SWITCH ON FOUNDATION

PILOT PROJECT REPORT ON ECONOMIC VIABILITY OF

MILLET CULTIVATION

IN BANKURA DISTRICT,WEST BENGAL

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Executive Summary

In the era of climate change, it is a high priority to adopt climate-friendly activities in all sectors including food production. Millets are climate-resilient crops that are grown easily in barren low fertile soils, are drought tolerant, thrive in water-scarce regions, and conserve water compared to crops like rice or wheat. They improve the soil by breaking up compacted areas, preventing erosion, and restoring fertility. Growing millets aids in increasing biodiversity, attracting diverse insect and bird populations, and maintaining ecosystem health. They play a vital role in food security, growing reliably in challenging conditions, and reducing the risk of crop failure.

Promotion of millets supports farmers' livelihood and helps in income diversification, reducing economic risks for farmers. Utilizing local varieties promotes sustainable agriculture, drawing on traditional knowledge and leveraging millet. A study was conducted in Bankura district of Purulia among the millet growers who reinitiated ragi cultivation in barren lands and research revealed that the outcome was encouraging. The benefit-cost ratio came to 1.28 and this seems to be a promising livelihood option for farmers even in the near future.

- The land-use pattern indicates an average land holding of 3.34 bigha per millet grower in the study area, with dry farming being the prevalent practice in the pilot study.
- Surveyed farmers in the pilot study rely solely on family labor, eliminating the need for hired labor and resulting in cost savings.
- The variable cost per bigha (Cost A) in Ragi cultivation is Rs. 1963.65, constituting 25.91% of the total expenditure.
- Ragi farming achieved a yield of 223.46 kg per bigha, with an average selling rate of Rs. 28.00 per kg, resulting in a total income of Rs. 6256.9.
- After deducting the total cultivation cost of Rs. 4877.01, the net income at cost C was Rs. 1379.87 per bigha.
- The benefit-cost ratio (BCR) for Ragi millet cultivation is 1.28, indicating that for every rupee invested, farmers can expect a return of Rs.1.28

Introduction

The Ministry of Agriculture and Farmers Welfare as a run-up to the International Year of Millets 2023 to create awareness and a sense of participation in the country around the ancient and forgotten golden grains. The earliest evidence for these grains has been found in Indus civilization and was one of the first plants domesticated for food. It is grown in about 131 countries and is the traditional food for around 60 crore people in Asia and Africa. India is the largest producer of millet in the world. It accounts for 20 % of global production and 80% of Asia's production. India, Nigeria and China are the largest producers of millets in the world, accounting for more than 55% of the global production. For many years, India was a major producer of millets. On the economic front, West Bengal is predominantly an agrarian State. The state of West Bengal has relatively less area under millets. In West Bengal state farmers of Bankura district are growing a few millets in limited areas. Therefore, there is a wide scope for improving the production, consumption, export, and branding of millets in West Bengal.

Finger millet, scientifically known as Eleusine coracana, holds significance in the agricultural landscape of West Bengal, contributing to the economic fabric of the region. The production of finger millet in West Bengal plays a pivotal role in the state's agrarian economy, providing both economic sustenance and nutritional support to the local populace. The demand for finger millet and its products has been on the rise, driven by increasing awareness of its health benefits. The finger millet production in West Bengal not only serves as a valuable agricultural commodity but also aligns with broader goals of sustainable farming, improved nutrition, and economic well-being for the farming communities in the state. The study aims to investigate the economic viability of cultivating finger millet in the Bankura district, seeking to provide insights into the feasibility and potential benefits associated with millet cultivation in the region.

Objectives of the Study

The study encompasses the following objectives-

1. To assess the impact of growing millet on the socio-economic status of millet growers, and

2. To evaluate the cost and return of millet cultivation in uncultivated barren lands

Scope of research

This study gives a primary emphasis on comprehending farmers' perspectives in choosing millet cultivation over other seasonal crops in the Bankura district of West Bengal. The central aim of the research is to analyze the cost and return structure associated with millet cultivation. Additionally, the study seeks to understand why farmers opt for millet cultivation without compromising their income objectives.

In the study area, diverse concepts about farming are observed, particularly among millet growers whose perspectives differ from others. For them, income is the paramount goal of farming. This economic analysis of millet farming aims to uncover the reasons behind cultivating millets in the Bankura District of West Bengal. Notably, there is a scarcity of research studies on the economic analysis of millet cultivation, making this research distinctive in its examination of the actual expenditure and returns structure in millet cultivation.

Review of literature

Ambana et al. (2019) revealed that the foxtail and little millets hold great potential in contributing substantially to food and nutritional security of the country and thus they are not only a powerhouse of nutrients, but also are climate resilient crops and possess unique nutritional characteristics. Karnataka is one of the major producers of foxtail. Based on the highest area under production of foxtail millet, two districts, Ballari and Koppal, were selected for the study. Forty sample farmers cultivating foxtail millet from each district were interviewed. Since the area under little millet cultivation is limited, snowball sampling technique was employed to collect data from 40 little millet-growing farmers in Ballari and Koppal districts. The net returns work out to be 12,116 and 11,506 with a return per rupee of investment of 1.60 and 1.52 for foxtail and little millet farmers. Human labour cost, bullock labour cost, machine labour cost and seed cost in foxtail millet and human labour cost and machine labour cost in little millet were significant and positive thus foxtail and little millet production was highly influenced by these factors respectively. Marketable surplus of foxtail and little millet was found to be around 88 percent.

Reshma and Choudhary (2020) focused to investigate the "economic analysis of production of finger millet in Bastar district of Chhattisgarh state of India." Chhattisgarh state consists of 28 districts out of which Bastar district had been selected purposely. Out of 7 blocks (Jagdalpur, Bastar, Bakawand, Lohandiguda, Tokapal, Bastanar and Darbha) from Bastar district only one third of the total blocks i.e.,Lohandiguda and Bastanar blocks were selected on the basis of maximum area under selected minor millets for the purpose of the study; subsequently, four villages namely Mardum, Matnaar, Kilepal and Turangur were selected for the study. Thus the total sample size was 97 for finger millet growers.

Primary data was collected through a personal interview method with the help of a pre-tested questionnaire. The major findings of the study revealed that compound growth rate in finger millet for area, production and productivity shows significant growth. It was calculated that the commercial cost of cultivation (C3) was Rs. 36900.35 per hectare. Cost A1/A2, Cost A2+FL, Cost B1, Cost B2, Cost C1 and Cost C2 were worked out Rs.18040.52, Rs.22353.02, Rs.18531.5, Rs. 28916.75, Rs.22844 and Rs. 33229.25 per hectare. The Benefit- Cost ratio in the cultivation of finger millet was estimated for cost A1/A2, Cost A2+FL, cost B1, cost B2, cost C1, cost C2 and cost C3 were 2.15, 1.73,2.09, 1.34,1.70,1.17 and 1.05 respectively.

Sundar et al. (2020) studied the economic analysis of production of pearl millet in Sikar district of Rajasthan. Which was conducted in the year 2019-20 with a sample of 120 respondents. The results indicated that the total cost of cultivation of Pearl millet for small, medium and large size farms were (Rs.27020.70/ha, Rs 26672.20 Rs/ha and 25390.50/ha) respectively. The gross returns obtained per hectare by large size and medium size farms were high (Rs.38000/ha) as compare to small size farms (Rs.36000/ha) respectively, and the net returns per hectare obtained by large size farms were high (Rs.12609.50/ha) as compared to medium and small size farms (Rs.11327.80/ha and Rs.8979.30/ha) respectively. Input-output ratio per hectare was highest in large size farms (1:1.50) compared to medium and small size farms (1:1.42 and 1:1.33).

Yash and Singh (2020) through his research, concluded that the Pearl millet is an important millet crop in India. It is an important source of energy, protein, vitamins, and minerals for millions of the poorest people. India is also considered to be the one of the centers of origin for pearl millet with many distinct cultivars growing throughout the country. Apart from dietary use it is also used in dairy and poultry, alcohol industry, starch industry, processed food industry and export demand. Rajasthan has the highest area under pearl millet cultivation.

Cost analysis suggested that the total cost of pearl millet cultivation was 30,779.63. Highest contribution in the cost of cultivation was human labour. Net return including irrigation charges was 4,347.89 per hectare. Input productivity was analysed using cobb Douglas production function and it was found that human labour was overused whereas inputs like seed and manure etc were underutilised. Although, pearl millet cultivation gave profit but it can be made more profitable by efficient utilisation of underutilised and overused inputs.

Methodology

This study was carried out as a pilot in the millet-growing Bankura district of West Bengal. Essential primary data were gathered using a personal interview method with a pre-tested questionnaire. The research specifically focused on the Kharif season of 2023 in the Bankura district of West Bengal.

The data collection for this study employed a multistage sampling technique. The survey design was structured with four stages of sampling, aiming to gather sufficient and precise information within the field of inquiry in West Bengal.

In the first stage, a particular Bankura district was selected

In the second stage, Taldangra block was selected from the district

villages namely Pakurdiha and Shibdanga were selected In the third stage

In the fourth stage from each of the villages, a list of millet growers has been obtained

From the selected 10 millet growers required primary data was collected through a personal interview method by using pre tested questionnaire.

Methods of data collection

Necessary primary data were acquired through in-person surveys utilizing a pre-tested questionnaire.

Data analysis

The economic and statistical processing of the data accessed from farmers were done by following various cost concepts. The utilized cost concepts are as follows:

Cost 'A'

encompasses expenses associated with hired human labor, bullock labor, machinery charges, the value of manures, fertilizers, seed, irrigation, plant protection, land revenue, depreciation, repairs, and interest on working capital.

Cost 'B'

involves the imputed cost, which includes the rental value of land and interest on fixed capital, added to Cost 'A'. Mathematically, Cost 'B' is determined as Cost 'A' + rental value of land + interest on fixed capital.

Cost 'C'

represents the comprehensive production cost, encompassing all cost items, both actual and imputed. The imputed value of family labor is incorporated into Cost 'B' to calculate Cost 'C'. The formula for Cost 'C' is Cost 'B' + imputed value of family labor.

Fig. 1. Survey of Millet growers in Bankura District of West Bengal.

Result and Discussion

Socio-economic characteristics of selected sample organic and inorganic farmers

The socio-economic features of the surveyed farmers will furnish insights into the background and resource capabilities of the farmers in the designated study area within the Bankura district of West Bengal. This encompasses details regarding family composition, landholding size, crop distribution, livestock count, and other relevant factors. Understanding these elements is pivotal for implementing positive transformations in the agricultural economy of the region. According to the data presented in Table 1, the average family size of millet farmers is 4.33, which translates to approximately 5 persons per family. When examining land holdings, it is evident that the average size of land under cultivation for the selected farm households is 3.34 bigha per farmer. Family types, including both joint and nuclear, are prevalent among farm households.

Table No. 1. Family members and land size of the sample farms

Particulars	Numbers
Total family members (Per farm)	4.33
Landholding (Bigha)	3.34

Age and education distribution

Table 2 illustrates the age distribution and educational levels of the surveyed millet farmers in the Bankura district of West Bengal. The data reveals that the largest portion of the total farmers (50 percent) falls within the age range of 40-50 years, with the subsequent age group of 30-40 years comprising 30 percent of the sample. Approximately 20 percent of the farmers belong to the age group above 50 years, while there were no farmers in the 20-30 years age group. The table additionally presents the educational attainment of millet growers in the Bankura district of West Bengal.

Notably, 20 percent of farmers are categorized as illiterate, while the majority of farmers (40 percent) have received education up to the high school level. The distribution continues with 30 percent having attained education up to the higher secondary level, and only one farmer possessing a college education.

Table. 2. Age and Education Levels of the Ragi Millet growers in Bankura District of West Bengal

Sl. No.	Particulars	Total Farmers
A.	Age in Years:	
1.	20 - 30	0 (00)
2.	30 - 40	3 (30)
3.	40 - 50	5 (50)
4.	Above 50	2 (20)
	Total	10 (100)
B.	Education Level	
1.	Illiterate	2 (20)
2.	High School	4 (40)
3.	Higher Secondary School	3 (30)
4.	College	1 (10)
	Total	10 (100)

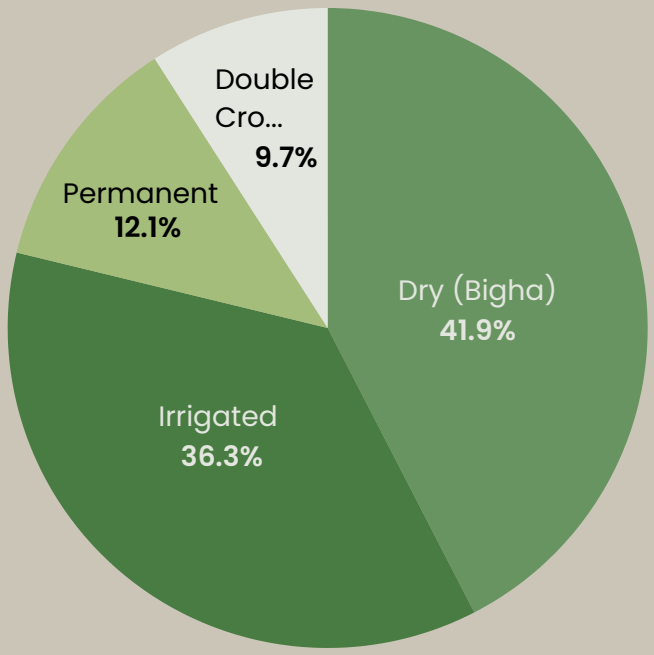
Note: Values in brackets show percentages

Land utilization pattern

According to the data presented in Table 3, the average land holding of millet growers in the study area stands at 3.34 bigha per farmer. Notably, in the pilot study area, a predominant practice is dry farming, and there is an observed permanent fallow of 0.50 bigha per farm. A significant aspect is that the majority of farmers possess their own land for cultivation. Interestingly, no farmer has leased out their land, indicating that all farmers in the study area are actively engaged in cultivating their own land.

Table 3. & Fig. 2. Land Utilization Pattern of the Ragi Millet growers in Bankura District, West Bengal

Particulars(Bigha)	Overall
Total	3.34
Dry	1.75
Irrigated	1.50
Permanent Fallow	0.50
Double Cropped Area	0.41



Cropping and expenditure pattern of alternate crops in District of West Bengal

The Irrigated area accounts to 36.3%, and 0.41% area found to be double cropped region. About 40% of the area in the survey lands was found to be dry land and it is very crucial that there is a lot of scope for exploration. Alternate crops should be experimented in uncultivated lands which has economic and ecological benefits for the regions' growth. (Table 3 & Fig.2).

Table 6. Per bigha input use pattern of the Ragi Millet growers in Bankura District of West Bengal.

Particulars	Units / Name of Material	Qty
Human Labour	Man Days	15.34
Bullock Labour	Pair days	0.00
Machine Labour	Hours	1.00
Seed Treatment	-	0.00
Seed	kg	2.02
Fertilizers	-	0.00
Compost/ Manures	FYM (kg)	1000.00
Plant Protection	-	0.00

Input use pattern under Ragi millet cultivation in Bankura District of West Bengal.

Table 6 displays the quantities of inputs, both organic and inorganic, applied per acre for the cultivation of millet.

a. Human labour: The average per bigha requirement of human labour for Ragi millet cultivation is 15.34 mandays. Millet cultivation requires less manpower in comparison to other field crops. In this pilot study, it was noted that all surveyed farmers rely solely on their own family labor, leading to cost savings by eliminating the necessity for hired labor.

b. Bullock labour: In the pilot study area, farmers engaging in Ragi millet cultivation notably abstain from employing bullock labor. The cultivation practices employed by these farmers underscore a reliance on alternative methods, possibly family human labor, highlighting a distinctive aspect of their agricultural practices.

c. Machine labour: In case machine labour, which is measured on an hourly basis table, shows that in the study area farmers have employed machines on an average of 1 hour per farm for plowing and harrowing.

d. Seed treatment: In the pilot study area, farmers growing Ragi millet opt not to use seed treatment, showcasing a unique approach in their cultivation methods. This decision may be influenced by various factors, underscoring the region's localized and diverse strategies for Ragi millet farming.

e. Fertilizers: Ragi millet cultivators in the study area refrain from applying any fertilizers in their fields. This practice results in cost savings and reduces cultivation expenses.

f. Compost and manures: Regarding compost and manures, farmers cultivating Ragi millet in the pilot study area have utilized 1 quintal of Farm Yard Manure (FYM) in the fields. The choice of FYM, which is locally available and cost-effective, demonstrates a practical approach adopted by these farmers in their cultivation practices.

e. Plant Protection: In the study area, farmers engaged in Ragi millet cultivation adopt a practice of refraining from the application of plant protection chemicals on their millet crops. This strategic decision in input utilization of Ragi millet growers in Bankura district of west Bengal holds economic implications as it mitigates the costs associated with purchasing, applying, and handling inputs like seed treatment material, fertilizers and plant protection chemicals etc. By avoiding the use of such inputs, these farmers contribute to a potentially lower input cost, enhancing the economic viability of Ragi millet cultivation in the region. This approach aligns with sustainable agricultural practices and emphasizes the economic considerations embedded in the cultivation choices made by local farmers.

Evaluation of cost of cultivation of the Ragi (Millet) in the barren uncultivable lands in Bankura District, West Bengal

The cost of cultivation involves expenses incurred by farmers for production, categorized into variable and fixed costs. Variable costs include seeds, labor, fertilizers, pesticides, and operational inputs, while fixed costs encompass land rent, taxes, machinery depreciation, and other stable expenditures. This study evaluates diverse cost components like hired labor, family labor, machine labor, seed, plant protection, fertilizer, interest, land revenue, land rental, and depreciation. Utilizing standard cost concepts (Cost A, B, and C), the analysis aims to estimate the comparative cost of cultivating Ragi millet in the study area, as detailed in Table 7. Different cost concepts serve varying purposes in understanding cultivation economics.

Table 7: Per bigha cost of cultivation of the Ragi Millet Production in Bankura District of West Bengal.

Sl. No.	Cost Components	Ragi MilletValue in Rs.
1	Hired Human labour	0.00 (0.00)
2	Bullock labour	0.00 (0.00)
3	Machine labour	800.00 (10.55)
4	Seed	102.50 (1.35)
5	Chemical fertilizer	0.00 (0.00)
6	FYM	600.00 (7.92)
7	Plant protection	0.00 (0.00)
8	Land revenue	0.00 (0.00)
9	Depreciation	350.00 (4.62)
10	Interest on working capital	111.15 (1.47)
11	Cost A (Σ item 1 to 10)	1963.65 (25.91)
12	Interest on fixed capital	694.40 (9.16)
13	Rental value of land	318.96 (4.21)
14	Cost-B (Σ item 11 to 13)	2977.01 (39.27)
15	Family human labour	1603.17 (35.00)
16	Cost-C (Σ item 14 to 15)	4580.18 (100.00)

(Figures in brackets shows the percentage)

Total variable cost per acre (Cost A)

Table 7 illustrates that the total variable cost per bigha (Cost A) in Ragi millet cultivation amounts to Rs. 1963.65, constituting 25.91 percent of the overall millet cultivation expenditure. Notably, the cost of machine labor holds the highest share at 10.55 percent, followed by the cost of Farm Yard Manure (FYM) at 7.92 percent. Other expenses, such as Depreciation, Interest on working capital, and Seed cost, register lower percentages. The cultivation of Ragi millet, following traditional practices in the pilot study area, involves minimal costs as farmers abstain from hiring human and bullock labor. Furthermore, the omission of chemical fertilizers and plant protection materials contributes to additional cost reductions.

Labour costs

Upon closer investigation of input costs, specifically labor expenses, encompassing both hired human labor and family labor, it is noteworthy that in the pilot study area, Ragi millet growers abstain from hiring any external human or bullock labor for cultivation practices. This deliberate choice directly reduces costs. Interestingly, all Ragi millet cultivators in the pilot study area rely entirely on family labor, accounting to be 35 percent identified as Cost C, i.e., the total cost of cultivation. In contrast, the cost of machine labor accounts for a smaller share, totaling 10.55 percent.

Seed costs

Additionally, a significant observation emerges regarding millet cultivation in the Bankura district of West Bengal. The seed cost constitutes a mere 1.35 percent of the total cost of cultivation for millet growers. This low percentage reflects a noteworthy aspect of the agricultural economics in the region, suggesting either the utilization of cost-effective seed sources.

Cost of manure and chemical fertilizers

The cost of chemical fertilizer registers as zero in the pilot study area, as the chosen Ragi millet growers opt not to apply any fertilizers to their crops. Instead, they solely utilize Farm Yard Manure (FYM) as manure, contributing 7.92 percent to the total cost of cultivation. This strategic choice aligns with a sustainable and possibly organic approach to Ragi millet farming in the studied region, emphasizing the reliance on organic inputs and minimizing reliance on synthetic fertilizers.

Cost of plant protection

Concerning plant protection measures, the chosen Ragi growers do not implement any pest or disease control strategies on their crops. This approach indirectly reduces a significant portion of the cost of cultivation. However, according to farmers' response it also involves a risk, as the absence of **pest and disease management measures may lead to potential production losses** during periods of infestation. Balancing the cost-effectiveness of cultivation practices with the associated risks becomes a crucial aspect of the chosen strategy among these Ragi growers.

Economics of the Ragi Millet production in Bankura District of West Bengal

The economic analysis encompasses key factors such as yield per acre, gross income in rupees, Cost-A, Cost-B, Cost-C (total cost of cultivation), farm business income at different cost levels, net returns, per kilogram cost of production, and the B:C ratio. The benefit-cost ratio for millet cultivation in the study area serves as a metric to gauge returns per rupee invested. These crucial metrics are succinctly presented in Table 8, offering a comprehensive overview of the economic dynamics, profitability, and efficiency of millet cultivation within the pilot study area.

Table 8. Per bigha economics of the Ragi Millet production in Bankura District of West Bengal.

Sl. No.	Particular	Ragi
1	Average yield per bigha (kg)	223.46
2	Selling Rate (Rs./kg)	28.00
3	Gross Returns (Rs.)	6256.88
4	Cost-A	1963.65
5	Cost-B	2977.01
6	Cost-C	4877.01
7	Farm business income (Gross return minus Cost-A)	4293.23
8	Family labour income (Gross return minus Cost-B)	3279.87
9	Net profit (Gross return minus Cost-C)	1379.87
10	Benefit-Cost ratio	1.28
11	Per quintal cost of production	21.82

In Ragi millet farming, a yield of 223.46 kg per bigha was obtained, and the average selling rate was Rs. 28.00 per kg. This resulted in a total income of Rs.6256.9. The overall cost for cultivating Ragi millet summed up to Rs.4877.01. Farmer's also gain a net income of Rs.1379.87 per bigha at cost C. To measure the profitability of Ragi millet cultivation, we use the benefit-cost ratio (BCR), which in this scenario is 1.28, This means that for every rupee invested in Ragi millet cultivation, farmers can anticipate a return of Rs. 1.28. This indicates a positive economic outcome for those involved in Ragi millet farming. Furthermore, the cost of producing one kilogram of Ragi millet is Rs. 21.82. This figure is crucial for farmers as it helps them understand the efficiency of their spending and assess the economic viability of Ragi millet cultivation, particularly when considering the cost per unit (per kilogram).

According to the feedback from Finger millet growers in the study area, they primarily cultivate ragi for personal consumption rather than selling it in the market. This preference stems from a lack of adequate information regarding marketing channels and the potential for value addition to Finger millet based on market demand. The growers appear to be unaware of opportunities for enhancing the market value of Finger millet and optimizing its sale through strategic marketing approaches. This highlights the need for providing farmers with insights and knowledge about effective marketing channels and value-added processes tailored to meet the market demand for Finger millet.

Economics of the Ragi Millet cultivation in barren area

The net profit, calculated as the difference between the total revenue and the total cost of cultivation (Cost-C), for ragi millet, came to Rs. 1379.87 and the benefit-cost ratio for Ragi Millet is calculated at 1.28. This ratio exceeding one indicates that the benefits derived from cultivating Ragi Millet substantially outweigh the associated costs. Consequently, choosing to cultivate Ragi Milletin barren, low fertile/ drought prone proves to be economically viable for farmers in the area. The positive benefit-cost ratio in the case of Ragi Millet suggests that the returns on investment are favorable, making it a more financially sound option for farmers seeking economic sustainability in their agricultural endeavors. This insight provides valuable information for farmers and policymakers to make informed decisions regarding crop selection and resource allocation in the region.

Climatic and geographic factors in Bankura favorable for millet cultivation

Bankura district, primarily reliant on rain-fed agriculture, faces the paradox of being both rain-fed and drought-prone. Despite its status as an agriculturally dominated region, Bankura experiences regular drought conditions. The district receives an annual rainfall of approximately 1400 mm, yet the cultivation and crop production hinge largely on a constrained time frame characterized by erratic rainfall patterns. Several factors contribute to the recurring drought challenges in Bankura.

High runoff rates, the absence of adequate structures for rainwater storage, the deterioration and desiccation of traditional water harvesting systems, siltation of significant surface water bodies, and the limited water-holding capacity of the soil collectively exacerbate the prevalence of drought in the district. These interrelated issues underscore the complex nature of the water management challenges faced by Bankura, highlighting the need for sustainable solutions to mitigate the impact of drought on agricultural practices in the region.

1.Drought: Millet crops, including pearl millet, foxtail millet, and finger millet, exhibit inherent drought tolerance. Suited for Bankura's rain-fed agriculture, these millets can withstand water scarcity and erratic rainfall patterns.

2.Shorter Growth Duration: Millet crops generally have a shorter growth duration compared to paddy. Aligns well with Bankura's constrained time frame for cultivation due to unpredictable rainfall, enabling quicker maturation.

3.Low Water Requirement: Millets have lower water requirements compared to water-intensive crops like paddy. Ideal for rain-fed agriculture in Bankura, addressing water scarcity challenges in the region.

4.Soil characteristics: The soil is mostly lateritic, light in texture and acidic in nature. The fertility of the soil is also very low. The soil is light and porous in nature with low organic matter and low water holding capacity. So, the Millet crops, with their deep root systems, contribute to improved soil conservation. Effective in preventing soil erosion, a common issue exacerbated by high runoff rates in Bankura.

5.Crop Diversification: Cultivating millets offers an opportunity for crop diversification. Crucial for building resilience against unpredictable weather patterns, allowing farmers to hedge risks associated with dependence on a single crop.

Conclusion

The findings of the current investigation conducted in the Bankura district of West Bengal can be summarized as follows-

- The land-use pattern reveals an average land holding of 3.34 bigha per millet grower in the study area, with dry farming being the predominant practice in the pilot study area.
- The pilot study revealed that surveyed farmers exclusively rely on family labor, eliminating the need for hired labor and resulting in cost savings.
- The variable cost per bigha (Cost A) in Ragi millet cultivation is Rs. 1963.65, making up 25.91% of the total expenditure.
- In Ragi millet farming, the yield was 223.46 kg per bigha, with an average selling rate of Rs. 28.00 per kg, resulting in a total income of Rs. 6256.90.
- After deducting the overall cultivation cost of Rs. 4877.01, the net income at cost C was Rs. 1316.2 per bigha.
- The benefit-cost ratio (BCR) for Ragi millet cultivation is 1.28, indicating that for every rupee invested, farmers can expect a return of Rs. 1.28.
- The benefit-cost ratio for Ragi Millet's ratio at 1.28 makes it economically viable and preferable for cultivating in barren and low fertile soils which is mostly not suitable for water intensive crops like paddy.
- Thus, emphasizing the adoption of recommended farming practices for millet cultivation is crucial to boost income and enhance the socio-economic status of Ragi cultivators in the pilot study area.
- Understanding the prevalence of dry farming highlights challenges for farmers, stressing the need for sustainable practices, crop diversification, and water management to enhance production amid climatic constraints.

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Appendix

QUESTIONNAIRE

Topic: Economic Viability of Millet Cultivation in West Bengal
Name of researcher:
Name of farmer: **Mobile No.**

1. Socio-Economic Status

1.	Date of interview	
2.	Name of the main crop referred for the survey	
3.	Country	India
4.	State	West Bengal
5.	District	Bankura
6.	Block	**Bankura**-1. Taldangra2. Sonamukhi3. Simlapal
7.	Village	
8.	Farm size	
9.	Land holding	
10.	Total family member	
11.	Family type (Joint/Nucleolus)	

2. General Family Information

Sr.No.	Name	Gender	Age	Education	Occupation	AnnualIncome	Remark
1.							
2.							
3.							
4.							
5.							
6.							
7.							

3. Land Inventory

Particulars	Dry (acres)	Irrigated (acres)	Permanent fallow(acres)	Total (acres)
Own land				
Leased/shared in land				
Leased/shared out land				
Operated land (own land+ leased/shared in- leased/shared out land)				

4. Cropping Pattern and Cost of Cultivation of Alternate crops

Total area (ha)	Kharif			Rabi			Summer			Annual		
	Name of crop	Area	Cost of Cultivation	Name of crop	Area	Cost of Cultivation	Name of crop	Area	Cost of Cultivation	Name of crop	Area	Cost of Cultivation

5. Livestock

Type	Quantity (No)	Present total value (Rs.)
1. Draft animals		
2. Cows		
3. Buffaloes		
4. Goat		
5. Sheep		
6. Poultry		
7. Others		

6. Farm Implements

Particulars	**Quantity (No)**	**Present total value (Rs.)**
1. Tractor		
2. Harvesters		
3. threshers		
4. shellers		
Sprinkler sets		
6. drip irrigation		
7. Bullock Cart		
8. Electric Pump set		
9 Diesel Pump set		
10. Manual sprayers		
11. Power sprayers		
12. Others		

7. Farm Building/Residential structure

Particulars	Quantity (No)	Size (Sq.feet)	Present total value (Rs.)
1. Residential house			
2. Farm house			
3. Cattle shed			
4. Poultry shed			
5. Engine pump house			
6. Others (Specify)			

8. Labour Use Pattern

Name of Crop: Variety:	Area Under Crop:	Irrigation Method:		Date of Sowing:
Date of Harvesting:		Sowing method:	Spacing:	Soil type:

Sr.No	Operations	Human Labour required days				Bullock required (pair days)		Machinery (hrs.)	
		Owned		Hired					
		M	F	M	F	Owned	Hired	Owned	hired
A)	Preparatorytillage								
1)	Rotavator								
2)	Harrowing								
3)	Bed preparation								
4)	Othersa. Cultivatorb. Tillering								
B)	Seed treatment								
C)	Farm management								
1)	Sowing								
2)	Irrigation								
D)	Intercultural operations								
1)	Weeding								
2)	Hoeing								
3)	Earthing up								
E)	Fertilizer Application								
F)	Plant protection chemical / Organic material Application/ Practices								
G)	Supervision								
H)	Harvesting								
I)	Threshing								
J)	Transport								
1)	Farm to store								
k)	Land Revenue								
l)	Others								

9. Input use pattern

Sl. No.	Particular		Qty	Rate	Amount
1	**Seed Treatment Chemicals / Organic material**				
	a)				
	b)				
	c)				
	d)				
	e)				
2	**Seed**				
3	**Fertilizers**				
	a) Nitrogen	Urea			
		DAP			
		Complex			
		Others i.			
		ii.			
		iii.			
	b) Phosphorus	SSP			
		DSP			
		Others i.			
		ii.			
		iii.			
	c)Potassium	MOP			
		Others i.			
		ii.			
		iii.			
	d) Compost/Manures	FYM			
		Vermicompost			
		Green Manuring			
	e) Micronutrients	i.			
		ii.			
		iii.			
		iv.			
4	**Plant Protection Chemicals / Organic material**				
	Herbicides	i.			
		ii.			
		iii.			
	Insecticides/Pesticides	i.			
		ii.			
		iii.			
	Fungicides	i.			
		ii.			
		iii.			
5.	Others i.				
	ii.				
	iii.				

10. Production

A	Main produce		
	Quantity (Kg/qtls)	Rate (Rs/qtls)	Total value (Rs.)
B	By produce		
	Quantity (Kg/qtls)	Rate (Rs/qtls)	Total value (Rs.)
C	Grand total (Rs) (A+B)