Environment & Ecology 27 (4B) : 2095—2098, 2009
 ISSN 0970-0420

Farm Management : Input-Specific Technological Inclusion in Farm Business to Sustain Net Profits and Benefit : Cost Ratio

A. P. SINGH

Department of Agronomy, Indira Gandhi Agricultural University
Raipur (CG) 492006, India
E-mail :apalsingh@yahoo.com

Abstract

In the era of information technology and globalization, farm management at one hand has become easier but on the other hand, more responsible and analytical for the present and towards future. In general, it has been observed that benefit : cost ratio of farm business is either constant or decreasing despite of the reason most of the efficerntly managed farms, irrespective to size of holding and country, are harvesting maximum possible yield of various crops. Upon critical analysis of the reasons responsible for constant or meager benefit : cost ratio is the steep price hike of agricultural inputs mainly farm labor wages, energy and inputs like fertilizer, seeds compared to marginal increase in the prices of agricultural produce. This might be due to over all increase in production, surplus granaries and their slower disposal and above all competitive market world over. To overcome this situation, it is imperative to reduce the cost of production with similar or enhanced levels of productivity per unit area. This can be done by adoption inclusion of new techniques/practices through which energy/labour and other input can be minimized or optimized. One of the classical examples in this regard is inclusion of zero-tillage technique to reduce the over loaded bills of energy world over. Therefore, the rate of acceptance of this technique is much higher than any other technology in agriculture at the moment. In this study, zero tillage technique was adopted and energy economy up to 78% was obtained in single planting season only without any adverse effect on grain yields of wheat, linseed and mustard during 2004-05. There are certain other promising technologies also on the verge of wider acceptance by farmer such as dry seeding of rice in place of transplanting. This has the capability of higher production and reduction of more than 20% labor/ha (in this region). However, an effective pre- and post-emergence weedicide for rice is required because weeds in dry seeded rice are a major limitation. Another promising technique available to reduce expenditure on fertilizer input by adopting integrated nutrient management. This technology also has the capability to substitute chemical fertilizer input up to 50%.

Key words : Benefit : cost ratio, Conventional tillage, Dry seeded rice, Farm management Zero tillage.

Management is an important factor of production. The farming performance is subject to the behavior of weather and rainfall conditions, which not only change the characteristic of work from season to season, but also frequently cause drastic changes in the daily programs. The decision on production has also biological limit. Under such situations, the management performance cannot be predicated with certainty, because of imperfect knowledge of prices and yield in the years ahead. Despite of tremendous progress in agricultural sciences especially in genetics and plant breeding fertilization, plant protection and management, farm machinery, there is a tendency of narrowing of benefit : cost ratio of farming business mainly, owing to growing cost of agricultural production system. Also, evidence from long-term experiments shows that crop yields are stagnating and sometimes declining (1, 2). In the modern agriculture, the yield of different crops has reached to its maximum potential in most of the efficiently managed farms. Still the benefit : cost ratio has not been swelled up to the expectations. A critical analysis given in Figure 1 where the trend of increase in prices of three most crucial resources as energy, farm labor and inputs like fertilizer and pesticides vs increase in support price of produce especially rice shows the disparity between the output per unit of input. The increase in cost of energy, farm labor and fertilizer and pesticides was to the tune of 45, 19 and 16% respectively in last five years compared to the meager increase in support price of rice to the tune of 6% only over last three years. The consequence of this

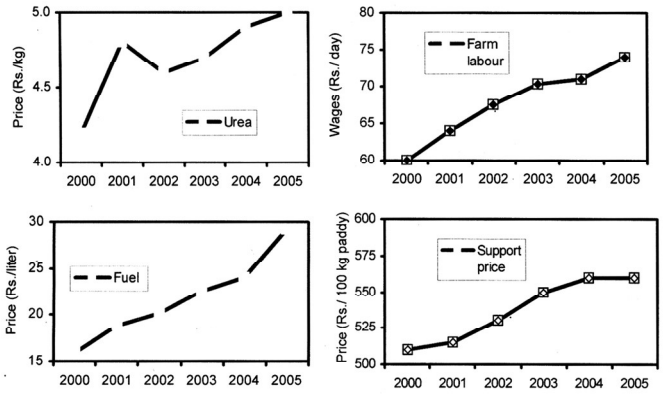

Figure 1. Price hikes trends of urea, fuel, farm labor and support price in last five years.

imbalanced increase in output vs input is causing social conflict especially in developing countries.

Therefore, to sustain benefit : cost ratio of farm business, a need was felt to optimize usage of energy, input and farm labor in a strategic way without sacrificing existing yield levels of different crops. Farmers profit could be enhanced either by changing existing crop establishment methods which is highly labor dependent but this will only be possible if an effective pre- and post-emergence weedicide is made available at reasonable cost to the farmer. Also, inclusion of new technologies requires minimum new implements and reduces the energy consumption drastically over the existing one or by synchronizing the synergy between both. Farm mechanization saves labor and time but increases the energy bill of farmers. In the year ahead there will be a steep increase in the energy for agriculture. Therefore, keeping all these in view, the endeavor was made to reduce energy consumption in the first step, then moves to labor and finally to fertilizer input reduce energy consumption in the first step, then moves to labor and finally to fertilizer input reduction in second and third step so that, benefit : cost ratio of farm remains comfortable.

Methods

Yield of paddy, soybean grown in rainy season and wheat, sunflower, chickpea, linseed, mustard grown in winter season have reached to its maximum at Instructional Farm of Indira Gandhi Agricultural University, Raipur, Chhattisgarh, India. However, the benefit cost ratio, despite of maximum production, is either stable or shrinking mainly due to imbalance increase in the prices of energy, inputs like fertilizer and pesticide and wages of farm labor compared to increase in support price. With the objective to raise the benefit : cost ratio over existing one from the same cropping system, equipments and other resources, strategic inclusion/replacement of technologies were taken into consideration to minimize expenses on energy, labor and nutrient.

Among these three practices, zero tillage technique of sowing was adopted three years back on 2.0 ha area after the harvest of rainy season paddy. Wheat, soybean and mustard were sown with this technique and were repeated second year also. The results were encouraging as the yield was at par to the crops sown with conventional tillage. Considering the results of two year, almost one third of the farm area was put under this technique.

Where zero and conventional- tillage was adopted during *rabi,* the previous crop during *kharif*

Table 1. Various crops with different tillage methods during 2004-05.

Crops	Conventional tillage (ha)	Minimum tillage (ha)	Zero tillage (ha)
Wheat	4.0	4.0	4.0
Linseed	1.0	1.0	0.5
Mustard	1.0	-	3.0

was paddy. Whereas, soybean was the crop during *kharif* where minimum tillage was adopted during *rabi* season.

The soil where minimum and zero tillage technique was used for wheat and linseed was deep black clay soil belongs to vertisol having 8.2 pH and was low in organic carbon and available N and medium in available phosphorus and rich in available K. On the other hand, the soil where mustard was sown with zero tillage technique was sandy-loam in texture, neutral in reaction, low in organic carbon and nitrogen and medium in phosphorus and potassium content. Rainy season crops of soybean and paddy were harvested from third week of October to first week of December.

In conventional tillage ploughing was done twice with nine-tine tiller, followed by two harrowing and then sowing was done with seed-cum-fertilizer drill. In all above operations for field preparation to sowing, a total of 14 hours running of 35 HP tractor having an average consumption of 4 liters HSD per hour was recorded and in minimum tillage, mostly done in the fields where soybean was the previous crop, two times disc harrow was used by the same tractor followed by sowing with zero till seed cum-fertilizer drill. A total of eight hours running of tractor with similar rate of fuel consumption/h was recorded under minimum tillage. However, no ploughing was done in zero tillage where direct sowing with zero till seed-cum-fertilizer drill was done. A total of three h of running of similar tractor was noted with similar trend of fuel consumption. Recommended doses of N : P : K and seed rate were used for all the crops under all three methods of sowing.

A three hours come-up irrigation through sprinkler was given to the crop sown under conventional and minimum tillage practice, whereas only 1½ h sprinkler was given to crop sown under zero tillage method as the residual moisture was higher in fields where zero till was adopted than conventional and minimum tillage sowing of various crops. Sprinkler was given immediately after sowing under conventional and minimum tillage but in zero till sowing, sprinkler was started after two days of sowing as the seed in conventional tillage and minimum tillage was in dry zone but in zero till sowing, seed was in well moist zone. All the other operations were similar for all the methods of sowing.

Table 2. Influence of various tillage operations on seed yield of various crops and energy consumption in 2004-05.

Crops	Conventional tillage (t/ha)	Minimum tillage (T/ha)	Zero tillage (t/ha)
Wheat	2.21	2.20	2.18
Linseed	0.50	0.50	0.48
Mustard	0.78	-	0.85
Energy consumed (M/ha)	3180.80	1817.60	681.6

Results and Discussion

Saving of Energy

By adoption of zero tillage, energy consumption reduced remarkably over conventional method of sowing. Seed yield of wheat and linseed obtained under conventional tillage was marginally higher than minimum tillage and zero tillage. However, mustard performed better than wheat and linseed under zero tillage (Table 2) and gave 8% higher seed yield as compared to conventional tillage. The yield data of all the crops shows that repeated tilling is not essential for harvesting higher seed yields. Further, the reduction in energy consumption by shifting from conventional tillage > minimum tillage > zero tillage was found to be significant and was to the tune of 43 and 78% lesser than the energy required in conventional tillage. On monetary comparison of all the three methods, a net return under zero tillage increases by Rs 953/ha over conventional tillage. Moreover, a saving of 11 h/ha which otherwise would have been a load on farm machinery. Long-term advantages of zero tillage on soil health and environment have also been reported by several researchers (3, 4). Net returns were more in zero tillage over conventional tilling and saving of energy up to 78% as well.

Saving in Farm Labor

Three most popular and prevalent methods of rice cultivation i.e. dry seeding in line, transplanting and bushening methods were compared for yield and labor utilization. Transplanting is the first preference of those farms where assured irrigation facility is available . The reason of this preference in early days was due to excessive weed under dry seeded method than transplanting method but now days it is only the mind

Table 3. Cost of cultivation (Rs/ha) and share of labor input in rice cultivation.

Particular	Dry seeding in line	Transpl-anting	Bushening
Labor input	2675	6475	5950
Other inputs	5075	4075	4775
Total	8750	10550	10725
Share of labor (%)	42	61	55

set but nothing else. The production of new and cost-effective weedicides has made dry seed method much more economical than transplanting. The data given in Table 3 belong to a village where a team of scientists conducted such experiments under NATP project on more than 30 hectares and reported that labor can be reduced by 20% simply by shifting from transplanting to dry seeding method of rice cultivation (5).

Saving in Fertilizer Inputs

Fertilizer is another costly input need to be curtailed and replaced by other substitutes. Integrated nutrient management is the right answer at the moment. Use of farmyard manure poultry manure, vermin-compost and city waste are the certain organic materials available with which farms can substitute fertilizer input up to 50% (6, 7). However, application of these organic materials in combination with chemical fertilizer in a ratio of 1 : 1 is not helpful in reducing the expenditure instantly.

Conclusion

It is concluded that those farms which have attained the peak in productivity within the available capital, resources and equipments must think of reducing cost of production just by inclusion of new technologies capable to reduce either expenses on labour or energy or fertilizer input step by step and finally all together. Zero tillage is one of the efficient technologies, which directly can reduce the consumption of energy up to 78% /ha during one season only. Similarly, labor can be reduced up to 20% just by shifting from transplanting to dry seeding of rice in lines. Also fertilizer input may be substituted up to 50% by the application of organic materials like FYM, poultry, manure, vermi-compost and other specific recyclable materials. So that, benefit : cost ratio in farm-business keeps on swelling despite of continuous increase in prices of agricultural inputs.

References

1. Duxbury J. M., I. P. Abroi, R. K. Gupta and K. F. Bronson. 2000. Analysis of long-term fertility experiments with rice-wheat rotation in South Asia. Pp. vii-xxii. *In Rice-wheat consortium paper series* 6. New Delhi, India : RWC.
2. Ladha J. K., D. Dawe, H. Pathak, A. T. Padre, R. L. Yadav, B. Singh, Y. Singh, Y. Singh, P. Singh, A. L. Kundu, R. Sakal, N. Ram, A. P. Regmi, S. K. Gami, A. L. Bhandari, R. Amin, C. R. Yadav, E. M. Bhattarasi, S. Das, H. P. Agrawal, R. K. Gupta and P. R. Hobbs. 2003. How extensive are yield declines in long-term rice-wheat experiments in Asia ? Field Crops Res. 81 : 159—180.
3. Derpsch R. 1999. New paradigms in agricultural production. Volume 4. ISRO-INFO EXTRA.
4. Shoran J., R. K. Sharma and S. C. Tripathi. 2004. *Wheat : New varieties and production.* The Hindu Surv. of Indian Agric. 2004.
5. Rathore A. L., K. K. Sahu and B. R. M. Rao. 2004. *Development of regional scale watershed plants and methodologies for identification of critical areas for prioritized land treatment in the watershed of rainfed rice production system.* Final report of Nat. Agric. Tech. Proj. 2004.
6. Singh A. P., R. S. Tripathi and B. N. Mitra. 2000. Effect of integrated use of organic and chemical sources of nitrogen in rice-wheat cropping system. *Oryza* 37 : 205—208.
7. Singh A. P., R. S. Tripathi, B. N. Mitra and G. K. Shrivastava. 2001. Nourishing rice-mustard cropping system with organic and chemical sources of nitrogen in Chhattisgarh plains. *J. Agric. Issues* 6 : 21—26.