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Economic analysis of scientific sorghum fodder production technology and its comparative impact on farmers' livelihood

Vikas Kumar[1] and Maharaj Singh[1]

Indian Grassland and Forestry Research Institute, Jhansi, UP, India

Corresponding author: vyadav21@gmail.com

Abstract

Sorghum is a warm-season annual that is used for silage production and fed to dairy cattle in many regions of the India. The economics of sorghum fodder crop (cv. JHO -822) production under the farmer's fields was analysed for the period of kharif 2011-12 to kharif 2012-13 in Datia, M.P. A total of 12 farmers were taken during kharif 2011 and 9 farmers were guided about the scientific fodder production practices. At the same time, 6 farmers were selected in 2011 and 5 in 2012 that were growing local seed of sorghum and adopting traditional methods of fodder production. The total working capital is ₹ 14907.03 per hectare and total variable cost is ₹ 15354.24 which is 67.53 per cent of total cost. The average total cost is found as ₹ 22738.20 per hectare. Thus the highest expenditure in percentage term is incurred on labour followed by manures and seed cost and draft power. On per hectare basis the average fodder production was 523.89 quintals. The average rate of green fodder is taken as ₹ 100 per quintal. It is the rate at which the farmers sell their green fodder in the market. The total value of green fodder that is total return is found as ₹ 52388. The net return is ₹ 29650.68 per hectare. The average benefit cost ratio at farm only is found as 2.31. Impact of sorghum fodder (MP Chari) crop was studied in relation to the existing fodder crop of sorghum grown by the farmers in Datia (M.P.). The green fodder yield was 13.03 per cent higher and the gross return is also increased by 13.03 per cent over the traditional practice.

Keywords: Economic analysis, sorghum fodder production, cost of cultivation, benefit- cost ratio, impact analysis, livelihood

Sorghum is a warm-season annual that is used for silage production and fed to dairy cattle in many regions of the India. The sorghum plant is a tall, erect annual grass, up to 5 m high. Sorghum roots are adventitious and the root system can extend from the top 90 cm soil layer to twice that depth. It is a drought resistant annual crop and is cultivated mainly for fodder and grain (FAO, 2011). It is not suited to higher elevations (more than 1200 m). It can be grown on any soil except on very sandy soils. Forage sorghum can be grazed (young or as deferred fodder), cut fresh, made into hay or ensiled. If it is a single cut, it should be harvested at 60-65 days (50% flowering) after sowing and if it is a multicut, the first cut is 60 days after sowing and subsequently once in 40 days. Sorghum can be harvested after flowering stage for green fodder (Harada *et al*. 2000). Compared with corn plants, it uses water more efficiently which is important in bundelkhand like areas where irrigation is limited or there is a greater chance of drought. The feeding value of forage sorghum is influenced greatly by variety planted and stage of maturity at harvest. Sorghum can grow well in areas with less rain and produces the same

amount of fodder as maize. Sorghum can regenerate (grow again) after cutting the stalks for fodder and harvesting the grain (second crop or ratoon); the ratoon crop will mature early in the following season but yield slightly less than the first crop – depending on level of plant feeds available. This way the farmers can reduce the cost of replanting, land preparation, seeds and time (Lambert *et al.* 1999). The economics of sorghum fodder crop (cv. JHO-822) production under the farmer's fields was analysed for the period of khairf 2011-12 and kharif 2012-13 in Datia, M.P.

Materials and Methods

For conducting the research work, the two villages of datia were selected during kharif 2011 and Kharif 2012. A total of 12 farmers were taken during Kharif 2011 and 9 farmers were guided about the scientific fodder production practices. At the same time, 6 farmers were selected in 2011 and 5 in 2012 that were growing local seed of sorghum and adopting traditional methods of fodder production. The adopted farmers were provided the truthfully labelled seed of sorghum for fodder production. The crop was sown in month of July. The technical knowhow was provided by the institute in growing the fodder crop. The crop fields were also monitored to guide the adopted farmers. With the onset of monsoon, the fields were prepared by harrowing/ cultivation. The fields operations are varied from farmer to farm to some extent on the basis of availability of resources (Kumar, 2014).

The seed rate was 40 kg per hectare and 80 kg DAP was applied as basal dose and 80 kg Urea was applied (50% as basal and 50% as top dressed). Crop was rainfed and in demonstrations, on an average two cuttings was taken, while in traditional crop only one cutting was taken. The variable cost and fixed costs were calculated for different machines used and multiplied with hours for which they used to find the expenditures incurred on them (Kumar, 2009). The prevalent labour rate was taken as ₹ 130 - 150 per manday for 8 hours. The total working capital shows the total variable cost incurred on various operations. The total variable cost is calculated by adding three per cent interest to total working capital. The addition of all the fixed cost, overhead cost and rental value of land gives the total fixed cost. The rental value of land was considered as that prevailing in the locality (₹ 10000/ha). The management and risk was considered as ten per cent of total variable and fixed cost. The cost of cultivation data were calculated for every stage of crop growth.

Results and Discussion

Operation wise cost of cultivation

The cost of production was calculated over individual farms and data were converted into per hectare basis. The operation wise expenditure for the crop has been presented in Table 1. The average expenditure incurred on field preparation is ₹ 1374.72 per hectare that came to be 6.05 per cent of total cost. The average expenditure made on sowing was ₹ 2035.13 which was 8.95 per cent of total cost. The average expenditure per hectare made on manures and fertilizers was ₹ 4719.98 that came to be 20.76 per cent of total cost. The crops were rainfed, so the expenditure on irrigation was not incurred. The total expenditure incurred on fodder cutting was ₹ 6777.20 which was done manually by sickle. The total working capital was ₹ 14907.03 per hectare and total variable cost was ₹ 15354.24 which was 67.53 per cent of total cost. The average total cost was found to be ₹ 22738.20 per hectare.

Table 1: Operation-wise cost of cultivation in sorghum fodder production (Average for 2011 and 2012, hectare basis)

Operations	Average per hectare (₹)	Percentage to total cost
Field preparation	1374.72	6.05
Sowing	2035.13	8.95
Manures and fertilisers	4719.98	20.76
Fodder Cutting	6777.20	29.81
Total operation cost	14907.03	65.56
Total variable cost	15354.24	67.53
Total fixed cost,	5316.85	23.38
Other cost	2067.11	9.09
Total Cost	22738.20	100.00

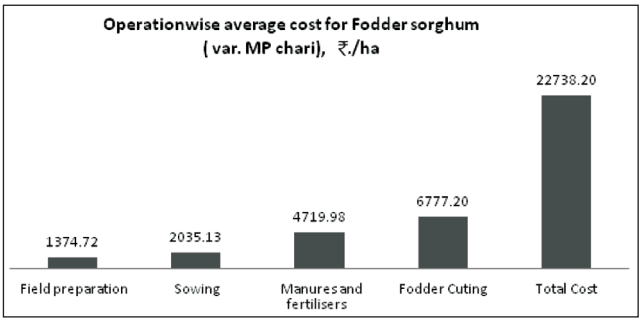

Fig. 1: Operation-wise cost of cultivation in improved sorghum fodder production

Item wise cost share

Item wise cost of cultivation on per hectare basis was presented in Table 2. The average draft power used per hectare was 3.25 hours. The variable cost incurred on draft power was ₹ 1302.26 per hectare. The average total labour man days used per hectare were 47.34. The average total expenditure incurred on labour was ₹ 7193.00 which was found to be highest in total cost. The expenditure incurred on seed purchase was ₹ 1780.00 per hectare. The total expenditure incurred on manures and fertilizers was ₹ 4577.25 per hectare which was found as second highest in total cost. Thus the highest expenditure in percentage term was incurred on labour followed by manures and seed cost and draft power.

Table 2: Item wise cost of cultivation on per hectare basis for scientific fodder production

Item wise cost of cultivation	Average per ha (₹)
Draft power	
Draft power hours	3.25
Draft power cost	1302.26
Labour power	
Total mandays	47.34
Total Labour cost	7193.34
Seed cost	1780.00
Manures and Fertilizers	4577.25
Total Working capital	14907.03
Interest on WC	447.21
Total variable cost	15354.24
Fixed and other overhead cost	316.85
Rental value of land	5000.00
Total fixed cost	5316.85
TVC+ TFC	20671.09
Management & risk	2067.11
Total Cost	22738.20

Return analysis

The return from sorghum was analysed and presented in Table 3. On per hectare basis, the average fodder production was 523.89 quintals. The average rate of green fodder was taken as ₹ 100 per quintal. It is the rate at which the farmers sell their green fodder in the market. The total value of green fodder (total return) was ₹ 52388. The net return was ₹ 29650.68 per hectare. The average benefit cost ratio at farm only was 2.31. The respondent farmers produced fodder for their own domestic animals. So, the estimation of cost of production of green fodder was very essential. The cost of production of green fodder was found to be ₹ 43 per quintal. Thus, it is clear from the study that fodder production was highly profitable if sold in the market.

Table 3: Return analysis of sorghum fodder production for improved practices

Particulars	Average
Total cost of seed production (Rs.)	22738.20
Green fodder/ dry fodder (quintals)	523.89
Rate (Rs./quintal)	100
Gross return (Rs.)	52388.89
Net return (Rs.)	29650.68
B:C ratio	2.31
Cost of production of fodder (Rs./kg)	0.43

Impact analysis of Improved practices of sorghum fodder production over the existing fodder production technology

The comparative impact analysis of sorghum fodder production on farmers' livelihood was presented in Table 4. The farmers were given package of practices to adopt to have higher fodder yield and visits were made to farmer's fields for improvement. To find the impact of forage crops on livelihood development of farmers, some parameters were selected that can analyse improvement in income, employment of labour and machines, green fodder yield, net income to farmer and cost reduction in production of fodder . The Table 4 shows the percentage change made due to the use of improved varieties and scientific fodder production practices against the traditional technology and local varieties of the fodder crops. The positive sign shows that scientific practice had higher value and negative sign shows

that scientific practice has lesser value against the existing technology and varieties of sorghum fodder crop grown by the farmers. The cost of cultivation for existing fodder production was also calculated for 2011 and 2012 (Table 4).

Table 4: Impact analysis of improved practices of sorghum fodder production over the existing fodder production technology

Particulars	Improved practice Sorghum (MP chari)	Traditional practice (Local variety)	Net difference	% improvement
Total cost (₹)	22738.2	20166.81	2571.4	12.75
Draft power (hours)	3.25	2.56	0.69	26.95
Labour (man days)	47.34	38.55	8.79	22.8
Total green fodder yield (kg)	52388.89	46350	6038.89	13.03
Gross return, ₹	52388.89	46350	6038.89	13.03
Net return, ₹	29650.68	26183.19	3467.49	13.24
B:C ratio	2.31	2.3	0.01	0.36
Cost of green fodder ₹/kg	0.43	0.44	0	-0.28

Conclusion

The impact of sorghum fodder (MP Chari) crop was studied in relation to the existing fodder crop of sorghum grown by the farmers in Datia (M.P.). The total expenses had increased by 12.75 per cent in growing of sorghum fodder (MP Chari) crop against the existing sorghum local varieties. There was higher use of machine and labour man days as the crop has given two cuttings in most of the fields. The green fodder yield was 13.03 per cent higher and the gross return is also increased by 13.03 per cent over the traditional practice. The B:C ratio and cost of production were more or less the same, however higher quantity of green fodder from the same piece of land was obtained by utilisation of resources efficiently over the existing fodder production practices**.**

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