Asian Journal of Agricultural Extension, Economics & Sociology

Volume 42, Issue 5, Page 241-248, 2024; Article no.AJAEES.114193
ISSN: 2320-7027

Study the Input Use Pattern and Cost and Returns of Hybrid Cotton Seed Production in Karnataka, India

Channamma [a++*], D. G. Satihal [b#], Amrutha. T Joshi [a†], Basavaraj S Ganigara [c‡] and Vasudeva Naik, K [d‡]

[a] Department of Agricultural Economics, College of Agriculture, University of Agricultural Sciences, Raichur -584104, Karnataka, India.
[b] ARS Bheemarayanagudi, University of Agricultural Sciences, Raichur- 584104, Karnataka, India.
[c] Department of Seed Science and Technology, College of Agriculture Bheemarayanagudi, University of Agricultural Sciences, Raichur -584104, Karnataka, India.
[d] Department of Agricultural Economics, College of Agriculture Gangavathi, University of Agricultural Sciences, Raichur -584104, Karnataka, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2024/v42i52433

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/114193

Original Research Article

Received: 25/01/2024
Accepted: 29/03/2024
Published: 13/04/2024

ABSTRACT

The cotton industry is a cornerstone of the global agricultural sector, contributing significantly to economies, employment, and trade. The improved situation regarding hybrid seeds made this investigation to undertake the present study on "Input use pattern and cost and return of hybrid

[++] M.Sc., Student;
[#] Senior Farm Superintendent and Head;
[†] Professor & Head;
[‡] Assistant Professor;
**Corresponding author: E-mail: channamma246@gmail.com;*

cotton seed production", with major objectives as to study the cost and returns in hybrid cotton seed production and to study the labour use pattern in hybrid cotton seed production in the study area and to suggest appropriate remedial measures. For this study multistage sampling method as well as snow ball technique was adopted to select districts based on highest area and 60 hybrid cotton seed growers. The per acre total labour utilised for the production of hybrid cotton seed was 2075.73 labour days. The per acre total cost incurred for hybrid cotton seed (cost C) stood at ₹ 1,78,204. Cost of production per quintal over the total cost (cost C) was ₹ 20,965 per quintal. Returns per rupee of expenditure results revealed that HCSG obtained ₹ 1.77 returns per rupee of expenditure. Overall, these findings underscore the potential benefits of hybrid seed production in terms of both net returns, overall type of costs and rate of return per rupee of expenditure, despite the higher initial cost.

Keywords: Cost; cotton; net return; hybrid; seed; labour days.

1. INTRODUCTION

Cotton (*Gossypium herbaceum*) is as ancient as the human civilization. Exclusive cotton fabrics have become a status symbol and are becoming increasingly costlier. Cotton, the 'White Gold' and 'King of Fibres', is a crop of prosperity and is considered to be an industrial commodity of worldwide importance. Cotton is the world's most important natural fiber crop, accounting for more than half of all fiber used in textile production. It is more valuable than synthetic fibers, and it is cultivated in more than 80 nations worldwide. It's the only crop that produces natural fiber, edible oil, and seed by-products for livestock feed. Furthermore, it generates revenue for hundreds of millions of people. It's an agro-industrial crop grown in both developing and industrialized nations [1,2].

Globally, 27 M tonnes of cotton was produced from 33 million hectare of land in the year 2022. Major cotton-producing countries in the world are India, the USA, China, Pakistan and Brazil in area wise. Global exports stood at 9.96 million metric tonnes. The USA is the top exporting country with 2.96 million metric tonnes, followed by Brazil with 2.10 million metric tonnes.

In India, cotton is grown over 129.57 lakh hectares in India, yielding 371.00 lakh bales and a 487 kg/ha productivity. The top ten cotton-producing states in India are Gujarat, Maharashtra, Telangana, Karnataka, Andhra Pradesh, Haryana, Madhya Pradesh, Rajasthan, Punjab and Tamil Nadu (together known as the "cotton basket of India"). They account for more than 95 per cent of the country's cotton production. Approximately 65 percent of the cotton crop in the country is grown in rainfed conditions.

In Karnataka, average per hectare cotton yield was 274 kgs of lint which is 85 per cent of the national average yield of 322 kgs. In the state, cotton is grown in an area of 8.17 lakh hectares with a total production of 2,330 thousand tonnes desi cotton occupies nearly 30 per cent of the total area under cotton. Cotton is an important commercial crop which can be grown in all parts of Karnataka. Dharwad, Ballari, and Raichur are the major cotton cultivating districts of Karnataka (Anon., 2022b).

1.1 Cotton Seed

The cotton industry is a cornerstone of the global agricultural sector, contributing significantly to economies, employment, and trade. Hybrid cotton seed production, a key aspect of the cotton industry, has undergone a remarkable transformation over the past few decades. Hybrid cotton seeds are engineered to exhibit superior traits, such as increased yield, pest resistance, and better fibre quality. These traits have led to enhanced productivity and profitability for cotton farmers, making hybrid cotton seed production a crucial driver of modern cotton agriculture.

Cotton hybrids are specifically bred to exhibit higher yield potential compared to traditional varieties. They often result in plants with improved growth characteristics, such as increased boll production, more effective utilization of nutrients, and enhanced tolerance to environmental stressors. Hybrid seeds produce plants that are more uniform in terms of growth, maturity and boll development. This uniformity makes it easier for farmers to manage their crops, plan harvesting schedules, and optimize resource allocation. Cotton hybrid seeds are often bred to carry resistance to common pests and diseases that can negatively impact cotton crops. This reduces the need for excessive

pesticide use, which is beneficial for both the environment and farmers' profitability. Cotton hybrids are selected for better fibre characteristics, such as length, strength, fineness, and colour. Improved fibre quality can lead to higher market prices for the cotton produced, benefiting farmers' income.

The global cotton seed market is competitive, with the leading players capturing a whopping share in revenues. Longping High-tech, Monsanto, DowDuPont, Nuziveedu Seeds Ltd, Kaveri Seeds, Mayur Ginning & Pressing Pvt. Ltd, Bayer AG, Corteva Agriscience, Maharashtra Hybrid Seeds Co. (Mahyco), and Namdhari Seeds Pvt. Ltd. are focused on technology advances for new launches at affordable prices. The major players are utilizing strategies including acquisitions & mergers, regional expansion, and partnerships to stand out as strong competitors in the market [3].

Indian cotton farmers use certified seed, truthful label seed, open market seed and rarely their planting seed. The Seed Act of Govt. of India of 1966, designed to regulate seed quality, seed certification is not mandatory but labelling of seed is compulsory. State Seed Corporations (SSC), Private Seed Companies and other seed-producing agencies market certified seeds through their own seed outlets, distributors and dealers. Agencies other than SSCs also produce truthful label seeds. Private Seed Companies have a major share (more than 55%) in the production and marketing of both public and private bred hybrids. Cotton hybrid seeds hold significant importance in modern agriculture due to their various advantages and contributions to the cotton industry.

Cotton seed production in India is concentrated in five states, namely, Andhra Pradesh, Tamil Nadu and Karnataka in South India and Gujarat and Maharashtra in the central part of India. These five states account for nearly 95 per cent of total cotton seed production in the country. Of the total 98,000 acres of cotton seed production in India in 2021-22, Gujarat has the largest area covering nearly 54,000 acres (55%) followed by Andhra Pradesh with 24,000 acres (24.50%) and Karnataka with 9,000 acres (9.20%) [4]. The India Cotton Seed Market (seed for sowing) is projected to register a compound annual growth rate of 3.86 per cent hybrids have a higher share in the cotton seed market, accounting for 97.6 per cent of the market value in 2021.

In Karnataka, seed production began in the 1970s and Karnataka was the first state in south India to produce hybrid cotton seeds for commercial cultivation. The Cotton seed production was mainly concentrated in the conventional seed production areas like Raichur, Koppal, Gadag, Bagalkot and Haveri and it was very meagre in the Nonconventional areas like Chikkaballapura and Tumkur. Both public and private organizations and companies are involved in the production and distribution of hybrid cotton seeds. The cotton seed industry has emerged as an important component in the seed market basically due to its ability for the development of hybrids and diversity of production. It becomes very important on the part of the seed producer to deliver good seeds at the right time, at the right place and required quantities for better performance of the company. To satisfy the continuous demand for cotton seeds by the farmers, several seed companies in the corporate sector are supplying seeds in the cotton-growing region [4].

In Kalyan Karnataka Raichur and Koppala together contribute nearly 50.47 per cent of the area under hybrid cotton seed production in the state. Seeds are mainly distributed through seed coordinators of the respective private companies. In the year 2021-22, the total area under seed production by different companies was 24,895 acres [5].

In Kalyana Karnataka many people are involved in seed production activity as owing to realization of higher profitability [6]. However literature review suggests very limited information on economic profitability of seed production [7]. Therefore an attempt was made to assess cost and return structure of hybrid cotton seed production with special reference to labour usage as it contribute highest cost of production to the farmers of seed production. More specifically, the objectives of the study are: To work out the cost and returns in hybrid cotton seed production and to study the labour use pattern in hybrid cotton seed production in the study area and to suggest appropriate remedial measures.

2. MATERIALS AND METHODS

The multistage sampling technique was adopted for selection of study area and area was chosen based on highest area under cotton seed production. The snow ball technique was adopted for collection of primary data from sample farmers. Hybrid cotton seed is grown

extensively in Kalyana Karnataka region of Karnataka i.e., 50.47 per cent of the area, hence, this area was purposively selected for the study. Kalyana Karnataka contains seven districts. In the first stage two districts were selected based on highest area under cotton seed production. Based on the information obtained from Agricultural officers and seed coordinators two taluks were chosen and in the third stage villages were chosen based on data obtained from seed coordinators. Finally 60 sample farmers from six villages were selected using snow ball sampling method.

2.1 Nature and Sources of Data

The primary data required for the study were collected through personal interview method with the help of pre-tested and well structured schedules and data pertained to the 2022- 23 crop year. The secondary data on area, production, productivity of hybrid cotton seed were collected from Department of Agriculture and Directorate of Economics and Statistics (DSO) of respective districts and district wise seed coordinators.

2.2 Analytical Tools Applied

The tabular presentation technique was employed to calculate frequencies, percentages, averages and management cost concepts were applied to know the profitability of hybrid cotton seed production.

2.3 Cost Concepts

The total input costs of hybrid cotton seed production have been distributed under three heads using the accepted cost concepts ‘A’, ‘B’ and ‘C’.

Cost A

Cost A: This cost represents the Actual paid out costs for owner cultivator includes actual expenditure incurred in cash and kind i.e. the cost on account of hired human labour, hired plus owned bullock labour, seed value manure and fertilizers, interest on working capital, depreciation and repair of implement and land revenue, etc.

Cost ‘B’

Cost ‘B comprised of Cost ‘A’ + imputed rental value of land and interest on fixed capital.

Cost ‘C’ Comprised of Cost ‘B’ + imputed value of family human labour. Thus the Cost ‘C’ presents the total cost of cultivation.

2.4 Evaluation of Inputs

Inputs are the factors of production they refer to those expenses of cultivation that are incurred in the form of cash and kind. The items considered are as : Physical inputs; Human labour, Bullock labour, Machine, Seed, Manures, Fertilizers, Plant protection, Depreciation on implement and machinery. Monetary inputs ;Land revenue, Interest on working capital, Interest on fixed capital, Rental value of the land. And special assessment on labour input usage is done as it holds major share in total cost of production.

3. RESULTS

The present investigation entitled “To study the Input use pattern and Cost and returns of hybrid cotton seed production in Kalyana Karnataka region of Karnataka, India” was undertaken with a view to identify the profitability and labour use pattern in the study area. The data collected were analysed and the results have been presented;

3.1 Input Utilization in Hybrid Cotton Seed Production

The input used per acre in hybrid cotton seed production are presented in Table 1. The observed input use pattern was found to be higher in hybrid cotton seed production (2075.73 labour days), followed by machine labour (21.13 hours), plant protection chemicals (20.96 litres) and bullock labour (18.29 pair days). The higher labour requirement in hybrid seed production was due to activities like land preparation, emasculation and pollination, intensive irrigation, inter-cultivation operations and other seed production processes. Table 1 also revealed that 1267 grams of seeds were used per acre in hybrid seed production. This is on par with the recommended seeds of 1200 grams per acre. The total quantity of manure applied to enrich soil fertility during the seed production process was 1.40 tonnes per acre. Crossing materials like plastic lockets (22 kg), cotton threads (18 kg) and pins were commonly used in the seed production process. These results were in confirmaty with the results recorded by Bellundagi, et al. [8] in his study on “Bt cotton seed production: Inter-company analysis in Karnataka”.

Table 1. Input utilization pattern in hybrid seed and commercial crop production of cotton

(Per acre)

Sl. No	Inputs	Units	HCSG
1	Seeds	Gm	1267.54
2	Farmyard manure	Tonnes	1.40
3	Fertilizer	Kg	486.18
4	Micronutrients	Kg	4.68
5	Human labour	Labour days	2075.73
6	Bullock labour	Pair days	18.29
7	Machine labour	Hours	21.13
8	Plant protection chemicals	Litre	20.96
9	Crossing materials		
a	Plastic lockets	Kg	22.00
b	Cotton threads	Kg	18.00
C	Pins	Kg	9.00

Table 2. Operation-wise human labour utilization pattern in hybrid seed production of cotton

(Per acre)

Sl. No	Activity	Gender division	HCSG	
			No. of labour days	Percentage
1	Land preparation	Male	10.00	0.48
2	Sowing	Female	9.00	0.43
3	Fertiliser application	Male	12.71	0.61
		Female	5.63	0.27
4	Pesticide application	Male	11.76	0.56
5	Inter-cultivation operations	Female	25.00	1.20
6	Emasculation and pollination	Female	1783.78	85.93
7	Picking of kapas	Female	177.29	8.54
8	Other activities (irrigation, drying, transportation etc)	Male	40.56	1.95
Total			**2075.73**	**100.00**

3.2 Operation-wise Human Labour Utilization Pattern in Hybrid Cotton Seed Production

Human labour is an important and key input used in the hybrid cotton seed production. Knowing the efficient utilisation of labour, which affects the growth of any farm, is the need of the hour. An investigation of the pattern and consistency of labour usage in hybrid cotton seed production. The operation-wise labour used in the production of hybrid cotton seed is presented in Table 2.

Hybrid cotton seed production is a highly labour-intensive activity; it requires about 10 times more labour days than commercial cotton production and indeed, cotton cultivation is more labour-intensive than any other crop production. The total labour utilised for the production of hybrid cotton seed was 2075.73 labour days. However, operations viz. emasculation and pollination (1783.78 labour days), picking of kapas (177.29 labour days) and other activities like irrigation, drying and transportation (40.56 labour days) were the major labour-consuming operations. It is also evident that the division of labour in different activities indicates that, to a large extent, cotton seed cultivations is dependent more on female labour. In hybrid seed production, women labourers were mostly employed in two important major works: emasculation and pollination (84.93%), followed by picking of kapas (8.54%). The results also revealed that nearly 96 per cent of the women labourers were employed in production of hybrid cotton seed. Similar conclusion were reported by Chulaki M [9] with his study on “Production and marketing of hybrid cotton seed in Northern Karnataka-an economic analysis”.

Table 3. Profitability of hybrid cotton seed production

(Per acre)

Sl. No	Particulars	HCSG (n=60)	
		Values (₹)	Percentage to total (cost C)
1	Human labour	89179.40	50.04
2	Bullock labour	3275.58	1.83
3	Machine labour	3738.79	2.09
4	Seeds	3804.55	2.13
5	FYM	1832.93	1.08
6	Fertilizer	11962.56	6.71
7	Pollination materials	3700	2.07
8	Micronutrients	2363.81	1.32
9	PPC	33262.90	18.66
10	Land revenue	66.93	0.03
11	Depreciation	591	0.33
12	Interest on working capital@7%	10764.50	6.04
Cost A		164543	92.33
13	Rental value of land	3715	2.08
14	Interest on fixed capital@12%	445.8	0.25
Cost B(CostA+13+14)		168704	94.66
15	Imputed value of family labour	9500	5.33
Cost C (Cost B+15)		178204	100

Table 4. Yield and return structure of hybrid seed production of cotton

(₹/ acre)

Sl. No	Particulars	Yield (q/acre)	HCSG
1	From seed	5.5	275000
2	From lint	3	42000
3	Total	8.5	317000

Table 5. Cost of production per quintal among different costs

(Per quintal)

Sl. No	Particulars	HCSG
		Cost of production/q
1	Cost A	19358
2	Cost B	19847
3	Cost C	20965

Note: Yield from hybrid seed production 8.5 q/acre
Yield from commercial crop production 13.04 q/acre

Table 6. Returns from hybrid seed production of cotton

(₹/acre)

Sl. No	Particulars	HCSG (n=60)
1	Return over Cost A (Farm business income)	152457
2	Return over Cost B	148296
3	Return over Cost C (Net returns)	138796
4	Returns per rupee of expenditure	1.77

3.3 Cost and Returns of Sample Farmers in Production of Hybrid Cotton Seed

The study of costs and returns of hybrid seed and commercial crop production of cotton helps farmers maximise profits by adopting efficient resource management practices. Actual paid-out costs (cost A) for owner-cultivator include expenses on labour utilised for performing cultural operations and expenditure on material

inputs like seed, manures, fertilisers, plant protection chemicals, land revenue, depreciation, hired labour, total bullock labour, machine labour and interest on working capital. Imputed cost (cost B), which includes cost A plus the rental value of land and interest on fixed capital. Cost C is the total cost of production, which includes all cost items, actual as well as imputed. The value of holding its own labour is to be imputed and added to Cost B.

The per acre cost incurred for hybrid cotton seed is presented in Table.3. The total cost of production (cost C) incurred in hybrid cotton seed production stood at ₹ 1,78,204. With respect to actual paid-out cost, hybrid seed production was ₹ 1,64,543, which includes human labour (50.04% of the total cost) as a major component, followed by plant protection chemicals (18.66% of the total cost) and fertiliser (6.71%) of the total cost of production of hybrid cotton seed. The imputed cost (cost B) per acre was ₹ 1,68,704 in hybrid cotton seed production. Hybrid seed production, due to its specialised nature and inherent requirements, leads to higher production costs across all cost categories.

Results with respect to yield and returns obtained from hybrid cotton seed production is summarised in Table 4. The results revealed that the production hybrid seeds yielded 5.5 quintals of cotton seed per acre and the by-product, cotton lint, of 3 quintals per acre, with a remarkable total yield of 8.5 quintals per acre. The impressive average gross return of ₹ 3,17,000 per acre, with ₹ 2,75,000 produced from the sale of cotton seeds and an additional ₹ 42,000 from the sale of cotton lint, further strengthens HCSG's success. This information highlights the commercial viability and profitability of the production of hybrid seeds.

Cost of production per quintal among different categories of cost are presented in Table 5. Findings from analysis revealed that the cost of production over cost A was ₹ 19,358 in hybrid cotton seed production. Production cost per quintal over imputed cost (cost B) was ₹ 19,847 in hybrid seed production and Cost of production per quintal over the total cost (cost C) was ₹ 20,965 per quintal.

Table 6 shows the analysis of returns obtained by HCSG for various cost categories. The findings showed that farm business revenue or income (return over cost A) was ₹1,52,457 per acre. With respect to farm investment income or owned farm business income, returns over cost B was ₹ 1,48,296 and net returns (return over cost C) were ₹ 1,38,796 in hybrid cotton seed production. Returns per rupee of expenditure results revealed that HCSG obtained ₹ 1.77 returns per rupee of expenditure. This indicated that hybrid seed production offered a more efficient utilisation of resources in terms of generating returns for every unit of expenditure. It was observed from the qualitative information that these hybrid seeds were mainly marketed through the seed coordinator to the respective company, who was appointed by the respective company to act as a guiding and marketing agent in the local area. Along with these activities, the seed coordinator provides technical guidance to farmers with respect to seed production.

Overall, these findings underscore the potential benefits of hybrid seed production in terms of both net returns, overall type of costs and rate of return per rupee of expenditure, despite the higher initial cost. However, it's essential to consider factors such as market demand, risk management, and long-term sustainability when making decisions related to agricultural production strategies. Further research and analysis may shed light on the broader implications and practical applications of these results within the agricultural sector.

4. CONCLUSIONS

The following conclusions have been drawn from the findings,

1. The input utilisation pattern revealed that hybrid seed production was more labour-intensive than the commercial crop production of cotton. There is a scarcity of labour, particularly skilled labour, in the study area.

2. Findings of labour use pattern revealed that women labourers are mostly employed in emasculation and pollination, sowing and weeding activities. Therefore, extension functionaries and seed coordinators need to organise appropriate skill-enhancing training programmes for the farmers who are involved in seed production activities, as it requires skilled labour for specific processes like emasculation and pollination.

3. The findings on cost and return emphasise the economic challenges faced by hybrid

seed producers, particularly in terms of labour use and specialised inputs. Such insights are valuable for stakeholders and policymakers when devising strategies to support sustainable agricultural practices like efficient utilisation of inputs, use of improved technologies to reduce cost of production and ensuring equitable economic outcomes for different types of cotton growers.

4. The findings suggest the cost of production per quintal in hybrid cotton seed production was found remarkably high. Therefore, efforts such as providing scale of finance and different kinds of production loans for HCSG by institutes like financial institutes, banks and other cooperatives can help farmers reduce the cost of production and encourage farmers to adopt hybrid cotton seed production.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Dong HZ, Li WJ, Tang W, Li ZH, Zhang DM. Increased yield and revenue with a seedling transplanting system for hybrid seed production in Bt cotton. Journal of Agronomy and Crop Science. 2005 Apr;191(2):116-24.
2. Visawadia HR, Fadadu AM, Tarpara VD. A comparative analysis of production and marketing of Bt cotton and hybrid cotton in Saurashtra region of Gujarat state. Agricultural Economics Research Review. 2006;19(2):293-300.
3. Anonymous. Global cotton seed market; 2023a.
Available:www.datamintelligence.in
4. Anonymous. Indian cotton seed market; 2022c.
Available:www.mordorintelligence.com
5. Anonymous. Annual report (2022-23). Kaveri Cotton Seed Company. 2023b;105
6. Venkateswarlu D. Child bondage continues in indian cotton supply chain: More than 400,000 children in india involved in hybrid cottonseed cultivation. International Labour Right Forum. 2007; 1-39.
7. Dulal PR, Marahatta S, Karn R. Comparative economics of maize grain and seed production in Okhaldhunga district, Nepal. Journal of Agriculture and Natural Resources. 2020;3(1):133-147.
8. Bellundagi V, Patil SS, Jadhav V, Dasari JR. Bt cotton seed production: Inter-company economic analysis in Karnataka. Economic Affairs. 2016;61(2):251-258.
9. Chulaki BM. Production and marketing of hybrid cotton seeds in northern karnataka-an economic analysis (Doctoral dissertation, University of Agricultural Sciences); 2001.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/114193