

## A Note on the Economic Aspects of Manuring Crops

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The level of manuring is an index of the economic or commercial importance of any crop and the care with which the required quantity and quality of manure is applied directly reflects the esteem in which the crop is held by the farmer. Thus sugarcane, plantains and tobacco among commercial crops, paddy, cholam, ragi maize etc., among grain crops are manured systematically and the farmer pays great attention to this operation.

Since manuring forms one of the important operations in the cultivation of a crop, there is great need to assess accurately the cost involved. In the existing system of farming, our ryots are not in a position to say exactly how much has been spent on each acre of land or for each crop in the shape of manures. At times it is not possible to get at accurate figures of manures applied, particularly of bulky organic manures like farmyard manure, compost or tank silt etc., The use of manures, natural and artificial has become widespread and it is time now that the economic aspect is clearly understood, before large increases in dosages are taken up. What is spent in the shape of manure has to be taken out in increased returns, the value of the increase being considered more than adequate, compared to the cost of manures. In this paper it is proposed to discuss this aspect of the cost in relation to production of crops and increasing of yields.

**Importance of cost:** The importance of assessing the costs involved in the manuring of crops has not been realised fully by the cultivators. The total cost of the manures should always be related to the increase in yields obtained as a result of the application, so that one is in a position to know whether the money has been well spent. It is one thing to apply increased doses of manure and another to judge what increases in yield have been obtained, as a result of the increase in dosages. There are two things involved in this problem; one is the increases in out-turn of the produce, the value of which is easily calculated. The second aspect is the residual effect left in the soil which is likely to give increased yields in the succeeding crop or crops. This second point, depends of course, upon the quantity and time of application of organic or inorganic manures. It is supposed that there is no residual effect due to artificial manures. In any case, it should be possible to evaluate the actual cost of of the different manures used and the value of the increased outturn of produce obtained on the basis of unit area, say an acre for each crop raised. Generally the ryot thinks that all the manure applied, including the organic manures, has been utilised by the crop to which such manure had been applied and the value of the increased yields has therefore to be set off fully against the total value of the manures used. It is difficult also to judge how much has been retained and how long the residual effects will last. This depends upon the nature of the soil, time of application and the kind of crops raised. However, it will serve our purpose in the evaluation of costs, if we assume that half the

value of the organic manure has been utilised by the crop to which such manures has been applied. Therefore half the cost of the bulky manure may be deducted from the total cost of manure used for any particular crop.

**Limitations:** Various limitations operate in the course of application of manures, such as quality of manure, irrigation sources, cost, availability, time of application etc., the chief among them being availability and cost. In all parts of our State, both irrigated and unirrigated lands are manured directly or indirectly. While only organic manures such as cattle manure, compost from old sites, tanksilt etc., were applied in the olden days, the need for and the advantages of incorporating heavy doses of organic and artificial fertilisers have of late, been well realised by cultivators and this practice has become a regular feature in farming operations. The manuring of rainfed lands presents many difficulties, connected with season, availability of manure and the economic position of the farmer. Application of organic manures like cattle manure which is not available in adequate quantities in dry land areas, is possible in these areas only once in two or four years. Availability and price of artificial fertilisers form important limiting factors for wetland and gardenland ryots. Judicious application of different manures is of great importance.

**Judging of yields in relation to cost of manures:** Crops in general respond well to manuring. Both rainfed and irrigated crops can be manured with advantage, if adequate moisture is available for the crops. Commonly all agree that the value of the increased yields of crops obtained should at least be equal to the value (or cost) of the manure used. Otherwise loss is inevitable. The increased value should be something over and above the cost spent in the shape of manuring as otherwise there is no incentive for manuring of crops. On the other hand large doses of manures should not also result in serious reduction in value of the yield. Thus an optimum dosage level and judicious method of application should result in maximum economic return from the crop. In recommending application of particular kind and doses of manures, it is necessary to indicate what will be the cost value of the increased return, at the prevailing rates, over and above the cost of manures. In all the manurial experiments in our State the economic aspects of of manuring should be definitely included for consideration. It is usual to indicate that such and such an improvement gives so much increase in percentage over control in yield. The point to be considered is whether this increase noted as percentage in yield can be a sufficient incentive to take up the improvement or it is only of academic interest. The increase should be appreciable and worth the trouble. One of the main handicaps to agricultural improvement is that the increased return from manuring may not be sufficient to warrant the pains taken.

**Law of diminishing returns:**— The classic example of this law is really the application of increased doses of manure to an unlimited extent and recording of yields due to every increase. After a stage, further additions of manure begin to give proportionately decreased yield and thereby it becomes uneconomical to continue any more applications. This point is to be remembered by over-zealous cultivators in the continuously cultivated areas of sugarcane, vegetables and orchards, as

there is a tendency on their part to dump heavy doses of manures without relation to the possible or actual increases in yield as a result of such manuring practices. Instances of uneconomic returns due to the increased doses of manure may be illustrated in the statements, given below with reference to sugarcane.

**Anakapalle Research Station—Manurial Experiments 1946-47.**

Quantity of Manure.	Cost of cultivation per acre Rs.	Net profit per acre. Rs.	Increase of profit over control Rs.	Value of manure. Rs.
0 lb. of N. ...	1050-10-0	302-5-0	...	...
50 lb. of N. ...	1081-11-0	387-15-0	15-10-0	30-15-0
100 lb. of N. ...	1177-15-0	491-2-0	188-13-0	127-5-0
150 lb. of N. ...	1189-0-0	366-3-0	63-14-0	148-6-0
200 lb. of N. ...	1225-11-0	379-7-0	77-2-0	175-1-0
250 lb. of N. ...	1242-3-0	288-3-0	14-2-0	192-9-0

For an increase of Rs. 30-15-0 worth of manure, a profit of Rs. 85-10-0 is obtained. Similarly by spending Rs. 127-5-0 of manure, a profit of Rs. 188-13-0 is obtained. But further increase has not given any increase in profit and in fact for every additional dose of 50 lb. of nitrogen, less and less profits are obtained.

This is more marked when the economics of sugarcane and jaggery production are worked out for the same experiment, as given below :—

Quantity of manure	Average yield of cane (tons) per acre	Yield of jaggery per acre (tons)	Net profit Rs.	Increase over control
0 lb. of N. ...	40.70	4.656	220-13-0	...
50 lb. of N. ...	47.06	5.177	289-2-0	69-5-0
100 lb. of N. ...	52.07	6.034	396-13-0	176-0-0
150 lb. of N. ...	40.99	5.673	286-0-0	65-3-0
200 lb. of N. ...	49.00	5.439	270-3-0	49-6-0
250 lb. of N. ...	50.16	5.426	258-12-0	37-15-0

The increase over control is the maximum in the case of 100 lb. of nitrogen giving a margin of Rs. 176/- and further doses of manure have given proportionately lower yields. Apart from the decline in yield, application of larger doses of manure tend to lower the quality of cane. Hence it is necessary to work out the economics of manuring for each crop and the optimum dose which will give maximum profit should be advocated.

Variations of this economic dose of manure are noticed from region to region and from variety to variety. The economic dose of nitrogen for sugarcane is indicated as 100 lb. of nitrogen for Anakapalle, 200 lb. of Nitrogen for Palur and Gudiyatham. Although higher yields are obtained with 250 lb. of nitrogen in the latter two stations they are not, however statistically significant. This is illustrated below :

**Increase of Profit over Control.**

	Anakapalle Co. 419	Palur Co. 261	Gudiyatham Co. 419
0 lb. of N.	...	...	...
50 lb. of N.	68— 5—0	...	323—15—0
100 lb. of N.	176— 0—0	145—0—0	515— 7—0
150 lb. of N.	65— 3—0	214—0—0	650— 5—0
200 lb. of N.	49— 6—0	278—0—0	773— 9—0
250 lb. of N.	37—15—0	216—0—0	796— 1—0

Anakapalle with 100 lb. of nitrogen has given a profit of Rs. 176/- and Palur and Gudiyatham gave Rs 276/- and Rs. 773/- respectively with 200 lb. of nitrogen, after which the increase in profit tends to go down with additional doses of manures.

**Economics of manuring of Paddy :** The maximum economic return varies from from variety to variety of the same crop. In paddy also, no two varieties give similar returns for the same quantity of manure applied. An experiment conducted at the Paddy Breeding Station, Coimbatore, with similar quantities of manure to different varieties or strains indicated that Co. 12 paddy had given the maximum return of Rs. 318—4—0 or 2808 lb. of paddy when compared with Co. 26 and Co. 19. But while assessing the extra money value for the cost of manure which works out to Rs. 72—2—0 (i.e. 2,000 lb. of green leaf at Rs. 6/-; 400 lb. of G. N. cake at Rs. 45/-; 112 lb. of super at Rs. 12—8—0 and 50 of ammonium sulphate at Rs. 8—10—0) it is found that the net income or profit over unmanured plots is only Rs. 73—4—0 i.e. the extra yield obtained only just covers the cost of manure applied. Among the varieties Co. 12 has given Rs. 12—1—0 worth of paddy more over Co. 19 and Rs. 7—14—0 over Co. 26. Again, among varieties, the level of the fields have a great influence over the yield of the crop between manured and unmanured plots.

	High level	Low level	Difference	Cost
Co. 12	2808 lb.	2414 lb.	394 lb.	Rs. 45/-
Co. 13	2254 lb.	1535 lb.	719 lb.	Rs. 82/-

With the application of the same manure, plots in the higher level give a larger margin of profit than the plots in the lower level and this is seen both in the crop grown in the main season and second season. When similar manures are applied to paddy crop for different seasons (main and second) the profit obtained is greater in the case of main crop than in the case of second crop. This is illustrated in the statement shown below :

(Manures 40 lb. of Nitrogen applied at different times)

	Main crop	Second crop
Excess yield	Rs. 51—14—9	Rs. 39— 6—0
Cost of manure	Rs. 28—10—8	Rs. 28—10—8
Profit ...	Rs. 23— 4—1	Rs. 10—11—4

Thus it is clear that economics of manuring differ widely with regard to season, varieties and regions. Any improvement suggested should bear specific indications of the net return obtained under particular conditions.

**Green Manuring:** Special mention has to be made of green manures from the economic point of view, particularly with reference to paddy. It is possible to raise a green manure crop in the field itself with a small expenditure of Rs. 10/- or less per acre, and the value obtained as green manure is anything from Rs. 50/- to Rs. 70/-. This can give an increase in yield by 10 to 15% over at least two acres. It has been estimated that 15 lb. of green manure is able to give an increase of 1 lb. of grain i. e. by spending about half an anna for production of green manure in the field we will be able to get about two annas worth of extra grain. Economically this is most sound and can be adopted whenever facilities exist. The same argument will hold good for application of green manure to other crops under irrigation like sugarcane, vegetables and fruits, inclusive of coconuts.

**Optimum economic doses indicated from previous experiments:** The Department has been conducting manurial experiments in different Research Stations on various crops. The optimum economic dose of manures that may be recommended are indicated below for paddy and millets.

**Paddy:** An ideal prescription for obtaining both sustained increases in yield would be a basal dressing of 5,000 lb. of leaf and super or bonemeal at 20 lb. of phosphoric acid, followed by a top dressing of 100 lb. of ammonium sulphate. Cost of manure for this prescription works out to Rs. 45/- and the extra yield that can be obtained on an average may be reckoned at 705 lb. over the normal of 1,795 lb. This leaves a good margin of Rs. 36/- per acre over the expenditure for manure. Since 15 lb. of green leaf are expected to give one pound of grain, the normal dose of 5,000 lb. of green leaf will result in an increased yield of 333 lb. which may be valued at Rs. 38/- apart from improving the condition of the soil.

**Millets:** The economic dose of nitrogen, phosphoric acid and potash that are to be applied to different types of crops vary considerably and have to be fixed with reference to soil and climatic conditions. Application of fertilisers to supply 30 lb. of nitrogen (it is concluded that ammonium sulphate is best for millets and about the same amount of phosphoric acid are adequate for rain-fed crops and 50% more for irrigated crops in the State. Ragi alone requires heavy dosage of potash. The yields recorded in the various Research Stations in the State vary from 14% to 160% in rainfed crops and 90 to 206% in irrigated crops. Taking the average for these as 87% for rainfed crops and 148% for irrigated, the value of grain may be worked out to see how far these manures are economical.

**Dryland Crops :**

		Normal yield lb.	87% increase lb.	Value Rs.	Profit Rs.
Ragi	...	720	626	66-0-0	21-8-0
Cholam	...	575	328	35-8-0	-9-0-0
Cumbu	...	555	483	53-12-0	8-4-0

(Cost of manure is calculated as Rs. 44-8-0)

It is uneconomic to manure dry land crops directly for higher yields.

**Irrigated Crops :**

		Normal yield lb.	148% increase lb.	Value Rs.	Profit Rs.
Ragi	...	1,500	2,250	236	169-4-0
Cholam	...	1,500	2,250	243	176-4-0
Cumbu	...	1,200	1,800	200	133-4-0

(Cost of manure is calculated at 50% more over rainfed crops i. e., Rs. 66-12-0)

Of course yields differ widely, depending upon moisture available and the season in which the crop is grown, although we have taken into consideration the increased average yield at 87% for rainfed and 148% for irrigated crops. Thus it will be seen that a better return is obtained from millets under irrigated conditions than under rainfed conditions. For rainfed crops which depend upon the seasonal success it is not safe to advocate manuring.

**Conclusions :** Consideration of the economic aspects of manuring is of paramount importance under modern conditions of farming. Cost of production of crops, though it always includes cost of manuring does not show how it far had been worthwhile. When attempts are being made to reduce the cost of production by improved methods, the use of optimum economic doses of manure is also a necessity to keep down costs in relation to yields. The great advantage in this is the large gain that may accrue to the ryot when prices of manures are kept down by controls. If normally prices of manure are kept down in parity with those for the produce, then the advantage gained is not much. The test of efficiency of manures is their capacity to multiply the yields several times in terms of money value. This is really important in the case of commercial crops. The ryots do not generally take into account or consider the actual increase in value obtained by particular instalments of the manure applied, because they do not keep proper accounts. Hence it is necessary to evaluate manures and their economic capacities in relation to increased yields and to judge the returns in the proper prospective, keeping in mind the cost involved in manuring and the relation it bears to the increased returns.