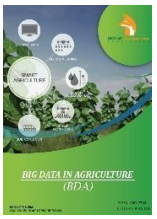
ZIBELINE INTERNATIONAL™ PUBLISHING

ISSN: 2682-7786 (Online)
CODEN: BDAIDR

Big Data in Agriculture (BDA)

DOI: http://doi.org/10.26480/bda.01.2026.32.36



RESEARCH ARTICLE

PERFORMANCE OF NEW MARDI INBRED RICE IN SKUDUK-CHUPAK, SIBURAN, SARAWAK

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ARTICLE DETAILS

Article History:

Received 23 August 2025
Revised 18 September 2025
Accepted 02 October 2025
Available online 27 November 2025

ABSTRACT

Rice production in Sarawak continues to face significant yield gaps when compared to the national averages of Malaysia, largely due to the limitations of non-granary ecosystems, suboptimal soil fertility, and the demographic challenges of an aging farming population. This study therefore examined the scaling-up of two improved inbred rice varieties, namely MARDI Siraj 297 and MR315 (also known as Seri Waja), under the Projek Inisiatif Ekonomi MADANI (R and D and C and I) in the Skuduk-Chupak region of Siburan, Sarawak. The project involved the establishment of 10 hectares of demonstration plots, equally distributed between the two varieties, with the objective of improving yields, enhancing farmer income, and evaluating the acceptance of new technologies among smallholder farmers. A combination of sustainable fertilization packages, Real Strong N-Bio Booster applications, and integrated pest and disease management were employed, and data were collected on agronomic performance, yield components, farmer perceptions, and cost–benefit ratios. Results indicated yield increments of 41.0% for Siraj 297 and 45.7% for MR315 compared to control plots, alongside a net increase in farmer income, with benefit–cost ratios of 1.99 and 2.09 respectively, compared to 1.48 for controls. Farmers expressed high levels of satisfaction with grain quality, crop management ease, and shorter crop duration. The findings strongly suggest that scaling up inbred rice varieties in Sarawak represents a viable pathway to closing productivity gaps and increasing rural incomes, though structural challenges such as farmer aging and cultural preferences for traditional rice remain

KEYWORDS

Rice production, yield gap, inbred rice varieties, farmer income, technology adoption, Sarawak

1. INTRODUCTION

Rice is not only a staple food for Malaysia but also a critical socio-economic commodity (MAFS, 2022) that sustains rural livelihoods, especially in Sarawak where self-sufficiency levels remain below the national target of 75% as set in the Twelfth Malaysia Plan (RMK-12) (Ministry of Agriculture and Food Security [MAFS], 2022). Despite extensive research and varietal improvements by the Malaysian Agricultural Research and Development Institute (MARDI), production in non-granary areas such as Sarawak continues to face constraints including limited irrigation infrastructure, inconsistent fertilizer use, and the persistence of traditional practices among an aging farmer demographic. Previous studies have shown that the adoption of improved rice varieties can increase productivity by more than 40% (Bakri et al., 2006; Abdullah et al., 2014) compared to local varieties (Bakri et al., 2006; Abdullah et al., 2014), yet the challenge of technology diffusion in non-granary zones remains. The Skuduk-Chupak area, located 55 kilometers from Kuching and covering approximately 200 hectares of paddy land, represents a strategic pilot site for scaling up newly released inbred varieties such as MARDI Siraj 297 and MR315. Both varieties have been officially released for their resistance to blast disease, stable yield potential, and grain quality characteristics (MARDI, 2023) aligned with local consumer preferences (MARDI, 2023). This article presents the methodology, results, and implications of a pilot scaling-up initiative under the Projek Inisiatif Ekonomi MADANI, with emphasis on agronomic performance, economic feasibility, and farmer acceptance.

2. METHODOLOGY

The project was conducted in 2024 in the Skuduk–Chupak region of Sarawak, covering a total of 10 hectares of land, with 5 hectares allocated to each of the inbred varieties and involving 17 participating farmers. In addition, three farmers served as a control group to enable yield comparison. The selection of these plots was carried out in consultation with local farmers and the Department of Agriculture Sarawak. The varieties chosen for evaluation were MARDI Siraj 297, known for its resistance to leaf blast (MARDI, 2023) and high yield potential, and MR315 (Seri Waja), which is resistant to panicle blast and maintains stable yields in medium fertility soils. The planting method adopted was transplanting *(mencedung)*, at a seeding rate of 80 kilograms per hectare. Fertilization followed a sustainable nutrient management package, applying NPK (121:66:121 kg N, P_2O_5, K_2O per hectare), urea, TSP, MOP, and foliar potassium-based fertilizers. Crop management also involved the application of Real Strong N-Bio Booster (All Cosmos Industries Sdn. Bhd., 2024), integrated pest and disease control measures, and routine monitoring at key growth stages. Data on actual yield was collected at the time of harvest by measuring the harvested grain from each plot, ensuring

Quick Response Code	Access this article online	
	Website: www.bigdatainagriculture.com.my	DOI: 10.26480/bda.01.2026.3236

Cite The Article Ernie Suryati Binti Mohamad Zain, Zaki Bin Musa, Hassan Bin Saji, Nur Fadilah Binti Abd Halim, Rosnani Binti Harun, Siti Khatijah Binti Jalal, Muhammad Fariq Bin Hamzah, Long Bin Sidi, Nurul Ain Binti Ismail (2026). Performance Of New MARDI Inbred Rice In Skuduk-Chupak, Siburan, Sarawak. Big Data In Agriculture, 8(1): 32-36.

accurate representation of the final productivity of the crop.

For the economic evaluation, the study was carried out to assess the viability of cultivating selected inbred rice varieties in non-granary areas of Sarawak as well as the level of farmers' acceptance towards these varieties. The sampling involved 17 project farmers in Skuduk–Chupak, Siburan, Sarawak, together with 3 local farmers who served as the control group. The data collection was conducted through face-to-face surveys using structured questionnaires as the research instrument. The data were then analyzed using descriptive analysis, cost–benefit analysis (CBA), and partial budget analysis.

2.1 Rice Varieties

Two improved inbred varieties were selected for evaluation based on their agronomic potential and relevance to local production constraints.

MARDI Siraj 297 was developed by the Malaysian Agricultural Research and Development Institute (MARDI) and is recognized for its high yield potential as well as its resistance to leaf blast disease, which is one of the major constraints to rice production in both rainfed and irrigated ecosystems of Sarawak. This variety has a medium growth duration of approximately 110–115 days and produces grains with desirable quality attributes, including a long slender grain type, good milling recovery, and high consumer acceptance. Farmers prefer MARDI Siraj 297 because of its ability to sustain productivity under moderate disease pressure and its adaptability to varying soil conditions, which makes it suitable for wider adoption in diverse environments.

MR315 (Seri Waja), also released by MARDI, was selected for evaluation due to its resistance to panicle blast, another serious fungal disease that affects yield stability in rice-growing areas. The variety is well suited for cultivation in medium fertility soils, where nutrient levels are not consistently high, yet it has the capacity to maintain stable yields across multiple seasons. MR315 is valued by farmers for its relatively strong stem structure, which reduces the risk of lodging, as well as its resilience under less favourable growing conditions, making it an attractive choice for smallholder farmers who seek reliability and consistency.

By comparing these two varieties, the study aimed to generate insights into varietal performance under local management practices, particularly when integrated with sustainable nutrient management innovations.

2.2 N-Bio Booster

As part of the nutrient management system, Real Strong N-Bio Booster was applied as a biofertilizer formulated with nitrogen-fixing *Bacillus* species. The product contributes to soil fertility by converting atmospheric

nitrogen into plant-available forms, thereby reducing dependence on synthetic nitrogen fertilizers. Results from previous field trials have shown their ability to enhance seedling vigor, increase tiller production, and improve plant resistance to pests and diseases. In this project, its use was intended not only to support yield performance but also to improve soil health and stimulate microbial activity, thus contributing to the long-term sustainability of paddy cultivation in Sarawak. In addition, the application of Real Strong N-Bio Booster is consistent with national initiatives to reduce fertilizer subsidy reliance and to encourage farmers to adopt environmentally friendly inputs without compromising crop productivity.

3. Results And Discussions

3.1 Yield Performance of Inbred Varieties

Referring to Figure 1, the evaluation of MR315 and MR297 under the Projek Inisiatif Ekonomi MADANI demonstrated notable yield improvements compared to the control plots. MR315 achieved an average yield of 4.587 t/ha, with several farmers surpassing this benchmark (5.469, 5.317, and 4.960 t/ha). Similarly in Figure 2, MR297 recorded an average of 4.365 t/ha, with some participants achieving yields as high as 5.831 t/ha. These results highlight the varieties' capacity to produce consistent and high yields (Bakri et al., 2006) across diverse farm conditions, provided that appropriate agronomic practices and effective management are applied.

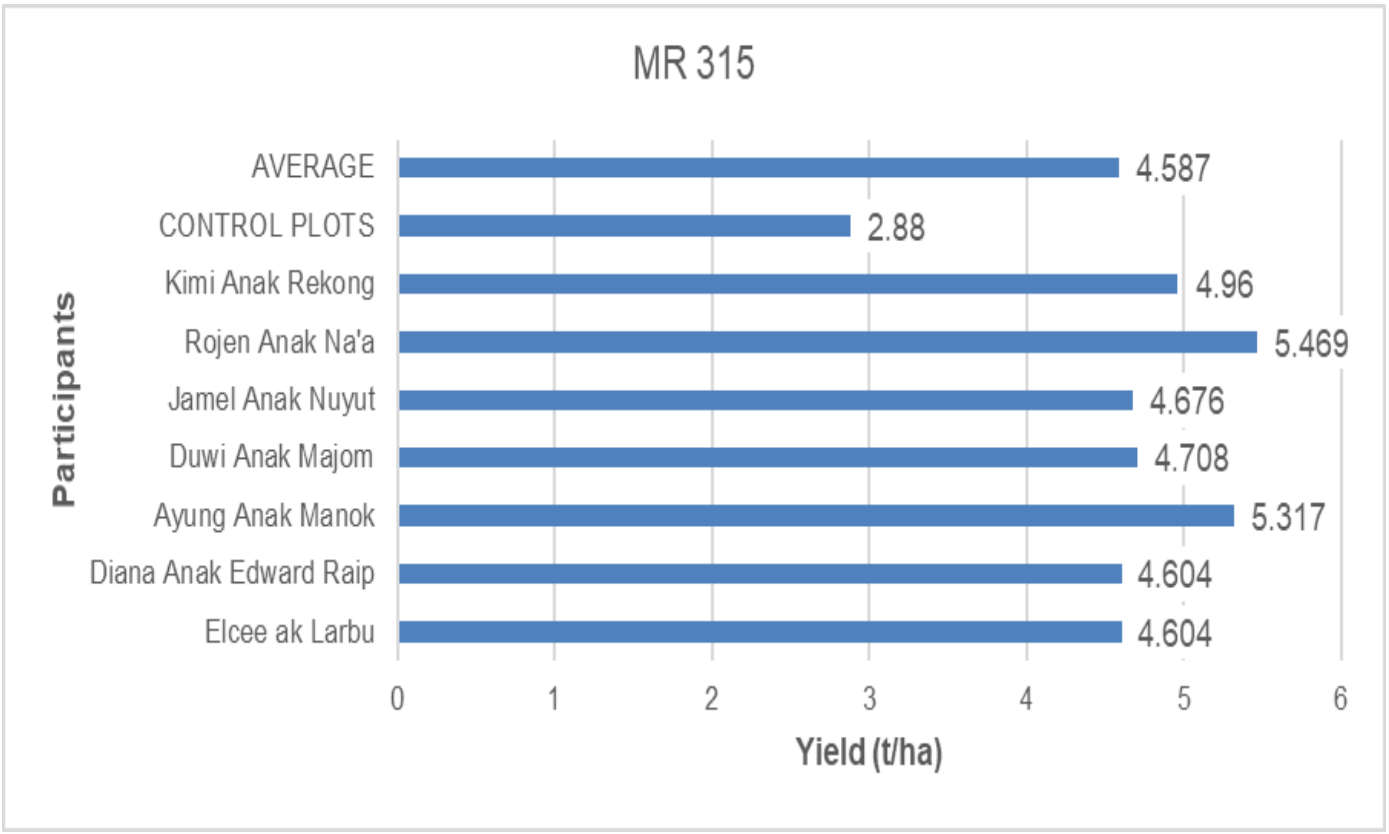

Figure 1: The harvested yields of the MR315 variety across the participating farmers.

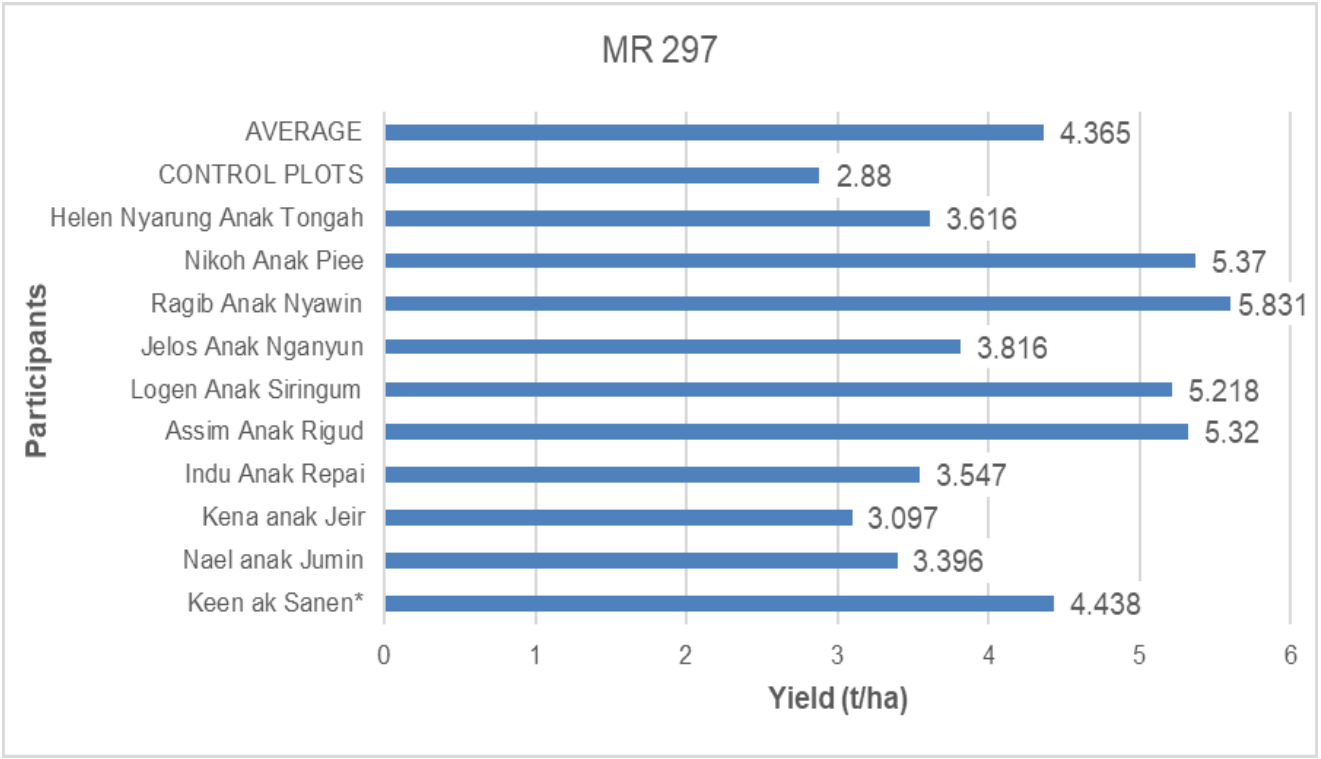

Figure 2: The harvested yields of the MR297 variety across the participating farmers.

3.2 Comparative Advantage over Control Plots

When compared with the control group (2.88 t/ha), MR315 and MR297 showed yield increases of 45.7% and 41.0%, respectively, as showed in Table 1. These gains underscore the effectiveness of varietal introduction combined with the application of N-Bio Booster fertilizer (All Cosmos Industries Sdn. Bhd., 2024; Gomez & Gomez, 1984). The differences observed among farmers reflect the influence of soil fertility, pest control measures, and individual management strategies, further emphasizing the importance of technical guidance in scaling productivity.

Table 1: Average yield performance of MR315, MR297, and control plots (t/ha).

Variety	Average Yield (t/ha)	Max Yield (t/ha)	Yield Increase vs Control (%)
MR315	4.587	5.469	45.7
MR297	4.365	5.831	41.0
Control	2.88	-	-

3.3 Economic Evaluation

Economic analysis confirmed that yield improvements translated into higher farm profitability. For paddy sales, MR315 and MR297 recorded benefit–cost ratios (BCRs) of 2.09 and 1.99 (Figure 3), compared with only 1.48 for the control. When sold as rice, profitability was even greater, with BCRs of 2.59 and 2.49, compared with 1.93 for the control. These results confirm that milling and marketing rice directly enhance profitability (Abdullah et al., 2014; Bakri et al., 2006), highlighting the importance of linking varietal adoption with value-chain improvements, including access to milling facilities and direct consumer markets.

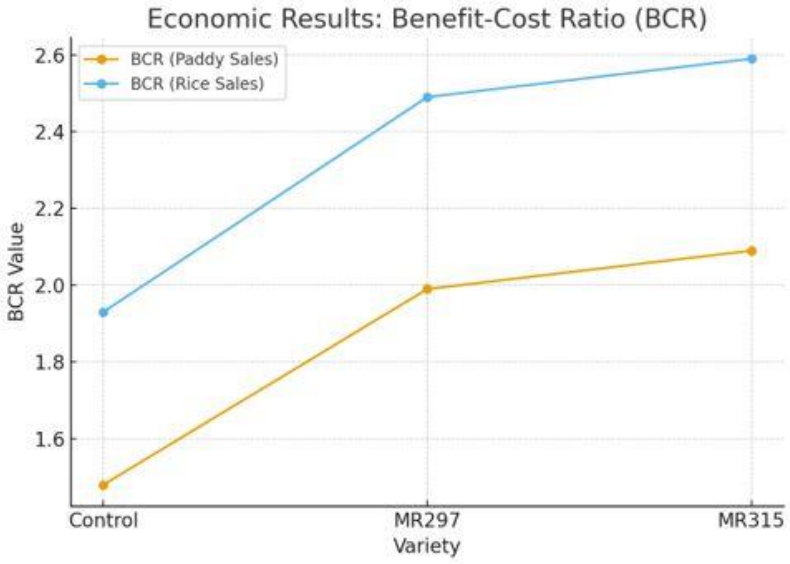

Figure 3: Benefit–Cost Ratios (BCRs) for MR315, MR297, and control plots under paddy and rice sales.

Partial budget analysis in Table 3, reinforced these findings. For MR315, the net additional benefit reached RM3,160/ha for paddy sales and RM7,948.60/ha for rice sales. MR297 also generated strong returns, with net additional benefits of RM2,720/ha for paddy and RM6,893/ha for rice. In both cases, the financial gains far exceeded the incremental costs of adopting the new technologies, proving that the interventions are

economically viable and acceptable to farmers.

Table 3: Partial budget analysis of MR315 and MR297 based on paddy and rice sales (RM/ha).

Variety	Net Additional Benefit (Paddy, RM/ha)	Net Additional Benefit (Rice, RM/ha)
MR315	3160	7948.6
MR297	2720	6893.0

3.4 Technology Impact and Farmer Perceptions

Survey results revealed that farmers recognized multiple advantages from adopting MARDI technologies (Figure 3). The varieties were perceived to produce higher grain quality (score 4.706), improve crop management efficiency (4.647), increase yields (4.588), and shorten the growing cycle (4.235). These benefits translated into time, labour, and cost savings, reinforcing the overall attractiveness of the technologies.

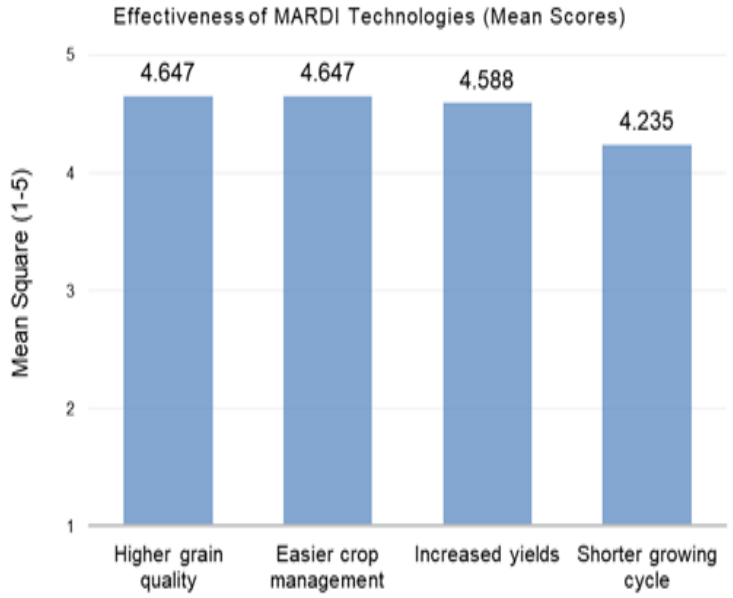

Figure 3: Mean scores of farmer perceptions on the effectiveness of MARDI technologies

3.5 Adoption and Acceptance

Farmer adoption rates were highly encouraging. All participants (100%) accepted the use of N-Bio Booster fertilizer. MR297 was adopted by 94.1% of farmers, while MR315 was adopted by 82.4%. The slightly lower acceptance of MR315 may reflect farmer preference patterns, but overall, both varieties achieved strong buy-in. Factors driving acceptance included government subsidies, technical advisory services, farmer training, and the provision of high-quality seed (MAFS, 2022; MARDI, 2016). Ease of management and demonstrable productivity gains further enhanced the likelihood of adoption.

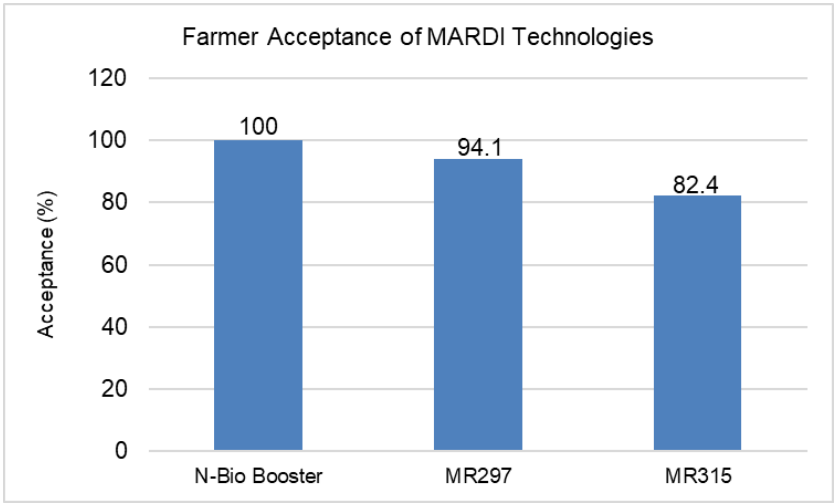

Figure 4: Farmer acceptance rates (%) of MARDI technologies (N-Bio Booster, MR297, MR315).

3.6 Overall Implications

The findings demonstrate that the introduction of MR315 and MR297, supported by N-Bio Booster, significantly improved rice yields, profitability, and farmer livelihoods in Skuduk–Chupak. Yield gains of more than 40%, combined with BCR values exceeding 1.9, provide clear evidence of the technologies' effectiveness. The strong farmer acceptance and positive perceptions of productivity, efficiency, and profitability suggest that scaling these interventions to other rice-growing regions in Sarawak and beyond is both feasible and desirable.

4. Conclusion

The scaling-up project demonstrates that MARDI Siraj 297 and MR315 are not only agronomically viable but also economically profitable options for farmers in non-granary areas of Sarawak. The varieties' resilience to blast disease, high yield stability, and compatibility with existing farming systems make them suitable candidates for broader dissemination. The significant increase in farmer income through both paddy and rice sales highlights the importance of linking varietal improvement with market access strategies (Abdullah et al., 2014; Bakri et al., 2006; MARDI, 2023; MARDI, 2016). Nevertheless, the findings also underscore systemic challenges, including an aging farmer population and cultural preferences for traditional varieties, which may slow adoption. Future interventions should focus on expanding the scale of adoption, improving supporting infrastructure such as irrigation and milling facilities, and providing targeted training programs to younger farmers. These measures would not only enhance rice productivity and income in Sarawak but also

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contribute to Malaysia's broader food security and self-sufficiency objectives (MAFS, 2022).

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