, has been taken up. These selected farms varied from 6 acres to 15 acres in size and most of them were irrigated by wells or otherwise known as garden lands in these parts. They are all adopting a diversified cropping pattern, of a commercial crop like Cambodia cotton followed by a grain crop like *sorghum* or *ragi*. Data collected from these holdings include cropping pattern, cultivation practices, rotations, number of days required for the different enterprises, cost involved, number of animals maintained for draught and milk, breeds, feed schedules, milk yields, etc. Data have been processed so as to arrive at the per acre return from crop as well as livestock. Based on the result of study, certain broad suggestions could also be made for future efficiency and development.

Cropping Pattern

The cropping pattern adopted by the farmers in the ten farms studied is presented in Appendix I. The cropping pattern in this region is designed so as to provide for cash income, grain for food and fodder for livestock. Thus we find Cambodia cotton being grown in the major area, if not in the entire area, followed by either *sorghum* or *ragi* or by both in certain proportions. The evolution of such a distinct rotation has facilitated the farmers to maintain a herd or at least a certain number of milch animals depending on the size of the farm. Even in areas of Kuniamuthur village where there is the comparative advantage of sugarcane cultivation, the farmers put to use the sugarcane tops as fodder for feeding the animals. Considering the fodder produced in the farms and the requirement, 40 per cent of the farms studied are self-sufficient in fodder supply, while the rest are deficient. The farms located in Ganapathi, Kuniamuthur and Tudialur villages have to make up the deficiency by purchase from outside. This can also be due to the increased number of animals kept on these farms. It is also interesting to see that except one farm no farm sets apart any area for fodder crop alone.

Livestock

(a) *Displacement of draught cattle*: Appendix II throws light on the number of livestock maintained in the farms, the natu e of the breed, the manure produced out of them and the fodder requirement.

It is notewo-thy that out of the ten farms nine farms are having electric motor and pump sets for lifting water. The advent of electric power as an aid for lifting water and at times in threshing the grains of *sorghum* and *ragi* has led to displacement of draught cattle. The old order of bullock *mhotes* has yielded to power pumping. This vacuum has been filled by milch animals resulting in a good source of income. It is found that out of ten farms studied eight farms maintain only one pair of work bullocks, the bearest minimum for agricultural operations. Even the two farms which maintain two pairs, the extra pair is used for off-farm work.

(b) *Cow versus Buffalo*: Among the milch animals buffaloes seem to out number the cows in most of the farms. Though the potentiality of increasing the yield of milk is indeed greater in cows, but still the buffaloes outnumber the cows for the simple reason that they are hardy animals, capable of feeding on any kind of roughage and at the same time needing less care than cows. Another reason advanced is that the fat content of the buffalo's milk being greater, not only there is a greater demand for it, but also it brings a premium over cow's milk. There is also a greater scope for adulteration in buffalo's milk than in cow's milk.

Regarding the breed of animals in these farms, it may be noted that among cows 50 per cent are cross-bred, while among buffaloes only 16 per cent are of improved breed.

Maintenance of Soil Fertility

Another reason given by the farmers which has given rise to the emergence of mixed farming is the maintenance of soil fertility. The lands are intensively cultivated which naturally requires copious manuring. Farmyard manure being a good source of organic manure, naturally has led to the adoption of the complementary enterprises of crop and livestock. The cultivators are enabled to feed the crop as well as feed the livestock. The lands receive not less than 12 tons of farmyard manure mixed with varying quantities of tank silt which are carted from the nearby tanks. There are numerous tanks all round the city of Coimbatore, and it has become a regular feature to cart tank silt. This has incidentally led to the efficient use of bullocks on idle days.

Regarding the position of demand and supply of organic manures in the farms studied, we find that all the ten farms are deficient in manure. A large quantity of tank silt is added to the farmyard manure.

Income from Crop vs. Income from Livestock

Appendix III indicates the investment on crop and livestock enterprises and also the income from these enterprises. The main income of the farmers is derived from crop enterprise, thanks to the cultivation of commercial crops like Cambodia cotton, rotated with food-cum-fodder crops of sugarcane in the area of Kuniamuthur. However, the income from livestock also forms a significant part. Thus it is found that the percentage of income from livestock in the ten farms varies from 16 per cent to 48 per cent. One noteworthy feature is that while the income from crops is seasonal, being affected by time lag, the income from livestock is steady being distributed throughout the year. This is a fact which is very important for the farmers and appreciated.

Considering the income from crops per acre, it varies from Rs. 540 to 1,770 in garden lands. The villages in high income group are Ganapathi and Kuniamuthur, which are noted for high level of production and record crop yields. The income from livestock is also found to be varying from farm to farm depending on the number of animals kept. Thus it is found that the livestock income per acre ranges from Rs. 150 in Telungupalayam village to as high a figure as Rs. 583 in Tudialur village where the number of milch animals is largest.

Increasing Employment

From the point of view of employment also mixed farming is a blessing to the farmer. In an already diversified cropping pattern adopted in this region, the combination of livestock enterprise has further increased the employment opportunities to the farmers. Appendix IV indicates roughly the man-days required for crop husbandry and livestock enterprise. Though the farmers engage casual labour for important operations like sowing in the case of cotton and planting of sugarcane, transplanting *ragi*, after cultivation and harvesting, most of the other operations like preparatory cultivation, manuring, threshing, etc., are attended to by the farmers themselves assisted by one or more permanent farm servants. The problem of separate labour for attendance on livestock does not arise, as it is the duty of the farm servants to attend to both. Thus the labour potential of not only the farm servants but also that of the family members of the farmer is put to maximum use.

Feeding and Feed Stuffs

The main source of fodder comes from *sorghum* and *ragi* and to some extent from paddy and sugarcane, while *sorghum*, *ragi* and paddy are dry fodder, sugarcane tops in Kuniamuthur forms the green fodder. The practice of feeding sugarcane tops as a green fodder wherever sugarcane is raised has very well developed in this region. An acre of sugarcane easily supplies more than 10,000 lbs. of green fodder. But the fodder supply in the farms studied is far from satisfactory and as many as six farms out of ten have to augment their supply by purchasing from outside.

Regarding concentrates, the main constituents are cotton seed and groundnut cake ground and mixed with water. Feeding the animals with concentrates is confined to only when the work bullocks are put to work or when the milch animals are in lactation. On idle days or when the milch animals are dry they have to be content with bulky fodder alone. As 50 per cent of the dairy animals among cows are of cross-breed they are heavy consumers of feeds and at the same time heavy milkers.

Conclusions and Suggestions

The result of study of mixed farming in ten farms round about Coimbatore leads us to the conclusion that the farmers have taken advantage of the situation and there is a phenomenal development of mixed farming in the suburban villages of Coimbatore town. On account of increasing demand for milk and milk products from the expanding population of the city, there is a tendency on the part of the farmers to maintain more and more milch animals of better breeds and this has also been facilitated by the displacement of draught animals due to electric motors and pump sets replacing the traditional bullock *mhotes* and the increasing area brought under irrigation with consequent increased supply of fodder and income. Nevertheless there is still a great potentiality and scope for improvement. Since the demand for milk is increasing, there is a proposal for installation of a pasteurisation plant at the co-operative milk supply union which means procurement of increasing quantity of milk. Because of the increasing attention paid by the milk trade and the co-operative organisation, there is definitely a trend towards better

breeding, as is evident from the enquiries that 50 per cent of the cows are cross-bred animals. However, the improvement of buffaloes is not spectacular, as only 16 per cent are of improved types in the farms studied. There is much scope for improvement in this line with the help of the Animal Husbandry Department. The study has revealed that buffaloes are preferred more as a dairy animal than cows for many reasons, and thus it is all the more important to improve the breed of buffaloes also.

The development of mixed farming has also led to increasing employment opportunities. It has not only increased the employment of farmers and his family members, but also to a number of milk vendors as a means of living. These vendors get up in the early part of the day, collecting milk regularly from different farms and wend their way to the city on cycles with heavy cans of milk. The marketing of milk is no longer a serious problem for the farmers as the vendors come to the doors and take delivery of milk. But the one drawback in delivering the milk to the milk vendors is that these middle men purchase milk in measures of 43 oz. while selling it to customers in measures of 33 oz., thus knocking away a sizable portion of consumer's rupee. Though the farmers are aware of this, they never mind it since they cannot devote greater time to marketing themselves.

It is, however, a sad commentary when we see that poultry development has not kept pace with dairying. In fact, there is great scope for poultry farming also in combination with dairying, as there is a steady demand for eggs and fowls which at present are imported from Kerala. A good number of breeds like White Leghorn, Rhode Island Red can well be profitably introduced in these farms with very little expense for maintenance, but at the same time a very lucrative line of development. A special organisation on co-operative lines to concentrate on this aspect will go a long way to augment the income of the farmers and at the same time meeting the demand of the city population for eggs and fowls.

Another fruitful line of development is the preparation of feed mixtures and supply. At present farmers cannot be said to be quite aware of the balanced feed that will be economical and promoting higher milk yield. Researches on these lines and preparation of balanced feed mixture and supply to the farmers will certainly place the mixed farming on a sounder basis. It is encouraging to find that the co-operative milk supply union is taking steps on these lines with the help of Government loans and subsidy, which will surely be emulated by private enterprise sooner or later. There is a great future in this line.

Another difficulty of the farmers is the maintenance of dry cows and buffaloes. In many instances it is learnt on enquiry that when milch animals of country breeds go dry they are disposed of in shandies since they would be a liability. However, improved breeds of animals are retained, as it would be very difficult to procure such animals again. Hence it would be better to open some salvage farm in the interior parts of the villages where facilities for natural grazing exists, so that good milch animals could be taken care of during such periods at nominal charges, as is done by the Co-operative Milk Supply Union for its members.

APPENDIX—I

CROPPING PATTERN

S. No.	Farm No.	Village	Area of holding (in acres)	Cropping pattern					Other Miscel-laneous crops	Nature of lift used	Approximate total quantity of fodder produced (Tons)	Approxi-mate fodder required (Tons)	Remarks
				Cam-bodia cotton	Sugar-cane	Paddy	Sor-ghum	Ragi					
1.	I	Telungupalayam	7.00	..	..	..	6	..	..	No lift	12.5 Dry	6.52	Surplus +
2.	II	,,	6.00	2.00	1.00	0.50	4.00	0.50	1.00	Elec. Motor	6.0 Green 8.5 Dry	11.68	Surplus +
3.	III	,,	8.00	4.00	..	..	7.00	4.00	..	,,	19.5	36.69	Deficient —
4.	IV	Ganapathi	12.50	9.00	..	..	7.00	4.00	..	,,	21.0	17.93	Surplus +
5.	V	,,	9.00	6.50	..	..	1.50	3.50	0.50	,,	8.0 10.0 Green	25.25	Deficient —
6.	VI	,,	7.00	6.00	..	0.25	4.00	2.00	..	,,	11.6	27.92	Deficient — Purchases for Rs. 1,000
7.	VII	,,	7.00	6.50	..	..	4.00	2.50	..	,,	12.25	22.05	Deficient —
8.	VIII	Kuniamuthur	7.50	5.50	..	2.00	..	..	..	,,	2.5 Dry 31.9 Green	31.83	Deficient —
9.	IX	Saravanampatti	15.00	12.00	..	..	15.00	..	..	,,	33.5 Dry	25.25	Surplus +
10.	X	Tudialur	8.00	6.00	..	1.00	1.00	5.00	..	,,	11.2	33.01	Deficient — Purchase for Rs. 800

APPENDIX—II

PARTICULARS OF LIVESTOCK

S. No.	Farm No.	Village	No. of animals						Breed				Manure produced (Tons)	Manure required (Tons)	Fodder required (Tons)
			Bullocks	Cows		Buffaloes		Heifers	Young stock	Country breed		Cross breed				
				Milk	Dry	Milk	Dry			Cows	Buffaloes	Cows	Buffaloes			
1.	I	Telungupalayam	Nil	2	..	..	..	..	3	..	..	2	..	13	18	6.52
2.	II	,,	2	..	..	2	1	..	1	..	3	..	..	67	72	11.68
3.	III	,,	2	3	..	7	..	..	11	1	6	2	1	58	96	36.69
4.	IV	Ganapathi	2	1	..	4	..	..	5	..	4	1	..	36	132	17.93
5.	V	,,	2	4	1	2	..	1	6	6	1	..	1	48	84	25.25
6.	VI	,,	2	5	..	4	..	..	9	..	4	5	..	51	84	27.92
7.	VII	,,	4	2	2	1	0	1	3	2	1	2	..	48	84	22.05
8.	VIII	Kuniamuthur	2	1	..	5	..	5	8	1	..	..	5	55	87	31.83
9.	IX	Saravanampatti	2	2	2	4	..	..	6	3	4	1	..	42	120	25.25
10.	X	Tudialur	4	1	..	7	5	..	8	1	12	..	..	67	96	33.01

APPENDIX—III

Investment and Income

(In Rupees)

S. No.	Farm No.	Village	Investment on		Gross income from crops	Expenditure on crop raising excluding Bullock Labour	Net income from crops	Gross income from Livestock			
			Land Building cum Residence	Livestock				Milk	Manure	Bullock labour	Total
1.	I	Telungupalayam	17,500	1,340	1,625	360	1,265	1,814	104	..	1,918
2.	II	„	20,000	1,515	5,590	1,550	4,040	1,810	136	450	2,396
3.	III	„	68,000	4,890	6,000	1,675	4,325	7,615	464	607	8,686
4.	IV	Ganapathi	72,800	2,590	14,320	3,035	11,285	4,171	288	675	5,134
5.	V	„	50,000	3,330	8,435	2,125	6,310	3,585	384	675	5,644
6.	VI	„	50,000	4,680	9,700	2,265	7,075	6,975	408	675	8,058
7.	VII	„	57,000	3,425	8,175	1,400	6,775	2,495	384	1,350	4,229
8.	VIII	Kuniamuthur	65,000	5,020	18,600	5,325	13,275	6,738	440	675	7,853
9.	IX	Saravanampatti	96,000	3,540	16,005	4,425	11,580	4,320	336	675	5,331
10.	X	Tudialur	66,000	6,290	7,535	1,500	6,035	6,878	536	1,350	8,764

(Contd.)

APPENDIX—III (*Contd.*)

(In Rupees)

S. No.	Farm No.	Village	Expenditure on Livestock					Net income from stock	Percentage of income from livestock	Income per acre for crops	Income from Live-stock
			Bulky Fodder	Cotton seed	Cake	Bran and others	Total expenditure				
1.	I	Telungupalayam	326	346	259	..	931	1,047	45.3	180	150
2.	II	„	584	486	432	..	1,502	894	18.11	673	139
3.	III	„	1,834	1,382	1,361	..	4,577	4,109	48.61	540	329
4.	IV	Ganapathi	896	749	778	..	2,423	2,711	15.75	903	301
5.	V	„	1,262	730	886	..	2,878	1,766	21.10	701	252
6.	VI	„	1,396	1,440	1,296	..	4,132	3,926	43.64	1,010	561
7.	VII	„	1,102	826	799	..	2,726	1,503	18.16	968	215
8.	VIII	Kuniamuthur	1,591	1,065	972	..	3,648	4,205	24.05	1,770	560
9.	IX	Saravanampatti	1,262	844	886	..	2,992	2,339	16.81	772	156
10.	X	Tudialur	1,650	1,152	1,296	..	4,098	4,666	43.61	754	583

APPENDIX IV

EMPLOYMENT OPPORTUNITIES IN CROP AND LIVESTOCK ENTERPRISES

S. No.	Farm No.	Village	Area (in Acres)	Man-days required by crop raising	No. of animals		Man-days required
					Adult	Young stock	
1.	I	Telungupalayam	7 dry	168	2	2	91
2.	II	,,	4.50 garden 1.50 dry.	758	5	1	124
3.	III	,,	8 garden	932	12	7	296
4.	IV	Ganapathi	12.50 garden	932	12	7	182
5.	V	,,	9.00 -do-	866	9	7	205
6.	VI	,,	7.00 -do-	814	11	9	273
7.	VII	,,	7.00 -do-	962	10	3	251
8.	VIII	Kuniamuthur	7.50 -do-	1332	13	8	319
9.	IX	Saravanampatti	15.00 -do-	1968	10	8	250
10.	X	Tudialur	8.00 -do-	966	17	8	435

PATTERN OF MIXED FARMING IN PUNJAB—CASE STUDIES OF SOME SELECTED VILLAGES IN DIVERSE REGIONS*

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This paper is based on the data of three villages in Punjab collected in the Continuous Village Surveys Project of Agricultural Economics Research Centre, University of Delhi. The villages are Aulant, Mirka and Lodhi Nangal. They are situated in three diverse regions of Punjab. Aulant is located in the sandy tract of district Gurgaon where the rainfall is scanty and the level of sub-soil water is very low. Mirka is situated in the canal irrigated tract of district Hissar, and Lodhi Nangal lies in that belt of district Gurdaspur near Fatehgarh Churian where cultivation of fodder is widely prevalent.

The figures of land utilisation given in Table I in the Appendix, show that the proportion of area under cultivation to the total area varied only between 84.8 per cent to 90.5 per cent in these villages. This fact shows that cultivation of land was quite extensive in all the villages. There were, however, large differences in the proportions of area under irrigation to the total cultivated area. Irrigated area was 14.6 per cent, 39.5 per cent and 45.5 per cent of the total cultivated area in Aulant, Mirka and Lodhi Nangal respectively. The proportions of area under current fallow to the total cultivated area was the highest in Lodhi Nangal and lowest in Aulant.

Another significant aspect of land use pattern in these villages was that the conditions of the availability of waste lands varied. In Aulant no waste land at all was available to people though pasture land was found there. But in Mirka and Lodhi Nangal, as much as 9.5 per cent and 15.2 per cent respectively of the total area was waste which was used for grazing of cattle. Thus, grazing facilities were available to people in all the three villages.

An important aspect of the agricultural situation in Aulant was the frequent recurrence of crop failures. Located in an area of draught and scanty rainfall, maturity of crops was not satisfactory. These crops, however, remain an important source of fodder in the village.

The area under different crops also shows significant variations between villages. The proportion of gross cultivated area under cereal and pulses was as high as 87 per cent in Aulant while in Mirka and Lodhi Nangal it was 64 per cent and 65 per cent respectively. The latter two villages also produced some commercial crops like cotton, sugarcane and oil seeds covering about 14 per cent and 11 per cent of the gross cultivated area respectively. In contrast Aulant

* The authors are grateful to Shri R. Dayal for his assistance in the computation of data.

had only one per cent of the gross cultivated area under commercial crops. The area under fodder crops was also more in Mirka and Lodhi Nangal than in Aulant.

The pattern of mixed farming generally prevalent in Aulant, where the major part of the area was under cereals and pulses, was that of calf-rearing and ghee production along with arable cultivation. But in Mirka and Lodhi Nangal, because of nearness to the urban market and pressure of demand for fluid milk from Hissar and Fatehgarh Churian[1], milk was sold directly and ghee was made by and large only for home consumption and not for sale.

The type and quality of livestock, as given in Table II, highlights these regional variations in the pattern of mixed farming. Wide differences are found in the types of animals kept in different villages. Buffaloes were proportionately more in number in Mirka and Lodhi Nangal while cows were more numerous in Aulant. The availability of green fodder (an essential feed for milch cattle), ready market for milk in the nearby urban centres, and the traditions of cattle breeding, *i.e.*, *Murrah* Buffalo in Mirka and Montgomery Buffalo in Lodhi Nangal explain this difference in the number and quality of cattle found in the villages. The presence of cows in large number at Aulant goes to prove the practice of calf-rearing in the village. It may be noted that jowar and barley crops, grown in the village, are essential food for raising young calves and for turning them into strong and sturdy draught cattle of Hariana breed.

The number of goats and sheep is insignificant in all the three villages but a cross-section of farmers in one or two villages, undertake poultry farming on a limited scale.

In terms of the average value per cattle, Mirka had the best quality of draught and milch cattle, especially buffaloes with high milk yielding capacity. Next comes Lodhi Nangal. Aulant possesses relatively poor quality of milch cattle. The Datti Singi breed of buffaloes found in this village are good in milk-yield only when fodder is abundantly available.

II

The caste composition of the village communities under study shows that mixed farming is predominantly followed by the land-owning castes, *viz.*, Jats, Ahirs and Rajputs. Some members of the other caste groups like Harijans, Christians, Jogis, Kumhars, Brahmins, Khatris, Sunars and Nais are also found engaged in this occupation. From the data regarding land ownership, it is found that the first four of these latter castes belong to non-landowning social groups which are engaged in agriculture as cultivating tenants. The other four castes are reported to be owning some land and cultivating some land on lease as well.

Among cultivators, mixed farming is followed by different categories of farmers, *e.g.*, cultivating owners, cultivating owners-cum-tenants and cultivating owners-cum-rent receivers (Table III). It is interesting to note that among those engaged in mixed farming there were three distinct groups.[2]

1. Fatehgarh Churian is a sub-centre of Dairy Development Scheme, Amritsar.
2. We refer as mixed farmers only persons of groups 'A' and 'B' and persons of group C are referred as arable farmers.

A — Farmers-cum-producers and sellers of livestock products.

B — Farmers-cum-producers but non-sellers of livestock products.

C — Farmers having draught cattle only or having milch cattle but no production and sale of livestock products during the period under study.

On closer examination of the data, it is found that in the three villages, farmers of type B were more than those of type A while farmers of type C were few in number. The proportion of farmers of type A and B ranged between 85.2 to 95.8 per cent of the cultivating households and between 46 per cent to 81.7 per cent of the total households in three villages. Thus, despite the variations in the proportion of households engaged in mixed farming whether of type A or B in the villages under study, the general prevalence of mixed farming amongst households is evident from the data.

Another significant feature is that of the 215 households of cultivators engaged in mixed farming, or of all the 317 households in the three villages, only 4 cultivating households in village Mirka were engaged in production of livestock products as a principal occupation. The overwhelming majority of cultivating households, thus, followed production of livestock products as a subsidiary occupation. This was a conclusive indication of the fact that the scope for the development of animal husbandry lies only when carried on in conjunction with cultivation as an ancillary enterprise. Cultivation provides external economies which make it profitable for the cultivators to engage in milk enterprise with minimum of extra cost and resources as compared to non-cultivators. Incidentally, this also shows that programmes of dairying, etc., entrusted to landless sections do not have much chance of being successful, since the external economies available to the cultivators are not available to them.

III

An analysis of land-cattle ratio and distribution of mixed farmers, according to different size groups of cultivated holdings, throws light on some of the important aspects of economic organisation of mixed farming. For every 100 acres of cultivated area there are 78, 51, 84 heads of cattle respectively in the villages of Aulant, Mirka and Lodhi Nangal respectively. The number of draught cattle varies from 16 to 22 and that of milch cattle from 15 to 26 per 100 acres of cultivated area. It is evident that Aulant possesses more of draught and milch cattle though the total number of all kinds of livestock on an average per 100 acres of cultivated area is more in Lodhi Nangal. The explanation for it lies in the demand for draught cattle for lift irrigation by Charas in Aulant. Similarly, for the purpose of calf-rearing, Aulant maintains relatively a much large number of milch cattle. It is important to note that the pattern and needs of cultivation determine to a very great extent the nature and scope of livestock enterprise and the pattern of mixed farming depends very much on the pattern of agriculture prevalent in a village or a region.

The distribution of mixed farmers according to different sizes of holdings, given in Table IV, shows that the proportion of mixed farmers is high in all the three size groups of holdings. The proportion of the number of farmers varies

from 70 to 87 per cent, 88 to 100 per cent and 96 to 100 per cent of the total number of households, respectively, amongst the small, medium and big farmers. Mirka had, in total, the smallest number of small mixed farmers whereas Lodhi Nangal had the largest number both of the medium and the big farmers engaged in mixed farming.

A comparative study of the intensity of cropping, on the basis of data collected from households of mixed farmers and arable farmers, brings out important features of the pattern of mixed farming. It is observed that intensive use of land has invariably accompanied mixed farming. Except in Mirka, intensity of cropping in the other two villages is generally higher for mixed farmers and it is significant to note that, more or less, the same tendency was found even on small holdings.

IV

A study of the pattern of income [3] of different types of farmers, analysed in Table V, shows that the maximum contribution to total village income comes from crop production in all the three villages. It is further found that the contribution of crop production to total income is large in case of all types of farmers. This is a further indication of the fact that animal husbandry and dairying is followed essentially as a subsidiary occupation, and contributes only a fraction of the total income of cultivating households who derive its major part from crop production. It may be noted that the proportion of receipts from sales of 'livestock products' was 41.3 per cent, 17.5 per cent and 16.9 per cent respectively of the gross income in Aulant, Mirka and Lodhi Nangal. In Aulant the share of income from calf-rearing and sale of ghee is relatively larger because of the extremely depressed character of agriculture.

Further analysis of income per acre brought out that in the case of mixed farmers income per acre was substantially larger among all the size groups of cultivators as compared to cultivators who did not engage in mixed farming. In the case of small farmers also engaged in mixed farming, as compared to small farmers without it, it was significantly larger. The same can be said on the basis of income per household of the different types of mixed farmers in the different size groups of holdings. It is, thus, evident, that mixed farming has been more advantageous for small farmers. It was reported by the farmers that among the factors which had contributed to the success of mixed farming among small holding farmers were their personal supervision, participation by family labour and their intense need for cash incomes.

In this context, it is important to emphasise that mixed farming is prevalent more as a way of life than as a lucrative economic enterprise run on business principles. Mixed farming has not yet matured into a purely business enterprise and the characteristics of the agricultural economy leave its marks on the pattern of animal husbandry and dairying also. To a sizable extent livestock products were retained for home consumption in all the villages. It can however be stated that the development of mixed farming in the present stage of the deve-

3. Income here refers to gross income from different sources.

lopment of the village economies fulfills a dual purpose, *viz.*, that of catering to the milk, ghee and cattle requirements of the cultivating households on the one hand and that of selling a part of these products for sale in the market with a view to augment the cash incomes of these households. Therefore the growth of animal husbandry, cattle rearing, and dairying as economic enterprises, in the present set up, is to a large extent, dependent on the existence of favourable external factors as for instance in the case of Mirka and Lodhi Nangal.

V

On the basis of the data analysed here it can safely be concluded that the pattern of mixed farming was closely related to regional characteristics in agriculture. Further, the varieties of breed of cattle, the facilities of fodder supply, transport and marketing of livestock products, also affect the growth of mixed farming in particular regions. Arable cultivation has been found closely inter-related with animal husbandry in a variety of ways. In all the three villages, dairying formed an integral part of mixed farming and was followed as a subsidiary source of income by farmers, generally, belonging to land-owning castes and classes. A cross-section of mixed farmers had also combined poultry keeping with cultivation but on the whole its magnitude was insignificant. The contribution of livestock products to the total income of households, particularly among the small farmers, was substantial.

It was observed that bullocks (in some cases he-buffaloes and camels as well) were the main source of draught power in farming in the villages under study. But buffaloes and cows also provide milk to the farmers and consumers in urban areas. This combination had brought about the development of a 'dual purpose' breed of the two types of cattle in order to supply draught cattle and milk.

This was mainly a consequence of the growth of mixed farming along with arable cultivation. But it is worthwhile mentioning that besides other factors, successful animal husbandry was conditional upon facilities of fodder supply and marketing of livestock products. Therefore, irrigation facilities and efficient transport system, linking rural milk production centres with urban markets, are the essential requirements for mixed farming as was revealed in village Mirka and Lodhi Nangal.

It may further be stated that in countries[4] where stock-keeping is strictly economic, the bullocks require to be fully employed, the cows to be of a heavy milking strain and the manure to be carefully conserved and returned to the land. So far the situation in Indian villages is not that since stock-keeping is still not an independent economic enterprise by itself but is integrally allied to the needs and requirements of arable farming. But with development, programmes of mixed farming would need reorientation towards better breeding, better nutrition and control of diseases of livestock. Besides, structural changes in farm organisation and management will have to be made *pari passu* so that farming and animal husbandry may develop each on their own.

4. Report of Royal Commission on Agriculture in India.

APPENDIX

TABLE I—LAND UTILISATION

(Area in Acres)

Village	Cultivated Area					Non-cultivated Area								Total	Forest	Grand Total
	Net Area Sown			Current Fallow	Total	Not available for cultivation					Waste					
	Irrigated	Unirrigated	Total			Abadi	Pastures	Groves	Others	Total	Cultivated	Uncultivated	Total			
Aulant	196	969	1165	11	1176	13	105	..	46	164	..	..	..	..	..	1340
Percentage	14.6	72.3	86.9	0.8	87.7	1.0	7.8		3.5	12.3						100.0
Mirka	647	602	1249	235	1484	10	..	..	..	10	4	141	145	155	..	1639
Percentage	39.5	36.7	76.2	14.3	90.5	0.6				0.6	0.3	8.6	8.9	9.5		100.0
Lodhi Nangal	182	32	214	125	339	7	..	..	41	48	6	17	13	61	..	400
Percentage	45.5	8.0	53.5	31.3	84.8	1.8			10.2	12.0	1.5	42.5	3.2	15.2		100.0

TABLE II—TYPE AND QUALITY OF LIVESTOCK

Village	Milch Cattle												Grand Total	
	Draught		Buffaloes		Cows		Total		Young stock		Others		Total	
	No.	Value Rs.	No.	Value Rs.	No.	Value Rs.	No.	Value Rs.	No.	Value Rs.	No.	Value Rs.	No.	Value Rs.
Percentage	28.0		14.0		19.4		33.4		34.8		3.8		100.0	
Aulant	142	27,110	71	15,779	99	4,262	170	20,041	177	1,823	20	71	509	49,045
Average value per cattle		190.92		222.24		43.05		117.89		10.30		3.55		96.36
Percentage	24.3		20.4		9.2		29.6		43.0		3.1		100.0	
Mirka	112	36,255	94	36,410	42	4,885	136	41,295	198	6,921	14	209	460	84,680
Average value per cattle		323.71		387.34		116.31		303.64		34.95		14.93		184.09
Percentage	24.5		17.0		7.9		24.9		29.2		21.4		100.0	
Lodhi Nangal	78	18,745	54	18,305	25	2,240	79	20,545	93	5,016	68	7,660.5	318	51,967
Average value per cattle		240.32		338.98		89.60		260.06		53.94		112.65		163.42

TABLE III—OCCUPATIONAL DISTRIBUTION OF MIXED FARMERS

Occupation	Aulant	Mirka	Lodhi Nangal
	No. of households	No. of households	No. of households
1. Cultivating owner	4	20	—
2. Cultivating owner and tenant	33	27	10
3. Cultivating owner and rent receiver	59	9	4
4. Cultivating owner-tenant and rent receiver	7	3	4
5. Cultivating tenant	11	11	4
6. Rent receivers	3	4	—
7. Land held for services rendered	—	1	—
8. Cultivating tenant and rent receivers	—	—	1
Total	117	75	23

TABLE IV—DISTRIBUTION OF MIXED FARMERS ACCORDING TO SIZE GROUPS

Size of Cultivators	Aulant						Mirka						Lodhi Nangal					
	No. of households practising mixed farming						No. of households practising mixed farming						No. of households practising mixed farming					
	No. of households in the group	Selling producers of livestock products	Non-selling producers of livestock products	Total	Percentage to total No. of households in the group	No. of households not producing livestock products	No. of households in the group	Selling producers of livestock products	Non-selling producers of livestock products	Total	Percentage to total No. of households in the group	No. of households not producing livestock products	No. of households in the group	Selling producers of livestock products	Non-selling producers of livestock products	Total	Percentage to total No. of households in the group	No. of households not producing livestock products
Small	39	12	22	34	87.2	5	27	15	4	19	70.4	8	7	5	1	6	85.7	1
Medium	50	33	15	48	96.2	2	34	23	7	30	88.2	4	9	6	3	9	100.0	—
Big	36	24	11	35	97.2	1	27	19	7	26	96.3	1	8	5	3	8	100.0	—
Total	125	69	48	117	93.6	8	88	57	18	75	85.2	13	24	16	7	23	95.8	1

TABLE V—PERCENTAGE OF DIFFERENT GROUPS TO GROSS INCOME ACCORDING TO TYPE OF FARMING

Type of Farmer	Aulant					Mirka					Lodhi Nangal				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Selling producers of livestock products	45.4	46.8	7.8	—	100.0	19.9	73.4	6.7	—	100.0	18.9	67.4	8.6	5.1	100.0
Non-selling producers of livestock products	31.6	55.5	4.6	8.3	100.0	13.6	77.9	8.5	—	100.0	13.8	70.4	7.9	7.9	100.0
Non-producer	—	58.9	22.8	18.3	100.0	—	78.2	21.8	—	100.0	—	100.0	—	—	100.0

Note: A—Livestock products; B—Crop production; C—Other occupation; D—Miscellaneous sources; E—Total

TABLE VI—GROSS INCOME OF MIXED AND NON-MIXED FARMER (PER ACRE AND PER HOUSEHOLD)

(In Rupees)

	Aulant				Mirka				Lodhi Nangal			
	No. of households	Land cultivated	Income		No. of households	Land cultivated	Income		No. of households	Land cultivated	Income	
			Per acre	Per household			Per acre	Per household			Per acre	Per household
Mixed												
Small ..	34	65.73	505.8	1,093.9	19	50.40	535.8	1,421.2	6	43.25	303.1	2,184.8
Medium ..	48	243.41	216.4	1,097.2	30	289.00	163.8	1,578.2	9	133.00	293.7	4,340.0
Big ..	35	345.62	168.3	1,662.3	26	559.25	182.2	3,918.4	8	200.50	391.3	9,806.5
Total ..	117	654.76	226.1	1,265.3	75	898.65	196.1	2,349.7	23	276.75	246.7	5,679.2
Non-Mixed												
Small ..	5	7.71	205.8	317.3	8	13.75	348.7	599.3	1	6.00	256.0	1,536.0
Medium ..	2	10.31	63.8	328.8	4	31.50	118.7	934.8	—	—	—	—
Big ..	1	10.21	74.1	756.8	1	16.00	158.9	2,542.0	—	—	—	—
Total ..	8	28.23	106.3	375.1	13	61.25	180.8	852.0	1	6.00	256.0	1,536.0
Total												
Small ..	39	73.44	528.0	994.3	27	64.15	495.7	1,177.7	7	49.25	297.4	2,092.1
Medium ..	50	253.72	210.2	1,066.4	34	320.50	159.4	1,502.5	9	133.00	293.7	4,340.0
Big ..	36	355.83	165.6	1,637.2	27	575.25	181.5	3,867.4	8	200.50	391.3	9,806.5
Total ..	125	682.99	221.1	1,208.3	88	959.90	195.1	2,128.4	24	382.75	344.8	5,506.6

ECONOMICS OF MIXED FARMING

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The draft for the Third Five-Year Plan outlines the principal economic objective of long-term development as to secure a progressive rise in the level of consumption per head. The rise in consumption can only be achieved through a large and continuous increase in production. In other words, development has to be so planned and organised that the economy expands rapidly and becomes self-reliant and self-generating within the shortest period possible. For achieving this, one of the essential conditions is the development of agriculture, based on utilisation of man-power resources of the countryside and the maximum use of the local resources. To develop agriculture on this basis, the practice of mixed farming on a large scale stands out as the most ideal and natural method, since mixed farming[1] is an integrated system of crop and animal husbandry for efficient and effective use of land, labour, stock and capital.

Carrying Capacity of Land and Food Supply

The attainment of the principal economic objective, namely, of securing a progressive rise in the level of consumption (per head) for the growing population, is related to the carrying capacity of land, *i.e.*, the ability of the land to provide food, drink, shelter and clothing. This in turn depends on two factors, *viz*, Biotic potential (B), *i.e.*, ability of the land to produce plants for feeding, clothing and shelter, and the Environmental Resistance (E), *i.e.*, the limitations which the environment (soil fertility, rainfall, temperature, etc.) places on the productive capacity of the land. This relationship may be expressed in the form of a simple equation : $C = B/E$. In order that the land is able to sustain a growing population at higher levels of food-intake, we have to increase the Biotic Potential and reduce the environmental resistance. This twin-objective is made fulfilled by the adoption of mixed farming, wherever it is found feasible and profitable.

To put this in a slightly different form, the degree of achievement of the goal of progressive rise in the level of consumption of both the steadily growing rural population and the rapidly expanding urban population is limited to the food supply available within the country.[2] The food supply within the country can be increased either by enlarging the acreage under food crops or by increasing the yield per acre. The scope under the former is limited since culturable waste and fallow lands (excluding current fallows) which have not been brought under cultivation uptil now form only a small proportion of the present total cropped

1. P. C. Raheja and S. R. Obharai, *Indian Farming*, June, 1953.
2. This assumes that self-sufficiency in food must be achieved as early as possible and an agricultural country like India with its ambitious plans requiring valuable foreign exchange, for other developmental activities cannot go on importing foodgrains on any large scale.

area and even here the cost of reclamation is so high that it is not economical to bring most of these areas under the plough. Again a shift in favour of food crops from the present cropping pattern is not advisable since raw materials will be increasingly needed for the growing industrial economy and also to make available exportable surplus of agricultural commodities to earn the very valuable foreign exchange. Although the potential of the second alternative is rated quite high, it is common experience that yield rates could not be improved to any appreciable extent in spite of good deal of planned efforts over a decade involving huge expenditure for provision of greater facilities of irrigation and increased supply of fertilizers, availability of larger credit at lower rates, etc. In a recent study of the yield trends of Rice and Wheat from 1946-47 to 1955-56 on the basis of data of large scale crop cutting surveys, Dr. V. G. Panse concludes that the average yield per acre was higher by 5.4 per cent for rice and 11.8 per cent for wheat in the First Plan period than in the preceding quinquennium. The figures[3] given by the Ministry of Food and Agriculture reveal that (during the three years after the first Plan period) the per acre yield for all foodgrains combined together registered a nominal increase of 32 lbs. to reach the record figure of 591 lbs. But, however, there was a shortfall of 38 lbs. in the yield per acre during the year 1957-58, when compared to the previous year. Thus the trend in increase in per acre yields is not very discernible over the last few years with any degree of definiteness.

The level of consumption can be increased qualitatively by raising special crops and food items, high in food nutrients per pound, under a proportionally higher acreage and making them available in plenty at comparatively cheaper rates so as to increase the intake of these items in the common man's food. The higher intake of these food items will contribute to a great extent in reducing the demand of foodgrains since the average Indian diet consists of more cereals than what is required for a balanced diet.[4] Such food items include among others, milk, potatoes, tapioca, sweet potatoes and vegetables. The inclusion of such items in the cropping and production plan of the farm is nothing but the practise of mixed farming.

Land Necessary to Supply a Given Amount of Calories and Proteins

Higher nutritive value per pound alone will not justify the raising of the food items mentioned above, since outturn per acre will also require equal consideration. The indicator which combines both the factors is the area needed to produce enough of food to supply calorie and protein requirements of an average adult male for a year and shown in Table I.[5]

Potatoes, sweet potatoes and tapioca can maintain more people on a given piece of land than any other crops. Since man is primarily concerned with physical energy or caloric needs, these crops are very well suited for raising as substitutable crops in the place of cereals. Red gram requires only one third of the area required by rice to produce enough proteins needed by an adult male for

3. Indian Agriculture in Brief, January, 1960.
4. According to the Agricultural Labour Enquiry, Vol. I, the cereal content of an average diet is 18.4 oz. as against 14 oz., specified for a balanced diet by the Nutrition Advisory Committee.
5. R.N. Mitra, "Land and Labour Necessary for Calorie and Protein Requirements in India," *Agricultural Situation in India*, December, 1959.

one year. These crops are not only high in food value, but they also taste good and grow quickly.

TABLE I

Crop	Area needed to produce (in acres)	
	Calories	Protein
Rice	0.84	1.07
Wheat	0.90	0.67
Jowar	1.49	1.30
Red gram	0.90	0.35
Potatoes	0.32	0.46
Sweet Potatoes	0.26	0.82
Tapioca	0.22	1.28

Sweet potatoes can grow both under tropical and sub-tropical conditions. Tapioca can be grown on all types of soil with 40 inches of rainfall as rain-fed crop, or even in places with lower rainfall as an irrigated crop. The potato is adapted to a wide and diverse range of climatic conditions. The extension of the area under these crops offers a great potential for solving the food problem.

Although under the present conditions where the animals are ill-fed, it may not be possible to raise milk of an equivalent nutritive value of cereals raised from the same acreage, but by proper feeding, it will become possible. Feeding given to milch animals can be improved considerably by growing enough of fodder crops also in the holdings. It has been estimated that additional cow milk production from the existing stock through better feeding of mixed green fodder would require one-third to one-fourth and even less land than required for additional production of cereals of an equivalent nutritive value.

What is Mixed Farming?

As defined earlier, mixed farming is a system which integrates crop production and animal husbandry to the mutual benefit of both. In this system, farming is diversified so as to include not only cereals but also fodder, vegetables and cash crops. It is designed to maintain not only bullocks but also milch animals and poultry so as to provide dairy and poultry products which will permit gradual improvement in diets of the growing population especially of the cultivating families. The forage crops grown in the farm and fed to milch cattle enable to raise the milk yield as well as to breed and rear suitable dairy stock and work animals. The shortage of manures is relieved to a great extent. Such an integration has been rightly expressed as 'making the milch cattle grow the crops for the farmer.'

If one reviews the history of agriculture as it developed with the growth of civilisation, it will be seen that the mixed farming occupies the vertex of the 'cone of agricultural evolution'.

Mixed Farming and Improvement of Cattle Wealth

Much has been said and written during the last few decades about the poor draft power and milk yields of the cattle, presence and multiplication of poor and inefficient animals, unbalanced and ill-feeding of stock, etc., but it seems that nothing in substantial has been achieved in remedying these maladies. The value of integrated approach with crop husbandry, though found out to be essential for efficient animal husbandry, no tangible measures have been taken to weld the two. The First and Second Five-Year Plans contain only isolated items dealing either with animal husbandry development or its integration with agriculture.

The high motto of better breeding, proper and balanced feeding and control of diseases has been set for the improvement of livestock. Correct feeding and management of livestock are essential if the improved type of animals are to express their full production potentialities and the lack of same will result in deterioration of the quality and performance of the cattle, even of efficient breeds. In addition, livestock which are under-fed and ill-managed easily fall prey to disease. Thus feeding is the vital aspect of livestock improvement and improvements effected in other fields will be nullified if proper feeding is not given to animals. However, the problem of feeding has not been given as much attention as it deserved.[6]

The practice of mixed farming offers to be the best solution for the problem of feeding of livestock.[7] But, however, mixed farming, either as a way to increase agricultural production or as a means to provide proper feeding of livestock, has received only scant attention from the planners as could be seen from its conspicuous absence among the technical programmes for increasing agricultural production for the Third Plan. A cursory reference is seen under feeding for livestock wherein it is proposed to work out schemes, in consultation with the States, for popularisation of mixed farming.[8]

Mixed Farming and Improvement of Dietary

In our country, as is well known, caloric levels continue to be low, while the average diets remain seriously unbalanced due to shortage of protective foods. Mal-nutrition coupled with protein deficiency is the chronic problem of the day. The predominance of cereals, absence of protective foods and serious imbalance in the average diet which is also highly deficient in caloric requirements taken by the common man is well brought out by the figures given in Table II.

Though the adverse effects of such an unbalanced and insufficient diet on health and efficiency of the population and on the scarce land resources, which has to be increasingly utilised to produce the valuable cash crops for the expanding industrial economy of the country and to enlarge foreign exchange earnings very much needed for the development of other sectors of production, are well-known, yet, the Five-Year Plans have been concentrating their attention only in increasing

6. Kehar and Mukerjee have estimated that the present supplies for India's bovine population form 23 per cent of digestible crude protein and 38 per cent of starch equivalents of required amounts—See Proceedings of Indian Science Congress, 1944, Part III, p. 137.

7. Dr. K. C. Sen (1952) has calculated that an increase in the fodder crop acreage of about 10 per cent is necessary to provide an important fodder basis.

8. Third Five-Year Plan—A Draft Outline, p. 169.

the cereal production, completely neglecting the qualitative aspects, which is "not only a primary goal of economic progress, but also an essential means by which it is to be attained."

TABLE II

Item of Food	Requirements for a balanced diet for adult male[9]	Nutritive standard as per	
		Agricultural Labour Enquiry	I. C. M. R. Diet Survey[10] 1945-48
Cereals	14 oz.	20.3	16.6
Pulses	3 oz.	1.1	2.3
Leafy vegetables	4 oz.	Negligible	0.9
Other vegetables	6 oz.	"	4.1
Fruits	3 oz.	0.2	0.6
Fats	2 oz.	0.2	0.9
Milk	10 oz.	0.1	3.3
Meat and eggs	4 oz.	0.2	0.9
Sugar and *Gur*	2 oz.	0.3	0.7

It needs no emphasis that practice of mixed farming on a wider area is the best solution to correct the imbalance in the average diet since the average Indian does not have so much of cash income to buy the protein-rich foods, such as milk, meat, vegetables, fruits, etc.

Mixed Farming and Marketable Surplus

The importance that the marketable surplus has acquired during the last decade due to the efforts taken for planned economic development of the country is really very significant. This is more pronounced in years of low agricultural production. From the foregoing paragraphs it is clear that wider practice of mixed farming will augment the marketable surplus of foodgrains since it results in higher yields per acre and lower demand for cereals in rural areas consequent on the larger availability and higher intake of protein-rich foods.

Mixed Farming

Another word for scientific agriculture:—As stated earlier, mixed farming occupies the highest place in the evolution of farming since it implies improved, reorganised, diversified, intensified and integrated (with livestock) agriculture. Such a "rounded development will solve unemployment problem, raise per capita income and purchasing power of the farmer and bring the goal of socialistic pattern within the possibility of realisation."[11]

It is a well-known fact that judicious crop rotations are not followed by a large majority of the farmers in the country while it has been found that rotation is 75 per cent as efficient as fertilizers in maintaining and increasing yields.[12] The ad-

9. Norm suggested by the Nutrition Advisory Committee—Indian Research Fund Association.
10. The Report on India's Food Crisis and Steps to Meet It, Ford Foundation Team, p. 239.
11. L.P. Sinha, "Role of Agriculture in the Third Five-Year Plan," *The Indian Journal of Agricultural Economics*, Vol. XV, No. I, January-March, 1960.
12. W. W. Weir, United States Department of Agriculture Bulletin 1377.

vantages of scientific crop rotations are very many[13] and most important among them are (i) maintenance or improvement of the fertility and physical condition of the soil, (ii) rise in yields of crops and (iii) constant employment of labour and livestock.

The introduction of leguminous crops, which are soil conserving, in the crop rotations, has been found to bring about a marked increase in crop yields.[14] India enjoys a relatively long optimum period of plant growth which will help the farmer to produce the green manure or composts required for each field ahead of main crop. "In the general background of poverty of the farmer (and the shortage of foreign exchange to import all the fertilizers required for crop production) the advantages of organic manure over inorganic are obvious. For, while it takes about three years to set up a fertilizer factory costing Rs. 18 crores and involving a capital outlay of about Rs. 23 per acre of crop manured, plus Rs. 16 per acre every year towards the cost of fertilizer, organic manure for an acre of paddy or wheat field can be grown in four to six weeks with the help of seeds raised in one line in the preceding season along a portion of the borders of the field from a nucleus pocket costing 5 *naya Paise.*"[15] Where double cropping is already in practice, the farmers are not going to adopt green manuring, however scientific it may be, unless it is based on sound economics. Experimental results have shown that green manure has a marked effect on the yields of all subsequent crops due to residual carry-over and double cropping or leaving the land fallow in one season did not show better returns than green manuring.[16]

Improved and scientific agricultural practices such as mixed cropping, green manuring and crop rotations are prerogative of mixed farming. With rotations of higher intensity and maintenance of milch animals, the land, labour, livestock and capital would be utilised effectively and efficiently. Propagation and practice of mixed farming on a large scale is very inevitable to increase agricultural production and to avert the impending food crisis.

Economics of Mixed Farming

No farmer will come forward to experiment on mixed farming, however, scientific it may be, unless the economics of mixed farming is demonstrated to him. The pioneer study on the economics of mixed farming was conducted by the I. C. A. R. during the 5 years between 1941 to 1946 in the States of U. P., M. P. North West Frontier Province and Sind. In U. P., one village was selected from each of the six selected districts, and again six holdings falling within the range of 8 to 10 acres, were selected in each village for the study. Two of them were advised to practise mixed farming and the remaining four were kept as controls. The two farms were supplied with enough credit to buy the required number of milch cattle, a suitable cropping pattern and rotation of crops and other needed technical advice. Accounts of daily expenditure and income were maintained for all the six cultivators. The results of the experiments are shown in Table III.

13. See Crop Rotations in India, I. C. A. R. Bulletin No. 12, Review series.
14 Results of Experiments Conducted in Pusa (North-Bihar) from 1908-09 to 1929-30.
15. M. S. Sivaraman, "Why Organic Manures?," *Agricultural Situation in India,* January, 1959.
16. T. J. Mirchandani and A. R. Khan : Green Manuring, I. C. A. R.

TABLE III—COMPARISON OF THE ECONOMICS OF MIXED AND ARABLE FARMING IN U. P.: 1941-1946[17]

Average Profits per Acre

Unit	First year	Second year	Third year	Fourth year	Fifth year	Average
	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.
Mixed Farming	23.15	95.5	141.2	122.6	169.6	110.7
Ordinary Farming	17.17	61.13	67.3	46.6	65.5	51.10
Percentage of additional profit	37.4	52.9	110.0	167.3	159.3	105.4

The figures speak for themselves about the profitability of mixed farming and about the steady increase in the percentage of additional return year by year. In western U. P., three milch animals and two bullocks were kept in each holding while in Madhya Pradesh two milch animals and two bullocks were maintained.

The results[18] of the study in Madhya Pradesh reveal that

(i) a unit of 12 acres worked with a pair of bullocks proved capable of maintaining two buffaloes without the need of purchasing fodder from outside ;

(ii) the cultivator could earn extra income varying from Rs. 200 to 250 by sale of milk and Rs. 125 to 200 from butter ;

(iii) the supply of manure was increased by 15 times and was sufficient to meet another three to four acres ;

(iv) the extra manuring enabled production of sufficient surplus dry fodder and grain to cover scarcity periods ; and

(v) about 25 to 30 per cent extra milk and milk product consumption provided additional nutrition.

The experiments conducted in Sind and N. W. F. P. were also successful.

Some of the other experiments conducted in India show that mixed farming is practicable on irrigated holdings of 5 acres in Anand or 7.5 to 8 acres in Delhi State.[19]

17. S. Ibne Ali, *Indian Farming*, August, 1954.
18. P. C. Raheja and S. R. Obharai, *Indian Farming*, June, 1953.
19. See R. O. Whyte : The Grassland and Fodder Resources of India, I. C. M. R., 1957.

Summary and Conclusions

(1) The economic objective of long term development, namely, of securing a progressive rise in the level of consumption per head, can be realised more quickly by adoption of mixed farming on a wider scale, since the scope for increasing the acreage under foodgrains and their yields seems to be limited.

(2) Vegetables, milk and pulses, the important among the protective foods, require less area to produce a given amount of calories and protein than cereals.

(3) Mixed farming, being the system which integrate crop and animal husbandry to the mutual benefit of both, occupies the highest position in the evolution of farming.

(4) The practice of mixed farming alone will help to improve the cattle wealth and dietary of the common man, which is not only inadequate but also ill-balanced.

(5) It also helps to increase the marketable surplus of foodgrains.

(6) Mixed farming which has been found to be economical by many experiments, is practised in our country for many centuries, though not scientifically.

(7) Other advantages of mixed farming are that it (*i*) ensures efficient and effective use of land, stock, capital and labour, (*ii*) ensures a more even distribution of receipts and expenses, (*iii*) increases the cash income of the farmer, (*iv*) helps to avoid the demoralising and evil influence of idleness on the family members, (*v*) enriches soil.

(8) A phased programme of mixed farming throughout the entire country should be evolved and executed efficiently. For the Pilot Projects, areas should be selected from the regions which are susceptible to such a development — areas which have been newly brought under irrigation and where livestock development has already proceeded sufficiently ahead.

(9) To make the system popular, fertilizers and seeds should be sold to willing farmers at subsidised rates at proper times. Loans will have to be arranged to buy quality cattle and poultry.

(10) Proper rotations including leguminous crops and fodders should be evolved, wherever such rotations are not known.

(11) The organisation of N. E. S. given with proper technical advice, is one of the agencies which can carry out this project successfully.

(12) The feasibility and success of efforts that would be taken to spread mixed farming need not be doubted since mixed farming is not a new practice to our farmers. If farmers are fully satisfied about the economics of mixed farming, the farmers will not hesitate to take it up.[20]

ECONOMICS OF MIXED FARMING IN INDIA

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Mixed farming has been defined variously by different authors in different countries. In England the term is generally applied to a farm consisting of both grass (for livestock) and arable fields. While in Nigeria a mixed farm consists of at least two separate, not logically interdependent, parts which comprises considerable proportions of both permanent grass and arable lands. It also implies that the basis of the manuring of the arable land is farmyard manure produced on the farm.

According to King, mixed farming represents a gradual evolution from the shifting method of cultivation to a static type of agriculture by the introduction of animal husbandry and by the use of animals for cultivation. In the views of Whetham, the most outstanding point in the evolution of farming is the present day tendency to move away from the old fashioned idea of the 'one crop farm' and the 'dairy farm' towards their combination in the mixed farm, the two main components of which are the dairy herd and arable crops.

In India, mixed farming refers to the dovetailing of crop production with animal husbandry or any other allied subsidiary industry like poultry farming, bee-keeping, piggery or fisheries, etc. Generally speaking, mixed farming means a combination of animal husbandry and crop production to the best advantage of both as complementary to each other. This enables the utilisation of the by-products of crops and their conversion into valuable animal products. This makes farmyard manure available to the cultivator. However, mixed farming

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20. In this connection, it will be of interest to refer to the paper presented by G. D. Agrawal to the Farm Management Development Centre held in New Delhi giving results of a Pilot testing of farm planning in a village in U. P. "In the second year of the project many of those farmers who were indifferent to farm planning (which includes mixed farming) in the beginning expressed their willingness to join the same."

should not be confused with mixed cropping which means growing of more than one crop in a single field at a time.

Various experiments have been conducted all over the world to work out the economics of mixed farming. The value of the gross output per acre on mixed farm is higher on smaller farms than on larger ones. This is well illustrated by the data given in Table I.

TABLE I—GROSS OUTPUT PER ACRE (£. S.D.)*

	Denmark			Norway			Sweden		
	Under 25 acres	25-50 acres	50-75 acres	Under 25 acres	25-50 acres	50-75 cres	Under 25 acres	25-50 acres	50-75 acres
Crop	1-11-7	1-4-4	1-13-5	3-7-1	3-2-11	2-14-7	1-2-5	1-4-4	1-18-8
Live stock & live-stock products	20-14-5	15-18-8	14-7-1	12-17-6	9-16-5	8-9-10	10-5-3	6-15-1	6-19-10
Other sources ..	1-7-0	0-15-3	0-12-7	1-18-10	1-1-6	0-19-7	0-17-8	0-10-1	0-17-2
Total	23-13-0	17-18-3	16-13-1	18-3-5	14-0-10	12-4-0	12-5-4	8-9-6	9-15-8

* *Source :* Edgar Thomas : The Economics of Small Holdings (1927) (pp. 10-11), reproduced by Singh Charan : Joint Farming X-Rayed, The Problem and Its Solution.

The study in the economics of Farm Management in U. P., undertaken at the instance of Research Programmes Committee, Planning Commission, Government of India, under the guidance of Dr. G. D. Agrawal, Agricultural Economist, Government Agricultural College, Kanpur in districts Meerut and Muzaffarnagar in 1954-55 also reveals that the contribution of dairy to total output on smaller holdings is higher than on larger holdings.

TABLE II—PERCENTAGE CONTRIBUTION OF MILK PRODUCTS TO TOTAL OUTPUT

Size group	Crop	Milk and Milk Products
Below 5 acres	77.2	22.8
5-10 acres	83.5	16.5
10-15 acres	88.1	11.9
15-20 acres	89.6	10.4
Above 20 acres	91.1	8.9
All holdings	86.5	13.5

In U. P., a survey was conducted during 1941-46 under the auspices of Indian Council of Agricultural Research to compare the economics of mixed farming with that of ordinary one. It was carried out in the districts of Meerut, Bareilly, Lucknow, Bara Banki, Gorakhpur and Deoria. The size of holdings varied from eight to ten acres in the different districts. Table III gives the percentage increase in the average profits per acre obtained in mixed farming over ordinary one in the six districts during 1941-46. Except the first year in Bareilly district and second and fifth in the Bara Banki, there is an increase in average profits in all the years and in all the districts in mixed farming over ordinary farming. The overall increase in average profits in mixed farming was 105.49 per cent.

TABLE III—PERCENTAGE INCREASE IN THE AVERAGE PROFITS PER ACRE OBTAINED DURING 1941-46 IN MIXED FARMING OVER ORDINARY FARMING

District	Years					Average for five years
	1941-42	1942-43	1943-44	1944-45	1945-46	
Meerut	58.10	68.32	108.72	169.96	170.08	115.03
Bareilly	—21.30	38.91	412.00	416.98	150.00	199.32
Lucknow	35.44	9.54	15.01	27.11	132.91	44.00
Bara Banki	32.24	—32.55	46.51	69.61	—90.00	5.16
Deoria	18.19	67.24	100.07	464.43	307.01	191.39
Gorakhpur	30.93	105.86	142.23	156.80	171.66	121.49
Overall	37.4	52.0	110.0	167.3	159.3	105.4

An enquiry was also conducted in 1959-60 by the Agricultural Economics Section at Government Agricultural College, Kanpur, with the help of the students of the post-graduate classes. A sample of 15 holdings, classified under three size groups—small (below 5 acres), medium (5-10 acres) and large (above 10 acres), was studied, the number of holdings in each category being 2, 8 and 5 respectively. The selection of the holdings was purposive. The percentage contribution of dairying to total output in each category is given in Table IV.

TABLE IV—PERCENTAGE CONTRIBUTION OF DAIRYING TO TOTAL OUTPUT

Category	Total Rs.	Income from dairying Rs.	Percentage contribution of dairying
Small	4,131.69	999.00	24.2
Medium	1,964.93	573.82	29.1
Large	1,968.57	323.30	18.4
Average holding	2,255.65	547.00	24.2

It is obvious from the above table that the percentage contribution from dairying to the total output is highest in medium category, being 29.1 and the lowest in the large category, being 18.4. The average for all the holdings is 24.2 per cent.

Table V illustrates clearly that the net income from milch cattle per farm and per acre decreases with the increase in the size of holding.

TABLE V—NET INCOME PER FARM AND PER ACRE

(In rupees)

Size group	Income from milch cattle	Expenditure on milch cattle	Net income	Net income per acre
Small	999.00	623.62	375.38	105.15
Medium	573.82	410.54	163.18	23.58
Large	323.30	243.45	79.85	5.16
All holdings	547.00	383.31	163.69	17.55

Conclusion

It is evident from the above discussion that on farms of the same size the income on mixed farm is higher than on arable farms, in general and the highest on small size of holdings. The low income of small holdings to a great extent is supplemented by mixed farming and the cultivator and his family find an additional remunerative employment on their own farms. It provides excellent opportunity of making intensive use of land to meet the fodder and food requirements of the cattle and domestic requirements of grains and vegetables, etc. In view of India's small size of holding, mixed farming is definitely superior to arable farming as it improves the fertility of land by the application of additional manures and also provides opportunity of utilising by-products of crop husbandry more profitably by animals to produce milk. It also serves as a proper hedging in times of distress. Therefore, all the necessary efforts should be mobilised to encourage and popularise mixed farming by replacing large number of poor cattle with improved breeds and adopting judicious cropping pattern, leading to sufficient fodder facilities and good farm returns.

THE ECONOMICS OF MIXED FARMING IN THE EASTERN ZONE OF INDIA

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LIVESTOCK POSITION IN EASTERN ZONE

Farms in the eastern zone depend mostly on the production of crops and the role played by livestock and livestock products is very insignificant. This can be illustrated by the data collected by the Agro-Economic Research Centre, Visva-Bharati which has been conducting for the last six years agro-economic surveys of villages within the States of Bihar, Orissa, West Bengal and Assam. The purpose of such study is to study "the periodical analysis of economic and social change taking place in the rural areas of the Eastern Region of India" with particular

reference to some external forces or agencies operating in the villages such as community development and national extension services, new irrigation projects, development of communication facilities, etc. It must be stated clearly at the very outset that the data presented below do not in any way fully represent the conditions of the zone, the States or even the districts to which they refer in view of the fact that the villages are selected purposively rather than in accordance with the principle of random sampling. On the contrary, the villages investigated so far may be considered as above the average village in the sense that some external forces are having their impacts on the village system as a whole so as to accelerate the process of social or economic change. Nevertheless, the data presented below would serve our purpose fully well. Table I consisting of data collected through village surveys during 1955-59 shows the livestock position in three villages in each of the States of the eastern zone for the cultivating farms only.

TABLE I—NUMBER OF LIVESTOCK PER FARM

State and Village	Total No. of cultivating farms	Number of Livestock per Farm				
		Milch Cattle	Goat	Sheep	Poultry	Duck
Bihar						
1. Samahuta (Shahabad) ..	47	1.17	—	—	—	—
2. Harnichak (Patna) ..	25	0.64	—	—	—	—
3. Keotjali (S. Parganas) ..	28	2.46	4.53	3.53	1.82	0.07
	100					
Orissa						
1. Kutra (Sundergarh) ..	48	0.58	2.58	0.02	3.13	—
2. Badkera (Dhenkanal) ..	14	2.60	0.33	1.40	—	0.9
3. Darlimunda (Kalahandi)	31	3.0	1.1	1.5	2.6	0.8
	93					
West Bengal						
1. Jangul (Birbhum) ..	24	1.54	2.96	1.46	0.29	0.83
2. Kashipur (Bankura) ..	43	2.33	2.49	—	0.37	1.58
3. Dakshinsija (Birbhum) ..	67	0.88	2.97	0.52	4.94	1.90
	134					
Assam						
1. Tektara (Goalpara) ..	38	1.45	0.11	—	5.61	—
2. Teghariartari (Kamrup) ..	31	2.32	1.42	—	—	1.35
3. Narasinghpur (Cachar) ..	28	0.50	0.22	0.03	—	6.07
	97					

It may be noted that of the domesticated animals, some types of cattle such as milch cattle, goat, sheep, poultry and duck are preferred while the other types, namely, beef cattle, pig, etc., are conspicuous by their absence. Of the animals maintained on the farms, milch cattle is by far the most important as this is the only animal which is kept in all the sample villages. The number of milch cattle per farm varies widely from village to village and this variation seems to reflect the economic condition of the villages. Goat which is reared for meat comes next in importance and its meat, it may be mentioned, is taken by all the people irrespective of caste or creed. Yet its importance appears to be the greatest in West Bengal where the average number of goats per farm varies from 2.49 to 2.97. In some areas, goat's milk is sold but its importance is negligible. Sheep provides mutton and wool but as there is no organised wool industry in the rural areas the importance of sheep remains more as a meat animal than a wool-producing one. Sheep appears to be more common and popular in Orissa than in any other State owing probably to the availability of extensive pasture lands in that State. The Hindu population of the eastern zone have great prejudices against the keeping of poultry birds as they normally do not take hen's egg or meat. The keeping of poultry is, therefore, confined mainly to the Muslim and tribal people of the States. In keeping of ducks, however, no such prejudice seems to operate but there is one great limitational factor which keeps the number of ducks low in the sample villages. The ducks like to stay in water where they can roam freely during the day time. The absence of tanks, ponds or similar other places acts as the chief bottleneck to extensive rearing of ducks. This applies more particularly to the State of Bihar than to any other States of the zone.

Another important fact which is to be mentioned in this connection is that the keeping of livestock is influenced more by religion, or social custom or tradition than by the economic considerations. As for example, the Muslim population who do not have any prejudice, whether religious or social, against the keeping of beef cattle but they have great prejudices against the keeping of pigs which is tabooed on religious grounds. Similarly, in case of the Hindu population, the keeping of beef cattle is against their religion though there is no religious bar against the keeping of pigs. Even then, pigs are not maintained by caste Hindus because it goes against the tradition or social custom. It may be observed from Table I that there is not a single farm in the sample villages where pigs are maintained though pig-raising is considered to be one of the best paying enterprises among the domesticated animals.

The number of livestock per farm, it should be recognised, is not small ; but the income they earn, as we shall see later on, is not at all high because of the bad conditions in which they are kept. The feeding of the cattle is far from satisfactory and the breed is very poor in most of the villages. The veterinary services are not readily available and loss of animals on account of diseases is sometimes staggering. It is considered that there is enough room for improvement in these respects.

The success of mixed farming depends to a great extent on the proper selection and combination of crops and livestocks. In the case of their wrong choice the advantages of mixed farming is lost to the farm and the farm income instead of going up will show a considerable decrease. Within the short space available

it is hardly possible to do proper justice to the subject and it is, therefore, proposed here to deal with the earning from livestock only. The earning from livestock depends on various factors such as breed of the cattle, the quality of feeds, housing, disease and pest attacks and last but not the least, the facilities of marketing. The prevailing conditions regarding these aspects are quite well-known and need not be elaborated here. It can, however, be stated that the conditions are far from satisfactory. Nevertheless, the gross income per farm from the sale of livestock and its products as shown in Table II is fairly high in some of the villages.

TABLE II—GROSS INCOME PER FARM FROM LIVESTOCK

State and Village	Gross Income per Farm in Rs. from					
	Milch Cattle	Goat	Sheep	Poultry	Duck	Total
Bihar						
1. Samahuta (Shahabad) ..	243.38	—	—	—	—	243.38
2. Harnichak (Patna) ..	64.52	—	—	—	—	64.52
3. Keotjali (S. Parganas) ..	21.65	36.30	53.03	6.63	N.A.	117.61
Orissa						
1. Kutra (Sundergarh) ..	11.45	N.A.	N.A.	14.53	—	25.98
2. Badkera (Dhenkanal) ..	91.00	3.00	2.80	—	N.A.	96.80
3. Darlimunda (Kalahandi)	85.50	5.70	3.50	7.30	N.A.	102.00
West Bengal						
1. Jangul (Birbhum) ..	39.23	12.17	1.33	0.29	0.92	53.94
2. Kashipur (Bankura) ..	100.12	16.12	—	1.53	5.53	123.30
3. Dakshinsija (Birbhum) ..	63.57	9.10	0.68	11.79	4.21	89.35
Assam						
1. Tektara (Goalpara) ..	25.00	3.95	—	9.69	—	38.64
2. Teghariartari (Kamrup)	50.13	N.A.	—	—	2.54	52.67
3. Harasinghpur (Cachar) ..	12.57	N.A.	N.A.	—	7.14	19.71

N.A.=Not Available.

It is revealing that the highest income per farm from livestock is earned in Samahuta in the State of Bihar and the whole of it is received from only one enterprise, namely, milch cattle. The cattle maintained in this village is of improved breed, namely, Hariana, Multani and Sindhi and as such the yield per cow is very high. The village seems to possess the highest comparative advantage in milk production and by concentrating the available resources to this enterprise alone the farmers have been able to draw quite a large dividend. Thus, though at present there is very limited scope of specialisation in agriculture best results can be attained even in mixed type of farming by keeping those cattle which have the greatest possible advantage. The conditions in Harnichak do not possibly favour

the keeping of other animals except the milch cattle but here the gross income per farm is not as high as in Samahuta even though Patna city situated very near the village offers a very good market for the livestock and its products. It is to be noted that the breed of cattle in this village is of inferior quality and the milk yield is rather poor. The village of Keotjali, situated very near the border of West Bengal, is inhabited wholly by the tribal and backward people whose selection of livestock is not affected so much by religious or social factors as it is in the case of Hindu or Muslim population. Thus, all the livestock enterprises of the zone except duck rearing have made some contribution to the farm income though individual contribution might not at all be large. It may look paradoxical that with the largest number of milch cattle per farm in Bihar the village shows the lowest income per farm. The reason behind this fact is that the tribal people inhabiting this village do not normally milk their cattle as milk is neither consumed by them nor is it sold in the market. This village, however, shows the highest income per farm from goat and sheep among all the sample villages owing mainly to extensive pasture lands.

In Orissa, the income per farm from livestock enterprises amounts to nearly Rs. 100 in the villages of Badkera and Darlimunda and major part of it is received from milch cattle. But in Kutra, the income seems to be too low particularly from milch cattle. This village, it may be mentioned, is inhabited by the tribal people who followed their tribal custom, *i.e.*, not to milk the cattle. The income from poultry is the greatest in this village and it is as high as Rs. 14.53 per farm. One significant fact worth mentioning is that in spite of a large number of goats per farm practically no income is derived from this enterprise. The local custom is mainly responsible for it. As most of the farmers in this village cultivate a very small area and do not possess the draught cattle of their own or even the necessary implements they, as a convention, maintain some goats to feed the farmers nearby who render necessary assistance to them in carrying out agricultural operations. The sample villages in Orissa depend mainly on wells for the supply of necessary water. As such, duck-keeping has not made any headway in the villages investigated.

The most striking fact about the West Bengal villages is that almost all the livestock enterprises of the zone find their ready acceptance on the farms. The income from the individual enterprises may look rather small but their joint contribution to the total farm income is not at all insignificant. Farmers appear to lay too much emphasis on diversification rather than on specialisation of products in the limited sense of the term. In Kashipur, the highest income is received from livestock and much of it comes from the milch cattle. The village is blessed with a rich and extensive pasture land and a forest is also situated very close to the village. This is the main reason why quite a large number of milch cattle and goats are maintained on the farms. The income earned by the other enterprises is just moderate. In Dakhinsija which is a purely Muslim village the income from milch cattle is quite considerable but it is far below the income earned by the Kashipur farms. Poultry and duck-keeping, however, show the highest income among the sample villages of West Bengal. The income per farm is the lowest in Jangul in spite of the fact that all the enterprises of the zone are adopted in this village. The village is very poor in pasture land and the proportion of old cattle being very high the average yield of milk per cow remains very low. Thus, the

income from milch cattle comes to be the lowest among the West Bengal villages. The other enterprises except goat do not also provide any decent income.

The State of Assam presents a sordid picture regarding the livestock enterprises as the maximum income from these sources comes to be only Rs. 58 per farm in Teghariartari in the district of Kamrup. Milk is the only notable enterprise in that village contributing 95 per cent of the total income. Tektara is inhabited fully by the tribal people who follow their age-old custom, *i.e.*, not to milk their cattle. This village has the good fortune to have an extensive pasture land within its border but this source remains almost wholly unexploited. There is a very good market for milk in Basugaon which has also a railway station. Thus, the village has immense possibility to build up a flourishing milk trade but this opportunity is not seized by the farmers. Further, the farmyard manure which is so very useful for crop production is not utilised in the fields and the whole of it is allowed to go waste. Lack of education and proper understanding may be considered the root causes for the backwardness of the village. Narasingpur, inhabited by the Hindu population, is very short of pasture land and there is hardly any scope for keeping milch cattle. The farmers lay much more emphasis on crop production than on livestock and as such, the income for livestock becomes the lowest in this village.

Cattle Trade

Cattle trade provides another source of income to the cultivating farms but the number of farms engaged in such trade is surprisingly low. The high capital investment required for this trade restricts the number of farms as very few farmers can afford to invest such capital after meeting the farm expenses. It has been found that out of 424 cultivating farms in the 12 sample villages in the eastern zone only 3 farms, one in Keotjali and two in Dakhinsija are involved in such trade and the gross income which comes to be Rs. 403 in the former and Rs. 1,240 in the latter is very high as compared to the total gross income earned by the livestock enterprises as shown in Table II. Incidentally, it may be stated that this trade is confined only to the non-Hindu farmers of the sample villages.