



A Comparative Cost Analysis of with and without Chemical Weed Management Practices in Onion Production in the Western Agro Climatic Zone of Tamil Nadu

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The study revealed that the expenditure on weeding in onion cultivation was six per cent higher in manually weeded farms than herbicide applied farms. The cost of weeding for manually weeded farm was Rs. 19,729/ha (15.15 per cent) whereas, it was Rs. 11,145/ha (9.44 per cent) in herbicide applied farms. The net returns (returns over cost C₃) were Rs.1, 93,715/ha for herbicide applied farms and Rs.1, 28,598/ha for manually weeded farms. The cost of production (per kg) was Rs.7.70 in manually weeded farms and Rs.5.98 per kg of onion in herbicide applied farms. Hence, per ha cost of cultivation in manually weeded farms was higher than herbicide applied farms. The partial budgeting analysis had revealed that an additional return of Rs. 70,982 /ha would be obtained with the use of herbicides in onion cultivation. The average yield obtained in manually weeded farms was lesser than (3, 874 kg/ha) the yield obtained in herbicide applied conditions. The average prices, gross return, as well as the net return were remunerative and higher to farmers under herbicide applied farms than in manually weeded farms.

Key words: Onion, Cost Concepts, Net returns, Partial budgeting

Onion (*Allium cepa*) is one of the most important commercial and spice crops produced and consumed all over the world. It is an ancient crop having been utilized in medicines and rituals besides, being consumed as food in India since 600 BC. In Tamil Nadu state, onion is cultivated in 25 out of 32 districts. The maximum area and production of onion is found in Perambalur district, followed by Thiruchirapalli and Thiruppur districts. Erode district has recorded the maximum productivity of 15,867 kg/ha, followed by Coimbatore district with 14,610 kg/ha and Namakkal with 12,803 kg/ha (Season and Crop Report, 2010).

In onion production, the most common problem is the control of weeds, particularly during the early stage of crop growth. Uncontrolled weed growth reduces the bulb yield to the tune of 40 to 80 per cent, depending upon types of weed flora, their intensity and dura-tion of crop-weed competition (Mishra *et.al.*1986). Manual weeding is a common practice in onion. Chemical weed killers have been found very promising in controlling weeds (Singh *et.al.*1986, Sandhu *et.al.* 1987, Vinay Singh *et.al.* 1997; Ravindar Singh *et.al.* 1998; and Yadav *et.al.* 2000). Herbicides, although may not control weeds as effectively as hand weeding, it frequently offers the most practical, effective and economical means

of reducing weed problems, crop losses, and lowers production cost (De Datta and Herdt,1983; Rameshwar *et.al.*2002; Muhammad Saleem Jilani *et.al.* 2007). However, due to increasing cost of chemicals and risk involved in application, the present study was carried out to find out the comparative efficiency of different chemical and non-chemical methods of weed control.

Materials and Methods

The Western Agro Climatic Zone covering the districts of Coimbatore, Erode and Tiruppur of Tamil Nadu state in India formed the study area based on the area of onion production in this zone. The farm level data were collected by using a structured survey from two randomly selected groups of onion growing farm households. In this sample of 120 farms, 60 farmers were using herbicides in combination with manual weeding and 60 farmers were adopting only manual method for the control of weeds.

Growth rate analysis

In order to analyze the growth in area and productivity of onion compound growth rates were computed using the ordinary least squares method for the following semi-logarithmic function:

$$Y = a b^t e^t$$

where,

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Y = Dependent variable (area/ production/ yield)

a = Intercept term

b = $(1+r)$ and r is the compound growth rate

t = Time trend ($t = 1, 2, 3 \dots n$)

e_t = Error term

In the logarithmic form, the function could be expressed as,

$$\log Y = \log a + t \log b$$

where, $\log a$ and $\log b$ were obtained using the

ordinary least squares procedure, and the R^2 was computed to test the goodness of fit. Antilog of $\log b - 1 \times 100$ gave the per cent growth rate.

Cost of cultivation

Cost of cultivation for onion was worked by taking into consideration various farm operations and inputs used. By working out both the variables and fixed costs, a comparative economic analysis was performed based on the costs and returns.

Partial budgeting

Partial budgets are commonly used to estimate the effects or outcome of possible adjustments in the farm business before such adjustments are actually made. In working out partial budgets, four elements are essentially needed, two of which related to the financial losses arising out of contemplated change (*i.e.*, the debit side) and other two related to the consequential financial gains (*i.e.*, credit side). It provides a method to understand how far the expenses and yields affect the adoption of the technology *i.e.* chemical weed management. In the present study, it was the herbicide applied farms *vis-à-vis* manually weeded farms.

Results and Discussion

Growth rate analysis of onion

The area and productivity of onion in the Western zone of Tamil Nadu, India during 1981-82 to 2010-11 were considered for the estimation of compound growth rates (CGRs) as furnished in Table 1. It could be seen from the table that the overall growth rate of

Table 1. Compound growth rate of area, production and yield of onion

Year	(in percentage)					
	India		Tamil Nadu		Western zone in TN	
	Area	Yield	Area	Yield	Area	Yield
1981-1990	0.18	0.01	0.23	-0.08	0.83	0.50
1991-2000	0.32	-0.07	0.33	0.09	0.28	0.16
2001-2010	1.09	1.9	0.84	0.23	0.63	-0.05
All period	0.68	0.45	0.53	-0.13	0.20	-0.06

area under onion was 0.68, 0.53 and 0.20 for the country, state and the zone, respectively. The yield has grown at the rate of 0.45 per cent at national level. Further, it has exhibited a negative rate at the state and zonal level. It could be inferred that area,

production and yield of onion had witnessed mixed trends due to the high volatility in the prices of onion over decades.

Cost of production

The cost of cultivation of onion was worked out separately, for herbicide applied and manually weeded farms, as this would help to understand the differences among the two categories and the results are presented in Table 2. It could be observed

Table 2. Cost of cultivation of onion herbicide applied and manually weeded farms

Particulars	(Rs./ha)			
	Herbicide Applied Farms		Manually weeded Farms	
	Cost	Percentage	Cost	Percentage
Labour (weeding)	11,145	9.44	19,729	15.15
Labour (other operations)	37,306	31.61	38,255	29.38
Machine power	3,961	3.36	4,836	3.71
Seed (bulbs)	31,358	26.57	32,327	24.83
Organic manures	4,993	4.23	5,580	4.28
Inorganic fertilizers	4,654	3.94	4,725	3.63
Plant protection chemicals	3,134	2.66	1,827	1.40
Transportation	1,279	1.08	1,567	1.20
Interest on working capital	3,424	2.90	3,809	2.93
Total variable cost	1,01,254	85.79	1,12,655	86.51
Depreciation on fixed capital	1,460	1.24	1,771	1.36
Land revenue	308	0.26	308	0.24
Interest on fixed capital	1,253	1.06	1,735	1.33
Rental value of owned land	13,750	11.65	13,750	10.56
Total fixed cost	16,771	14.21	17,564	13.49
Total cost	1,18,025	100.00	1,30,219	100.00
Yield (kg/ha)	20,395		16,521	
Value of main product	3,15,699		2,55,742	
Net income	1,93,715		1,28,598	
Net income (Rs./kg)	9.50		7.78	
Cost of production (Rs./kg)	5.98		7.70	

that, labour use (weeding) in crop production was higher in manually weeded farms than in herbicide applied farms. The value of labour for manual weeding was Rs. 19,729/ha (15.15 per cent), whereas, it was Rs. 11,145/ha (9.44 per cent) in herbicide applied farms. It could also be observed from the Table that, the total variable cost, total fixed cost and total cost were higher for manually weeded farms than in herbicide applied farms. In the second case, the total variable cost was Rs.1, 01, 254/ha while it was Rs.1, 12, 655/ha in manually weeded farms. The total fixed cost in herbicide applied farms was Rs.16, 771/ha, while it was Rs.17, 564/ha for manually weeded farms. Obviously, the total cost, which is the sum of total fixed cost and total variable cost, was Rs. 1, 18,025/ha for manually weeded farms and Rs. 1, 30,219/ha for herbicide applied farms. The cost of production was Rs.7.70 per kg in manual weeded and Rs.5.98 per kg in herbicide applied farms. It is higher in manually weeded farms than in herbicide applied farms (since, the productivity was lower and the cost of cultivation was higher in this category) of farms.

Partial budgeting

This estimate provided information about the added costs, reduced returns, added returns and reduced costs as presented in Table 3. It could be inferred from the Table that, additional cost of

Table 3. Additional benefits and costs in herbicide applied farms

Debit(A)	Value (Rs.)	Credit(B)	Value(Rs.)
Added Cost		Added Return	
Herbicides, PP chemicals and their application	1,307	Income	59,964
Reduced return		Reduced cost	
Nil	-	Other operations	12,325
Total	1,307	Total	72,289
Net Gain = (B-A) = Rs.70,982			

Rs.1307 was incurred for herbicides, plant protection chemicals and their application. There was a reduction in the cost of other operations to the tune of Rs.12, 325. An additional return of Rs.59, 964 was obtained with the use of herbicides and the net gain was found to be Rs.70, 982. The results indicated that adoption of herbicides for the control of weeds would reduce the cost of production and increase net gain during the cultivation of onion.

Conclusion

Area, production and productivity of onion exhibited a negative growth rate both at national and state levels. The expenditure on labour for weeding in crop production was higher in manually weeded farms than in herbicide applied farms. The total cost of cultivation was lower for herbicide applied farms and it was higher for manually weeded farms. Moreover, the net returns were higher for herbicide applied farms as compared to manually weeded farms. In partial budgeting, the net gain was found to be Rs.70, 982 indicating the effectiveness of integrated weed management practices.

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