Indian Farming 76 (11): 12-15; November 2026

Pigeon pea cultivation on field bunds: An innovative practice to boost farm profitability

Rakesh Kumar[1]*, Anup Das[1], Sanjeev Kumar[2], Nainsi[1], K.M. Maring[1] and A.K. Choudhary

[1]*ICAR Research Complex for Eastern Region, Patna, Bihar 800 014*
[2]*Bihar Agricultural University, Sabour, Bhagalpur, Bihar 813 210*

Cultivating pigeon pea on field bunds helps farmers to maximise land use, conserve soil, water and diversify income. This method is particularly useful in rainfed and semi-arid regions, where water and soil management are more critical issues. Cultivating pigeon pea on field bunds is beneficial, especially in low-lying areas as it helps in preventing water-logging and reduce fungal disease outbreaks. This method leads to better crop yields, provides food and economic savings for the farmers. Pigeon pea cultivation on field bunds acts as a climate-resilient innovative agronomic management practices for eastern India and similar agro-ecosystem, addressing challenges like waterlogging and drought. This approach enhances land use efficiency by growing a high-value crop on marginal land, improves the soil moisture retention and adds to farmer income, especially in changing climate conditions where erratic rainfall and temperature extremes can impact crop yields.

Keywords: Climate resilient technology, Eastern India, Income enhancement, Risk minimisation

RAINFED production systems are predominantly characterised by monocropping and are highly vulnerable to climatic variability, resulting in frequent crop failures, low and unstable crop yields, and consequently reduced overall farm income. Under such socio-economic and resource-constrained conditions, integration of pigeon pea cultivation on field bunds offers a viable diversification strategy to enhance system resilience and livelihood security. Field bunds, which are generally underutilised, can be effectively utilised for pigeon pea cultivation without competing for main crop area. This innovative agronomic management practice can generate an additional income through production of seed grain and biomass without requiring any expansion of cultivated land. Beyond economic benefits, this practice contributes to multiple ecosystem services, including soil conservation through reduced erosion, improved soil fertility via biological nitrogen fixation, and enhancement of soil organic matter through leaf litter addition. Deep-rooted nature of pigeon pea also improves soil structure and soil moisture dynamics, thereby contributing to long-term soil health improvement. Therefore, this innovative agronomic intervention serves as climate-resilient, resource-efficient, and livelihood-enhancing strategy, particularly suitable for rainfed agro-ecosystems of eastern India and other similar ecologies.

Pigeon pea is one of the most significant pulses grown in India. It is a protein rich staple food and contains about 22% protein, which is almost 2–3 times higher than cereals. It supplies a major share of protein requirement of vegetarian population of the country. It is mainly consumed in form of split pulse which is an essential supplement of cereal-based diets. Biological value improves greatly, when wheat and rice is combined with pigeon pea owing to complementary relationship of essential amino acids. It is particularly rich in lysine, riboflavin, thiamine, niacin and iron. In addition to being an important source of human food and animal feed, it also plays an important role in sustaining soil fertility by improving physical properties of the soil and fixing atmospheric N in symbiotic association with *Rhizobium* bacteria present in root nodules. Being a moderately drought resistant crops, it is suitable for dryland farming and pre-dominantly used as an intercrop with other crops.

India continues to occupy a pivotal position in global pulse sector, accounting for nearly 25% of world pulse production, 28% of total consumption, and 14% of global pulse imports during 2024-25. Pigeon pea is a major pulse;

however, despite high domestic production, substantial gap between demand and supply necessitates imports, making country reliant on external sources to meet its large consumption needs. About ~20% of the total domestic demand met through imports. Significant efforts and programmes under National Food Security Mission (NFSM) led to increased pulse production near to self-sufficiency. Key states for pulse production are Madhya Pradesh, Maharashtra, Rajasthan, Karnataka and Uttar Pradesh. Production of pigeon pea has also shown strong growth, contributing to overall increase in pulse output. Wholesale price of pigeon pea often trades above its minimum support price (MSP) due to strong domestic demand, indicating market forces of demand and supply. Factors like weather conditions in growing region can impact pigeonpea prices and affect production levels.

It is more suitable for intercropping, with different crops like jowar, bajra, mungbean, black gram, maize, soybean and groundnut for increasing system production and maintaining soil fertility. Its intercropping with jowar/bajra has a positive impact on reducing *Fusarium* wilt management.

Table 1. Standard package of practices for cultivation of pigeon pea on crop field bunds

Particulars	Activities performed
Season	*Kharif*
Crop	Pigeon pea
Variety	IPA 203
Type of variety	Long duration (235–245 days)
Crop establishment method	Line sowing on bunds
Sowing depth	4–5 cm
Seed treatment	Thiram/Bavistin @ 2.5 g/kg seed
Seeding rate	12–15 kg/ha
Sowing method	Dibbling with hand-hoe
Spacing	Plant to plant: 25–30 cm, Row to row: 60–75 cm
Time of sowing	15 June to 31 July, if rain continuous then sowing may be done up to August
Recommended dose of fertilisers (RDFs):	20:50:0 kg NPK/ha (DAP: 100 kg) additionally 15–20 kg S/$ZnSO_4$ may be applied. Apply full dose of the crop nutrition as basal dose while crop sowing
Weed control	Application of glyphosate (41% SL) @ 10 mL/L before crop sowing followed by pre-emergence pendimethalin @ 6.5 mL/L at 2–3 days after sowing (DAS). One hand weeding to be done at 40–45 DAS, if weed pressure is more
Water/irrigation management	Pigeon pea is generally grown as a rainfed crop. In case of long and continuous dry-spell, supplemental life-saving irrigation may be required for good cropping. If sufficient rains are received, then no need to provide any irrigation as 750–1,000 mm rains usually received during cropping
Plant protection	Application of Imidacloprid/Spinosad @ 4–5 mL/10 L of water at vegetative and reproductive phase to protect crop from cut worm, pod borer and other insect-pests
Harvesting	Crop can be harvested when 75–80% of pod turn brown and dry. Pods can be threshed manually or with a machine.
Grain yield	30–35 q/ha
Grain storage	Dry seeds for 1–2 days in sun to reduce moisture up to 10–12%

Benefits of pigeon pea production on field bunds

***Soil and water conservation*:** Field bunds are earthen embankments that slow down rainwater runoff, preventing soil erosion and allowing for greater water infiltration. Growing pigeon pea on these bunds further strengthens them with its deep root systems.

***Increased soil fertility*:** As a legume, it enriches soils by fixing atmospheric N, benefiting main crop planted in crop field. After main crop is harvested, it continues to protect and improve the soil health.

***Enhanced biodiversity*:** Bunds cultivated with pigeon pea attract beneficial insects like bees and butterflies, which aid to natural cross-pollination.

***Additional income*:** This technique allows farmers to grow an extra crop, providing an additional source of income particularly in *kharif* cropping.

***Protection for main crops*:** Pigeon pea also act as a protective barrier, especially in dry-areas, shielding adjacent crops from extreme heat and acting as a physical barrier against insect-pests.



Pigeon pea cultivation on field bund at ICAR Research Complex for Eastern Region, Patna, Bihar

***Efficient land use*:** Cropping in bunds helps small and marginal farmers increase total output from same land to generate an additional income.

***Prevention of soil erosion and windbreak*:** Deep rooting system of pigeon pea binds the bund soil, which helps to reduce bund damage during heavy rains and prevents soil erosion. Pigeon pea plants act as a protective barrier against hot and dry-winds, which helps in regulating microclimate for main crops and reducing moisture loss.

Observations from farmers' fields

Study on pigeon pea cultivation on field bunds was conducted during *kharif* 2022-2025 at Research farm of ICAR-RCER, Patna, and farmers' fields located in Gayaji, Nawada, and Banka districts of Bihar. Technology was evaluated under on-farm conditions to assess crop productivity and economic feasibility of utilising otherwise unutilised field bund for pulse cultivation. A representative crop field area of 1 acre having bund area of 390 m^2 was considered as the experimental unit. The specifications were:

- Plot size: 390 m^2; Bund base size: 1.5–2.0 m; Bund top size: 1.0–1.25 m
- Bund height: 70–75 cm
- Seed rate: 6.0 kg/acre
- Seed required for 390 m^2: 600 g

Pigeon pea variety 'IPA-203' (long duration; 230–235 days) was sown on crop field bunds following recommended standard package of practices. Seeds were treated with thiram/bavistin @ 2.5 g/kg seed and dibbled manually at 25–30 cm plant spacing. Recommended nutrient, weed, water, and plant protection measures were adopted uniformly across locations. Study was carried out through farmer participatory demonstrations involving multiple farmers across three districts, with each farmer's field serving as a replication. Data on grain yield and cost of cultivation were recorded at harvest. Economic indicators including gross returns, net returns, and benefit-cost ratio were computed using prevailing MSP and local market prices for grain and straw/stalk. Data generated over locations during study were analysed using descriptive statistical methods to assess potential feasibility of pigeon pea cultivation on crop field bunds as a climate-resilient and income-enhancing intervention for smallholder farming systems in eastern India and similar agro-ecosystem.

Table 2. Economics of pigeon pea cultivation on field bunds (Area: 390 m^2 from 01-acre crop field)

Items	Quantity/rate	Total cost (₹)
Seed cost (ICAR RCER Farm Rate)	₹180/kg	108
Labour in sowing (1 man-days)	₹400/man-days	400
Weeding/weed management		
Pre-emergence Pendimethalin with labour	₹450/L	150
Manual weeding (2 man-days)	₹400/man-days	800
Plant protection		
Imidacloprid/Spinosad with labour at vegetative phase	₹700/L	150
Imidacloprid with labour at reproductive phase	₹700/L	250
Imidacloprid/Spinosad with labour at podding	₹700/L	250
Labour for crop cutting (01 man-days)	₹400/man-days	400
Labour for threshing, cleaning (02 man-days)	₹400/man-days	800
Total expenditure		3,308
Crop yield		
Grain yield: 100 kg	₹70.5/kg (MSP: 2024-25)	7,050
Straw yield: 150 kg	₹5/kg (Farm price)	750
Stalk yield: 1,250 kg	₹1.5/kg (Farm price)	1,875
Gross returns		9,675
Net returns/profit		6,367
Benefit: cost ratio		2.94

From the economic point, cultivation of pigeon pea on field bunds is one of most emerging efficient climate resilient innovative agronomic management practices for enhancing farmers income particularly for Bihar, Jharkhand, Chhattisgarh, and Uttar Pradesh and similar agro-ecosystems of the country.

Limitations of the system

This innovative agronomic management production system is intended to supplement, not replace, conventional main-field pigeon pea cultivation, as cultivable bund area is limited. Grain production depends on availability and dimensions of field bunds, and proper bund maintenance is essential for optimum crop establishment. Technology is most suitable for rainfed farming systems having well-constructed and stable bunds. Although pigeon pea cultivation on field bunds is a promising climate-resilient and income-enhancing practice, it has certain operational limitations.

The technology is supplementary in nature because the available bund area is limited, resulting in lower



Pigeon pea crop production at the farmers field of Sirdala, Nawada, Bihar

total production than main-field cultivation. Its success depends on adequately constructed and stable bunds; poorly maintained bunds may suffer erosion during heavy rainfall. Narrow bunds may restrict optimum plant population, while improper spacing can cause shading of adjoining crops. In some locations, damage by stray animals and moisture stress during prolonged dry spells may reduce productivity.

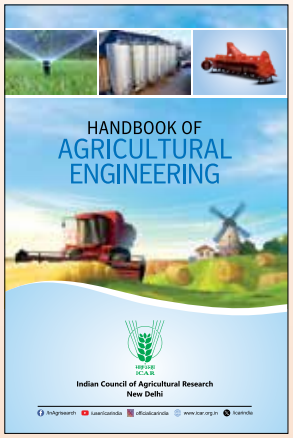
These limitations can be minimised through proper bund strengthening, maintenance of recommended spacing, protective fencing where necessary, provision of life-saving irrigation during extended drought, and timely adoption of recommended integrated insect and disease management practices. Consequently, the technology should be promoted as a complementary land-use strategy for productive utilisation of otherwise unutilised field bunds rather than as a replacement for conventional main-field pigeon pea cultivation.

SUMMARY

Pigeon pea cultivation on field bunds is an innovative, climate-resilient innovative agronomic management practices for eastern India and similar agro-systems that improves crop yields. This production method increases farmer profitability and promotes sustainable agriculture by maximising productivity, especially on marginal lands, where traditional flatbed sowing often fails. Key steps include adopting medium to long-duration, climate-resilient varieties, and optimising planting with methods like seedling transplanting, and improving water management techniques.

*Corresponding author email: rakeshbhu@gmail.com

Handbook of
Agricultural Engineering



"The 2nd revised edition will empower researchers with up-to-date knowledge on cutting-edge technologies like AI and precision agriculture, enabling them to develop innovative solutions. It will serve as a crucial bridge between research, education, industry and policy, fostering a more sustainable and technologically advanced agriculture sector. This handbook is meticulously structured into five sections, covering crucial topics such as Farm Machinery and Power, Soil and Water Engineering, Energy in Agriculture, Agro-process Engineering and Natural Fibers Engineering and Technology. Each section provides both theoretical knowledge & practical insights. It will be useful for the farmers, students, researchers, extension workers, policymakers, entrepreneurs, practitioners and other stakeholders.

TECHNICAL ASPECTS
Pages: 1188; Price: ₹ 2000.00, US$ 300.00; Postage: ₹200
ISBN No.: 978-81-7164-286-1
For obtaining copies, please contact:

Business Unit
ICAR-Directorate of Knowledge Management in Agriculture
Krishi Anusandhan Bhawan – I, Pusa, New Delhi 110012
Tel: 011-25843657; email: businessuniticar@gmail.com
website: www.icar.org.in

SCAN QR Code