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NUA 45, a dry bean cultivar, builds a subtle brand in Zimbabwe against all odds

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Global business today is driven by brands, each with a unique story, but rarely of a product that is a public good. Building a brand requires careful planning, creativity, and an understanding of the target market. Borrowing from various brand concepts and frameworks, this paper explores how a government-bred common bean cultivar, NUA 45, defied the odds to create a new identity and association in Zimbabwe. Firstly, the cultivar overcame the general lack of promotion investment in government-bred (public) common bean cultivars. Secondly, being a red mottle-colored cultivar in a red-speckled (sugar type) bean-predominated country, NUA 45 had to break the preference typecasts. Thirdly, NUA 45 was among the first generation of biofortified bean cultivars enriched with iron (Fe) and zinc (Zn), some of the most sought-after micronutrients in a world ridden with hidden hunger. Overcoming these market barriers required a systematic approach to awareness creation, collaboration, and commercialization, avoiding the tragedy of the commons, and instead, achieving a win-win situation for all stakeholders. This entailed understanding the needs and preferences of different value chain actors, developing messages, and engaging local farmers, retailers, aggregators, and private and public sector partners to promote NUA 45. Lastly, developing compelling stories and leveraging digital channels to reach new customers that sought personal experiences, moved the cultivar name from a mere label to a spontaneously endorsed lifestyle and a brand that 'spread like wildfire' across the country and the Southern Africa Development Community (SADC) region. The NUA 45 brand broke new ground for other biofortified bean cultivars and non-sugar bean cultivars. Following its release in seven other countries, NUA 45 pioneered listing on the SADC regional variety catalog.

KEYWORDS

NUA 45, brand, biofortification, multi-stakeholder, innovation platform, awareness

1 Introduction

The business world today is on brand power; brands influence market share, sales as well as revenue. In the contemporary business world of pervasive information, consumers or end-users may be well-informed of choices before entering the marketplace; thus, brands influence behavior and simplify choices through the reinforcement of loyalty. Brands fall into

two main categories: branded businesses and the trademark and associated values. Brands now form more than 85 percent of the capitalization value of large global (S&P 500) companies, unlike in the 1980s when 80 percent of a company's value would be in physical assets (Salamudin et al., 2010; Sinclair and Lane Keller, 2014). The concept of brand valuation was contentious throughout the 1980s and 1990s (Sinclair and Lane Keller, 2014; Skalický et al., 2021), but the continued shrinking of the proportion of tangible assets on the balance sheets and the growing proportion of goodwill and other intangible assets (Egginton, 1990), affirms the notion that indeed, brands drive businesses. There is a need, therefore, to create and sustain brands in every economic activity. There is growth in literature on brands, especially concepts, models, and frameworks, but very limited documented cases of brand evolution. While it is now possible to brand almost anything from manufactured products to places (Pike and Bianchi, 2016; de Moraes Ocke and Platt, 2022; Kamlot and Vieira de Jesus, 2022), building a brand with a government-bred cultivar of an inconspicuous crop such as the common bean is not as obvious.

The common bean (*Phaseolus vulgaris* L.) is among the most important food legumes in Zimbabwe. It occupies various contextual niches among food crops, cash crops, and industrial crops, but its overall national status is not well defined. At the national level, the common bean is considered a better food legume than other legume crops such as cowpea [*Vigna unguiculata* (L.) Walp] and bambara groundnut [*Vigna subterranea* (L.) Verdc], yet it trails groundnut (*Arachis hypogaea* L.) in terms of production and consumption. Among commercial crops, it is dwarfed by the golden leaf, tobacco (*Nicotiana tabacum* L.); among industrial crops, it is incomparable to cotton (*Gossypium herbaceum* L.), and among commercial legumes, it is overshadowed by soybean (*Glycine max* L.). For instance, recent participatory rural appraisal studies in one major bean-producing area of Zimbabwe (the Lowveld), identified maize (*Zea mays* L.) as the most extensively cultivated and prioritized food crop while the common bean was the most-important cash crop (Mutari et al., 2021). The unclear status of the common bean has caused under-investment in the value chain over the years.

In the past, the national demand for bean grain was inconsistent, thereby discouraging farmers from fully adopting improved bean varieties and management technologies; hence grain yields were consistently low. Farmers used the farm-saved seed of genetically unknown varieties, leaving the common bean cultivars developed by the national agricultural research system and its breeding partners largely irrelevant and unknown. The continued sensitization on undernutrition, especially micronutrient deficiency in developing countries, and the advent of the biofortification strategy (Graham et al., 1999, 2001) ushered in a new era in common bean research. The point of reckoning came after observations that certain common bean genotypes accumulated more iron (Fe) and zinc (Zn) in the grain than others (Blair et al., 2009). Among these bean genotypes was the family of common bean lines developed by the International Center for Tropical Agriculture (CIAT), called the nutritionally enhanced 'Nutrient Andean' beans shortened as NUA (Blair, 2013). This group of lines, which included NUA 45 was the first known to have been developed specifically for micronutrient content, and some lines about in the group registered between 18 and 23 mgkg⁻¹ or parts per million (ppm) higher Fe and between 8 and 7 ppm higher Zn (Blair et al., 2010) compared to ordinary varieties which had a baseline of about 55 ppm Fe and 35 ppm Zn (Beebe et al., 2000). NUA 45 was officially

released into the bean cultivar pool of Zimbabwe in 2010 as the first generation of biofortified dry bean cultivars in southern Africa. Following its release by the then "Department of Research and Specialist Services (DR&SS)," NUA 45 was integrated into the government of Zimbabwe's multi-sectoral approach to address malnutrition.

At the time of the release of NUA 45, there was growing consumer consciousness, especially with anti-transgenic crop sentiments (Chagwena et al., 2019) that needed to be demystified given that the word 'biofortified variety' was unfamiliar and assumed to be synonymous with 'genetically modified organism (GMO)'. In addition, when NUA 45 was released, the common bean grain market in Zimbabwe was dominated by red-speckled common bean cultivars, commonly referred to as sugar beans (Birachi and Mutua, 2020; Mukankusi et al., 2020) from both the public and private sectors. Unlike the red-speckled cultivars, NUA 45 was red-mottled, a new and unfamiliar grain type that reminded both farmers and consumers of unpalatable bean types introduced into communities through erstwhile relief food programs (Mutari et al., 2021). The fact that the primary attribute of the cultivar, high grain Fe and Zn is an invisible trait, further deterred value chain actors due to perceived poor demand. At the time of its release into the market, only one seed company, a parastatal, was prepared to market NUA 45. Various studies recognized food consumption as a social event that is influenced by familiarity (Harper and Sanders, 1975; Salvy et al., 2008), hence NUA 45 was likely to face resistance due to unfamiliarity. Meanwhile, food systems are undergoing transformation in recent times especially with growing urbanization in developing countries. Food purchases are no longer exclusively from farmers' markets; consumers now purchase convenient foods in local grocery stores, where there is stiff competition among alternatives. Similarly, when it comes to brands, physical attributes of the product, salespersons and other distinguishable features have become very important in influencing customers' purchase behavior (Deska et al., 2022). Against this background, NUA 45 and its derived food products had to be strategically positioned to enhance purchase and consumption.

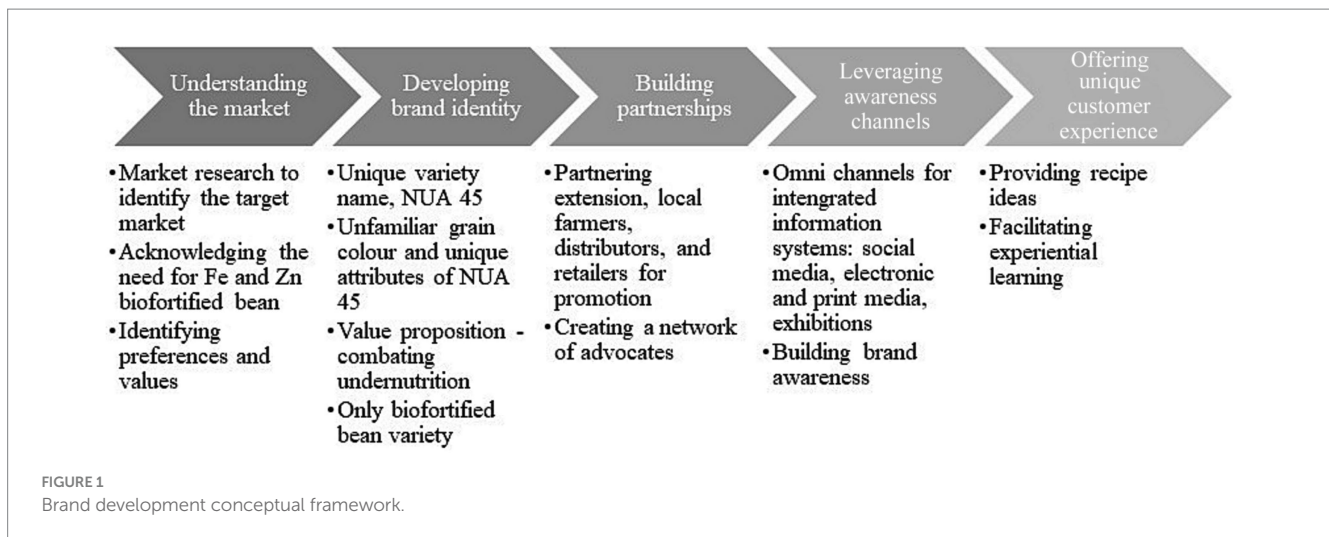
From the foregoing, it is clear that NUA 45 was an 'underdog' brand (Schmidt and Steenkamp, 2021) facing numerous obstacles that could only be overcome through new approaches. This paper presents barrier-breaking and pioneering work on the promotion of biofortified common bean cultivars and the introduction of 'unfamiliar' foods to communities. Importantly, it also presents the spontaneous evolution of a brand around the NUA 45 cultivar through the sequential stages of a conceptual model (Figure 1).

2 Materials and methods

2.1 Study area

This study was carried out in bean production, and consumption hubs located in the various agro-ecological zones of Zimbabwe as depicted in Figure 2. Bean production hubs are areas of intense

1 Now Department of Agricultural Research and Innovation Development (DARID) since 2022.



common bean production in the country (Birachi et al., 2023). Consumption hubs are areas where the beans are consumed in various product forms such as flour, canned grain, and cooked grain. Zimbabwe is a landlocked country located in southern Africa, bordered by Zambia to the northwest, Mozambique to the east, South Africa to the south, and Botswana to the west. Its geographical coordinates are 20.0° S latitude and 30.0° E longitude. It has a tropical climate, with distinct dry and wet seasons. The rainy season runs from November to March, with most rainfall occurring in December and January. During this period, temperatures range from 20°C to 28°C (68°F to 82°F) in most parts of the country. The dry season, from April to October, is characterized by cooler temperatures, with average temperatures ranging from 13°C to 24°C (55°F to 75°F).

The eastern highlands of Zimbabwe receive the highest amount of rainfall, with an annual average of over 1,000 millimeters (39 inches). The western part of the country, including the Karoo Basin and the Zambezi Valley, is generally drier, with an annual average rainfall of less than 500 millimeters (20 inches). Zimbabwe's climate is generally favorable for agriculture, with suitable conditions for the production of crops such as maize, cotton, tobacco, and common bean. However, the country has experienced recurrent droughts in recent years, which have had a significant impact on agricultural production and food security.

For better coordination and collaboration, stakeholders organized themselves into innovation platforms. Innovation platforms are networking groupings and members do not pay subscriptions, but indirectly pay in-kind through time and travel to attend networking meetings.

2.2 Data collection and analysis

Data used in this compilation were collected from the various stakeholders including traders, farmers, and processors during diverse annual stakeholder meetings, and visits in the country. Data were also collected through farm demonstrations and field visits. We also consulted annual reports provided by Pan Africa Bean Research Alliance (PABRA) to donors from 2015 to 2022. Seed production data were collected from the Seed Services unit of the Department of

Agricultural Research and Innovation Development (DARID). Information was also collected from impact studies across bean and non-bean-producing zones in Zimbabwe from 2015 to 2022.

2.3 Fitting NUA 45 into the policy environment

Released as a cultivar biofortified with Fe and Zn, NUA 45 fitted into the government of Zimbabwe's mandatory food fortification policy, which was introduced in 2015. The policy directed food processors to fortify specific food products such as sugar, cooking oil, and mealie meal (maize flour) with vitamins and micro-nutrients such as Fe and Zn. It also recognized healthcare-based interventions such as vitamin A fortification, micronutrient supplementation for young children, and Fe supplementation for pregnant and lactating women. Under this broad-based policy framework, NUA 45 came in as an agro-based intervention through lobbying with two key Government of Zimbabwe (GoZ) ministries. First, the Ministry of Lands, Agriculture, Fisheries, Water, Climate and Rural Development (MoLAFWC&RD) was engaged to include NUA 45 in the special agricultural input support programs that predominantly targeted cereal production. Second, the DR&SS in collaboration with the Ministry of Health and Child Care (MoH&CC) engaged the Ministry of Primary and Secondary Education (MoP&SE) to include NUA 45 grain as a relish in the mandatory school feeding programs. The government provided maize grain rations to school feeding programs, but the schools needed to provide relish, a role that NUA 45 grain fitted into. The MoLAFWC&RD (DARID and then the Agricultural Technical and Extension Service – AGRITEX²) introduced NUA 45 seed through schools' garden demonstration plots that served two purposes: a source of start-up seed and a source of grain used as relish the meals. Some

² Now Department of Agriculture and Rural Development Advisory Services (DARDAS) since 2022.

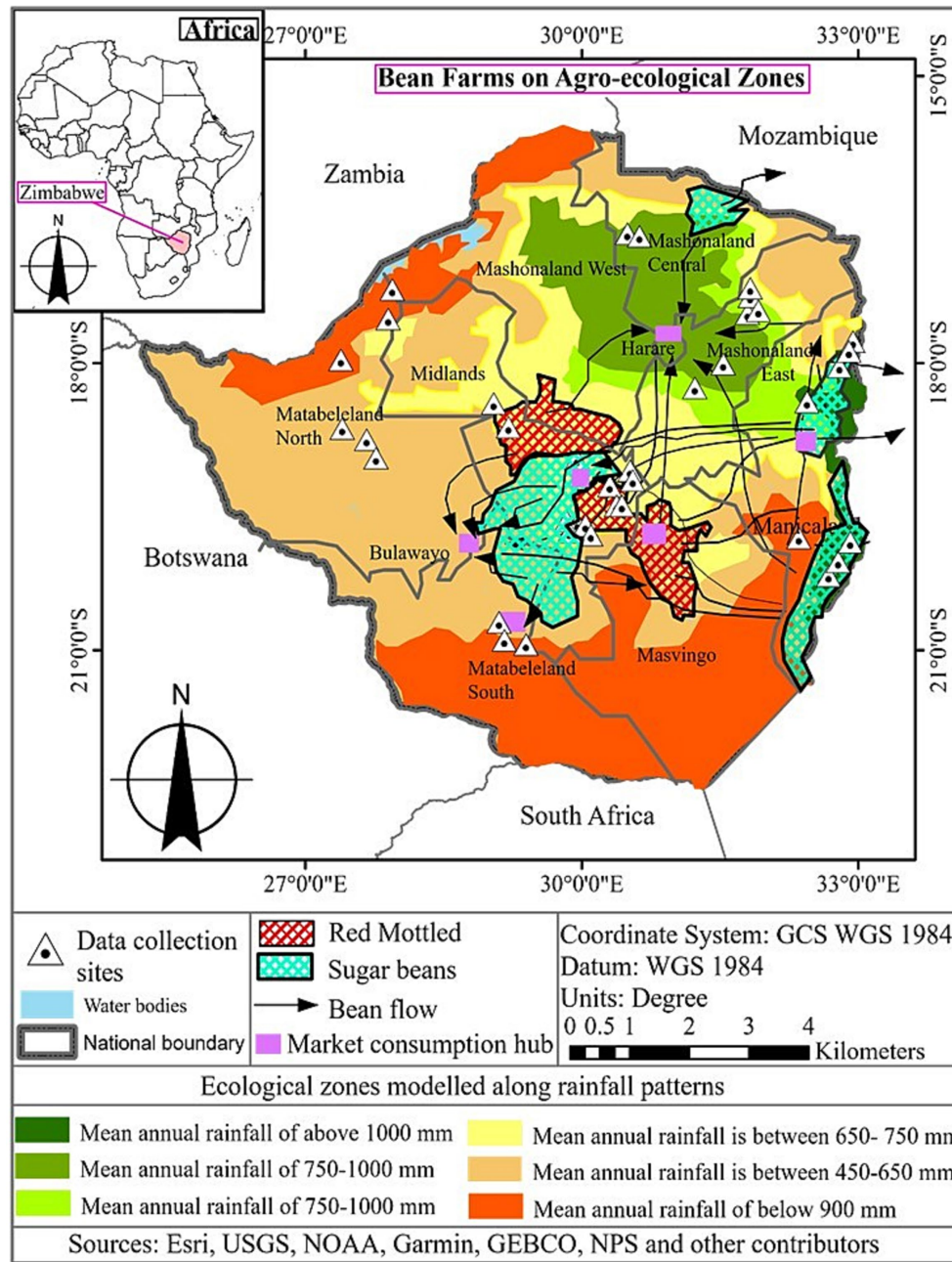


FIGURE 2 Map of Zimbabwe showing the Bean Corridors, survey data collection sites and the agro-ecological zones.

development programs like the Pan Africa Bean Research Alliance (PABRA) and the Technologies for African Agricultural Transformation (TAAT) also donated seed to schools.

2.4 Awareness creation campaigns and capacity development

Market research on the needs and preferences of consumers was carried out. A market segment for NUA 45 and other cultivars was identified (Nchanji et al., 2022). The market segment profiling revealed the differentiated needs of rural and urban bean farmers and

consumers, based on the bean market class, among them was the distinctive segment of NUA 45 as a biofortified bean variety.

NUA 45 promotion in Zimbabwe was spearheaded by the International Center for Tropical Agriculture (CIAT), DARID, and Department of Agriculture and Rural Development Advisory Services (DARDAS) working with various public and private partners including GoZ through MoH&CC and MoP&SE. NUA 45 was promoted through various media channels, including radio, television, and print. The messages focused on the benefits of the cultivar, including its high yield potential, nutritional value, and adaptability to various growing conditions. In addition, the partners conducted field trials to demonstrate the cultivar’s high yield potential and its

tolerance to drought, pests, and diseases. Awareness creation campaigns on the health benefits of consuming NUA 45 were also conducted targeting primary schools, irrigation schemes, youth groups, women groups, and mixed farmer groups. They were conducted during field days, agricultural shows (ward, district, provincial and national), and trade fairs. These aimed at educating participants on good agricultural practices (GAP) for NUA 45 and training on the diverse preparation options for enhancing bean consumption using participatory learning approaches (PLA) and the training of trainers (ToT) model. Events also included cooking demonstrations and organoleptic testing.

Information posters were displayed at the exhibition sites while various information education and communication (IEC) materials were developed by stakeholders. Schools and farmer groups also used theatre arts to create awareness of Fe and Zn deficiencies and the benefits of consuming biofortified crops. Corporate wear such as hats and t-shirts carrying the NUA 45 brand were distributed.

The 'food basket approach' was used to integrate NUA 45 into existing/new homemade dishes through training and cooking demonstrations at field days and exhibition fairs. The school feeding approach included training pupils on the nutritive value of NUA 45 and the various ways of preparing NUA 45-based products.

2.5 Building partnerships to develop and commercialize bean-based products

Value chain actors in Zimbabwe were engaged to innovate and deliver NUA 45 in various product forms, to counter the unfamiliarity of the red-mottled bean market class. Processors ranging from artisanal processors to established canning factories were engaged to evaluate jointly with the DARID, the products that targeted the processors' market. The team engaged leading grain traders that supported aggregation through networks of farmer groups. Large-scale grain traders developed contractual agreements with supermarkets while smaller grain traders facilitated onward repacking by networks of smaller entrepreneurs. Through the various innovation platforms described in the next section, stakeholders worked with researchers to evaluate and recommend specific value chain products.

Following the identification of stakeholders above, synergistic collaborations among similarly themed projects were established to promote the demand, utilization, consumption, and marketing of NUA 45 and a responsive production system amongst smallholder farmers. The collaborating private and public sector projects focused on food security, nutrition, and business development for smallholder farmers. They took a user-led approach to identifying challenges and proffering, and testing solutions in an iterative manner, an innovation platform approach (Figure 3). Innovation platforms were initially limited to irrigation schemes, but later became virtual spaces as stakeholders communicated with each other throughout the country. In the bean innovation platforms, stakeholders sequentially discussed challenges such as undernutrition, and inadequate access to seed, market information, bean processing information, and agricultural financing agencies. Some platform members or non-members identified the business opportunities presented by the challenges and presented a business proposition, which was evaluated and adopted by platform members. In these platforms, members had opportunities to co-learn and co-develop new products to solve pertinent challenges.

Through these multi-stakeholder and multi-sectoral approaches, research and extension staff kept platform members abreast of scientific evidence in bean research and development as well as commercialization models. The GoZ also supported the promotion of the cultivar through various initiatives such as subsidies for seed purchases. Seed companies were engaged to produce and distribute NUA 45 seed to farmers.

2.6 Compelling stories and unique consumer experiences

During the period 2015 to 2021, many success stories on income generation, health, and educational performance as a result of NUA 45 were documented periodically. The stories were captured on-site through interviews and physical observation of the evidence.

3 Results

3.1 The importance of the visible and invisible attributes of NUA 45

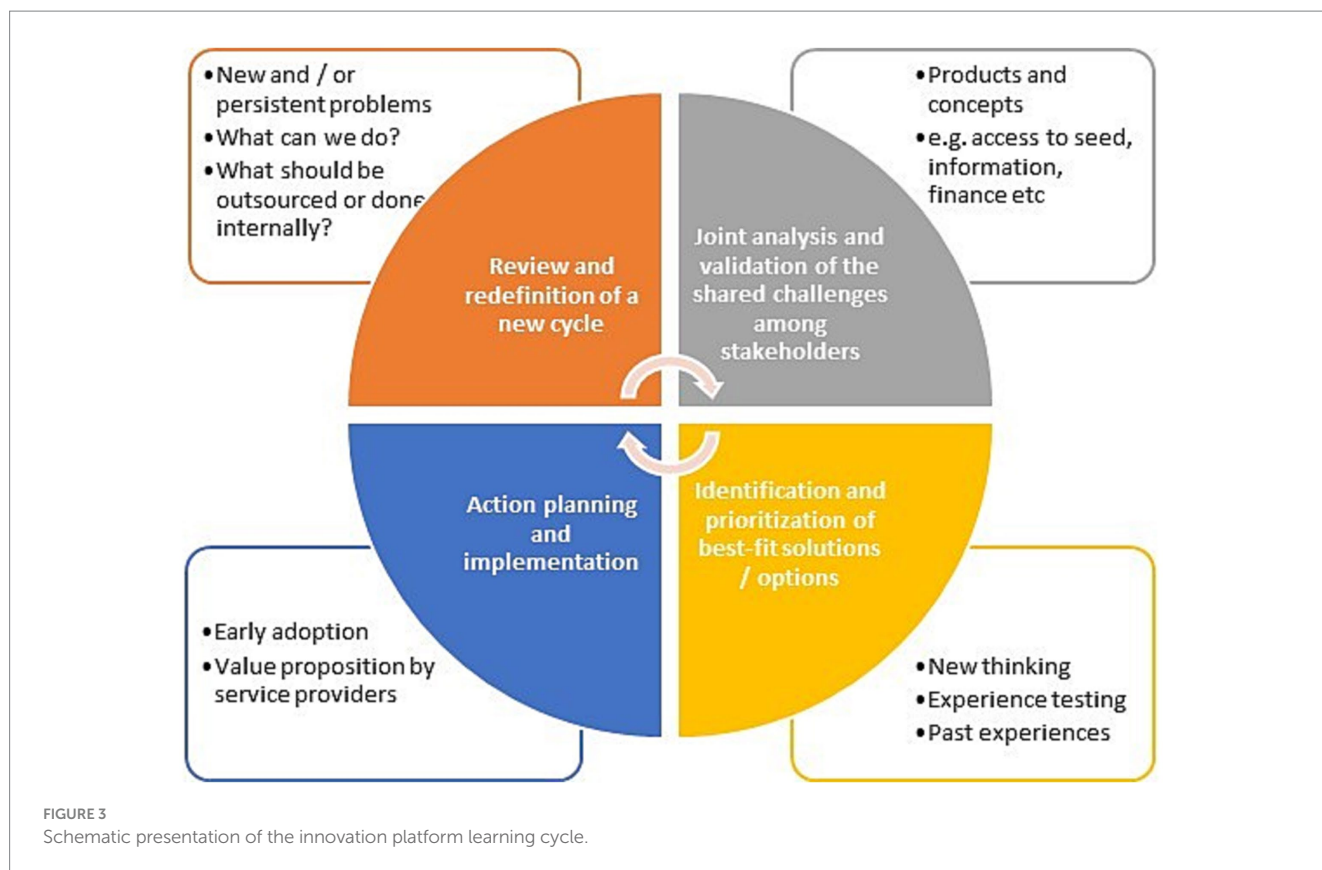
The name NUA 45 presented the first distinctive feature for the cultivar, defying the public cultivar nomenclature in Zimbabwe which stipulates that bean cultivars be named after flowers. During the participatory variety selection, stakeholders maintained the combination of 'vague' letters and numbers in the name NUA 45, unlike the usual flower names such as 'Iris' and "Sweet Violet" given to preceding varieties. The color difference was the second feature to set NUA 45 apart from the predominant red-speckled/sugar bean cultivars in the market (Figure 4). It is the reverse of the red-speckled cultivars, being red in the background (primary color) with white and cream speckles (secondary color). Third, behind the color lay the invisible trait of high Fe and Zn, which was also unfamiliar to stakeholders. Research and extension teams used visual identity to connect the farmers to the cultivar. IEC materials that were distributed highlighted NUA 45's physical peculiarity and its main selling point, which was the high concentration of Fe and Zn in the grain and the benefit it would bring to consumers. This value proposition resonated very well with a population that had embraced the government's fortification policy.

Following training on the food basket approach and the preparation of various bean dishes and recipes, different categories of NUA 45 products were developed. Considering that value chain actors in Zimbabwe were not used to the red-mottled bean market class, an effort was made for consumers to access the biofortified bean cultivar "NUA 45" in different product forms. Through various partnerships, awareness campaigns were conducted across the country and the response was positive (Supplementary Figure 1).

3.2 Building partnerships for markets and consumption

3.2.1 Commercialization of NUA 45

Supplementary Table 1 presents some of the categories of products based on the NUA 45 bean cultivar. Large-scale grain traders set up



bean grain aggregation centers for enhanced bean grain availability in supermarkets and other conventional markets through smaller entrepreneurs that packaged the grain for household consumption. Following the abundance of grain directly from farmers, supermarkets, and local markets, two small companies took up further processing of the grain into bean flour, composite flour, and samp (a mixture of cereals and beans). Before widespread commercialization of NUA 45 bean-based products, the most conspicuous bean products on the market were packaged grain and canned beans, both from cultivars other than NUA 45. In addition to grain, the canned beans, flour, and samp all from NUA 45 were also the first of these kinds of products on the market. NUA 45-based flour was particularly overshadowed by customarily used soybean and wheat flour. Overall, the NUA 45-based food products showed great potential and offered diversification of dishes, hence their uptake improved. One bean processor with a canning facility started canning NUA 45 in brine. Some NUA 45 farmers in the country adopted household-level processing of NUA 45, making plain and composite bean-cereal flours for domestic use and local community sales. Furthermore, bean flour is now sold in urban farmers' markets such as Mbare (Harare), Sakubva (Mutare) and Chitima (Masvingo).

Some farmers recorded yields of more than 1,000 kg/ha and others vertically integrated processing into their farming business to diversify income avenues. In terms of capacity building, farmers and entrepreneurs received training in local bean processing into various bean-based products. Furthermore, school teachers in the zones of influence reported better school attendance and academic grades of primary school pupils. These impact stories have been reported (Muthoni-Andriatsitohaina et al., 2022).

3.2.2 The innovation platform approach

The innovation platform approach was used to improve the adoption, production, consumption and marketing of NUA 45. In this forum, various actors including farmers, policymakers, traders, service providers, seed companies, processors, and entrepreneurs along the bean value chain worked together to tackle challenges that were hindering the production, consumption, and marketing of NUA 45 in Zimbabwe. Five innovation platforms were established in the main bean-producing areas of Manicaland, Masvingo, and Midlands provinces.

The use of innovation platforms enabled local grassroots coordination for a nationwide strategic vision, such that stakeholders would call others along to a new venture in a new location. For instance, seed companies requested training of farmers on nutrition in new locations, and grain buyers persuaded seed companies to make seed available in specific locations. The initial target beneficiaries were farmers in irrigation schemes; who could grow the cultivar up to three times within a calendar year. In addition, stakeholders also found a way of processing NUA 45 grain into various food products. Working together with researchers, this joint learning fostered ownership of the brand as groups and individuals were keen to showcase their innovations through recipes and processed products. NUA 45 was the dominant product traded across the major bean corridors making the grain available in almost all the biggest informal urban markets in Zimbabwe. These markets include Mbare (Harare), Sakubva (Mutare), Chitima (Masvingo), Kudzanai (Gweru) and Mandava (Zvishavane). Furthermore, the innovation platform approach enabled farmers to increase production and aggregation of NUA 45 thus attracting buyers.



Stakeholders deployed both push-and-pull strategies that enabled the availability of seed and grain and different locations in the country, starting with irrigation schemes and innovation platforms. Consequently, additional seed companies registered with the Crop Breeding Institute (CBI) of DARID to market NUA 45 certified seed. When NUA45 was released in 2010, only one public seed enterprise was multiplying and marketing the cultivar. However, by the year 2021, 14 seed companies were marketing NUA 45 (Figure 5), making it the most sought-after cultivar.

The amount of NUA 45 certified seed produced in Zimbabwe significantly increased ($p < 0.01$) from 24 tonnes in 2015 to 816 tonnes in 2021. Similarly, the cultivar's market share of certified seed grew from about 4% in 2015 to 38% in 2021. The time series analysis of the seed production trend showed significant yearly increments for seed production volume and biennial increments for the number of seed companies promoting NUA 45. Following the availability of seed, NUA 45 spread across the country, including the non-traditional bean growing areas (Figures 6A–C). The widespread production of NUA 45

resulted in increases in the number of households that were consuming biofortified bean varieties.

3.2.3 Policy briefs and enabling policy environment

The strategy to engage various stakeholders enabled collaboration rather than competition. The first major collaborator was the government, which created an enabling policy through the biofortification strategy. Stakeholders, therefore, rallied behind the call to reduce micronutrient malnutrition in the country. Furthermore, this was happening at a time when government efforts were also geared toward women's empowerment and the small-to-medium-scale processing industry. The mandatory food fortification policy coupled with increased emphasis on nutrition-sensitive agricultural value chains resulted in increased demand for bio-fortified commodities: seed, grain, and processed products from biofortified crops such as orange maize and orange-fleshed sweet potato. In addition, most programs by the government and development partners used NUA 45 as a vehicle to combat malnutrition in Zimbabwe.

3.2.4 Awareness creation

Multiple field days and awareness campaigns were conducted and attended by over 9,500 participants annually including farmers, parents, school pupils, and partners operating locally in the communities. Companies exhibited their NUA 45 products during the field days. These were biofortified bean value-added products such as biscuits, porridge, and yogurt developed for exhibition and tasting by participants. Promotional materials such as iron-biofortified bean recipe books, crop cultivar pamphlets, and GAP manuals were distributed in training sessions. The campaigns were a collaborative effort between various organizations to promote the cultivation and consumption of iron-biofortified and improve agricultural practices in Zimbabwe.

The DARID in collaboration with CIAT-Harvest Plus ran live radio discussions on the role of biofortified crops (including NUA 45) in addressing malnutrition. The radio programs reached approximately 2 million listeners around the country. The number of households accessing NUA 45 grain and food products per year increased from 8,000 in 2015 to 193,000 in 2021, having peaked at 386,000 in 2019. Cumulatively, more than 1,100,000 households accessed NUA 45 between 2015 and 2021. In addition, approximately 102,000 primary school pupils consumed NUA 45 grain through school feeding programs over 6 years. On average, in each year, 85 schools participated in the school feeding program and consumed a combined 61 t of NUA 45 grain. Adoption of NUA 45 and the associated GAP for the common bean in general, enhanced bean productivity and grain supply in the country. Some farmers recorded NUA 45 grain yields above 1,000 kg/ha and others vertically integrated processing into their farming business to diversify income avenues. In terms of capacity building, farmers and entrepreneurs received training in local bean processing into various bean-based products. Furthermore, school teachers in the zones of influence reported better school attendance and academic grades among primary school pupils. These have been reported by Muthoni-Andriatsitohaina et al. (2022). A similar trend in the dissemination of NUA 45 could be experienced in the SADC region following the release of NUA 45 in seven other southern African countries (Kondwakwenda et al., 2022), and its registration on the SADC regional variety catalog in 2020.

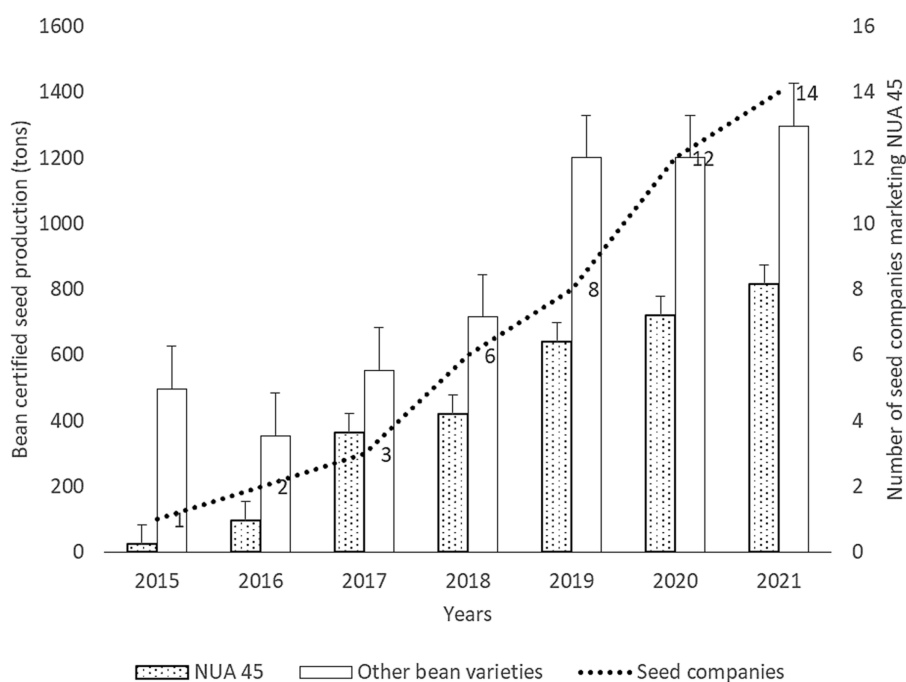


FIGURE 5
Gains in NUA 45 certified bean seed market share: 2015–2021.

4 Discussion

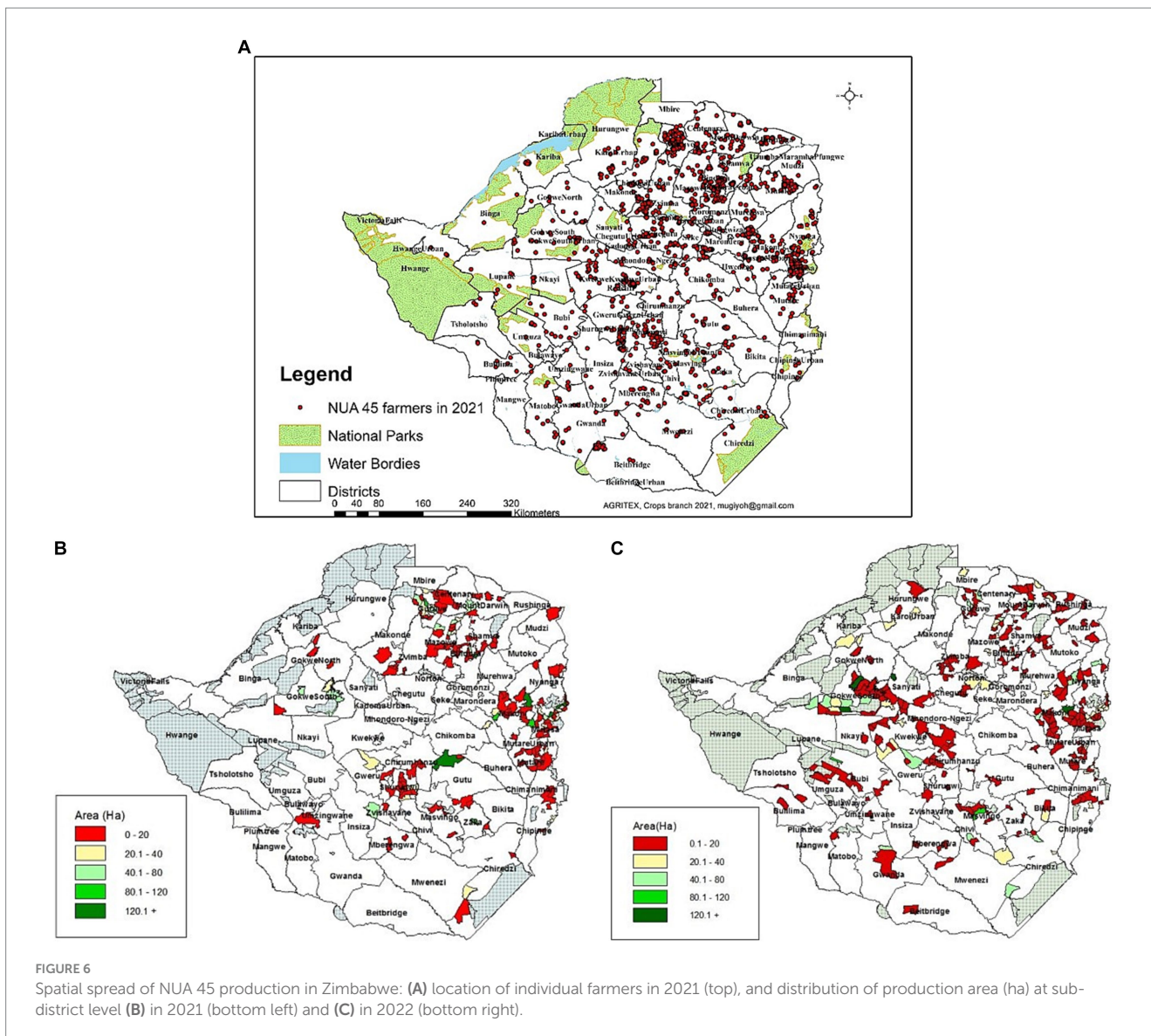
NUA 45's unique cultivar name and unfamiliar grain color amid familiar sugar bean varieties presented an acceptability challenge at first, but consumers' perceptions changed later and the cultivar became a brand in the country. Borrowing from brand development concepts, we discuss some of the prime movers for the bean cultivar's brand below.

NUA 45 was released to contribute to the eradication of rampant micronutrient deficiency, particularly of Fe and Zn. The brand's purpose was thus noble and represented the common good in addressing public health problems. One identified sustainable strategy is the mineral biofortification of staple crops, supported by the GoZ's food fortification policy, which enabled multi-sectoral stakeholders to highlight the noble cause. Similar exciting brand themes that resonate with consumers are observed with the LUSH brand's hand-made unpackaged cosmetics which created a differentiation advantage and fostered loyalty among green-conscious clients (Saraiva, 2022). In agriculture, green branding was proven to enhance consumer loyalty (Danko and Nifatova, 2022), but smallholder farmers would prefer more tangible benefits. The success of any brand depends on the benefits consumers perceive from it (Aziz and Yasin, 2010), which can instill stewardship. In addition to the invisible trait of biofortification, farmers perceived NUA 45 as a vigorous, excitable, high-yielding and early maturing cultivar that fitted well into their dryland, irrigated and residual moisture bean farming systems. The cultivar's excitable field performance was accompanied by its versatility in processing various food products ranging from various simple homemade dry bean soup recipes to complicated processing such as canning. Despite the cultivar's obvious lack of desirable canning qualities, processors explored delivering NUA 45 canned in brine. It was the first time that

canners dedicated resources to a cultivar not designed for canning. This was a clear indication of the popularity of the cultivar and stakeholders' loyalty to giving consumers a lasting experience at convenience. It was also clear the 'belongingness hypothesis' (Baumeister and Leary, 1995) was at work as stakeholders sought to include NUA 45 products in their product lines. NUA 45 created a successful business image and brand personality for all stakeholders along the value chain; from seed production to bean-based products. Key to the NUA 45 brand evolution was the bottom-up approach, which aimed at meeting the needs of consumers. This concurs with the notion that consumers are prime movers in transforming food systems and the business activities around the promotion of healthy diets as elaborated by GPAFSN (2020). The transformation however, requires collaboration and information.

Consistent promotion and awareness among the coalition of partners, built their confidence in the brand and its adoption. The use of theatre arts was effective in disseminating new knowledge on biofortification. NUA 45 producers and consumers were widely dispersed around the country, and to resolve the demand and supply glitches in the early days, stakeholders strengthened the networks to bring convenience, confidence and loyalty in the brand (Coelho et al., 2018) observed that social media brand building needed to be supported by convenience in the availability of products. Furthermore, consumers demonstrated price disdain as the priority was getting access to the cultivar. Unlike in the clothing sector where demand was reported to fall with premium pricing (Anderson and Simester, 2008), NUA 45 consumers were ready to pay a slightly higher price for the NUA 45 bean grain, a scenario which motivated producers financially (Muthoni-Andriatsitohaina et al., 2022).

Engagement with farmers and other stakeholders kept consistent and audience-specific messaging on benefits from nutritional,



agricultural, and business perspectives. Stakeholders were consistently updated on bean biofortification efficacy studies (Lung'aho et al., 2015), new bean-based products, and progress from counterparts in other countries. Sharing results from the proof-of-concept studies on the efficacy of high-iron bean beans in preventing iron deficiency anemia (Haas et al., 2016; Luna et al., 2020), helped build the confidence of researchers, private seed companies' staff and agricultural and health extension staff, the internal brand health. This internal brand health was buttressed by stakeholders' experiential engagements with the brand as they sought to develop, test, and entrench their specific products. Awareness of NUA 45 was made through various electronic and print media, and word of mouth (WOM) as stakeholders shared the brand values while at the same time capitalizing on the opportunities that were opening. The strength of peer opinions and recommendations (Laroche et al., 2013; Bowen and Bowen, 2015) on building trust was evident for NUA 45. Farmers, consumers, and extension staff became brand ambassadors. Seed production and processing activities in the bean subsector gravitated

toward NUA 45, allowing the cultivar to gain considerable market share.

This positive predictability encouraged emerging and established businesses to further invest in the cultivar and its products, ushering in drastic changes to the grain market scenario. Hitherto, grain aggregation had been supply-based, but the advent of NUA 45 marked the beginning of demand-led aggregation based on varietal preferences. Similarly, dry bean grain packs in supermarkets did not carry the cultivar names, but, for the first time, bean grain began selling under specific cultivar names in supermarkets and farmers' markets and NUA 45 grain attracted a premium. However, the downside was fake NUA 45 bean sold to unsuspecting customers and misspelling of the brand to 'Nower beans' or 'Noah beans,' both of which represent information gaps between the breeding, seed production, production, and marketing phases of the value chain.

Efforts are required to close this gap for brand consistency. Inconsistency in the labeling resulted in the low uptake of NUA 45

canned in brine. The processor might have left consumers confused and unaware of the 'brand inside' the can by labeling the product as 'biofortified sugar bean in brine' instead of 'NUA 45 biofortified beans in brine.' Contrary to the flour, the samp variations of NUA 45 were more acceptable on the market due to consumer familiarity with similar traditional dishes, but their uptake was limited by the high cooking energy requirements. The need to explore pre-cooked grain and samp becomes a worthy cause.

Throughout the promotion of NUA 45, the researchers maintained consistent engagement with the various stakeholders to understand their evolving needs through innovation platforms. Furthermore, the innovation platforms brought 'previously silent voices' to the fore. We saw an increased number of women in leadership positions and women entrepreneurs in NUA 45 (PABRA, 2022). In addition, the stakeholders demonstrated their interest in developing and validating new products through field and cooking or processing demonstrations. For instance, farmer groups in the north-eastern bean corridor were quick to adopt biofortified bean value-addition and needed help with market linkages and training in product branding. Importantly, there was a clear collaboration among stakeholders. The consistent engagement enabled the principals to generate clear anticipation of needs and aimed at delivering beyond expectation through networks of collaboration and information sharing. In similar collaborative efforts according to the customer brand engagement theories and frameworks, co-creation enhances the consumers' experiences, satisfaction, and loyalty and may lead to the consumers taking up the marketing function (Fernandes and Moreira, 2019). Consistent referral by satisfied customers built brand reliability among the common bean farmers and loyalty, which according to Jacoby and Kyner (1973), is the careful selection of repurchases based on preference, and not any other reason. Bean farmers and processors had other varieties at their disposal but repeatedly chose to grow and process NUA 45, respectively.

The multi-stakeholder approach significantly contributed to the increase in the adoption rate of NUA 45 from 2% in 2015 to 29% in 2018 (Katungi et al., 2020) and further to 47% in 2021. These gains are attributed to the government's push for food fortification combined with the intensive awareness campaigns, which both raised the demand for NUA45 in Zimbabwe. This demand-led approach to service and product delivery ensured successful collaboration along the value chain. NUA 45 provided good marketability for income generation, but farmers needed to balance the selling of its harvest with its consumption for nutrition security.

Overall, one major selling point for the NUA 45 brand was the absence of brand polarity, which often divides opinion. For instance, debates around transgenic crops stalled the dissemination of nutritionally enhanced transgenic crops under the African biofortified sorghum project (Kamanga et al., 2014; Wambugu et al., 2015) and golden rice (Glover et al., 2020) banners. Instead, PABRA's germplasm sharing scheme facilitated the release of NUA 45 in multiple countries in southern Africa, where the cultivar has gone on to command popularity also, providing a regional trade opportunity for both seed and grain to address deficits. This further strengthened the demand for NUA 45 seed in Zimbabwe and regionally. Some Zimbabwean seed companies responded to the NUA 45 regional seed demand by exporting certified seed of the cultivar to neighboring countries with the support of the United States Agency for International Development

(USAID).³ Multi-country release of NUA 45 and its registration on the SADC regional variety catalog in 2020, therefore, created a pathway for large-scale private sector investments (Kondwakwenda et al., 2022) which can further strengthen the brand at the southern African regional level.

The NUA 45 brand brought multiple benefits to various stakeholders including school children, farmers, and traders (Muthoni-Andriatsitohaina et al., 2022). The brand also facilitated the emergence of other business brands in food processing. Similar to brand endorsement, NUA 45 now features on the Southern African Plant Breeders Association (SAPBA) website wall of fame in recognition of its distinctive, broader consumer and agribusiness experience.⁴ Following the success of NUA 45, farmers recommended improvements to the cultivar., particularly increasing the grain test weight, given that grain off-takers preferred buying grain on weight (weighing scales) rather than volumetric (20-liter buckets) basis.

5 Conclusion

The dissemination of NUA 45 in Zimbabwe demonstrated the possibility of spontaneous brand evolution. In the absence of a deliberate initial effort toward branding, the market drive can result in the organic development of a brand. It is therefore important to have meaningful distinctness and brand purpose to achieve wide variety dissemination. Secondly, co-development of products ensured 'personalized' experiences with NUA 45 that facilitated a quick gain in customer brand loyalty as each stakeholder referred other stakeholders, akin to the adage, 'customers that bring customers.' Third, variety dissemination needs to be driven by a viable business case, which in this case, was demonstrated by the various stakeholders from farmers to processors. Furthermore, collaborative multi-disciplinary and multi-sectoral approaches involving crop research, nutrition, agronomy, education and markets elaborated through effective communication are key in driving the demand and supply of crop varieties. In our study, we appreciated that consumers know their needs better than any other stakeholder, and therefore allowed inclusive innovations to address challenges faster than a top-down approach.

Leveraging government efforts also helped the brand initially known as 'that red bean' to take off and become a 'red diamond,' rare and precious in the breeding pipeline. Typical of successful brands, NUA 45 laid the foundation for other biofortified varieties in the country through key lessons and a new set of institutional memory and brand recognition. Going forward it would be prudent to conduct studies on sustaining brand engagement and how consumer behavior will influence the uptake of other biofortified varieties that will be released in the country after NUA 45. An examination of generational nuances across consumers and how these affect NUA 45 purchase decisions is key for ascertaining its sustainability. Furthermore, it would be interesting to understand if the spontaneous brand would have emerged in the absence of government support.

³ <https://www.usaid.gov/southern-africa-regional/news/regional-seed-trade-empowers-farmers-and-bolsters-food-security>

⁴ <https://sapba.co.za/>

Data availability statement

The original contributions presented in the study are included in the article/[Supplementary material](#), further inquiries can be directed to the corresponding author.

Author contributions

EM: Conceptualization, Data curation, Investigation, Methodology, Writing – original draft, Writing – review & editing. BM: Data curation, Investigation, Methodology, Visualization, Writing – review & editing, Writing – original draft. FK: Data curation, Investigation, Methodology, Visualization, Writing – review & editing, Validation, Writing – original draft. EN: Data curation, Investigation, Methodology, Writing – review & editing, Validation. ST: Data curation, Investigation, Methodology, Writing – review & editing, Validation. RM-A: Data curation, Investigation, Methodology, Writing – review & editing, Validation. DC: Data curation, Investigation, Methodology, Writing – review & editing, Validation.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fsufs.2024.1260167/full#supplementary-material>

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