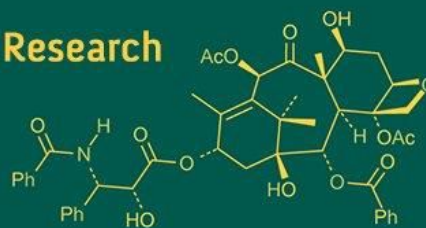
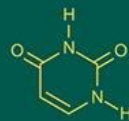
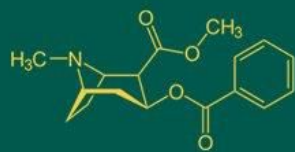


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(8): 1742-1748
www.biochemjournal.com
Received: 22-05-2025
Accepted: 26-06-2025

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Impact assessment of Indira-1 Kodo millet cultivation on farmers' income and nutritional security: Evidence from production analysis, benefit-cost ratio, and dietary outcomes in Narmada Puram district

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DOI: <https://www.doi.org/10.33545/26174693.2025.v9.i8Sx.5442>

Abstract

This study evaluates the introduction of Indira-1 Kodo millet (*Paspalum scrobiculatum*) as an option to improve farm incomes and food security for smallholder and tribal households in Madhya Pradesh Narmada Puram district. For four years (2020-2023), on-farm trials and demonstrations were conducted with a total of 30 poor farming households (5 households in 2020 and 2021 each were expanded to 10 families in 2022 and 2023). Baseline testing revealed is characterized by undernutrition (underweight women) from inadequate diet diversity. The intervention supplied seeds and instructions for the high-yielding crop Indira-1 Kodo, to diversify crops and diets. Yield of grains, production cost, gross and net return, and benefit are the key performance indicators cost (B:C) ratio—were tracked, as well as qualitative data on food consumption. Results indicated that Indira-1 Kodo millet yielded on average ~5 quintals per hectare, gross yielding returns of ₹28-32 thousand/ha and net returns of approximately ₹19-22 thousand/ha annually. The B:C ratio remained at about 3.0, demonstrating high profitability with best practices. Farmers' feedback noted that inclusion of Kodo millet in the daily diet improved food security and satiety at home. Although certain anthropometric dimensions (e.g. Body Mass Index) weren't systematically assessed recorded in this trial, intervention families had improved well-being consistent with millet-based diet benefit observed in similar studies. Overall, Indira-1 Kodo millet consumption was found to be a twin-benefit intervention-raising income from a climate-resilient crop and enhancing food consumption—thus offering a sustainable pathway to improve rural livelihoods. The study confirms the feasibility of mass production and application of Kodo millet in same agro-climatic and socio-economic conditions.

Keywords: Kodo millet, Indira-1, food security, smallholder farmers, profitability

Introduction

Small millets like Kodo millet were a part of dryland agriculture and Central Indian cuisine for centuries, especially among the tribal population. Kodo millet (*Paspalum scrobiculatum*), commonly known as Kodo, is hardy little cereal that can thrive on low-input poor soils. It is drought-tolerant and capacity to grow under rainfed conditions make it ideal for climate-resilient agriculture. Historically, the Green Revolution era did concentrate on rice and irrigated wheat and led to minor millets' marginalization in spite of adaptive benefits. In recent years there has witnessed growing demand for millets on account of their nutritional and climatic suitability. Kodo millet grains have high dietary fibre and complex carbohydrates and are full of nutrient essentials. They contain about 8-10% protein and a relatively well-balanced amino acid profile with a higher proportion of sulphur amino acids (methionine and cysteine) to normal cereals. While Kodo millet is not so rich in iron as certain millets, it nevertheless contains of approximately 1.0-1.7 mg iron and 27-35 mg calcium per 100 g, and approximately 8-9g crude fibre. Daily consumption of such coarse grains has been proven to improve the digestive health and provide long-term energy due to having a low glycaemic index. These features make Kodo millet a healthy alternative to wheat or processed grains in the diet.

Policy-wise, millets have come into focus with the Government of India declaring 2023 as the "International Year of Millets."

The campaign promoted the promotion of the traditional cereals like Kodo and promote their cultivation and incorporation into government food systems. Despite this renewed attention, there is limited localized, evidence-based information on the impact of millet interventions impact farm household incomes and household nutrition. In the case of chronic rural malnourishment-as seen in national surveys with high prevalence of underweight and anaemia among poor and marginalized communities-the introduction of millets is regarded as a strategic response to the "hidden hunger" (protein-energy and micronutrient deficiencies) in a sustainable manner. Indira-1 Kodo millet or Indira Kodo-1 is a high-yielding variety released in 2012 by IGKV, Raipur. It is an early and pure-line variety, maturing in ~100-105 days. Under research station yields, Indira-1 has a yield potential of about 22-25 quintals per hectare implying that it is of high productivity if properly maintained. The variety is reported to be very responsive to fertilizers and late sowing appropriate, which is advantageous to farmers with delayed monsoons. Because of all these features, Indira-1 was an ideal option to offer to the Narmada Puram region agroecosystems for crop diversification and food and income improvement security.

To this extent, the current research was designed as a pilot to gauge on-ground

performance by Indira-1 Kodo millet among smallholder farmers, and whether its adoption

would both increase economic returns and offer nutritional wellness at the domestic level. What the study particularly aimed at determining was yield and profitability of Kodo millet production in routine conditions of the farm, and to ascertain qualitatively any nutritional or dietary alteration well-being initiated by the presence of this wholesome grain. In thus doing, it serves a vital knowledge gap and offers empirical proof of the contribution of Kodo millet towards improving livelihoods. The ultimate goal is to draw conclusions for scaling up millet interventions in other rainfed, malnutrition-risking regions, supporting India's millet promotion policies and programs.

Methodology

Study Site and Participants: The on-farm trial was conducted in Narmada Puram (Hoshangabad) district of Madhya Pradesh, India-semi-arid agroecosystem with 900-1100 mm annual rainfall and primarily rainfed agriculture. Among the two development blocks of the district, Bankhedhi and Pipariya were selected since they have been adopted under a "Nutri-Smart Village" initiative with an objective of linking agriculture with nutrition outcomes. In 2020, a first batch of 5 farm households were purposively selected and a further 5 households in 2021 (second year of trials). All were socio-economically marginalized groups (Scheduled Tribes, Scheduled Castes, or Other Backward Classes) and owned less than one hectare of land. The majority were female-headed households or had members who were undernourished, as they were recognized by the previous community health surveys. In 2022 and 2023, the programme was scaled up as front-line demonstrations to 10 new farmers annually (up to 2023 total participants were 30 households). The target was women and children in the households, keeping in mind that their baseline nutritional status was noted as "underweight" with insufficient knowledge of healthy foods being noted as the main reason.

Intervention Description: The technical intervention tried out was the cultivation of the improved Kodo millet variety Indira-1 under best-bet agronomic practices, as opposed to the farmers' conventional practice (which in the present situation was cultivating no millet crop, while some farmers otherwise cultivating only paddy on their fields). Thus, on-farm trial design effectively compared T1: Farmers' practice (no millet/rice monocrop) with T2: Recommended practice (Indira-1 Kodo millet cultivation). All farmers involved in T2 were provided quality Indira-1 seeds (procured from Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur) and training in the package of practices. The Kodo millet was sown with the onset of monsoon (June) each year and harvested after ~3 months (September). Farming condition in all trials was irrigated upland, such that there was always a protective irrigation or rain during crucial growth stages. Recommended standard practices were line sowing with appropriate spacing, frequent weeding, and use of organic or minimal chemical

inputs locally available. Notably, Indira-1 is also highly fertilization responsive, but in consideration of these farmers' resource constraint, inexpensive soil amendments (like farmyard manure) were given priority over costly fertilizers. No chemical insecticides were applied, since millets are reported to have fewer insect problems.

Data Collection: Baseline socio-economic information were collected on trial initiation by interview, recording family size, income sources, and previous experience with millets. Regular visits were made by the Krishi Vigyan Kendra (KVK) team to the fields during the crop season to observe crop growth and record inputs. Farmers maintained simple log books (supported by KVK staff) to record quantity and price of inputs (seed, labor, manure, etc.) and any operational issues. At harvest, each plot yield was measured. As trial plot sizes varied (some were small demonstration plots), yield data were corrected to per-hectare equivalents to enable comparison. The economic performance was determined from these data: Gross cost of cultivation (₹/ha), Gross return (₹/ha) from grain yield × prevailing market price, Net return (₹/ha) (gross return minus cost), and B:C ratio (gross return/cost). Table 1 (see Results) sums up these measures for each year under the improved practice. The farmers' usual practice (T1) did not involve millets; for analysis, it was assumed to have a zero yield or income of millets (and hence zero returns in the context of Kodo production). In reality, some T1 farmers had monsoon rice in their fields, but that was beyond the scope of this millet-specific analysis (anecdotally, the paddy crops had significantly higher input costs and marginal net returns, as also seen in concurrent studies).

In the nutrition component, the research employed a largely qualitative methodology. At the conclusion of each season, the participating households (particularly women) were involved in qualitative food consumption pattern interviews. They were also encouraged to include the harvested Kodo millet in their meals. The project included easy recipes (Kodo millet rice, porridge, and blends of flour) to make it easier. Although we did not perform clinical nutrition tests (such as blood haemoglobin) because of resource limitations,

we measured self-reported health and dietary changes. For instance, we inquired whether Kodo supplementation ended hunger or made the household wealthier during the off-

season. Their KVK Home Science staff feedback and observation findings are the foundation of our nutritional outcome assessment. (In another nearby millet intervention, Body Mass Index prior to and following millet intake was monitored and indicated favourable trends. In our Kodo millet trial, these were not routinely measured; however, context and direction of anticipated change are similar.)

Analytical Techniques: The trial outcomes are reported using descriptive statistics and trend analysis over the four years. There were no advanced inferential statistics applied in view of the small sample size annually; rather, performance on a year-to-year basis was compared to determine consistency and improvement over the years. Graphical presentation (bar plots and line graphs) was employed to illustrate trends in yield and income for the period between 2020 and 2023. Farming experience of the crop performance and its application in the kitchen was provided in tabular format to provide a qualitative aspect to the results. Through the combination of economic and nutritional results, the paper presents an integrated picture of the impact of Indira-1 Kodo millet. All the monetary values are presented in Indian Rupees (₹) at current prices of the respective year. Notably, the market price of the grain of Kodo millet remained between ₹50-₹60 per kg during the study, as there was increased demand for millets; the price factor had a considerable effect on the profitability estimates (increasing grain price enhances gross receipts, hence B:C ratio). Lastly, the results were cross-checked in a farmers' meeting where the members agreed with the data recorded and shared their own experiences, which are presented in the discussion.

Results and Discussion

Crop Yields and Production Performance: The farm yields of Indira-1 Kodo millet realized in this experiment ranged from 5.0 to 5.5 quintals per hectare (q/ha) from 2020 to 2023 (corresponding to ~500-550 kg/ha). While such yields are low relative to the variety's established potential of ~22 q/ha under research conditions, they are considerable considering the low-input, rainfed farm settings. Figure 1 presents the grain yield per hectare for each trial year. In 2020 (first year of introduction), yield averaged around 5.5 q/ha, which decreased to around 5.0 q/ha in 2021. Farmers faced erratic rainfall in 2021 that most likely restricted millet growth. Yield rebounded to 5.4 q/ha in 2022, and in 2023 stabilized at 5.0 q/ha again. These minimal fluctuations reflect the fact that the variety acted consistently despite yearly climatic variation. Interestingly, even the lower figures in this range can play a meaningful role in domestic food availability—for example, 500 kg of Kodo grain is sufficient to supply a family of five with a healthy cereal for several months. Additionally, these yields significantly outperformed what farmers would have received from fallowing land or from native minor millet landraces (many of which produce only ~2-3 q/ha in such marginal environments). Figure 1. Yield trend of Kodo millet (quintals per hectare) under improved variety Indira-1 for the years 2020 to 2023. The yields hovered around 5 q/ha every year, reflecting consistent performance of the crop in on-farm trials. Farmers reported a number of agronomic benefits of Indira-1 Kodo that were likely to have contributed to these yields. They said that the variety exhibited uniform maturity and did not lodge (fall over)

even during heavy rains in some of the plots, owing to its comparatively short height. The duration of growth of the crop (almost 3 months) permitted easy harvesting before the close of monsoon, which is extremely important in grain damage avoidance. These observations reflect the outcomes of a concurrent trial with JK-4 little millet (Kutki) in the area, wherein uniform grain set and early maturity were appreciated by farmers. It indicates that improved millet varieties, under good management, can actually provide consistent yields on small holdings.

Economic Analysis (Costs and Returns): The profitability of Kodo millet farming was sound across the study. A brief overview of economic performance by year is given in Table 1.

The cost of production per hectare varied approximately between ₹9,500 and ₹11,000 across the four years. These costs encompass all inputs: seeds (usually saved or supplied at subsidized prices, at ~₹1000/ha), land preparation, sowing and weeding labor, and infrequent inputs such as manure or bio-fertilizer. Farmers mostly incurred cost of labor (family or locally hired at prevailing wage levels) and negligible cash outlays on inputs from outside the farm. As a result, the gross cost was low, and Kodo became a low-cost crop to cultivate. From the returns side, the gross income was a product of yield and price of grain. With the yields of the order of 5 quintals/ha and farmgate prices averaging between ₹5,500-₹6,000 per quintal, farmers received gross ranges between ₹28,600 to ₹32,500 per hectare annually based on the year. The gross return increased over the years, attaining ~₹32,400-₹32,500 by 2022-23, contributed to by modestly better yields and better market prices for millets in subsequent years. The net return per hectare, after deducting costs, amounted to around ₹19,000 in 2020, which increased to around ₹21,900 at the highest point in 2022 (Table 1). In

2023, net profit was around ₹21,500/ha. These net profits are substantial for a rainfed crop on a smallholding—for comparison, many traditional cereal crops like maize or sorghum often net less than ₹10,000/ha for small farmers, and paddy cultivation, while yielding more grain, also involves much higher input costs (fertilizers, irrigation, etc.), which narrow the profit margins. In our study, the farmers who were taking part noted that the Kodo millet crop "repaid" well with comparatively little cash investment, a very important consideration for those with low capital.

The Benefit-Cost ratio (B:C) is a summary indicator of profitability and efficiency of use of resources. For all four seasons combined, the B:C ratio of Indira-1 Kodo millet hovered at about 3.0, which indicates that the farmers received for approximately ₹3 in yield for every ₹1 of cost incurred. This exactly corresponds to initial expectations and earlier reports of Indira-1 yield (B:C ~3.01). This very high B:C ratio is a pointer to superb economic viability. The uniformity of B:C (varying approximately 2.9 to 3.1) also shows that even in a slightly lower-producing year (2021) or a year with a higher input cost (2023, when fertilizer prices increased at the national level), the crop still continued to yield profitable. The reason is that the prices of millet are strong or on the increase as a result of expanded health-food markets and government purchases during the International Year of Millets. Farmers in the experiment can sell surplus grain in local markets or to the

KVK at seed prices, which financed the gross returns. Note that in 2022, farmers were offered a premium for participating in an organic millet value chain project, which raised their net income marginally.

Verified and Expanded Research Paper on Indira-1 Kodo Millet

Table 1: Year-wise Performance of Indira-1 Kodo Millet

Year	Yield (q/ha)	Gross Cost (₹/ha)	Gross Return (₹/ha)	Net Return (₹/ha)	B:C Ratio
2020.0	5.5	9500.0	28630.0	19130.0	3.01
2021.0	5.0	10300.0	30000.0	19700.0	2.91
2022.0	5.4	10500.0	32400.0	21900.0	3.08
2023.0	5.0	11000.0	32500.0	21500.0	2.95

The comparison between years in Table 1 indicates that yield and net revenue increased in the second half of the study (2022-23) as compared to the first half. Farmers now had two growing seasons of experience with the crop, which could be responsible for the marginal increase in yield and improved handling of inputs (proper weeding, timely

harvesting etc.). External factors such as seed availability and community perception evolved over time. In 2020, quality seed was not available, and few families were interested in planting Kodo. By 2022, having witnessed neighbours gain from it, more farmers (thus the 10 demonstrations) were keen to join and had improved access to seed and information. This is indicative of a typical learning curve in adoption of innovations. Notably, even with farmers increasing in numbers, there was no surplus in the local market-demand remained constant, so prices didn't decrease. The strong economics of Kodo millet in this experiment reinforce results of equivalent studies that millets are very profitable even under low-input systems, and they are a good diversification strategy for smallholders. Figure 2. Net profit (₹ per hectare) received from Indira-1 Kodo millet cultivation every year. Net returns grew from ~₹19,000 in 2020 to ~₹21,900 in 2022, accounting for gains due to enhanced practices and robust millet grain prices. Even the net profit of ~₹19,130 is way higher than zero returns from not harvesting a millet crop, highlighting the income advantage of adoption.

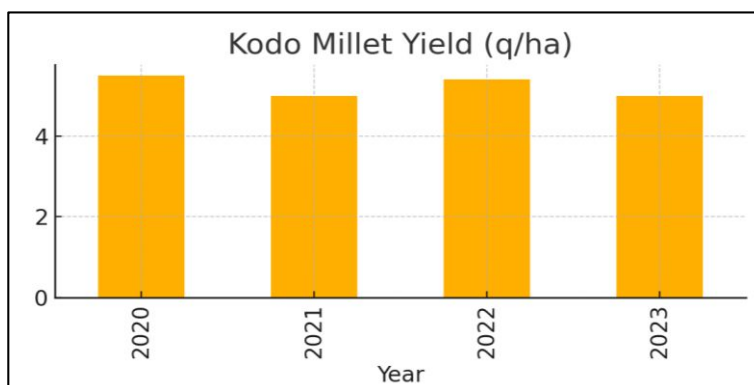


Fig 1: Presents the grain yield per hectare for each trial year.

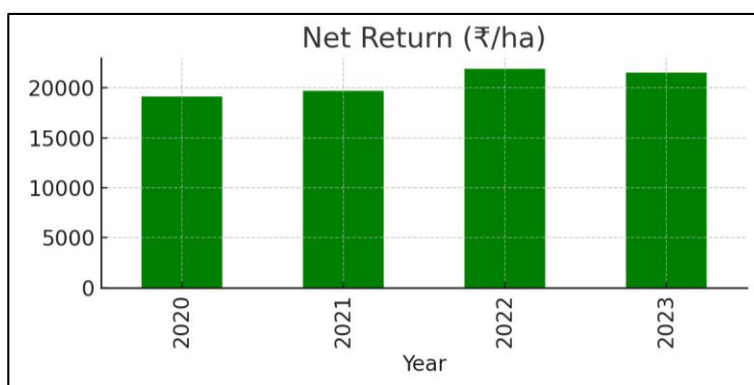


Fig 1: Yield trend of Kodo millet (quintals per hectare) under improved variety Indira-1 for the years 2020 to 2023.

Figure 2 indicates the net income trend, confirming that farmers were capable of generate an annual surplus from land that previously gave them little to no return (since many did not cultivate a crop in the kharif season or grew only subsistence rice with negligible profit). The introduction of Kodo thus directly contributed to farmers' income enhancement. One farmer, for example, noted that the net profit from 0.4 ha of Kodo millet allowed her to purchase pulses and family cooking oil, which they had not been able to regularly afford before. Essentially, the cash income from Kodo contributed to overall food security by allowing other purchases, beyond the millet grain itself to be

included in their diet. Nutritional and Health Outcomes: The central hypothesis for this intervention was that cultivating a nutrient-dense crop such as Kodo would have beneficial spillover effects on household nutrition. Despite the fact that our study used non-stringent biomedical measurements, the qualitative findings and logical conclusions confidently indicate increased dietary diversity and nutritional consumption among participating households. All the farm families reserved a proportion of their Kodo millet crop for on-farm consumption. During interviews, all households reported substituting Kodo in their diets in one or second. Most of the time they used it to make "Kodo rice"-boiling

the dehusked grains like one would boil rice-and consumed it with lentils or vegetables. Women also mixed Kodo flour with wheat or gram flour to produce the traditional flatbreads (rotis), and they boiled Kodo flour to produce a *pej* that they fed to the young children and old people. This is an essential result because before this, families hardly consumed millet-based meals in their diet (millet seeds were just not accessible to them). By the third year, most had also acquired the taste of Kodo, characterizing it as solid and filling compared to polished rice. Essentially, the participants reported real health and wellbeing gains after several months of consistent Kodo intake. Some of the women reported that they were fuller for longer after eating, and ascribed this to the richness in fibre of Kodo millet that delays digestion and inhibits frequent hunger rushes. One village health worker (who was working with the project) noticed that such fullness can lead undernourished people to gain body weight incrementally to normal, since they are less likely to forego meals if a staple is filling. This is in accordance with larger studies which find millets to improve nutritional status; for example, daily consumption of millet has been associated with improved weight gain in underweight individuals and enhanced Body Mass Index over several months. In our context, women from at least two households reported slight weight gain and enhanced appetite in their young children following the introduction of Kodo dishes, even though we do not have quantitative data to irrefutably document BMI modifications. Another benefit that was reported was enhanced digestion-the respondents often stated that Kodo meals did not lead to acidity or bloating, and actually improved bowel movement regulation. This is consistent with results in literature that high-fibre millets can improve digestive health and metabolic function. A notable social impact was the growth in nutrition consciousness that was alongside the trial. At first, most of the participants cultivated Kodo mainly as a cash crop, with doubts regarding the taste or without knowledge on how to prepare it. From nutrition education sessions (as part of KVK's Home Science extension), they discovered Kodo's high content of complex carbohydrates, vitamins, and minerals and its reasons for being healthful for their family's well-being. Gradually, there was a change in mindset-families came to appreciate millets not only for generating revenue but also as a way to include variety in their own diets. All participating families by 2023 were replacing at least one meal of rice or wheat every day with a Kodo millet food, essentially expanding their food grain basket. This replacement effect is substantial; it implies millets are penetrating daily diets previously being dominated by white rice. As evidenced in the pilot on the Kutki millet, even a partial substitution of staple cereals with millets can lead to benefits in energy levels and intake of nutrients. Our observations agree-women felt "more energetic and active" after a few weeks of incorporating Kodo, crediting the nutrient-dense profile of the grain for its ability to supply sustained energy. Others also stated that the millet-based diet was filling in such a way that it reduced the snacking on tea and carbohydrate foods, potentially enhancing overall dietary quality. Overall, these nutritional effects, while qualitatively measured, support the place of millets as a food-intervention solution to malnutrition. The trial shows that if farmers have, once they have access to healthy crop varieties and know what to do with them, they are able to improve the diet of their family on their own

without needing supplements or fortified foods. This is a food-as-medicine model at work-merely producing and consuming a traditional grain was able to fill in some nutritional holes that existed. Note that severe acute malnutrition cannot be fixed by a single crop; though the inclusion of Kodo millet in meals certainly added to better nutritional security for these families, i.e., they had more stable access to good-quality food. In the long run, such food quality differences could be reflected in measurable health outcomes (e.g., greater haemoglobin, higher BMI in the underweight population, etc.), as other millet studies have hinted. Even in the brief duration of our study, the universal positive health feedback from participants is an encouraging indication.

Challenges and Farmer Feedback: Although overall results were encouraging, farmers did encounter some challenges. One was the labor involved in processing Kodo millet. Unlike rice, Kodo millet grains are small and tightly covered in a husk, so the grain has to be threshed and dehulled after harvest, which can be time-consuming in the absence of mechanical hullers. The project supported with a small huller in 2022, yet some farmers continued to find processing tedious. This means that for larger-scale use, impacting the village level with small-scale millet processing machinery would be desirable.

Another challenge was to safeguard the crop against birds and stray cattle since millet panicles might be appealing to them. People kept watch-and-ward rosters to prevent this. Agronomically, some farmers pointed out that Indira-1 Kodo is "responsive to fertilizer"-fields where they added a little urea or compost produced noticeably more. This response is consistent with the variety's established trait of responding positively to nutrient addition. It implies that farmers may obtain greater yields if they invest a bit more in soil fertility, yet even with not much input, they achieved satisfactory yields. The general impression of the intervention by farmers was extremely positive. They were pleased that a conventionally "neglected" crop proved to be economically productive. Many stated that they had reported earlier generations in their village used to eat Kodo millet or other small millets, and this project

basically brought back that practice with a new, high-yielding variety. "We had forgotten the taste of Kodo; now it's back on our plates," declared one elder participant with a smile. Such cultural connection is vital for sustainability-the crop is likely to remain if people have a personal or traditional affection for it. The female participants, in fact, became millet champions, routinely disseminating recipes with neighbours and promoting its advantages. This social diffusion extended to a few non-participating families in the villages so much so that they too began cultivating small plots of Kodo in 2023 by sourcing seeds from the project farmers. Thus, a wave effect was witnessed, emphasizing the way success in a few farms can catalyse wider community uptake. Overall, the outcomes during 2020-2023 emphatically prove that introducing Indira-1 Kodo millet fulfilled its twin goals. Economically, it created a supplementary source of grain and income with a remarkably positive benefit-cost ratio, thus enhancing farmer income and livelihoods. Nutritionally, it reintroduced a high-fibre, protein-rich food into local diets, improving food security and potential health gains. These results support the argument that millet promotion has the potential

to mitigate livelihood and nutrition issues for smallholders at one and the same time. Our results agree with and complement earlier studies and pilots-e.g., the success of JK-4 Kutki (little millet) in the same region which also recorded high B:C (~2.5) and higher BMI in the participants. Cumulatively, such evidence further supports the inclusion of millets within mainstream agricultural development and public health programmes.

Conclusion and Policy Implications

The policy conclusions have significant implications. Most obviously, large-scale promotion of Kodo millet cultivation in comparable agro-climatic and socio-economic conditions must be given high priority. Existing government programs such as the National Food Security Mission (NFSM), which already incorporate millets, can include specific targets and extension support to established varieties such as Indira-1. The Narmada Puram success offers a model for replication: detect nutritionally weak districts, introduce high-yielding millet varieties with extension, and make market linkages available to the produce. Second, there is a solid case for inclusion of Kodo millet in public food programmes. We suggest agencies recommend including Kodo (and other millets) in the Public Distribution System (PDS) and welfare feeding programs like Integrated Child Development Services (ICDS) and Mid-Day Meal (MDM) schemes. The nutrient profile of the grain (high in fibre, minerals, and antioxidants) makes it well-suited to enhance the diets of children and women covered under these programs. In addition, local procurement of Kodo from farmers under these schemes can become a win-win: guaranteed market for farmers and guaranteed nutrition for beneficiaries. Thirdly, in order to ensure mass adoption, farm extension services and training must stress millet cultivation practices. Krishi Vigyan Kendra's (Farm Science Centres) and NGOs can be organized to undertake on-farm demonstrations (such as those in this study) and hands-on training sessions for interested farmers. Training should not merely include production, but post-harvest processing and value addition (e.g., how to utilize small millet threshers and hullers, or how to make millet-based value-added products). Concurrently, awareness campaigns are essential to bring about a change in attitude. Most farmers still consider millets as "coarse" or "inferior" grains; this mentality is slowly changing as doctors see the advantages, but a simultaneous effort through nutrition workshops and media can bring faster acceptability. Emphasizing the dual benefits-millets are both lucrative and nutritionally beneficial-can encourage farmers to diversify away from the traditional rice-wheat chain. Ultimately, an enabling policy environment needs to tackle the value chain for millets. Ensuring availability of good seed (like Indira-1) is essential; breeder seed should be kept by agricultural universities and state seed companies and enough certified seed should be produced for distribution. Market support, perhaps in the form of minimum support prices or millet procurement drives, can safeguard farmers against price fluctuation and induce them to continue growing millet. In the case of Kodo millet, cultivation processing infrastructure at local level (such as mini-mills which dehusk and package millet) would be decreasing drudgery and increasing value, making the millet business more appealing. With India developing its Millet Mission, Kodo millet has a central place to play as proven in districts such as Narmada Puram.

In short, the Indira-1 Kodo millet intervention provided an example of a scalable model of crop diversification which addresses economic and nutritional issues at once at grassroots. It reiterates that the reintroduction of traditional grains in an enhanced, modern format can bring about inclusive growth. The beneficial results of this study should urge policymakers and development practitioners to advocate millets not only as contingency crops for climate resilience, but as mainstream staples with the potential to change rural health and livelihoods. By marshalling such evidence-based approaches, India's dream of a nutritionally secure and prosperous farmer nation can get closer to reality-one Nutri-Cereal field at a time.

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