ECONOMICS OF MILK PRODUCTION IN BHUBANESWAR AREA

THESIS SUBMITTED TO
ORISSA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY
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DEGREE OF MASTER OF SCIENCE IN AGRICULTURE
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C E R T I F I C A T E

I certify that the thesis entitled " ECONOMICS OF MILK PRODUCTION IN BHUBANESWAR AREA " submitted in partial fulfilment of the requirement for the award of the degree of Master of Science in Agriculture (Agricultural Economics) of the Orissa University of Agriculture and Technology, is a faithful record of bonafide research work carried by Sri Biswamohan Samantaraya under my guidance and supervision. No part of the thesis has been submitted for any other degree or diploma or published in any other form. It is further certified that such help or information as has been availed of during the course of investigation has been duly acknowledged by the candidate.

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A C K N O W L E D G E M E N T

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(Biswamohan Samantaraya)

C O N T E N T S

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CHAPTER 1

Introduction

I N T R O D U C T I O N

IMPORTANCE OF THE STUDY :

In the predominantly agricultural economy of Indi where 72 per cent of the population depend on Agricultural pursuits, the importance of Milk production needs hardly any emphasis. It is an accepted fact that agriculture is the fundamental basis of our rural economy and cattle is the back bone of Agriculture. Agriculture and Animal Husbandry are interdependent and live stock keeping provides supplementary occupation to the agriculturists and large numbers of small farmers, marginal farmers and landless labourers can benefit from the additional income from milk. The economy of our country cannot improve unless animal husbandry progress alongwith agricultural production.

India has about 176 million cattle and 53 million buffaloes out of which 69 million are milch animals.This bovine population of India is nearly 23 per cent of the total bovine population of the world. Inspite of this large number of bovine population in the country, the total production and supply of milk and milk products is not sufficient.

The average per capita daily consumption of milk for the world is 10.7 ounces while that in India it is 4.62 ounces and in many of advanced countries it is more than 30.59 ounces. This lowest per capita daily consumption of milk in India, which is much below the nutritional

requirements (10.386) , is largely due to low milk producing capacity of cows in our country. It has been estimated that in India 94.3 per cent of cows yield less than one kilogram and only 0.4 per cent yield over two kilograms daily. The annual average milk production per cow in our country is only 175 Kgs. as compared to 5000 Kgs. in Austria, 4220 kgs. in Nerther land, 4154 Kgs. in U.S.A., 4000 Kgs. in U.S.S.R., 3950 Kgs. in U.K., 3905 Kgs. in Denmark, 3650 Kgs. in Switzerland and 2794 Kgs. in Newzeland. Present total milk production of India is 22 million tons per annum, which is nearly 6 per cent of the total world milk production. Thus, India, with nearly 1/4th of the world cattle population, produces only about 1/6th of the world milk production .Although the cattle population in India has increased at the rate of 2.5 per cent per annum during the past 15 years, increase in milk production is recorded at less than 2 per cent per annum. This in a way implies that milk in India is produced at a such higher cost, frustrating the milk producer in regard to returns from the enterprise.

It is pity that a vast country like India with unsurpassed cattle population is not able to feed its people with the most important nutritive food, milk. The milk we get from bovine is the natural food of the new born mammal and generally Mother's milk serves as the sole nourishment in the early months of the life of the human infants. In later periods of life, also, cow's or buffalloe's milk or, milk products serves as valuable dietary supplements. For vegetarians, milk is the only

source of animal protein. Most of the Indians are predominately vegetarian in their diet. They do not get adequate protein to supplement their diet.The deficiency of protein in the food must be overcome by addition of milk to their diet daily as milk is highly rich in protein. Mal-nutri-tion in India is a common fact, which must be overcome by balance diet and Balanced diet must include milk inorder to supplement the deficiency of proteins. Milk serves as the most nutritious human food, but a milk consumer in India has to pay more price for the milk he buys than his counterpart in any country in the world. It is also fact that a milk producer in our country gets less returns for his produce as compared to what producer gets in other countries. This is all due to low productivity of our milch animals. To get better returns from milch animals, it is essential that Dairy farmers should know about the economics of milk production.

Milk brings in good health to human population. Babies grow well and become stronger if they are fed with milk of cow. Stronger and stouter babies are the foundation stones of the healthier nation. In view of this, there is need to give priority for increasing milk production in the country. As agricultural production is not increasing propertionately with the increasing human population, there is a stagnation in agricultural front which has created acute food crisis. The country's needs for human

food can only be met by striking a balance between foods of plant and animal origin. Increasing milk production is important at a time when country is facing an acute food crisis. Increasing milk production can solve the problem to some extent.

About 50 per cent of agricultural income comes from animal husbandry and dairy whereas 50 per cent of national income of India comes from agriculture. From this we can well imagine the vital importance of dairy. One hand it plays a substantial role in augmenting agricultural income in the country and on the other hand it helps in stabilising agriculture as it assures daily net income. It also helps in increasing the farm business income of a farmer who includes dairy enterprise in their main farming enterprise. Dairy both complementary and supplementary to crop enterprise. Not only it absorbs idle labour of the farm but also adds to the production of the main crop enterprise by providing enough manure, thus increase the farm business income.Dairy is much more stable enterprise than crop husbandry, as this is a provision against risk and uncertainty for the farmers.

Due to the above views, dairy enterprise has occupied an important place in our agricultural economy. Hence it is necessary that well organised and concentrated efforts are necessary to sustain healthy growth of milk production. Efforts have, therefore, to be geared up to see that we are atleast self-sufficient in this respect.

SOURCE: 1. Kurukshetra, May 16, 1974, Page 9 "Growth of Industry in India", by - A.R.Patel.

OBJECTS OF THE STUDY :

In India we have got a vast cattle resources. But the milk production is very poor. This poor production is only due to lack of proper care, management and proper feeding of the animal. Ofcourse milk yield rates of cows are fairly satisfactory in urban stalls and to some extent satisfactory in rural specialised stall, but in rural stalls it is quite unsatisfactory, even the cows of rural stalls are the same breed as that of urban stalls.The rural cows are poor yielder because they are lack of proper management, proper and adequate feeding, proper care and good environmental conditions. This poor stocks of cattle constitutes major factor limiting production. It is an established fact that cow must have inherent capacity to produce more milk and this quality can be maintained according to care, management and feeding of the animal. It is therefore imperative to introduce such qualities in rural areas. Improvement in milk production can be brought about only by an aggresive programme for improving the productivity of the cattle.

Therefore, an aggresive programme may be made of the economics of higher level of feeding in the rural cows, as in the case of urban cows. If it is found to be economical, then this feeding rate can safely be applicable to the rural cows, as both the urban and rural cows are from the same stock and breed. This higher level of feeding will result higher milk yield rates from the rural cows promoting higher production of milk.Therefore,

the main objective of this project is to estimate the extent of rise in milk production with higher levels of feeding.

CHAPTER II

Review of Literature

REVIEW OF LITERATURE.

Chatterje and Goswami (1965) have found that the non-cultivator households manage cattle and buffaloes better than the cultivator households in rural areas of India. Cultivator households constitute 80 % of rural households in India. Poor feeding and management practices in cultivator households have resulted in an uneconomic growth of cattle and buffalo population in India. Consequently, development of Agriculture and Animal Husbandry suffers for want of hard working drought animals and high yielders.

Singh (1965) concluded that if the Dairy cows and buffaloes are charged with the maintenance costs of the dry animals, then serious losses are involved in the Dairy enterprise at the price levels used. The possible explanation for the persistence of dairy production under these conditions could be the willingness to produce milk when a large part of the milk produced is consumed in the household, and when the maintenance of dry cattle is governed by considerations other than economy.

Mathur (1968) reported that the experiments on feeding ,cheap farm grown protein rich fodders in place of costly concentrates reveals that according to conventional method of feeding concentrates,limited greens and ad-libitum straws for maintenance and

milk production,the cost of feeds to produce one litre of milk worked out to 33 paise.

By partial replacement of the concentrate ration with protein rich fodder in the above practice, the cost of feeds to produce one litre of milk worked out to be 26 paise.

Replacing most of the concentrate ration with protein rich fodders like para or guinea grass fed ad-libitum plus 1-2 kgs.of straw 1-2 Kgs. molases, the cost of feeds to produce one litre of milk worked out to be 20 paise.

On the basis of these experiments it is possible to maintain 4-5 animals yielding 5 litres of milk per animal per day on one acre of land ,which could yield about 75 tonnes of para or guiena grass (10 % protein) per year with proper agronomic practices and irrigation facilities.

- Misra (1970) found out that the average annual maintenance cost per milch cow on the basis of cost comes to Rs.532.06. The average annual milk yield per milch cow in lactation period is observed as 394 litres and average cost of productions per litre was estimated Rs.1.57 and bulk line cost per litre of milk has been observed at Rs.2.02.

. Persai (1970) opined that Khillar cows , an inferior cow of Maharastra have potentialities of quick improvement under better care and mandgement and are capable of contributing 2600 lbs per lactation as compared to 3000 to 3500 lbs per lactation from better breeds like Sahiwal ,Sindhi, Tharparhar etc.

Narayanan (1971) stated that good quality fodder could replace grains . This did not affect growth sexual maturity or milk production. According to him dry cows could be maintained on 10 to 11 kgs. of green Berseem and 2-3 Kgs. of oat straw.Continuing the milk yield studies on cows fed with Berseem showed that they cant yield 10K g. per head per day with this ration. The cost of feeding per kilo of milk when green berseem alone was fed was only 16 paise but it was 43 paise with the usual feed.Thus cost of milk production is cut down.

Gopal and Bhatnagar (1969) stated that economy of milk production of an animal is uncontrolled to a greater extent by life time production than by lactation production.Therefore it is essential to predict the life time production than by lactation production of an animalin the initial stage itself for effective selection.

Variationdue to age at first calving was 39, 39, 26 % in milk produced up to 6,8, and 10 years of age respectively. Further it was observed that for a decrease of age at first calfing by one month from 38.08 (months) there was an increase in the total milk production by 150 ,161 and 205 Kgs. respectively up to 6,8 and 10 years age. Variations in the 4 estimates of life time production as explained by 305 days first lactation yield was estimated to be 43,22,30 and 6 % respectively.

The partial regression coefficient indicate that an increase of 161, 67,and 68 Kgs of milk in first lactation was equivalent to reduction of one month of age at first calving for predicting the milk production up to 6,8, and 10 years of age respectively.

. Sundaresan (1973) concluded that the total expenditure involved and the income incurred by maintaining a) one cross-bred cow and one buffaloe b) two cross-bred cows (c) two buffaloes d) two deshi cows.According to him the maximum net profit by maintaining two cross bred cows was Rs.2,360/- per year whereas it was Rs.1657 by maintaining one cross-bred cow and a buffalo, and two buffaloes gave not more than Rs.760 net profit per year.But two desh cows hardly gave a net profit of Rs.55 per year.

Narang and Kaker (1973) reported that the low yielding cattle can hardly be profitable to the Dairy farmers even with higher plan of nutrition. Maximum output can only be derived from animals having high degree of genetic potentialities duly supported by adquate nutrition. Green nutritious fodder can meet the complete requirement of maintenance and partly the production of a cow or buffaloe, it is yielding milk not above 4 litres per day. Again they stated that an adequate leguminous fodder can meet the requirements of a cow yielding about 5 to 6 litres of milk , whereas an adequate non-leguminous fodder can meet the requirements of a cow yielding about 3 -4 litres of milk per day. So feeding of concentrates could be eliminated to most of the animals, since they are poor yielded and they can be maintained on good quality fodder alone.

Reddy and Jayashankar (1973) found out that the cost of milk production varies from lactation to lactation and also the cost of milk per litre varies from breed to breed. The cost per litre of milk production is 112 paise and 98 paise and 102 paise for Tharparkar, Redsindhi, and Sahiwal cows respectively. They have also stated that cost of milk production up to 800 litre production level of an animal is too high. The cost per litre decreases as the milk yield increases. Up to 2401 - 2800 litre of milk production level, there are quite significant variation in the cost of milk of pure breeds. So the cows only up to production level of 2401 - 2800 are economical.

CHAPTER III

Material and Methods

METHODOLOGY

Generally two methods are adopted for the collection of data from the respondents. Among which one is cost accounting method and the other is survey method.

In cost accounting method the investigator keeps careful accounts of day to day transaction for the sample holdings by personal observations on the spot, whereas in survey method data are obtained at suitable intervals, for various operations for a given period of time and dates are collected either by personal interview or, by filling Questionnaires supplied to the farmer.

Though the cost accounting method has several advantages and gives more accurate result than the survey method, it is not possible to adopt as it involves more costs and requires more time than the survey method. Further, without the assistance of the investigators, cost accounting method cannot be adopted, whereas survey method does not have these difficulties. Survey method requires less time and less personnel to obtain the required information.

Due to shortage of time and paucity of funds for taking up the study, a less costly and less time taken method i.e. survey method is preferred in this study.

SAMPLING TECHNIQUES :-

For the purpose of study, a list of all villages

of Bhubaneswar Block was obtained from the Block Office and 2 villages namely Kalyanpur and Haridaspur were selected at random. New Capital town of Bhubaneswar is included as the urban area. Now from each of the village 10 stalls have been selected at random. Therefore, 20 stalls from the rural areas were selected. Then another 10 stalls were selected from the urban area i.e. New Capital, Bhubaneswar at randum. Thus, 30 stalls in total were selected for the purpose of the study. The stalls in the selected centres are classified according to the number of cows in each stall i.e. 2-3, 4-5, and 6 and above. The stalls which have more than five numbers of cows in the rural stalls are taken as professionals i.e. rural specialised stalls. So this forms a class for comparison. The stalls which have less than six numbers of cows are taken as rural ordinary stalls. The urban stalls which were selected constitutes the standard against which the performances of the rural cows are to be compared.

Collection of data : Questionnaires were prepared according to the broad objectives of the study. Each and every stall owner was personally interviewed and data were collected by filling the Questionnaire.

Nature of data : All data are from the primary sources namely from the stall owner, as the owner did not keep any record. Therefore attempt was made to get information as correct as possible. Since the stall owners are sceptic

and suspicious of the stranger, they hesitate to disclose information on their income and production from their cows. Also the data obtained were with reference to the year 1973-'74. Therefore, it is likely that some error might have crept in.

METHODS OF COMPUTATION : In the study, an attempt has been made to examine the total income from the milch cows for better comparison between rural and urban stalls. Inorder to achieve this, certain measures hafe been followed while computing and processing the data after collection.

INCOME MEASURES: While computing various income measures, two points have been kept in mind.

i) Both the dry and milch periods of cows are included in the calculation inorder to get the actual cost and return incurred by the stall owner from the dairy enterprise i.e. cow.

ii) Again inorder to have better comparison in between rural and urban stalls , price of milk per litre has been charged at the same rate in both the cases.

(a) GROSS INCOME : Gross income from a cow has been calculated by taking the total income derived from the milk and also from the compost produce by the cow.

(b) NET INCOME : Net income has been calculated by deducting the total cost from the money value of total yield of milk and compost.

(c) FARM BUSINESS INCOME : Farm business income has been divided by adding to the net profit, the imputed value of family labour and interest on owned capital. While family labour income has been obtained by taking a total of net profit and imputed value of family labour employed in the stall.

COMPUTATION OF COST OF PRODUCTION OF MILK: Under the cost of production of milk, the following items of expenditures are included.

(a) HUMAN LABOUR : Human labour employed in the stall constitutes family labour, permanent labour and casual or, hired labour . Value of family labour has been imputed on the basis of prevailing wage rate i.e. value of family labour has been taken at par with hired labour assuming that the stall owner would have borne the same amount of expenditure paying to hired labourers if no family labour was used. Value of hired labour has been assessed on the actual payments made to the labourer either in kind or, in cash,while the value of permanent labourer has been calculated by taking into consideration the total value of payments made in cash or, kind for the whole time labourer including the cost of meals, clothing,housing and other benefits provided to him.

(b) COSTS OF PERISHABLE DEAD STOCKS, EQUIPMENTS, FEEDS AND FODDER AND MEDICINE USED BY THE CATTLE: These items have been charged according to market

value at the time of requirement.

(c) INTEREST AND DEPRICIATION ON FIXED CAPITAL :

Interest on fixed capital has been charged at the rate of 6 %. Inorder to calculate depriciation, straight line method has been adopted in this study.

(d) VARIABLE COST: In the study, variable cost includes value of feeds and fodder, human labour (family labour , hired labour), medicine, grazing , perishable dead stocks. In the calculation imputed value of family labour has been included so as to have an easy comparison.

SCOPE OF THE STUDY: Scope of this study was confined to the economic back ground of the area under study, economics of milk production and milk supply potention in Bhubaneswar. Inorder to study economic background of the area, cattle population of the area and factors affecting their low milk yield rates were studied. To study economics of milk production , estimation of total cost of production per litre of milk, components of variable cost, gross and net returns per milch cow, input and output relationship and production function were dealth with . To estimate supply potential of milk in Bhubaneswar, variation of milk yield due to lactation numbers and seasons were first studied. Then existing supply of milk in Bhubaneswar was estimated and the possibility of increasing milk production within the existing resources was studied.

LIMITATION : In the present study, data are

collected from the stall owner by sample survey method, through direct enumeration. As this study involves stall owners, most of whom are ignorant and illiterate, they do not maintain records of their day to day operations and transactions and hence they furnish data from their memory. Thus the degree of reliability and accuracy of data are limited to certain extent. Moreover, these illiterate and ignorant stall owner hesitate to give correct information relating to their return and cost from the cow.

There was also difficulties in obtaining accurate information as the stall-owners were afraid that such informations might lead to taxation on cattle wealth.

Further, the milk production is mostly dependent on a large number of variable factors such as, feeds, labour, time of milking, grazing periods etc.among with feed is most important than others. So except feed, the effect of other measurable and unmeasurable input has been left out of the scope. Ofcourse, the variation in milk yield due to lactation number and size of stalls has been studied , but their contribution to the total milk yield has not been assessed. Therefore, the objective, as has been indicated earlier, is only to estimate the extent of increase in the production of milk, by higher levels of feeding.

Lastly since the study is confined to two vill

Kalyanpur and Haridashpur of Bhubaneswar Block of Puri district and the investigation relates to six months and also to relatively small number of samples, it will not be appropriate to draw over all conclusion with full confidence.However, attempts have been made to reduce this type of non sampling error to the minimum through appropriate measures.

C H A P T E R IV.

" THE ECONOMY OF THE SELECTED AREAS WITH SPECIAL REFERENCE TO DAIRY "

THE ECONOMY OF THE SELECTED AREAS WITH SPECIAL REFERENCE TO DAIRY.

It is very necessary to go for the back ground study of the area and the sample villages, before proceeding further to study the problem.

LOCATION: Ofcourse, our study is limited only to the Bhubaneswar block of Puri district, but it is necessary to study briefly about the location of the district as a whole, as it is very difficult to bring out a distinct physiographical characteristics for a particular region.

Puri district is centrally located in the coastal tract of Orissa between 19°.28' North and 20°.35' N latitudes between 84°.29' E and 86°.25' E longitudes. The district has mainly two distinct physiographical regions, namely a plain alluvial tract in the South and South-east region and a hilly tract to the North-West. The river Mahanadi flows in the north-eastern portion and many small rivers traverse through the eastern part of the district. The areas under study comes under the alluvial tract of the South-east region. Kuakhai is the main feeder of the deltaic rivers and has three distributories, namely Kushabhadra to the east. Bharghavi in the centre and Daya to the West.

TOPOGRAPHY : In general, entire land of the region is level alluvial plain and the drainage is from the east to West as the slope being gradual through out.

Haridashpur village is not subjected to flood, whereas Kalyanpur is subjected to flood up to some extent by the river Daya.

CATTLE POPULATION:* Out of total cattle population of 15,687 strenth, in Bhubaneswar sub-division, male population is 7241 and that of female population is 8446. Out of this female population 7340 are either dry or milch cows and rests are either calves or, heifers. From the total strength of the cows under dr, and milk group, 52 percent are dry cows and the rest 48 percent are milch cows. From this it can well be imagined that the milch cows are proportionately less than the dry cows in the region. This is due to lack of proper breeding policy and alterness on the part of dairy men.

CHARACTERISTICS OF THE COWS: The good quality breeds like Hariana, Red Sindhi, Sahiwal etc. which are good milk yielder are found to be very few in number in Orissa and particularly in Bhubaneswar area. The initial cost and maintenance cost of these good breeds are very high. So the people in rural areas, where most of the people are very poor cannot catch the imagination of such breeds. People keep non-descript local breeds in rural areas,

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* Census Report of Orissa, 1961 of Puri district.

which are very low yielder of milk. Because of the fact that, the rural cows are not supplied with proper nutrients in adequate amount but only a substantial nutrient requirements is available to them.

In urban areas people very often keep local breeds, which are not bad yielder of milk. This may be ascribed to higher levels of feeding. In Bhubaneswar sub-division cross-bred cows are very few, and that few cross-breds are generally found in the New Capital area of Bhubaneswar. So it is not necessary to study about such cross-bred cows characters.

CHARACTERISTIC FEATURES:

(a) A non-descript local breed has body moderately long, back straight,neck short, dewlap small, sheath tight and skin not very fine.

(b) A non-descript local breed has Head moderately sized, forehead slightly prominent,muzzle fairly wide, tail not very fine, moderately long with a black switch,horns small, strong,curving upward and slightly inward from top of the poll ,ears small and pointed.

UTILITY : A non-descript local bullock is good for draught purposes and cows are very poor milk yielders.

BODY MEASURIMENT OF AN AVERAGE COW OF NON-DESCRIPT TYPE:

Height - 42"

Length - 50"

Girth - 60"

Weight -600 lbs.

Weight in lbs. f a cow can be found out by the formula

$$\frac{L \times G^2}{300}$$

where,

L = Length of the cow

G = Girth of the cow

YIELD RATES OF COWS**:

India has about 176 million cattle and 53 million buffaloes, out of which 69 million are milch animal.This bovine population of India is nearly 23 percent of the total bovine population of the world. Inspite of this large number of bovine population in the country, the total milk production in India is 22 million tons per annum, which is nearly 6 percent of the total world milk production.Thus, India with nearly 1/4th of the world cattle population,produces only 1/6th of the total world milk production.

The annual average milk production per cow in our country is 175 Kg. whereas in Australia it is 5000 Kgs.

** Gosamvardhana -Vol. XIII, No.3, Nov. 1965 page 21, " Better Cattle Health through better fodder production" by Harbans Singh.

* TABLE - 1.

Comparison in annual average milk production per cow between some advanced countries and India (expressed per cow).

Sl.No.	Name of the country	Annual average milk production in Kgs.	
1	Australia	5000	INDIA -175
2	Northerland	4220	
3	U.S.A.	4154	
4	U.S.S.R.	4000	
5	U.K.	3950	
6	Denmark	3905	
7	Switzerland	3650	
8	Newzealand	2794	

The relative performance of cows can be very well accessed from the foregoing table. It has been estimated that in India 94.3 percent of cows yield less than one kilogram and only 0.4 per cent yield over two kilograms daily.

Also in case of India a lot of differences in milk yield rates are found between different Breed of cows, the comparison of which will be very interesting. It will reveal the extent t which we are to move up. The

* Kurukshetra, May 16, 1974, Page 9, " Growth of Dairy Industryin India by A.R.Patel.

comparison is given below in the TABLE 2.

TABLE - 2. @

Comparative performances of one of the breeds of cows in India.

Sl.No.		Breed	Average milk yield per cow per annum (in litres)
1	*	H.Sahiwal	1630.80
2	*	Red Sindhi	1360.80
3	*	Hariana	813.60
4	**	Local (Rural cow)	219.30

From the above table it is clear that local breed cows are very much low yielder than the improved breeds. Even if, there is very little scope to attain the yield rates of improved breeds, there are evidence of achieving yield rates more than the existing one, as will be discussed later on in a different chapte .

Whatever it may be, the causes leading to the miserably low yield rates of cows in the locality under study is necessary to examine.

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* Agriculture and Animal Husbandry in India by H.S.Randhva
** Estimated by personal investigation.Average is based on milch animals only.

@ 1. Agriculture and Animal Husbandry in India by M.S. Randhawa
2. Estimated by Personal investigation .Average is based on milch animal only.

(1) CLIMATE : Climate is the key factor affecting the development of good cattle population.The extreme climate of North and North-West India is very much helpful for the vigorous groth and sound health of the cattle. In fact most of the improved breeds in India hails from this region.As compared to this region,the humid and hot climate of our region is not favourable for the healthy growth of the cattle.For raising of good breeds Eastern region is not climatically suitable. A temperate climate does not suit the cows to grow well.This conclusion is derived as there are evidences of these improved breeds of cattle losing their health and milk yield when brought into this environment for a period covering one or two lactations. So climate is a most important factor which lead to the miserably low yield rates of the cattle . Therefore, it is necessary to study the climate of the sub-division, which can be read from the table given below.

TABLE- 3.*

Seasonal Distribution of rainfall over 10 years in Bhubaneswar in mm(1)

Years / months	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Jan.	-	-	15.9	87.6	59.9	33.6	-	-	3.4	-
Feb.	-	21.4	7.0	31.8	-	57.9	-	44.0	27.4	31.2
Mar.	47.4	10.4	38.9	-	47.1	80.4	-	52.5	0.1	-
Apr.	-	47.8	36.7	5.0	38.6	11.8	5.9	23.1	58.3	4.
May	132.3	82.6	1.2	6.3	9.4	9.8	36.5	95.7	71.4	3.1
Jun.	-	212.8	51.0	178.6	165.6	278.8	120.3	337.7	492.8	66.6
Jul.	289.1	478.8	373.0	332.1	340.3	329.9	513.0	306.0	237.3	272.0
Aug.	-	345.5	284.5	223.0	389.5	138.6	408.2	399.0	267.5	463.3
Sep.	370.3	292.2	287.3	323.5	388.8	333.7	214.2	-	190.0	431.7
Oct.	237.2	80.0	108.6	116.5	27.5	53.0	59.3	148.3	-	117.2
Nov.	342.4	2.4	-	103.3	4.0	87.4	83.5	108.0	-	1.6
Dec.	-	-	6.2	-	0.5	-	4.7	-	-	-
Total rainfall of the year	1418.7	1573.4	1210.3	1407.7	1555.2	1354.4	1445.6	1417.1	1348.2	1390.7

Source: Observatory Experiment Station, O.U.A.T., Bhubaneswar.

The annual normal rainfall of the sub-division is 57.83 inches or 146.89 cms. but the sub-division does not receive same amount of down pour every year. There is deviation from normal rainfall each and every year. The sub-division gets such greater populati-on of rainfall during rainy season as the rainfall is mostly seasoned. Ofcourse, Bhubaneswar sub-division receive some summer shower, which is helpful for agricultural operations.

There is a continuous rise in temperature from March to May. The mean daily maximum temperature in the latter month being 38.8 C (100.4° F) at Bhubaneswar. After May , with the arrival of monsoon, the temperature follows a downward trend until Se tember, towards the end of which there is a slight increase in day temperature. Afterwards, both day and night temperature begins to decrease gradually till December, which is the coldest month, as evidenced by the mean daily minimum temperature which is 15.7°c (60.3°F) in Bhubaneswar.

Relative humidities are high throughout the year in this area. Winds are fairly strong in summer and monsoon months. The wind speed is much less in the post monsoon months and in the winter.

As compared to the rainfall and humidity of the day part of the north and north-western part of the country, this sub-division has much greater rainfull and humidity.

which is unfavourable for the sound growth of the cattle. As a result many diseases of cows are found in this region. Apart from the rainfall and humidity, the temperature between different months, which is contrast to the extreme climate of the important cattle areas of the country.

(2) LAND USE AND CROPPING PATTERN:

Land utilisation and cropping pattern have much importance with the quality of herds in an area. Land utilisation is important, as it will give the extent of areas available for grazing particularly with reference to the size of cattle population. Land utilisation pattern of Bhubaneswar sub-division is given below in the Table No. 4.

TABLE - 4.*

Utilisation of land in Bhubaneswar sub-division.

Heads	'000' Hectare	Percentage to the total
1. Land put to non-agricultural use	12	2.10
2. Barren and uncultivated	25	4.39
3. Cultivable waste	20	3.51
4. Net area shown	220	38.60
5. Total crop area	251	44.21
6. Area shown more than once	32	5.61
Total	570	100

* Census Report, 1961 of Puri district.

From the items given in the table, items 2 and 3 i.e. i.e. Barren and uncultivated land and cultivable waste land are of special significance for grazing. Cultivable waste land is the only source for the cattle population for grazing as barren and uncultivated land is devoid of vegetation.Thus the cultivable waste land which constitute 20,000 hectares against a total cattle population of 15,687 heads, works out a favourable ratio. But the carrying capacity of these pastures are very low.The pasture condition and its carrying capacity can be improved tremendously by rotational grazing, which means rotational use of the whole pasture land for grazing by dividing the whole pasture land into some parts. The cows should be allowed to graze one part and when grasses will be exhausted from that, they will be taken over to another part.Likewise they will move over whole the pasture land by phases.But in the villages continuous over grasing in a particular area have been subjected for a long time so it is almost devoid of vegetation. At present, however, the pastures are probably carrying 3 to 4 animals per acre for most part of the year and serve merely as exercise ground. Therefore, it is highly desirable to develop all the available cultivable waste lands on proper lines to provide ample grass and hay.

Total cropped area is more or less played an important role in providing feed and fodder to the cattle, which are most essential requirements for the maintenance and growth of the cattle. So cropping pattern of the area under study should be known. The cropping pattern of Bhubaneswar block is illustrated in the table given below :

TABLE - 5.*

CROPPING PATTERN OF BHUBANESWAR BLOCK:

CROPS	Area in Hectare	Percentage to the total.
1. Winter Rice	150,000	75.46
2. Autumn Rice	30,820	15.51
3. Summer Rice	9,070	4.56
4. Maize	500	0.25
5. Ragi	2,890	1.45
6. Wheat	70	0.03
7. Gram	10	0.01
8. Arhar	210	0.11
9. Sugarcane	557	0.28
10. Potato	300	0.15
11. Oil seeds	3,555	1.79
12. Fibres	800	0.40
TOTAL :	1,98,782	100

From the table it is observed that winter rice or 'Sharda' rice is the most important crop of Bhubaneswar block and autumn rice has some importance, Ofcourse relatively less than winter rice. But these

* Census Report, 1961 of Puri district.

provides straw and feed to the cattle when they are scarce. Summer rice or,Dalua paddy is very rare in this area due to scarcity of water.

Ofcourse the information regarding pulse crops is nil as the source from which data is collected is silent about it but there is abundance of pulse crops like Mung, Biri and Kulthi are grown in rotation with rice.Kulthi is particularly given to working bullock and to some exten milch cow.Rice, Mung and Biri brans are very important feeds of the cattle .

Absence of fodder crops is the most painful features for animal husbandry.For successful production of crops, this area depends on rain and so all intensive crops like pulses are grown during Rabi underresidual soil moisture conditions. People of this area do not want to substitute fodder crop for rice,and rice is very much necessary for their subsistence.

(3) FEED AND FODDER: Nature of feeds and fodder given to the cattle is the most important factor for the cattle to produce more milk. In Bhubaneswar Block bran of rice, rice straw , Biri ,Kulthi are given to the cattle. Generally bran of rice and rice straw are given to the cattle and Biri and Kulthi are very rarely given to the cattle. In the Village, rural specialised stall owners sometimes Boti and husks of Black gram and green gram to their cattle, but in the town the stall owner

give wheat bran, husks ,of Black gram, and green gram alongwith bran of rice , rice straw, Biri. In the rural ordinary stall the cattles are fed below the maintenance ration whereas in the rural specialised stalls feed ration is som thing better than the rural ordinary stalls. But in the Urban stalls cows are fed at a higher level. In the case of rural areas the cows depend mostly on grazing. In case of town area grazing is very inadquate. Grazing has a very important place in the cattle feed as it provides most economical and cheapest form of cattle feed. The grasses are most palatable to animals and require very little handling. The rural cows get reasonable quantity of grasses only in the rainy season because in other seasons the grazing land is completely devoid of grass vegetation.

Whatever be the inherent qualities of the animals, they are not able to improve their productive efficiency unless they are fed well.So inadequate feeding is perhaps the greatest limiting factor for the improvement of productive efficiency of our cattle. The shorts of cattle feeds and fodder is also another limiting fa for the improvement in the productive efficiency.If balanced feeds and fodder is ensured then their produ vity can be increased.This has been proved unequivoca in a scheme of the Indian Council of Agricultural Res where the non-descript cows of Bengal (resemble with

cows of Orissa in milk yield, stature, and other physical characteristics) which under traditional practice of maintaining only on paddy straw, green grass hardly give one to two pounds of milk, yielded ten to fifteen pounds of milk in the first lactation, when they are fed with balance ration.

(4) BREEDING POLICY. In this region hardly few good breeds of cows are seen .For a good progeny, a good and improved breed should be crossed with a stand bull of that breed.But in this region neither good crossed breeds of cows nor bulls are there.Even, if there is a good breed, they are crossed with a stray bull as a result their potency is decreased and the breed is degenerated. In villages generally cows are crossed with a particular stray bull. So, naturally, succeeding breeds are not up to the quality. The people do not follow the scientific breeding policy because they do not keep cows for commercial purpose and also they are interested more on bullock power and pay maximum attention to upkeep and maintenance of the bullocks.It has been observed that the number of dry cows is much greater than the cows in milch which is due to the defective breeding policy. Adoption of better principle will solve many problems in this regard.

(5) MANAGEMENT: The management of dairy cows in the area study is perhaps poorest in the world.The obvious reasons is that the people are interested in only

securing draught animals for the farm .Nobody is very much concerned with milk production.For them milk is a bi-product.The cows are brought up in the most unhygenic condition and ill-nourished that they lose their vigour and health.The dwelling places of cows in the village are too small, dark and dirty and unhygenic which are due to most unproper and careless management of the owner .Due to these reasons cows are not expected to grow well, hence very weak, short, and dwarf cows are seen in this region .Cows are let free once in the morning for grazing and brought back in the evening. The cows in many cases remain through out the night under open sky in rain and winter. Cowshed is either cleaned or not, the cows remain with those unhygenic stables. Somany diseases of cows are found in this region. Due to superstitious beliefs no modern scientific treatment is given for cows.This give rise to serious diseases and bring down the health of the cows. In almost all villages cows suffer from many diseases due to absence of nutritive feeds and bad sanitation conditions.Bad sanitation and other unhygenic conditions are also partly responsible for the low milk yield rates of cows.

DEPENDANCE ON LIVE STOCK ENTERPRISE :

It is impossible to think of improving agricult without having good cattle.Holdings are small,agricult

practices are old fashioned and marketing of produce continues to be done with bullock carts.Therefore,cattle are indispensable for the small economy.Various agricultural operations including irrigation and rural transport and also manure for the fields are provided by the cattle. Specially during the wide gap between the sowing and marketing of agricultural crops the farmer supplements his major resources through the sale of milk. Thus dependance on cattle, both in regard to their milk yield and draught capacity, is very important.

At present, in India, more than 50 percent of our totala agricultural income is derived from cattle; and it is obvious that they should receive adequate attention in the planning programme for the rural sector.

Particularly in the rural areas dependance on live stock enterprise is not more. Mostly people of this area depend on Agriculture and to them live stock enterprise is a subsidiary occupation. They keep hardly over two cows to meet only the home consumption of milk and cow dung is used as manure on the field.A very few people keep more number of cows for commercial purposes.Generally, good cattle are found in areas where fodder crops are grown in plenty. Generally the people in the area under study do not get sufficient agricultural produce from their field to meet their own consumption, so they do not bother about growing fodder crop.

If a balanced agricultural policy is to be followed in this area in which the cultivation of fodder crops finds an appropriate place in the crop rotation programme, live stock enterprise can be a paying enterprise. This enterprise cannot flourish without feed and fodder.

C H A P T E R V.

" ECONOMICS OF MILK PRODUCTION "

E C O N O M I C S O F M I L K P R O D U C T I O N.

COST CONCEPT : We have already known about the important role of milk in the Indian diet.Therefore, the importance of Dairy animals and bovine draft animals for the organisation of Indian farms can be well imagined. But it is a pity that very little is known about the physical nd economic relationship involved in this process.In this chapter we have emphasised the objective assessment of the extent to which the cultivators of the rural area and as well as the herd-keepers in the urban area of the celected region have derived benefits.

The milk yield rate is affected by large number of variable factors. The nutrient value of the feed combinations, seasonal effect, location and management are the factors ,among the various factors which introduce heterogeneity in the conditions for effecting valid comparison better the performance of the various categories of cows. Feed is the major determining of feed milk relationship.

As regards the cost concept all fixed and variable costs, are included .Labour cost, cost of feed and cost for perishable dead stocks are included in fixed costs.

$$\frac{\text{Total Cost}}{\text{Total milk yield.}}$$

In other words by dividing the total physical product with total cost.

TOTAL COST IN RELATION TO CATEGORIES OF STALLS:

The total cost of production per year per head of milk cows which refers to the lactating cows is presented in the table given below .The total cost is estimated for three categories of stalls namely Rural ordinary stalls.Rural specialised stalls and urban stalls are presented in the table.

TABLE - 1.

Distribution of total cost of production of milk between the different types of stalls (Expressed per cow per annum in Rs.)

Categories of stalls.	Total cost per cow per annum	Total milk yield per cow per annum in litre.	Cost per litre of
Rural ordinary stalls	216.74	219.279	0.98
Rural specialised stalls	203.39	229.396	0.88
Urban stalls	325.17	336.077	0.96

From the above table it is seen that even total cost per cow in urban stalls is higher than the rural ordinary stalls, but the cost of production per litre of milk is same.Though the cost of production per litre of milk remains same between the two stalls , higher production rate in Urban stalls enables them to secure higher levels of income and profit per cow as will be seen later.

The extent to which urban cows are fed at higher levels will examined subsequently. The rural specialised stalls secure reduced cost per litre of milk even with smaller investment. This might be ascribed to better management.

The variable cost among the total cost hands heavy on the stall owners. It is worthwhile therefore to compare the variable cost incurred per unit of milk per cow between different categories of stalls. This finds mention in Table 2 below.

TABLE -2.

Distribution of variable cost incurred per litre of milk in different categories of stalls- (expressed per cow per annum in Rs.)

Categories of stalls	Total variable cost	Total milk yield in litre	Variable cost per litre of milk.
Rural ordinary stalls.	169.04	219.279	0.77
Rural specialised stalls.	160.46	229.396	0.69
Urban stalls	250.98	336.077	0.79.

It is seen from the table that the variable cost per litre of milk does not differ significantly between urban and rural stalls. Cost if little lower in specialised stalls. This greater variable cost per cow in urban areas is ascribed to greater levels of feed input as may be seen later.

From the above two tables it is seen that the total cost per litre of milk is 0.98 and the variable cost per litre of milk is 0.77 in Rural ordinary stalls, but a litre

of milk costs Rs.1.75 in the market, which in a way indicates the possibility of increasing milk production in rural areas. Milk production can be increased to a considerable leve by incurring more costs on feeds in the rural stalls.It will be seen later that there is positive and significant correlation between the feed input and milk output . These are some of the evidences of achieving greater production of milk in the rural areas only by increasing the level of feed alone i.e. achieving greater output by increasing the level of input in the rural areas.

FIXED COST: The characteristics of fixed cost is that it is incurred eventhough there is no production .They are not greater at higher yield.The principle of large scale economy applies mostly to the fixed cost. Fixed cost is imputed by taking a total of depreciation, upkeep and rate of interest on cattle, dairy equipments and machinery and cow sheds.The fixed cost per cow per annum for different categories of stalls are illustrated in the Table given below:

TABLE- 3.

Distribution of fixed cost incurred per litre of milk in different categories of stalls.

Item	Rural ordinary stall	Rural specialised Stall	Urban Stall
Fixed cost in Rs.	. 47.70	42.93	74.19

COMPONENTS OF VARIABLE COST:

It is observed that there is a greater feed input in urban stalls relating to rural stalls resulting greater output per cow which in its turn lowers the cost per litre of milk, it is necessary to examine whether there is greater feed input in Urban stalls as compared to rural stalls or, not. The table given below illustrates the structure of cost for individual stalls.

TABLE - 4.

Distribution of Variable cost in different categories of stalls of rural and urban areas (Expressed in Rs per cow per annum).

Items of Variable cost	Rural ordinary stalls	Rural specialised stalls	Urban stalls.
a) Feeds and Fodder			
i) concentrates	52.49	68.41	133.40
ii) Roughages	46.38	37.21	58.44
b) Human labour	45.57	32.18	26.70
c) Medicine	9.24	8.08	9.63
d) Other miscelleneous	8.50	-	8.32

From the above table it is observed that the relative importance of feed and foffer is much greater in urban stalls. The relative importance of concentrates among the feed in urban stall is about 2.00 times greater than rural ordinary stalls and 1.4 times greater than rural specialised stalls, while that of roughages is approximately same in urban and rural specialised stalls, but in rural ordinary stalls it is slightly higher. So it indicates that the the actual limiting factor for increased production of milk is the inadequacy of concentrates rather than roughages.

It can also be observed from the table that the cost of human labour is much less in urban stalls than the rural stalls.The cost of human labour is highest in rural ordinary stalls.The labour cost is much less in urban stalls because the cows in urban areas do not go outside for grazing for a longer period.Labour cost in rural specialised stall is less than the rural ordinary stalls as the total labour cost is divided among larger number of cows than the rural ordinary stalls .

Milk production can be increased significantly if the stall owners can ensure more investment on concentrate feeds.

GROSS MARGIN: Study of Gross margin level obtained per milch cow per annum in different categories of stalls is necessary inorder to find out the Economics of Milk production. Variation of gross margin level per milch cow per annum in different category of stall are given in the table below :

TABLE- 5.

Variation of Gross margin level in different categories of stalls (Expres in Rs.per cow per annum).

Categories of stalls	Gross income	Variable cost	Gross margin or Gross retu n
Rural ordinary stall	431.69	169.04	262.65
Rural specialised stalls.	454.81	160.46	294.35
Urban stalls	642.15	250.98	391.17

Gross margin or Gross return can be obtained by subtracting variable cost from the Gross income.

It is seen from the above table that gross margin lever per cow per annum is significantly higher in urban stalls as compared to other classes of stalls.This difference is due to the higher production efficiency of thes categories of cows. Ofcou se the efficiency has been secured by greater investment in variable cost per cow.

NET INCOME. It is seen from the above table that there is sufficient margin over variable cost for all classes of cows. It is worthwhile, to examine the margin over total cost or in other words, what amount is obtained due to their entrepreneural function needs to be studied. This is obviously the return on total cost or the net profit. The table below compares the same between different categories of stalls.

TABLE- 6.

Variation in net income between different categories of stalls (Express in Rs.per cow per annum).

categories of stalls	Gross income	Total cost	Net income
Rural ordinary stalls.	431.69	216.74	214.95
Rural specialised stalls.	454.81	203.39	251.42
Urban stalls	642.15	325.17	316.98

It is seen from the table that not only with the increase of total cost per cow per annum, the yield rates of milk as reflected by the gross income is pushed up per cow

per annum but also at the same time there is increase of Net income and return over variable cost. (Gross return- Variable cost) and per cow per annum. Therefore, it can be concluded that there is enough potential of increasing milk production from the local breed of cows if proper and adequate feed is given to the local cows.

COSTS AND RETURNS PER DAY: It is relevant to study the cost and returns per day per cow in different categories of stalls with context of the present study. The table given below illustrates the costs and returns per day per cow between different categories of stalls.

TABLE 7.

Variation in costs and returns in Rs. per day per milch cow between different categories of stalls.

Items	Rural ordinary stalls	Rural specialised stalls.	Urban stalls.
1. Average daily gross income per milch cow	1.19	1.26	1.78
2. Average total cost per day per milch cow	0.60	0.57	0.90
3. Average daily net income per milch cow	0.59	0.69	0.88
4. Average daily milk yield per milch cow in litres.	0.609	0.637	0.933
5. Average total cost per litre of milk	0.98	0.88	0.96

According to Table 6 higher average total cost per day per milch cow in the urban stall is accompanied by higher average daily gross income ,and average net income per milch cow .This is ascribed to higher yield rates of milk obtained from urban cows.Further owners of the urban stalls have been wise in investing relatively higher amount on feeds specially concentrates, their production efficiency has greatly increased. The additional milk obtained by the stall owners is almost at the same cost per unit relative to rural stalls.

TOTAL COST IN RELATION TO SIZE OF STALLS.

It is natural to assume that the economics of large scale of production may be operative in various stalls. But after all, this is a rigid factor and in the short run , no adjustment in this regard can be possible for increasing the milk production potential of the area . But, all the same, it may help in framing up of policy for rearranging the size of stalls.The total cost of production per year per head of lactating cow is presented in the table given below. The total costs are estimated for three sizes of stalls like , stalls having number of cows 2-3, 4-5 and 6 and above, and presented in the table. From this the variation in the total cost per litre of milk between various size of rural and urban stalls can be examined.

TABLE - 8

Distribution of the cost per litre of milk betweenn various sizes of rural and urban stalls (expressed per cow per annum).

Categories of stalls	Rural stalls			Urban Stalls		
Sizes of stall items of costs	2-3	4-5	6 and above	2-3	4-5	6 and above
Total cost in Rs.	216-76	225-36	230-26	339-42	345-28	349-86
Total milk yield in litre	200.058	216.373	240.837	311.508	332.598	353.008
Cost per lit. of milk in Rs.	1.08	1.04	0.95	1.08	1.03	0.99

It is obvious from the above table that in both rural and urban area,as the size of stall is increasing the total cost per cow per annum is increasing, but at the same time the total cost pe litre of milk is decreasing in these stalls. The difference in the cost per litre of milk is however not significant.The emerging conclusion from the above is that there is a positive correlation between output and cost per cow and the total cost per cow increases as the size of stall increases. Other expenses particularly over head costs are distributed widely over all the cows. That is why the total cost is increasing at a decreasin rate.

VARIABLE COST : The rates of production is directly influenced by the variable cost. The production increases with the increase in the variable ~~x~~ cost. Therefore, it is necessary to compare the variable costs incurred per unit of milk as well as per cow between various sizes of stalls in the rural and urban areas. The following table illustrates the same.

TABLE 9.

Distribution of variable cost incurred per litre of milk in various sizes of stalls in the rural and urban areas (expressed per cow per annum)

Categories of stalls	Rural stalls			Urban Stalls.		
size of stalls	2-3	4-5	6and above	2-3	4-5	6 and above
Items of costs						
Total variable cost in Rs.	164.09	177.41	191.07	266.25	279.21	291.42
Total milk yield in litre.	200.058	216.373	240.837	311.501	332.598	353.008
Variable cost per lit.of milk in Rs.	0.82	0.81	0.79	0.85	0.83	0.8

Above table reveals that the total variable cost increases with the increase in the size of stalls.The variab cost per litre of milk ,however, does not differ significan between the various sizes of stalls. The cost of producti per litre of milk in various size of stalls ,in both rura and urban areas is below than the prevailing market price So it is obvious that milk production can be increased i each of the sizes of stalls. The total milk yield can be increased to a greater level by incurring more costs on But since the increased yield is obtained with higher inputs it may be concluded that constant returns to sc might be operated.

FIXED COST: The characteristics of fixed cost is the it is incurred even though there is no production.Th are not greater at higher yield.The principle of law

economy applies mostly to the fixed cost. Fixed cost if imputed by taking a total of Upkeep, Depreciation and interest on cattle,dairy equipments and machinery , cow-sheds. The fixed cost for cow per annum for various sizes of stall. In the rural and urban stalls are illustrated in table given below.

TABLE 10

Distribution of Fixed cost in various sizes of stalls in Urban and rural areas (Expressed per cow per annum) in Rs.

Size of stalls / categories of stalls	2-3	4-5	6 and above
	2-3		
Rural stalls	52.67	47.95	39.19
Urban Stalls	73.17	66.07	58.44

It appears from the table that fixed cost follows a decreasing trend with the increase in the size of stalls in both the urban and rural stalls. This due to the fact that fixed cost is widely distributed over the cows in larger stalls,The extent to which the principle of large scale economy operates by increasing the size is evident.Another point which can be observed from the table is that the fixed cost is significantly greater in urban stalls.

COMPONENTS ... ON VARIABLE COST:

A study of the components of variable cost is essential inorder to have an idea of the extent of use of the important inputs, which are responsible for higher returns from the cows in the larger size stalls.

The table given below illustrates the structure of Variable cost individually for various sizes of stalls.

TABLE -11.

Structure of Variable cost in various sizes of stalls in both rural and urban sector (Expressed in Rs. per cow per annum).

Categories of Stalls	Rural Stalls			Urban Stalls		
Items of Variable cost:	2-3	4-5	6 and above	2-3	4-5	6and above.
(1) Feeds and Fodders						
(i) Concentrates	71.82	83.92	91.44	115.55	131.35	139.48
(ii) Roughages	40.52	44.37	49.88	66.56	70.13	76.56
(2)Human Labour)	38.65	35.45	31.20	63.64	56.50	48.26
(3) Medicine,perishable dead stocks grazing fees	13.10	13.67	18.55	20.50	21.23	27.12

From the above table ,it is evidennt that the inputs, which are responsible for higher rate of production, such as concentrates and roughages are used to a greater extent in the larger stalls.Again in comparison to rural stalls, stall owners in Urban are s invest more on all components of variable costs.

It is also observed from the table that human labour cost decreases with the increase in size of stall in both rural and urban stalls.This is due to better management, efficiency in the larger stalls.

GROSS MARGIN : Gross margin i.e. gross return over cost is calculated by deducting total variable Gross income. It is considered as an indicato

efficiency of the stall owner . The following table gives a comparative account of gross margin obtained per milch cow per annum in various sizes of stall in the rural and urban areas.

TABLE 12.

Distribution of gross margin between various sizes of stalls (Expressed per cow per annum)

categories of stall	Rural Stalls			Urban Stalls		
Sizes of stalls / Items of cost.	2-3	4-5	6 and above	2-3	4-5	6 and above
Gross income in Rs.	389.72	427.89	478.36	610.38	685.88	719.20
Variable cost in Rs.	164.09	177.41	191.07	266.25	279.21	291.42
Gross margin in Rs.	225.63	250.48	287.29	344.13	406.67	427.78

In the above table, it is observed that the gross margin level per milch cow per annum is highest in the larger size stalls i.e. 6 and above stalls and lowest in the smallest size i.e. 2-3 stalls. Gross margin level increases ~~in~~ with the increase of the size of stalls due to increase in the gross income of the stalls. The increased gross income may be ascribed to higher level of feeding in these stalls.

NET INCOME: Net profit or net income is the difference between the gross income and total cost.Thus, net income measures the return to the stall owner for his ability in management. The table given below shows the distribution of net income or, net profit between various sizes of stalls in rural and urban areas.

TABLE -13.

Distribution of net income between various sizes of stalls in urban and rural areas (Expressed per cow per annum)

Categories of stalls / size of stalls / Items of costs	Rural Stalls			Urban Stalls		
	2-3	4-5	6 and above	2-3	4-5	6 and above
Gross income in Rs.	359.72	427.89	478.36	610.38	685.88	719.20
Total cost in Rs.	216.76	225.36	230.26	339.42	345.3	349.86
Net income in Rs.	172.96	202.53	248.10	270.96	340.60	369.34

It is observed from the above table that the size of the stalls have some influence on the average cost and return per milch cow per annum.

The gross income per milch cow is more in bigger size stalls whereas the total cost is proportionately less in these stalls.This may be due to relatively small over head costs and labour costs etc. per milch cow in the bigger size stalls. Higher gross income may be ascribed to larger numer of animals and higher level of feeding in larger stalls.

It contributes to larger net income derived by larger farms.

COSTS AND RETURNS PER DAY- It is necessary to study the costs and returns per day per milch cow in varying sizes of stalls in rural and urban areas.The table given below illustrates the same.

TABLE- 14.

Variation in costs and returns in Rs. per day per milch cow between various sizes of stalls in Urban and Rural areas

Categories of stalls	Rural Stalls			Urban Stalls		
Size of stalls / Items of costs	2-3	4-5	6 and above	2-3	4-5	6 and abov
1.Average daily gross income per milch cow.	1.08	1.18	1.32	1.69	1.90	1.99
2.Average total cost per day per milch cow in Rs.	0.60	0.62	0.63	0.94	0.95	0.97
3.Average daily net income per milch cow in Rs.	0.48	0.56	0.68	0.75	0.95	1.02
4.Average daily milk yield in litres.	0.555	0.601	0.668	0.865	0.923	0.980
5.Litre of milk in Rs.	1.08	1.04	0.95	1.08	1.03	0.99

The table no. 13 reveals that the average total cost per day per milch cow increases in with the increase in size in both stall categories. It is accompanied by increases in average gross income and average net income per day per milch cow. This is due to the fact

that stall owners of higher size groups invest more on feeds which ultimately results in higher milk yield rates as indicated in the table.Further, there is a perceptible difference in average gross income and average net income earned per day per cow and average total cost incurred per day per cow between rural and urban stalls,irrespective of their size group. The size group of stalls in urban area seem to be more efficient of the two type of stalls .This may be ascribed to comparatively higher yield in urban stalls, which is due to judicious investment on feeds especially on concentrates.

INPUT AND OUTPUT RELATIONSHIP.

It has already been seen that feed is the main factor contributing higher level of production.As such feed is taken as input and milk yield is taken as output. These farmers who are keeping milch animals are confronted with the problem of deciding on the optimum feeding ration for their milch animals as they have to make decisions on what to feed and how much to feed inorder to get maximum net income from their milch animals.They have to consider various limitations while making their decisions on the combination and quantity of different feed and fodders to be fed to the animals. The milch animals require a certain minimum combination of nutrients for the maintenance of their body and for the production of milk. Ofcourse milk yield is affected by a multiplicity of causes. In the present study only feed components is considered, in the context of the present study.

The energy values of various feeds and fodders were calculated in terms of Total digestible Nutrient (T.D.N.). Digestible protein (D.P.) was used to represent the available protein in the feed.This has been done inorder to convert the various feeds into a common term, so as to facilitate the determination of physical correlation between independent and dependent variables. Total digestible nutrient and Digestible protein were calculated on the basis of feeds and fodders available to the cows in different stalls.

The average nutrient fed in grams per milch cow and average milk yield in litres per milch cow in different stalls of rural and urban areas are illustrated in the table given below. It will be seen that the urban cows are getting more nutrients than the rural cows resulting in the difference of milk yield rates.

TABLE -1.

Correlation between feed input in TDN and DP values and milk output per milch cow in litre per day.

categories of stalls	T.D.N. in grams	D.P. in grams	Milk yield in lit es
Rural ordinary stalls	58.4	13.4	0.609
Rural specialised stalls	66.9	12.0	0.637
Urban stalls	98.7	21.3	0.891

It is seen from the table that the milk yield

per day is highest in urban stalls. The specialised stalls have more yield per cow than the rural ordinary stalls.This is due to the availability of nutrients to a larger extent in urban stalls and rural specialised stalls which can be seen from the table above. The owners of urban stalls have dairy enterprise as their main occupation for which they are interested for more profit. So they fed more of concentrates to their cows for securing higher milk production. The owners of rural specialised stalls have dairy enterprise as some what main occupation. So they fed their cow with concentrates as far as possible to get more of milk to increase the income from it.

PRODUCTION FUNCTION : It has already been observed that the yield per cow is positively correlated with the feed input per cow. Therefore, there is every reason to believe that milk yield can be increased by a higher level of feed input. The economics of feedings also suggests that feed input can be increased to secure higher profit.

In the production function analysis , the product or,output is expressed as a function of the resources or, input. The linear regression analysis was carried out between Total digestible nutrient and milk yield to eliminate the quality difference of feed. The co-efficient of correlations between TDN in gram per cow and the milk yield in litres per cow has been estimated at 0.665, 0.700, 0.765 respectively for rural ordinary, rural specialised and urban stalls with 13 degrees of freedom,

this value is significant at 1% level of probability. This confirms that there is a strong correlation between input and output. T.D.N. (Total Digestible Nutrients) has been estimated and is used as independent variable. Milk yield is used as the dependent variable. The linear regression function is of the model :-

$$Y = a + bx$$

where, Y = Milk yield in litre per cow per day.

X = Input i.e. T.D.N. in gram per cow per day.

b = Regression co-efficient of input X.

a = Intercept.

The linear regression is fitted separately for different categories of stalls i.e. Rural ordinary stalls, Rural specialised stalls and urban stalls.

b, estimated for different categories of stalls are ; 0.264, for rural ordinary stalls

0.432, for rural specialised stalls,

0.613 , for urban stalls.

The function thus read :-

Y = 0.433 + 0.264 x , for rural ordinary stalls.

Y = 0.377 + 0.432 x , for rural specialised stalls.

Y = 0.267 + 0.613 x , for urban stalls.

The 't' test showed that with 13 degree of freedom ,b values are highly significant at 1 % level of probability in all the categories of stalls. It indicates that with 1 Unit change in T.D.N. the corresponding change in milk yields are

0.264 in case of Rural ordinary stalls,

0.432 in case of Rural specialised stalls

0.613 in case of urban stalls.

Since the elasticity of production is less than one in all categories of stalls, thre is diminishing returns to scale. It appears from the study that urban cows are more productive than the rural cows. The co-efficient of determination denoted by r^2 is estimated to, 0 . 442 for Rural ordinary stalls

0 . 490 for Rural specialised stalls

0.. 577 for Urban stalls.

It indicates that the variability of milk yield due to the factor T.D.N. are

44 % for Rural ordinary stalls.

49 % for Rural specialised stalls

57 % for Urban stalls.

It was again necessary to verify the result of the above regression analysis by fitting a production function of/cobb-Douglas/ type. The function is linear in logarthim. The non logarthimic form of the function read as ;

$$Y = a\, x^b$$

where, Y = Milk yield in litre per cow per day.

X = Input i.e. T.D.N. in gram per cow per day

b = Regression co-efficients of input x.

With the estimates of the above parameters the cobb-douglas production function for different categories of stalls read separately as;

$Y = -0.1116\ x^{0.2522}$; for Rural ordinary stalls

$Y = -0.1252\ x^{0.2500}$; for Rural specialised stalls

$Y = -0.0568\ x^{0.8437}$; for Urban stalls.

The regression co-efficients b. for different categories of stalls are

0.2522 , for rural ordinary stalls,

0.2500 , for rural specialised stalls

0. 8437 , for urban stalls.

The regression co-efficients or, the elasticity of production specifies the percentage increase in the gross yield with one percent increase in the resource inputs.

The 't' test showed that with 13 degrees of freedom, b,values are highly significant at 1 % level of probability in all the categories of stalls.

Thus it is observed from the production function that with 1 % change in T.D.N the corresponding percentage change in milk yields are

0.2522 , for rural ordinary stalls,

0.2500 , for rural specialised stalls,

0.8437 , for urban stalls.

Since the elasticity of production is less than one in all categories of stalls, there is diminishing returns to scale. It appears from the study

that urban cows are more productive than the rural cows.

The co-efficient of linear determination denoted by r^2 is estimated to ,

0.677 , for rural ordinary stalls.

0.528 , for rural specialised stalls,

0.630 , for urban stalls.

It indicates that the variability in milk yield by the factor T.D.N. are

67 % for rural ordinary stalls

53 % for rural specialised stalls

63 % for urban stalls.

Since r^2 is greater in the cobb-douglas production function, in all the categories of stalls, it may be presumed that the cobb-douglas production function function fits better in this case.

C H A P T E R VI.

" MILK SUPPLY POTENTIAL "

M I L K S U P P L Y P O T E N T I A L.

1. INTRODUCTION : Most of the small and large milk producers in the rural areas do not appear to have taken up the milk enterprise at a commercial level. Most of them are having just one or two lactating cows to meet the consumption of milk of their own family. A few milk producers are there in the rural area who have taken up the milk enterprise on a commercial basis. Whereas in the urban most of the milk producers have taken up the milk enterprise for commercial purpose. But we have taken up total milk production into consideration to estimate the supply potential for this area.

Production of milk is influenced by a large number of factors. But, four factors such as feed, season , sizes of herds and lactation number are considered in the study .Out of these four factors season and lactation number are rigid factors whereas, feed and size of herds are flexible factors. From the flexible factors adjustment of size of stalls can only be made in the long run whereas rigid factors cannot be changed according to one's will to increase the production. Effect of feed which is a flexible factor can be changed to increase the milk production. Milk production can be increased by gradually

increasing the level of feed. So feed is the main factor to increase the milk production and supply potential of this area can be increased by increasing the level of feed.

For immediate increase in supply, only feed can work miracles.The study of its economics is in support of the possibility of increasing yield of milk through higher levels of feed input. Therefore, the effect of higher levels of feeding on the increase of milk production has been studied for the purpose of the assessment of supply potential of milk. But since, there might be some interaction between feed levels and seasons, it is worth-while ,to study the seasonal effects in estimating the milk production potential. As a whole, attempts are made to estimate the present milk supply and the rise in the supply, if cows are fed at higher level. The difference gives us the idea of the rise in the supply of milk.

2. VARIATION IN MILK YIELD DUE TO LACTATION: The lactation number of cows which is a purely physiological factor, has some influence on milk yield of cows. This is a rigid factor and is not subjected to change.The following table illustrates the variation in milk yield per lactation per lactating cow in different lactation numbers.

TABLE - 1.

Variation in milk yield per lactation per lactating cow in different lactation number.

Cow in different lactation numbers	Average milk yield per cow per lactation in litres.
Lactation I	209.850
Lactation II	220.700
Lactation III	206.450
Lactation Iv	198.125
Lactation V	192.000
Lactation VI	159.500
Lactation VII	124.350

It is observed from the above table that milk yield of cow is highest in lactation number II and lowest in Lactation number VII. It is also seen that after lactation number II, the milk yield of cow decreases, with the increase in the lactation number.Good milk yield of cow is observed in between I and IV lactation. In between this period cow remain in vigour and yield more . But after that as the lactation number increase the cow become weaker and weaker and consequently milk yield rate falls.

3. SEASONAL VARIATION IN MILK SUPPLY :

Season is another factor which affects the milk yield rates of cows. Climatic factor has much more effect on milk production.Therefore, it is essential t study

the effects of seasonal variation in milk yield in various sizes of stalls as well as in different categories of stalls. This seasonal effect is a rigid factor which is not subject to change. The following tables illustrates the seasonal variation in milk yield in various sizes of stalls and also in different categories of stalls.

TABLE - 2.

(i) Seasonal variation in milk yield with varying sizes of stalls in both urban and rural areas.

Categories of stalls	Milk yield in litre per lactating cow					
	Rural Stalls			Urban Stalls		
sizes of stalls / Seasons	2-3	4-5	6and above	2-3	4-5	6 and above
Rainy season	90,000	105,240	120.500	154.125	166.320	157.450
Winter season	60,823	66,135	71,126	95,600	101.100	106.140
Summer season	40,235	44,998	49,211	61,783	66.178	89,418
Yearly	200.058	216.373	240.837	311.508	332.598	353.008

It is obvious that from the above table that the milk yield per lactating cow per season is the highest in rainy season and lowest in summer season in varying sizes of stalls irrespective of the categories of stalls. It is evident now that seasons have got wider impact on milk yield of cows. The sizes of stall is a rigid factor in the short run.That is why it is not going to affect the milk supply immediately ,but after all its study gives us an idea about the extent of variation with varying sizes of stalls. Since this factor if not going to enter into the estimate of present and potential supply of milk, a knowledge about its variation will tell how far it deviates from the actuality in the estimate of

supply potential. Even season is a rigid factor it hasbeen duly considered to estimate the present and potential supply of milk in the area.

The table given below illustrates the seasonal variation in milk yield for lactating cow between different categories of stalls.

TABLE -3.

(2) Seasonal variation in milk yield in different categories of ~~stock~~ stalls.

Seasons	Milk yield in litres per lactating cow		
	Rural ordinary stalls	Rural specialised stalls	Urban stalls
Rainy season	107.375	110.246	172.235
Winter season	68.250	72.220	93.125
Summer season	43.654	46.930	70.717
Yearly	219.279	229.396	336.077

From the table it is observed that there is highest milk yield in rainy season and lowest milk yield in summer season in all categories of stalls. This is ascribed to the fact that during rains ,the cows get enough grass to eat.

It is further seen from the table that there is differential yield rates between seasons and the levels of feeding. In urban stocks the cow yields more due to higher levels of feeding.This higher in yield rates is much greater than the rural cows withe the change of seasons. Therefore, it is obvious that there is the presence of

interaction between season and levels of feeding . In other words, animals respond much better to higher levels of feeding under favourable climatic conditions.

4. The variation in total existing supply of milk and the total achievable supply of milk in the are under study.

Total existing supply of milk was found out by adding of the existing total supply of milk for each seasons and the total existing supply of milk for each seasons was found out by multiplying total numbers of milch cows of the area with seasonal variation in milk yield of rural stalls. Similarly total achievable supply of milk was found out by adding of the achievable supply of milk for each seasons and the achievable supply of milk was found out by multiplying total number of milch cows of the area with the seasonal variation in milk yield of urban cows. The total number of the cows of the rural area is 524 from which 252 are milch cows.Therefore, existing total supply of different seasons in rural areas is as follows :

Rainy Season	-	27058.500	Litres
Winter season	-	17199.000	Litres
Summer season	-	10999.800	Litres
Total existing supply of milk	-	55257.300	Litres

and the total achievable supply of milk in different seasons in rural areas is as follows:

Rainy season	-	43403. 220	litres
Winter season	-	23467. 500	litres
Summer season	-	17820. 684	litres
Total achievable supply of milk	-	84691.404	litres

5. Percentage rise in supply of milk was found out by the following method ;

$$\% \text{ rise in supply} = \frac{\text{Total achievable supply} - \text{Total existing supply}}{\text{Total existing supply}} \times 1$$

$$= \frac{84691.404 - 55257.300}{55257.300} \times 100$$

$$= \frac{29434.104}{55257.300} \times 100 = 0.53 \times 100$$

$$= 53\ \%$$

To estimate the same result for the % rise in supply of milk another procedure can be done.For that estimation,existing total supply of milk can be found out by multiplying total number of milch cows of the area with the average milk yield per lactating cow per annum in rural stalls and total achievable supply can be found out by multiplying to the number of milch cows of the area with the average milk yield per cow per annum in urban stalls.

It must be remembered that this enhanced supply is due to feed alone.Further, it has not been possible to locate the economic dose of feed. Its location might enhance the supply potential of milk still further.However, this is the minimum increase in supply that could be brought about with a little higher level of feed input.For improved

estimates all the relevant factors are to be considered. But, as has been mentioned earlier other factors like breeding and management have been left out of the scope of the present study. Therefore, breeding and management factors have been completely ignored in its estimation.

Summary and Conclusions

SUMMARY AND CONCLUSION.

The study entitled " Economics of milk production" was conducted in Bhubaneswar Block of Puri district.The study lasted for 7 months. It commenced in January and continued up to August, 1974.

Mostly the study has been concentrated on the variation of milk yield rates between rural and urban cows and between different size groups of stalls, effect of levels of feed, sizes of stalls, seasons and lactation numbers; cost and return pattern in the enterprise, and supply potential for this area.

A less costly method, i.e. survey method was used in this study. Two stage sampling was used in selecting the areas and stalls from rural and urban areas.Data were collected through personal visit and interview with each and every stall owner. The summary of the findings are summarised below.

In rural areas most of the people have hardly one or two lactating cows inorder to meet the home consumption of milk and to get manure for the field. They are not treating the dairy enterprise as a business whereas people of urban area treat milk production on a commercial basis. Unavailability of feeds and fodders ,lack of marketing and environmental condition in rural areas have had lesser emphasis on dairy as an enterprise. Fodder is scarce in this region and fodder crops are not included in cropping pattern.

YIELD RATES:

(i) Significant difference was observed in the yield rate of milch cows between rural and urban areas.Due to higher levels of feed input in urban stalls, 50 per cent increase in the milk yield rate of cow was observed, over the rural one's. This is because, importance of feed and fodder is much greater in the urban stalls. Specially concentrates among the feed is 2½ times greater in urban stalls whereas importance of roughage is nearly same in both urban and rural stalls.

(ii) Significant variation was observed in the yield rate of milch cow between different sizes of stalls.There is difference in milk yield between the size 2-3 and 6 and above size stalls. It was revealed that milk yield per cow increases with the increase in the size of herd. This is ascribed to larger investment in larger cow stalls.

(iii) Significant variation was observed in the yield rate of milk due to the seasonal effect. Much difference was observed in the yield rate of milk between rainy and summer seasons in all sizes and categories of stalls. Highest milk yield was found in rainy season and lowest milk yield in the summer season, in all the sizes and categories of stalls.It was also seen that milk yield per cow in urban stalls in much greater than the rural cows with the change of seasons from summer to rains. Therefore, it may be assumed that there is the presence of interaction between seasons and levels of feeding. Animal responds better in higher levels of feeding under favourable climatic conditions.

(iv) The significant variation in the milk yield rate due to the effect of lactation numbers of cows was also revealed from the area under study.In this area cows up to seven lactation numbers are seen. The highest and lowest milk yield due to // lactation numbers were found in lactation number II and VII respectively. It was also seen that as the lactation number of cows is increasing from Lactation Number II , the milk rate is decreasing. There is a satisfactory milk yield rate within lactation numbers one to four. Lactation number is a purely rigid and physiological factor and is not subnected t change.

(1) TOTAL COST OF PRODUCTION:

It was revealed that the total cost of production per cow is highest in the urban stalls but the total cost o production per litre of milk per cow is approximately same in all categories of stalls. Even there is same cost per litre of milk per cow, the higher production rate of milk per cow in urban stalls enables them to secure higher levels of income. There is greater investment in urban cows in the form of concentrates and roughages, for which there is highest total cost per cow in urban stalls, but compared to rural stalls, the total cost per cow is relatively less in urban stalls.This may be ascribed to relatively to less investments in overhead costs in these stalls.

There is also difference in total cost of production per cow betwen higher and lower sizes of stall .It was observed that the total cost per cow is increasing as the size of stalls is increasing and at the same time the cost

per litre of milk is decreasing in these stalls. The difference in the cost per litre of milk is , howeve , not significant.So the emerging conclusion from this is that there is a positive correlation between output and input cost per cow and the total cost per cow increases as the size of stall increases.

It was observed that the feed cost per cow per annum is greater in the extreme sizes of stalls.Particularly in urban stalls the feed cost is higher. The milk /s yield rate is higher in the largest size stalls. It may be due to presence of inferior cows , each of proper care and management in the small size stalls.

As the level of input varies between different sizes of stalls , yield rates of milk also varies. So by increasing levels of feed input yield rate of milk can be increased.

2. GROSS MARGIN LEVEL.

There is significant difference in gross margin level per cow per annum. The gross margin level per cow per annum is significantly higher in urban stalls as compared to other classes of stalls. This difference is due to the higher production efficiency of thisecategories of cows. Ofcourse the efficiency has been secured by greater investment in variable cost per cow in the urban stalls.

Similarly there is also significant difference in gfoss margin level per cow per annum between the large and small stalls. Level of gross margin per cow increases as the size of the staII increases, due to increase in gross income.The increased gross income may be ascribed to higher level of feeding in these stalls.

3. NET PROFIT PER COW.

There is significant difference in the net profit per cow between urban and rural stalls. Net profit per cow in urban stalls is higher than the rural stalls. This is ascribed to higher level of feeding , better management, and larger size of the stall resulting in large scale economy.

There is also significant difference in the net profit per cow between large and small sized stalls. Net profit in large stalls is greater than the small stalls. Size of stalls have some influence on the cost and return per head of milch cow. The total cost is relatively small in large size stall, due to the operation of large scale economy. This increases net profit in large stall.Therefore, it is evident that not only with a little more cost the yield rates of milch is pushed up but also there is scope of maximising net profit per cow by increasing the size of stall.

INPUT OUTPUT RELATIONSHIP.

In the production function analysis the product of out put is expressed as a function of the sources and input. The linear regression analysis and cobb-douglas production function was carried out between total digestible nutrient and milk yield to estimate the quality difference of feed. Total digestible nutrients has been estimated and is used as independant variable and milk yield is used as the dependant variable.It has been found out that cobb-Douglas production function fits well in all categories of stalls. The co-efficient of correlation

between T.D.N. in gram per cow and the milk yield in either per cow has been estimated at 0.665, 0.700, 0.765 respectively for rural ordinary , rural specialised and urban stalls,with 13 degrees of freedome, this value is significant at 1 % level of probability. This confirms that there is a strong correlation between input and output.

Again it was observed that since the elasticity of production e is less than one in all categories of stalls, there is diminishing return to scale. It is also appeared from the study that the urban cows are more productive than the rural cows. This is ascribed to higher level of feeding input. Therefore, there is every reason to believe that milk yield can be increased by a higher level of feed input.

SUPPLY POTENTIAL.

It is obvious from the study that the total achievable supply is 55 percent more over total existing supply in the area under study. This is however the minimum increase in supply that could be brought about with a little higher level of feed input. It was observed that there is a positive correlation between output per cow and the level of feed input per cow. So greater milk production rates can be achieved with a rise in the feed input. It may be remembered that the estimated increase in supply is due to feed alone. Again, it has not been possible to find out the economic dose of feed. Adoption of economic dose of feed might have further increased the supply potential of milk.

It is also observed that there is potentialitees and scope of increasing the yield rates of milk of rural cows. But a workable plan for the development of Dairy Industry in rural areas should be formulated and executed. In the rural areas the cattle are generally poor in health and production due to the deficiency of proteins, vitamins and minerals in the feed. Deficiencyes of these can be overcome by addition of small quantities of oil cakes , green fodder and mineral supplements in the ration. The cattle in this region are fed generally with paddy straw. Experiments have indicated the usefulness of supplementation of paddy straw by small amount of leguminous fodders, such as cowpeas and Berseem, which are specially rich in calcium , trace minerals and proteins . Cultivation of liguminous fodder crops should be encouraged as these provides highly nutritious and expensive cattle feed and at the same time very valuable green manure for the field.

Therefore, highest priority should be given to increase the production of feeds and fodders in all of the programmes for the development of live stock enterprise. Ofcourse, due to the increased population, it is not possi-ble to put large areas of land under fodder crops. Still the most feasible course would be to evolve such varieties of fodders which are nutritionally rich and give higher yields per acre.

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