**STUDIES ON THE ECONOMICS OF BABY CORN CULTIVATION UNDER SOLE AND INTERCROPPING WITH SHORT DURATION VEGETABLES**

**ABSTRACT**

 A study was conducted on the feasibility of cultivating vegetables including fenugreek, radish, and Amaranthus with baby corn crop and evaluated the effects of intercropping. The study was conducted during rabi season 2022-2023 in farmer’s field of Nambal village, Mancherial District, Telangana to find out the most suitable and profitable baby corn intercropping with different short duration vegetable crops. The experiment was laid out in Randomized Block Design with ten treatments which was replicated thrice. The treatments comprised of baby corn as main crop along with radish, fenugreek and amaranthus as inter crops in different combinations and sole cropping of baby corn, radish, fenugreek and amaranthus. The results of the research showed that baby corn + radish + fenugreek intercropping system registered the higher baby corn equivalent yield of 10.44 t ha-1. The highest gross returns (₹322175), net return (₹258758) and returns per rupee invested (Benefit: Cost ratio) was also highest (4.08) in this treatment.

**Keywords:** baby corn, intercrops, baby corn equivalent yield benefit: cost ratio, economics.

**INTRODUCTION**

“Maize (*Zea mays* L.) is a crop of the 21st century due to itshigher yield potential and versatility in growth and uses and it is a very important crop for food and nutritional security for the modern world, as it has multifarious uses, *viz.* food, feed, fodder, vegetables, and energy. In India, especially in peri-urban agglomeration, maize is taking place by replacing the other non-remunerative crops. Among the specialty corns, baby corn is becoming very popular owing to higher market demand, economic returns, export and huge employment generation potential” (Meena *et al.,* 2023). “Baby corn (*Zea mays*) refer to the young, fresh corn ear just before or within two to three days after silking but prior to pollination and fertilization, which upon de husking and de silking is used as vegetable. Generally, creamish-yellow to very light-yellow colored baby corn is preferred in the market” (Golada *et al*., 2013). “The commercial crop of the twenty-first century could be baby corn because of its versatility. The demand of the baby corn is increasing due to its nutritional value” (Mohan *et al.,* 2022). “It appends several health benefits as it is a highly nutritive crop having the capacity to convert more nutrients into food. For every 100 g of edible portion, it contains 88.10 percent moisture, 8.20 g carbohydrates, 1.90 g protein, 0.20 g fat, 28.00 mg calcium, 86.00 mg phosphorus, 0.10 mg iron, 0.50 mg thiamine, 0.08 mg riboflavin and 11.00 mg of ascorbic acid” (Jinjala *et al.,* 2016).

“Baby corn is dual purpose crop grown round the year in India (Singh *et al*., 2015). An interesting recent development is of growing baby corn for vegetable purpose. At present Thailand and China are the world leaders in baby corn production. Maize is currently grown in 170 countries around the world” (FAO STAT, 2020). “With a production of roughly 31.51 million tonnes and a productivity of 3.19 tonnes ha-1. In India, baby corn is being cultivated under large scale in Meghalaya, Western Uttar Pradesh, Haryana, Maharashtra, Karnataka and Andhra Pradesh. With an annual production of 1147.7 million tonnes from an area of 193.7 million hectares and an average productivity of 5.75 tonnes ha-1, maize is grown on an area of 9.86 million hectares in India” (Agri. Stat. at a Glance, 2021).

“In general, the rabi season is dominated by wheat, chickpea, safflower, vegetable, and pulse crops. To supply the needs of the growing population, there is a need to increase the productivity per unit area and per unit time, which can be achieved by increasing cropping intensity to fulfill the optimum food requirement of the country” (Mohan *et al*., 2023).

“The intercropping method is one promising way to increase productivity. Baby corn is the crop which performs best for intercropping systems since it is short-lived, requires little land due to its single stem upright growth habit rather than spreading, and provides companion crops with greater sunlight and aeration” (Adhikary *et al.,* 2015). Due to the demand for these crops in peri urban regions, it is advised that baby corn be intercropped with short-duration crops such legumes, leafy vegetables, pulses and vegetables. Additionally, it ensures increased land occupancy and increases farmer returns.

“Depending on the extent to which the component crops complement each other in using growing resources, different crops are going to have different rooting abilities, canopy structures, heights, and nutrient requirements” (Bijarnia *et al*., 2022). Growing of potential intercrops including radish, fenugreek, and amaranthus ensured more effective use of the land, increased yield stability, diversity of produce, and market opportunities. The intercropping method provides an opportunity to enhance dietary diversity, production stability, effective labour usage, intensification of production with restricted resources, as well as return maximization.

Keeping all this in view the present experiment was conducted on studies on the economics of baby corn cultivation under sole and intercropping with short duration vegetables

**MATERIALS AND METHODS**

A field experiment was carried out in Nambal village, Mancherial District, Telangana, during the rabi season of 2022 (January-March). The experimental site is located at 18.921674° N latitude and 79.164054° E longitude, at an altitude of 145 m above Mean Sea Level in northern Agro Climatic Zone of Telangana. The soil in the experimental region was black cotton soil with an alkaline pH (7.61), medium organic carbon (0.54), low available nitrogen (207.21), and medium available phosphorus (14.32) and potassium (125.19) during the late rabi season of 2022. The research study used baby corn hybrid G-5414, radish cv. Pusa chetki, local fenugreek, and amaranthus seeds.

The experiment was laid out by following the principles of Randomized Block Design, with ten treatments which were replicated three times. The plot size is 6 m x 3 m, and the details are as follows: T1- Baby corn +Radish, T2- Baby corn + Fenugreek, T3- Baby corn + Amaranthus, T4- Baby corn + Radish+ Fenugreek, T5- Baby corn + Radish+ Amaranthus, T6- Baby corn + Fenugreek + Amaranthus (in between the rows of baby corn), T7- Baby corn (sole crop), T8- Radish (sole crop), T9- Fenugreek (sole crop), T10- Amaranthus (sole crop).

Bunds were formed prior to sowing in accordance with the specified spacing. Baby corn hybrid G-5414 seeds were sowed in rows with 45cm between the rows and 25cm between plants. Intercrops were sown between two rows of baby corn. Radish seeds were hand-dibbled 10 cm apart, while amaranthus and fenugreek seeds were broad-casted between rows of baby corn. The recommended doses of nitrogen (150 kg ha-1) as urea, phosphorus (60 kg ha-1) as single super phosphate, and potassium (40 kg ha-1) as muriate of potash were applied according to the treatment plan. Initially, 50% of the N and K fertilizers were applied along with the full dosage of P. The remaining half of the N and K were applied as a top dressing at 25 DAS. All agronomic techniques were followed in accordance with the recommendations of the TamilNadu Agricultural University.

**RESULTS AND DISCUSSION**

The economics of baby corn with different short duration vegetables grown as intercrop in baby corn was worked out and presented in the table1 and 2.

**Baby corn equivalent yield**

The results pertaining to the effect of inter cropping of short duration vegetables with baby corn significantly influenced the performance of Baby corn Equivalent Yield was presented in table 1. The maximum BEY (10442.00 kg ha-1) was obtained in the treatment (T4) baby corn + radish + fenugreek which was followed by the treatment (T6) baby corn + fenugreek + amaranthus (9860.00 kg ha-1) and the lowest BEY (7300 kg ha-1) was obtained with sole baby corn (T7). Increased yields from radish and fenugreek in comparison to other intercrops without reducing the main crop yield and a higher market price for the intercrops may be the cause of the increased BEY with baby corn + radish + fenugreek (T4).This results are corroborates with the findings of (Rathika *et al.,* 2014), (Tejaswitha *et al.,* 2021) and (Meena *et al.,* 2023) in baby corn.

**Table: 1. Effect of inter cropping system on Baby Corn Equivalent Yield (BEY)**

|  |  |
| --- | --- |
| **Treatments** | **BEY** |
| **T1** - Baby corn + Radish | 8837.5 |
| **T2** - Baby corn + Fenugreek | 9006.25 |
| **T3** - Baby corn + Amaranthus | 8190 |
| **T4** -Baby corn + Radish + Fenugreek | 10442 |
| **T5** - Baby corn + Radish +Amaranthus | 9642.5 |
| **T6**-Babycorn+Fenugreek+Amaranthus | 9860 |
| **T7** - Baby corn (sole crop) | 7300 |
| **S.Ed** | **179.14** |
| **CD (p=0.05)** | **376.21** |

**Economics**

Irrespective of the intercropping systems tried with baby corn, the highest gross returns (₹322175) and net return (₹258758) was recorded in baby corn + radish + fenugreek (T4) which is significantly superior to sole baby corn(T7) (table 2). The returns per rupee invested (Benefit: Cost ratio) was also highest (4.08) in Baby corn + Radish+ Fenugreek (T4) treatment. The next desirable treatment was baby corn + fenugreek (T2) with highest gross returns (₹304250), net return (₹244333) and Benefit: Cost ratio 4.07 as the returns per rupee invested. The minimum net income (₹1,93,333) was recorded in the treatment baby corn + radish (T1) and this also recorded the lowest returns per rupee invested (3.16). Higher net returns were attributed to yield benefits in succeeding crop owing to inclusion of legume crop like fenugreek intercropping system. Similar results were also reported by Babu *et al.,* (2020). Inter cropping of baby corn with fenugreek was expected to provide an additional income to baby corn growers as fenugreek may provide a sufficient additional income in baby corn inter cropping system. Increased yields from fenugreek in comparison to other intercrops and a higher market price for the fenugreek may be the cause of the increased the B:C ratio. These similar findings are reported with Rani *et al.,* (2015) and Ruangsanka *et al.,* (2021) in baby corn.

**Table 2. Effect of inter cropping on Benefit: Cost ratio of baby corn**

|  |  |  |  |
| --- | --- | --- | --- |
| **Treatments** | **Gross returns** | **Net returns** | **B:C  ratio** |
| **T1** - Baby corn + Radish | 254500 | 193333 | 3.16 |
| **T2** - Baby corn + Fenugreek | 304250 | 244333 | 4.07 |
| **T3** - Baby corn + Amaranthus | 263100 | 204953 | 3.52 |
| **T4** - Baby corn + Radish +Fenugreek | 322175 | 258758 | 4.08 |
| **T5** - Baby corn + Radish +Amaranthus | 262200 | 200553 | 3.25 |
| **T6** - Baby corn + Fenugreek +Amaranthus | 281700 | 221303 | 3.66 |
| **T7** - Baby corn (sole crop) | 251650 | 193983 | 3.36 |

**CONCLUSION**

Based on this experiment it can be concluded that among all the intercropping systems, baby corn intercropped with radish and fenugreek was found promising for achieving higher gross returns, net returns and returns per rupee invested for its increased yield and higher market price under northern Agro-climatic zone of Telangana.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

**REFERENCES**

Adhikary, S., Pandit, M. K., Koundinya, A. V. V., Bairagi, S., and Das, A. 2015. Examination of system productivity and profitability of baby corn based vegetable intercropping systems. **J. of Crop and Weed., 11(1)**, 220-224.

Babu, S., Mohapatra, K.P., Das, A., Yadav, G.S., Tahasildar, M.,Singh, R., Panwar, A.S., Yadav, V. and Chandra, P. 2020.Designing energy-efficient, economically sustainable andenvironmentally safe cropping system for the rainfed maize–fallow land of the Eastern Himalayas. **Science of the TotalEnvironment722**: 137874.

Bijarnia, A., Tetarwal, J. P., Ram, B., Singh, P., Yadav, R., and Gupta, A. K. 2022. Interactive effect of intercropping systems and fertility levels on yield and economics of summer cowpea intensified with baby corn. **Ind. Soci. of Agri. Sci., 164**.

FAO STAT UNICEF. 2021. The state of food security and nutrition in the world 2021.

FAOSTAT. 2020. FAO Statistics, Food and Agriculture Organization of the United Nations, Rome.

Golada, S. L., Sharma, G. L., and Jain, H. K. 2013. Performance of baby corn (*Zea mays* L.) as influenced by spacing, nitrogen fertilization and plant growth regulators under sub humid condition in Rajasthan, India. **African J. of Agri. Res., 8(12),** 1100-1107.

Jinjala, V. R., Virdia, H. M., Saravaiya, N. N., and Raj, A. D. 2016. Effect of integrated nutrient management on baby corn (*Zea mays* L.). **Agri. Sci. Digest-A Res. J., 36(4)**, 291-294.

Kumar, A. and Singh, S.N. 2002. Production potential and economics of winter maize based intercropping systems. **Ann. Agric. Res., 23:** 532-534.

Meena, R. P., Dhar, S., Kumar, A., Rathore, S. S., Singh, V. K., Bamboriya, S. D., ... & Meena, M. C. (2023). Productivity and profitability of baby corn (*Zea mays*)-based cropping systems under various nutrient-management practices. **Ind. J. Agro.** ***68*(2),** 176-181.

Mohan KP, Rajesh S, Thakur I. 2022. Effect of phosphorus and zinc on yield and economics of baby corn (*Zea mays* L.). **J. Pharm. Innov. 11:**1466-1469.

Mohan, M., Khajanji, S. N., & Pandey, N. 2023. Baby Corn-Based Intercropping System in Enhancing the Growth and Production of Winter Season Baby Corn in Chhattisgarh Plains. **Int. J. Plant & Soil Sci. 35(20),** 393–396.

Nataraj, D., Murthy, K. N., and Viswanath, A. P. 2011. Economics of baby corn cultivation under sole and intercropped situation with leguminous vegetables. **Agri. Sci. Digest-A Res. J., 31(3):** 211-213.

Rajendra prasad meena, Shiva dhar, Ashok kumar, S.S. Rathore, V.K. Singh, Shanti devibamboriya, Hari singhmeena, Kamal garg, Dinesh kumar, & M.C. Meena. (2023). Productivity And Profitability of Baby Corn (*Zea Mays*L)-Based Cropping Systems Under Various Nutrient-Management Practices. **Indian Journal ofAgronomy, 68(2),** 176-181.

Rani, P. L., Sreenivas, G., and Katti, G. S. 2015. Baby Corn Based Inter Cropping System as an Alternative Pathway for Sustainable Agriculture. **Int. J. Curr. Microbiol. App. Sci., 4(8),** 869-873.

Rathika, S., Velayudham, K., Thavaprakaash, N., and Ramesh, T. 2013. Biological Efficiency of Legume Intercrops in Baby Corn (*Zea Mays* L.).  **Int. J. Agri. Environ. Bio technol., 7(3),** 627-633.

Reddy, V. B., Madhavi, G. B., Reddy, V. C., Reddy, K. G., and Reddy, M. 2009. Intercropping of baby corn (*Zea mays* L.) with legumes and cover crops. **Agri. Sci. Dig., 29(4):** 260-263.

Ruangsanka, S., Sanfan, S., and Chaiwong, U. 2021. Does Intercropping of Baby Corn (*Zea mays* L.) with Pulse Legumes Improve Soil Fertility, Crop Productivity and Profitability?.**J. Agri. Sci. 16(1):** 19-27.

Singh, A. K., Kumar, R., Bohra, J. S. and Kumawat, N. 2015. Fodder yield, nutrient uptake and quality of baby corn (*Zea mays* L.) as influenced by NPKS and Zn fertilization. ***Res. Crop.* 16:** 243-49.

Tejaswith, S., A. V. Nagavani, V. Chandrika A. Prasanthi and Pratap Kumar Reddy, A. 2021. Cropping Indices of Baby Corn based Intercropping Systems under Varying Crop Geometry. Int .J. Curr. Microbiol. App. Sci. 10(01): 3654-3660. doi: https://doi.org/10.20546/ijcmas.2021.1001.431