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ORGANIC FARMING: A ROAD FOR SUSTAINABLE FUTURE IN INDIA

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Abstract

It is realized that green revolution with high input use has reached its peak and is now sustained with diminishing return of falling dividends. Sustainable agriculture will be the solution to the effect caused by intensive farming to the environment. Organic farming is one such method with an eco friendly and socially responsible approach. An important question on the contribution of organic agriculture to the future of agriculture is whether organic agriculture can produce enough food to feed the world. Comparison of organic and conventional yields plays a central role in this debate. Thus the current study compared the productivity and economics of the two different farming systems viz conventional and organic farming.

Key words : Sustainable agriculture, Partial budgeting, Cost and returns.

Introduction

Commercialization of agriculture towards more intensive way of farming in recent years questioned the sustainability of resources and results in destruction of self reliant rural economy. Processes which attempted to increase agricultural productivity results in large-scale and rapid destruction of fertile agricultural soils in India (GoI, 2008). The increased paddy productivity due to intensive farming results in depletion of ground water level. (Kavitha *et al.,* 2016) According to the 2016 Central Ground Water Board (CGWB) report, barely 3 per cent well structures registered some rise in ground water level whereas it declined in 64 per cent of the wells. Average water levels in January 2016 were found lower than the average water level between 2006 and 2015. The board also found that about 50 per cent of groundwater in country is contaminated. Besides depletion of natural resources, intensive farming also forced the farmers to buy everything out of their village such as seeds, fertilizers and pesticides. Thus at one stage, unable to cultivate with their own means, farmers depend on credit agencies to suffice their money needs. The average monthly income of agricultural households was Rs. 6426 but their monthly expenditure during the same period was Rs.6223 (NSSO Report, 2013) Thus with the low returns due to decreasing yield and increasing cost of production, farmers were unable to return their debts and as a result farmer's suicides have been steadily increasing over the years. Since 1995, over three lakh farmers have committed suicide. Suicides by farmers and farm labourers increased (12,360) in 2014 against 11,772 in 2013 (ADSI, 2014). It is realized that green revolution with high input use has reached its peak and is now sustained with diminishing return of falling dividends. Thus a natural balance is needed to maintain sustenance of life and property.(Sharma *et al.,* 2008). Sustainable agriculture will be the solution to the effect caused by intensive farming to the environment. Organic farming is one such method wherein the crops are grown without the use of chemical fertilizers and pesticides with an eco friendly and socially responsible approach. Input costs in organic agriculture are much lower as it avoids costly external inputs like chemical fertilizers and pesticides. Lower costs reduce financial risk and avoid the need for credit and subsequent indebtness.

Materials and Methods

For the study, Coimbatore district was selected as it is one of the major organic growing districts in Tamil Nadu, India. In the district, vegetables, banana, paddy and coconut were predominantly grown under organic farming. For the study, vegetables (tomato, brinjal, onion) banana and paddy were selected. The farmers registered under Tamil Nadu Organic Certification Department

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Table 1: Input requirements for organic and inorganic paddy cultivation (per ha).

Particulars	Organic paddy	Inorganic paddy	Difference in input requirement
Labour (man days)	138.25	126.44	11.81
Machinery (hrs)	11.54	19.16	-7.62
Fertilizers (kg)	Nil	664.44	-664.44
Manures (tonnes)	5.15	4.58	0.57
Seed (kg)	33.59	73.80	-40.21

Table 2: Input requirements for organic and inorganic Onion (per ha).

Particulars	Organic onion	Inorganic onion	Difference in input requirement
Labour (man days)	202.97	154.86	48.11
Machinery (hrs)	16.50	17.56	-1.06
Fertilizers (kg)	Nil	646.84	-646.84
Manures (tonnes)	12.38	10.59	1.79
Seed (kg)	1237.62	1205.54	32.09

Table 3: Input requirements for organic and inorganic Tomato (per ha).

Particulars	Organic Tomato	Inorganic Tomato	Difference in input requirement
Labour (man days)	295.05	287.13	7.92
Machinery (hrs)	21.03	20.11	0.92
Fertilizers (kg)	Nil	529.08	-529.08
Manures (tonnes)	16.58	9.28	7.30
Seedlings (no's)	29207.92	19801.98	9405.94

Table 4: Input requirements for organic and inorganic Brinjal (per ha).

Particulars	Organic Brinjal	Inorganic Brinjal	Difference in input requirement
Labour (man days)	559.82	189.00	370.82
Machinery (hrs)	9.96	10.00	-0.04
Fertilizers (kg)	Nil	50.00	-50.00
Manures (tonnes)	15.93	8.00	7.93
Seed (g)	342.41	396.00	-53.59

Table 5: Input requirements for organic and inorganic Banana (per ha).

Particulars	Organic Banana	Inorganic Banana	Difference in input requirement
Labour (man days)	113.04	139.04	-26.00
Machinery (hrs)	16.07	29.64	-13.57
Fertilizers (kg)	Nil	2240.00	-2240.00
Manures (tonnes)	8091.17	4560.00	3531.17
Suckers (no's)	2185.64	2500.00	-314.36

(TNOCD) and farmers who were practicing organic farming for many years but not certified were also selected for comparison. Based on the predominance of organic farmers who have cultivated the selected crops in each block, five blocks were selected for the study namely Thondamuthur, Karamadai, Periyanaickenpalayam, Annur and Annamalai. From each block two farmers for each five crops were selected under both organic and non organic condition. Thus 50 producers of organic and 50 producers of non organic totally 100 producers were selected. The study was pertained to the period 2017- 2018.

Results and Discussion

Analyses of the input use pattern of organic and inorganic cultivation

It has been seen from the table 1-5, that the labour requirement for organic crops is comparatively more than that of inorganic crops. The difference in labour requirement was particularly higher in case of brinjal cultivation (370.82 man days) since for the organic cultivators the harvesting period is prolonged than that of inorganic cultivation. The seed or seedling requirements also varied greatly for organic and inorganic crops. In case of organic cultivation especially in tomato the seedlings requirement was comparatively higher since most of the organic cultivators preferred to cultivate local varieties than that of hybrid cultivators. Whereas in case of banana cultivation, labour, machinery and sucker requirement of organic was less than that of inorganic banana, but the manure requirement of organic banana was more than inorganic cultivation.

Analyses of the value of inputs in organic and inorganic cultivation

Analyses of the value of inputs are given in tables 6-10. Amount spent for machinery, seed, and plant protection were higher in inorganic paddy cultivation. In sum, the cost of cultivation of organic paddy cultivation was comparatively lesser by Rs 1968.79 than that of inorganic paddy cultivation. In case of onion, the amount spent for machinery, chemical fertilizers, manures and manuring and plant protection were comparatively higher in organic onion than inorganic onion. In total, Rs 264.81 were spent more in inorganic onion cultivation when compared to organic onion cultivation. The difference in amount was higher in case of seed (Rs. 39663.55). In case of tomato, cultivation practices under organic methods incur less cost of cultivation by Rs 18707.92 than that of inorganic cultivation. Since the amount spent for inputs like labour, seed and plant protection were lesser in organic cultivation. In organic brinjal cultivation the

Table 6: Value of inputs in organic and inorganic paddy cultivation (Rs/ha).

Operations	Organic Paddy	Inorganic Paddy	Change in gross margin
Machinery	10137.58 (13.60)	16086.82 (21.02)	-5949.24
Labour	37669.84 (50.52)	30573.89 (39.95)	7095.95
Seed	2015.21 (2.70)	4185.92 (5.47)	-2170.71
Chemical fertilizers	Nil	9660.39 (12.62)	-9660.39
Manures and manuring	23591.38 (31.64)	10753.58 (14.05)	12837.81
Plant protection	1153.72 (1.55)	5275.94 (6.89)	-4122.22
Total	74567.74 (100.00)	76536.53 (100.00)	-1968.79

Figs. in parenthesis indicates percentage to the total.

Table 7: Value of inputs in organic and inorganic onion cultivation (Rs/ha).

Operations	Organic Onion	Inorganic Onion	Change in gross margin
Machinery	12376.24 (6.12)	12779.35(6.31)	-403.11
Labour	48886.14 (24.16)	41062.26 (20.27)	7823.88
Seed	117574.26 (58.10)	77910.71 (38.45)	39663.55
Chemical fertilizers	Nil	14732.83 (7.27)	-14732.83
Manures and manuring	18564.36 (9.17)	34266.46 (16.91)	-15702.11
Plant protection	4950.50 (2.45)	21864.69 (10.79)	-16914.19
Total	202351.49(100.00)	202616.30 (100.00)	-264.81

Figs. in parenthesis indicates percentage to the total.

Table 8: Value of inputs in organic and inorganic tomato cultivation (Rs/ha).

Operations	Organic Tomato	Inorganic Tomato	Change in gross margin
Machinery	21881.19 (15.09)	16089.11 (9.83)	5792.08
Labour	56113.86 (38.69)	71379.95 (43.60)	-15266.09
Seed	11559.41 (7.97)	12376.24 (7.56)	-816.83
Chemical fertilizers	Nil	12159.65 (7.43)	-12159.65
Manures and manuring	23460.40 (16.18)	17017.33 (10.39)	6443.07
Plant protection	660.89 (0.46)	7487.62 (4.57)	-6826.73
Material cost	22400.99 (15.45)	18861.39 (11.52)	3539.60
Transport	8940.59 (6.17)	8353.96 (5.10)	586.63
Total	145017.33 (100.00)	163725.25 (100.00)	-18707.92

Figs. in parenthesis indicates percentage to the total.

Table 9: Value of inputs in organic and inorganic brinjal cultivation (Rs/ha).

Operations	Organic Brinjal	Inorganic Brinjal	Change in gross margin
Machinery	6229.37 (3.46)	9900.99 (4.48)	-3671.62
Labour	89521.45 (49.79)	66336.63 (30.01)	23184.82
Seed	9625.96 (5.35)	9900.99 (4.48)	-275.03
Chemical fertilizers	Nil	19801.98 (8.96)	-19801.98
Manures and manuring	36883.94 (20.51)	34653.47 (15.68)	2230.47
Plant protection	3987.90 (2.22)	44554.46 (20.16)	-40566.56
Transport	33553.36 (18.66)	35891.09 (16.24)	-2337.73
Total	179801.98 (100.00)	221039.60 (100.00)	-41237.62

Figs. in parenthesis indicates percentage to the total.

total cost incurred per hectare was Rs 179801.98 which was lesser by Rs 41237.62 when compared to that of inorganic brinjal cultivation. Organic farmers spent more for inputs like labour and manures whereas inorganic farmers incur more cost for machinery, seed, chemical fertilizers, transport and plant protection. Farmers in banana cultivation spent Rs 48635.70 lesser by following organic methods than that of their counterpart's inorganic farmers. Particularly the amount spent was lesser incase of machinery, labour and suckers. The amount spent on manures and plant protection was higher for organic farming when compared to inorganic farming.

Partial budgeting of organic and inorganic crops

Partial budgeting of organic and inorganic crops are given in table 11-15. The decrease in costs and increase in returns by planting organic paddy amounts to Rs 39888.96/ha whereas the debit accounts to Rs 10273.75/ ha. Organic farming results in a net gain of Rs 29615.21/ha compared to inorganic paddy cultivation. Partial budgeting of organic and inorganic onion shows that the increase in returns and decrease in costs in organic onion cultivation amounts to Rs 108910.64 / ha. The net gain in organic onion cultivation was Rs 59423.21/ha. The net gain in organic tomato cultivation was Rs 89623.76/ha when compared to inorganic tomato cultivation. The higher net gain in organic tomato cultivation was mainly due to increase in net returns by Rs 70915.84/ha. Organic brinjal cultivation results in a net gain of Rs 23910.94/ha when compared to inorganic brinjal cultivation. The net gain in organic cultivation was mainly due to reduction in cost of cultivation in inputs like machinery, seed, manure, plant protection and transport. Partial budgeting of organic and inorganic banana cultivation shows that organic banana results in a net gain of Rs 123091.15 compared to that of inorganic banana cultivation.

The cost and revenue comparison of organic and inorganic cultivation for the selected crops is given in tables. It can be seen that yield per hectare of organic paddy was 4883.43, which was 317 kg more than that of inorganic paddy

Table 10: Value of inputs in organic and inorganic banana cultivation (Rs/ha).

Operations	Organic Banana	Inorganic Banana	Change in gross margin
Machinery	10229.99 (9.57)	20160.00 (12.97)	-9930.01
Labour	39111.39 (36.60)	48000.00 (30.87)	-8888.61
Sucker	26386.14 (24.69)	30000.00 (19.29)	-3613.86
Chemical fertilizers	Nil	40320.00 (25.93)	-40320.00
Manures and manuring	24132.84 (22.59)	14400.00 (9.26)	9732.84
Plant protection	6745.05 (6.31)	2400.00 (1.54)	4345.05
Transport	243.40 (0.23)	204.50 (0.13)	38.90
Total	106848.80 (100.00)	155484.50 (100.00)	-48635.70

Figs. in parenthesis indicates percentage to the total.

cultivation. Organic paddy also fetches higher price (Rs 15.16 per kg) and hence the difference in revenue was Rs 27646/ ha. The benefit cost ratio was 1.73 and 1.32 respectively for organic and inorganic paddy. The cost and revenue comparison of organic and inorganic tomato shows that organic tomato yields higher than the inorganic tomato by around 1300 kg/ha. Along with yield difference, organic tomatoes fetches higher price by around Rs 9.82/kg when compared to Rs 1.65/kg of inorganic tomato. Organic methods reduces the cost of cultivation by Rs 18707/ha. Still, farmers incurred loss due to lowest prices which does not cover even the production cost. The comparison of cost and revenue of organic and inorganic onion cultivation shows that the benefit and cost ratio of organic onion was comparatively higher (2.56) than inorganic onion (2.26). This difference was mainly due to yield advantage in organic onion cultivation by around 1400 kg/ha which results in a revenue difference of Rs 59158/ha. It can be seen that yield was lesser in organic farms by 4730.47

Table 11: Partial budgeting of organic and inorganic Paddy.

S.No	Debit		S.No	Credit	
a	Increase in costs /ha	Rs	a	Decrease in costs /ha	Rs
1	Labour	7095.95	1	Machinery	5949.24
2	Fertilizers and manure	3177.80	2	Plant protection	4122.22
			3	Seed	2170.70
b	Decrease in returns/ha	nil	b	Increase in returns / ha	27646.80
A	Total (a+b)	10273.75	B	Total (a+b)	39888.96
	Net Gain(B-A) (Rs /ha)	29615.21			

Table 12: Partial budgeting of organic and inorganic Onion.

S.No	Debit		S.No	Credit	
a	Increase in costs /ha	Rs	a	Decrease in costs /ha	Rs
1	Labour	7823.88	1	machinery	403.11
2	Seed	39663.55			
			3	Fertilizers and manure	30434.92
			4	Plant protection	16914.19
b	Decrease in returns/ha	nil	b	Increase in returns / ha	59158.42
A	Total (a+b)	47487.43	B	Total (a+b)	106910.64
	Net Gain(B-A) (Rs /ha)	59423.21			

Table 13: Partial budgeting of organic and inorganic Tomato.

S.No	Debit		S.No	Credit	
a	Increase in costs /ac	Rs	a	Decrease in costs /ac	Rs
1	Machinery	5792.08	1	Labour	15266.09
2	Material cost	3539.60	2	Seed	816.83
3	Transport	586.63	3	Fertilizers and manure	5716.58
			4	Plant protection	6826.73
b	Decrease in returns/ha	nil	b	Increase in returns / ha	70915.84
A	Total (a+b)	9918.31	B	Total (a+b)	99542.07
	Net Gain(B-A) (Rs /ha)	89623.76			

Table 14: Partial budgeting of organic and inorganic Brinjal.

S.No	Debit		S.No	Credit	
a	Increase in costs /ha	Rs	a	Decrease in costs /ha	Rs
1	Labour	23184.82	1	Machinery	3671.62
			2	Seed	275.03
			3	Fertilizers and manure	17571.51
			4	Plant protection	40566.57
			5	Transport	2337.73
b	Decrease in returns/ha	17326.70	b	Increase in returns / ha	Nil
A	Total (a+b)	40511.52	B	Total (a+b)	64422.46
	Net Gain(B-A) (Rs /ha)	23910.94			

Table 15: Partial budgeting of organic and inorganic Banana.

S.No	Debit		S.No	Credit	
a	Increase in costs /ha	Rs	a	Decrease in costs /ha	Rs
1	Plant protection	4345.05	1	Machinery	9930.01
2	Seed	3613.86	2	Labour	8888.61
3	Transport	38.89	3	Fertilizers and manure	30587.16
b	Decrease in returns/ha		b	Increase in returns / ha	81683.17
A	Total (a+b)	7997.80	B	Total (a+b)	131088.95
	Net Gain(B-A) (Rs /ha)	123091.15			

Table 16: Cost and revenue comparison of organic and inorganic paddy (per ha).

Particulars	Organic Paddy	Inorganic Paddy	Difference
Price per kg	15.16	15.00	0.16
Yield (kg)	4883.43	4565.46	317.97
Total revenue (Rs)	129008.19	101361.39	27646.80
Total cost of cultivation (Rs)	74567.74	76536.53	-1968.79
Profit (Rs)	54440.45	24824.85	29615.60
BCR	1.73	1.32	0.41

Table 17: Cost and revenue comparison of organic and inorganic Tomato (per ha).

Particulars	Organic Tomato	Inorganic Tomato	Difference
Price per kg	9.82	1.65	8.17
Yield (kg)	8415.84	7116.34	1299.50
Total revenue (Rs)	82673.27	11757.43	70915.84
Total cost of cultivation (Rs)	145017.33	163725.25	-18707.92
Profit (Rs)	-62344.06	-151967.82	89623.76
BCR	0.57	0.07	0.50

kg /ha. But higher price difference of organic brinjal (Rs 5.90 per kg) and lesser difference in cost of cultivation (41237.62/ha) increases the profit of organic brinjal cultivation by Rs 23910.89/ha. Thus the BCR of organic brinjal cultivation overweighs inorganic brinjal cultivation by 0.43. It could be observed from the Table 4.32 that though organic banana fetches less price than inorganic banana, the yield per hectare was comparatively higher in organic banana cultivation by 1509 kg/ha. Besides, the lesser cost of cultivation by Rs 48635.70/ha increases the profit in organic banana cultivation by Rs 39724.82/ha. Thus organic banana cultivation attracts BCR of 7.77 when compared to 5.40 benefit cost ratio of inorganic banana cultivation.

Conclusions

1. It is a general opinion among inorganic farmers that production ability of organic farming is lesser when compared to inorganic farming. But the results from the study shows that organic crops results in higher yield and returns when compared to inorganic crops. The misconception about organic farming can be rectified by arranging a regular face to face meeting with successful organic farmers, imparting training in organic production methods and arranging more field visit to organic farms and successful farmer producer organizations. This will slowly changes the perception of inorganic farmers towards organic farming. Thus bringing more farmers towards organic farming through creating awareness will raise production and bring down the price of organic produce.
2. Though the cost incurred in the use of synthetic fertilizers, pesticides and herbicides has been

Table 18: Cost and revenue comparison of organic and inorganic Onion (per ha).

Particulars	Organic Onion	Inorganic Onion	Difference
Price per kg	38.00	37.77	0.23
Yield (kg)	13613.86	12213.05	1400.81
Total revenue (Rs)	517326.73	458168.32	59158.42
Total cost of cultivation (Rs)	202351.49	202616.30	-264.81
Profit (Rs)	314975.25	255552.02	59423.23
BCR	2.56	2.26	0.30

Table 19: Cost and revenue comparison of organic and inorganic Brinjal (per ha).

Particulars	Organic Brinjal	Inorganic Brinjal	Difference
Price per kg	29.90	24.00	5.90
Yield (kg)	16309.13	21039.60	-4730.47
Total revenue (Rs)	487623.76	504950.50	-17326.73
Tot cost of cultivation (Rs)	179801.98	221039.60	-41237.62
Profit (Rs)	307821.78	283910.89	23910.89
BCR	2.71	2.28	0.43

Table 20: Cost and revenue comparison of organic and inorganic Banana (per ha).

Particulars	Organic Banana	Inorganic Banana	Difference
Price per kg	26.92	28.33	-1.41
Yield (kg)	30841.58	29331.68	1509.90
Total revenue (Rs)	830198.02	839108.90	-8910.88
Tot cost of cultivation (Rs)	106848.80	155484.50	-48635.70
Profit (Rs)	723349.22	683624.40	39724.82
BCR	7.77	5.40	2.37

nil in organic farming, input costs particularly for labour has been higher in all the organic crops. In the organic cultivation practices, more labour was required to collect natural herbicidal and pesticidal crops. Providing labour through 100 days employment guarantee programme to marginal and small organic farmers will reduce cost of cultivation and encourages other inorganic farmers to practice organic farming.

3. Highly prone to pest and diseases was the major constraint exposed by many farmers in organic cultivation. Also in organic farming, plant protection formulations were not tailor-made as in chemical farming. Farmers have to prepare their own pesticides and herbicides. Many farmers were unaware of those natural plant protection practices. Hence periodical training and technical advisory with respect to plant protection was the expectation of many farmers.
4. For organic manure preparations, possession of livestock is a must in every organic farm. Farms without livestock, buy manures and bio liquid nutrients like panchakavya, jeevamirtham, etc. These were costlier if purchase from outside. Hence inorder to bring down cost of cultivation bio inputs could be prepared in the farm itself. But many of the inorganic farmers don't possessed livestock which acts as a major constraint for organic farming conversion. Nil interest livestock loans for country breeds and free distribution of country breed livestock to marginal and small farmers will promote organic farming.
5. High certification and renewal fee and the time consuming procedures followed during the process of organic certification bother many organic farmers. The marginal and small farmers were the highly affected since during transition period, they incur loss due to reduction in yield. Further certification costs acts as an additional burden. The certification process should be simplified and the registration fee, fee for inspection and certification, travel time fee and scope certificate fee could be removed for marginal and small farmers.
6. Organic shops were unable to procure all the harvested produce from a farmer. Only a portion of the produce has been sold by the farmer for the premium price in the organic shops and the remaining were sold at the market price in regular shops or vegetable markets. Less demand from consumers was the major reason sort out by the retailers for non procurement of all the harvested produce from a single farmer. Hence promoting awareness about the importance of consuming organic produces is the need which should be propagated to the mind of all the consumers through media.

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References

GoI (Government of India) Economic Survey (2007- 08) (2008) Ministry of Finance, Economic Division, New Delhi.

Kavitha, V., K. Chandran, M. Umanath and R. Sudha (2016). Intensive Farming and Ground Water Sustainability in India. *Progressive Research-An*

International Journal, **11(5):** 2885-2888.

NSSO Report, Some Characteristics of Agricultural Households in India, NSS 70 th Round January– December (2013) Government of India, Ministry of Statistics and Programme Implementation, Report No. 569 (70/33/1).

National Crime Reports Bureau, ADSI Report (2014) Ministry of Home Affairs, Government of India.

Sharma, K.L., J. Kusuma Grace, U.K. Mandal, P.N. Gajbhiye, K. Srinivas, G.R. Korwar, V.H. Bindu, V. Ramesh, K. Ram chandran and S.K. Yadav (2008). Evaluation of long term soil management practices using key indicators and soil quality indices in a semi and tropical Alfisol. *Australian Journal of Soil research*, **46:** 368-377.