Castor cultivation– an approach to get sustainable income under rainfed condition

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ABSTRACT

The main focus of the present study was to assess the effect of cultivation of improved castor variety YTP 1 as pure crop under rainfed ecosystem in Tiruchirappalli district, Tamil Nadu. ICAR- Krishi Vigyan Kendra, Sirugamani, Tiruchirappalli district, Tamil Nadu introduced high yielding improved variety castor YTP 1 as pure crop through demonstrations in 4.0 ha (10 demonstrations). Interview schedule and focus group discussions were used on one hundred respondents randomly selected in the study area. The demonstrations were conducted during kharif season of 2019. Trainings on seed to seed castor cultivation techniques were imparted to selected farmers. Source seed (certified seed 1) was given to the farmers for sowing. Frequent field visits and inspections were made by the KVK scientists. The farmers harvested a castor yield of 12.7 q/ha from YTP 1 variety compared to 10.3 q/ha using inferior quality castor seed. There was a gross margin of Rs 1,60,625 per hectare and average cost-benefit ratio of 1:2.28 due to YTP 1 variety. It was noticed that more yield and easy marketing were influencing factors for higher profitability of castor cultivation. The study concluded that the respondents preferred high yielding varieties like YTP 1 over local varieties.

Keywords: Castor; improved variety; alternate crop; pure crop; yield; income

INTRODUCTION

Climate change is likely to impact agriculture and food security across the globe. A large fraction of the world's food is grown as rainfed annual crops in the tropics where climate variability plays an important role in determining productivity. Asia alone has more land under cultivation than all of the industrialized nations taken together (Slingo et al 2005). Persistent low level of farmers' income under rainfed condition can cause serious adverse effects on the future of agriculture in the country.

To secure the future of agriculture and to improve livelihood of half of India's population, adequate attention needs to be given to improve the welfare of farmers and raise agricultural income. Introduction, adaption and acceptance of new crops and new varieties as well as new and upcoming production technologies can potentially strengthen farmers' cropping systems by increasing yields, improving drought resilience, boosting resistance to pests and diseases and also by capturing new market opportunities. There is a need to identify crops and varieties that may suit to a range of environments and farmers' preferences (Khanam et al 2018).

Agricultural crop diversification is an important stress relieving option for economic growth of the farming community. Crop diversification and advanced crop varieties can enable farmers to gain access to national and international markets with new products, food and medicinal plants. Diversifying from the monoculture of traditional staples can have important nutritional benefits to farmers in developing countries and can support a country for becoming more self-reliant in terms of food production. Diversification can also manage price risk on the assumption that not all products will suffer low market prices at the same time and increase the profitability of the farming community. Crop diversification provides better conditions for food security and enables farmers to grow surplus products for sale in the market and thus help to obtain increased income to meet other needs related to household wellbeing (Khanam et al 2018).

Castor (*Ricinus communis* L) is an indeterminate and non-edible oil seed crop grown in low rainfall regions of semiarid India. Castor is an important famous oilseed crop grown in rainfed and also in irrigated condition (Daisy and Thavaprakaash 2019). Earlier cultivation of castor was limited to high altitudes but with the advantage of biodiesel production, cultivation of castor crop has become important by providing effective land utilization pattern in dryland cropping system with profit generation and creating employment opportunities for farm families.

India ranks first in castor bean production in the world followed by China and Brazil. In India castor is cultivated mainly in Gujarat, Telangana and Andhra Pradesh. To a lesser extent it is produced in states like Rajasthan, Karnataka, Tamil Nadu, Maharashtra and Orissa. Castor can be grown on all types of soils having good drainage. In Tamil Nadu castor is cultivated in two different ecosystems. Hybrids are cultivated mainly as pure crop both under rainfed and irrigated system. Castor varieties are cultivated as intercrop or mixed crop with pulses and groundnut. Castor varieties are also cultivated as shade crop for turmeric and as bund crop with cotton and vegetables (Venkatachalam et al 2020). The crop responds well to good management and copious inputs. Castor oil has numerous uses in production of biodiesel, polimer materials, soap, waxes, greases, lubricants, hydraulic and brake fluids, painting industry etc. Oil cake is used as fertilizer. Currently castor oil is used as an animal feed for energy production (Patel et al 2016).

Participatory on-farm research was done to assess the effect of castor crop as pure crop on changes of farmers' income under rainfed situation in Tiruchirappalli district of Tamil Nadu.

METHODOLOGY

The villages covered under the study were Nettavelampatti (6 locations) and Sevanthalingapuram (4 locations) in Tiruchirappalli district, Tamil Nadu. Farmers involved in castor cultivation were selected for this study based on their involvement and experience in castor cultivation. A preliminary survey of the farms and farmers was carried out during the production season by a multidisciplinary team of researchers during which a focus group discussion was conducted with the participating farmers. This formed the design of interview schedule used for data collection during May 2019. A stratified random sampling method was used to select 100 farmers from the study area. The information on expenses involved in production of different rainfed crops was collected and compared for conclusion. Sorghum, cotton, groundnut and castor as intercrops are the important drought tolerant crops grown in this area covering about more than 1,550 ha.

ICAR- Krishi Vigyan Kendra, Sirugamani, Tiruchirappalli district, Tamil Nadu introduced high yielding improved variety castor YTP 1 as pure crop through demonstrations in 4.0 ha (10 demonstrations). The demonstrations were conducted during kharif season of 2019. All inter-cultural operations were followed as per the recommendations of Tamil Nadu Agricultural University.

The YTP 1 variety is red stemmed, triple bloom and spiny. The variety can be maintained as perennial with average yield of 3 kg/plant/annum. It is resistant to lodging with non-shattering capsules. This variety is specifically known for high basal branching with more than 95 per cent of female flowers. It is suitable for irrigated and rainfed condition, fertilizer responsive and suitable for intercropping also. YTP 1 is suitable for pure border and mixed intercrop, resistant to semilooper, *Spodoptera*, thrips and capsule borer. First harvest could be done on 120th day of sowing. Capsules were harvested after attaining physiological maturity. The yield and income of farmers from existing crops and variety were considered as check plot and collected for interpretation. The calculation of benefit-cost ratio was done by finding the ratio between the gross return and gross cost of production (Marimuthu and Surendran 2015). From sowing to harvest, respondent farmers were taken to the demonstration fields and their feedback was collected. To determine the factors influencing the profitability of castor production in the study area, interview schedule and focus group discussions were used on the respondents randomly.

RESULTS and DISCUSSION

Performance of new variety Castor YTP 1

The total income accrued to the farmers from the castor cultivation under rainfed condition is presented in Table 1. It consisted of the monetary value of all products and byproducts like stalk. It was found that on an investment of Rs 70,500/ha, average Rs 1,60,625/ha was realized. The cost-benefit ratio was 2.28. In terms of yield, farmers received an average

Table 1. Comparison of benefit-cost ratio of improved variety YTP 1 and local variety of castor

Component	Old local variety	Improved castor variety YTP 1	Additional income obtained through seed production (%)
Yield obtained (q/ha)	10.3	12.7	23 .3
Production cost (Rs/ha)	65,500	70,500	7.6
Gross income (Rs/ha)	1,11,250	1,60,625	44.4
Net income (Rs/ha)	45,750	90,125	97.0
Benefit-cost ratio	1.69	2.28	34.9

Table 2. Distribution of respondents (farmers) on the basis of preference for improved castor variety YTP 1

Component	Preference (%)		
	Local variety	Intermediate	Castor YTP 1
Pest and disease resistance	12	14	74
Grain yield	20	22	58
Low input requirement	29	35	36
Accessibility and availability of seed	44	24	32
Climate variation resistance	42	10	48
Time of maturity	12	18	70
Ease of processing during harvesting	4	10	86
Socio-cultural compatibility	20	26	54
Market price	30	16	54

yield of 12.7 q/ha of castor variety YTP 1 against 10.3 q/ha of old local castor variety under similar management practices. The crop resulted in 23.3 per cent additional yield and thus proved highly profitable. Similar trend was observed by Venkatachalam et al (2020) in castor. Geetha et al (2019) also reported that identification of better lines would be helpful in the process of improving castor productivity and production under rainfed situation.

Outlook on superiority of new castor variety YTP 1 over local variety

The responses of the farmers were compared between the attributes of old and improved castor variety YTP 1 (Table 2). The farmers expressed their preference for castor variety YTP 1 on the aspects like pest and disease resistance (74%), grain yield (58%), climate variation resistance (48%), time of maturity (70%), ease of processing during harvesting (86%), socio-cultural compatibility (54%) and market price (54%). Chindi et al (2017) reported that improved crop varieties are widely recognized as fundamental input for ensuring increased production and productivity. However majority of the respondents preferred the local and old varieties in terms of ease of accessing and availability of seeds under regular cultivation.

Economic difference of various crops vs castor variety YTP 1 under rainfed situation

The economics of castor variety YTP 1 was compared with other crops grown in the region (Table 3). The highest yield per hectare was recorded in case of groundnut (1,950 kg/ha) followed by sorghum (1,650 kg/ha), pearl millet (1,500 kg/ha) and castor YTP 1 (1,270 kg/ha). Highest cost of cultivation per hectare was involved in groundnut (Rs 1,11,317 ha) followed by castor variety YTP 1 (Rs 70,500). The highest gross income (Rs 2,04,861) was also realized from groundnut followed by castor variety YTP 1 (Rs 1,60,625). The highest net income of Rs 93,544 was also recorded in case of groundnut followed by castor variety YTP 1 (Rs 90,125). But highest benefit-cost ratio (2.28) was realized in case of castor variety YTP 1 followed by 1.84 in case of groundnut. Based on the experiment it can be concluded that the cultivation of castor as pure crop recorded more profit. Hence new crop castor in

Table 3. Economic difference of various crops vs castor variety YTP 1 under rainfed situation

Crop	Yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B-C ratio
Cotton	815	30,550	65,100	34,550	2.13
Sorghum	1,650	17,500	29,700	12,200	1.7
Pearl millet	1,500	14,000	24,000	10,000	1.7
Groundnut	1,950	1,11,317	2,04,861	93,544	1.84
Castor local variety	315	8,500	14,280	5,780	1.68
Castor as pure crop with improved variety YTP 1	1,270	70,500	1,60,625	90,125	2.28

rainfed condition is a viable option for combating negative impacts of climate change. Similar view on agroforestry system under low rainfall areas was expressed by Singh et al (2013). Direct marketing of castor from producer to oil industry was found to be strongest marketing channel and farmers avoided to sell their product through private players and traders.

CONCLUSION

Resistance to biotic and abiotic stresses, high yield and superior quality of castor YTP 1 proved major attributes that determined its adoption. Better economic return and sustainable flow of income convinced the farmers to adopt the improved castor variety. On the basis of the above findings it can be inferred that improved variety with drought tolerant capacity can play a central role in livelihood security of farmers under low rainfall areas. The study recommended a strong need to intensify promotion of castor YTP 1 in low rainfall areas.

REFERENCES

Chindi A, Shunka E, Solomon A, Gebremedhin WG, Seid E and Tessema L 2017. Participatory potato seed production: a breakthrough for food security and income generation in the central highlands of Ethiopia. Open Agriculture **2(1):** 205-212.

Daisy M and Thavaprakaash N 2019. Yield performance of castor hybrid (YRCH 1) to different crop geometry levels under SCI practices. Chemical Science Review and Letters **8(29):** 79-82.

Geetha A, Shankar GG and Priya B 2019. Variability of physiological and yield parameters of castor genotypes under rainfed conditions. Journal of Pharmacognosy and Phytochemistry **8(1):** 197-199.

Khanam R, Bhaduri D and Nayak AK 2018. Crop diversification: an important way-out for doubling farmers' income. Indian Farming **68(1):** 31-32.

Marimuthu S and Surendran U 2015. Effect of nutrients and plant growth regulators on growth and yield of black gram in sandy loam soils of Cauvery new delta zone, India. Cogent Food and Agriculture **1(1):** 1010415, doi: 10.1080/23311932.2015.1010415

Patel VR, Dumancas GG, Viswanath LCK, Maples R and Bryan Subong BJJ 2016. Castor oil: properties, uses and optimization of processing parameters in commercial production. Lipid Insights **9:** doi: 10.4137/LPI.S40233.

Singh N R, Jhariya MK and Raj A 2013. Tree crop interaction in agroforestry system. Readers Shelf **10(3):** 15-16.

Slingo JM, Challinor AJ, Hoskins BJ and Wheeler TR 2005. Introduction: food crops in a changing climate. Philosophical Transactions of the Royal Society B: Biological Sciences **360(1463):** 1983-1989.

Venkatachalam SR, Arutchenthil P, Kathirvelan P and Deivamani M 2020. YTP-1 (YRCS-1205): a promising castor variety for Tamil Nadu. Journal of Oilseeds Research **37(Spl Issue):** 53.