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Public Awareness and Perception of Genetically Modified Crops: A Case Study in Wardha, Maharashtra, India

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ABSTRACT

This research provides an account of the awareness and perception towards GM crops: A study in Wardha, Maharashtra, India. Genetically modified (GM) crops are one of the approaches that biotechnical science has developed to meet the demand for food through higher yields and the reduction of pesticide use. On the contrary, they also evoke some biosafety and health and environmental issues It is essential to understand public attitudes especially in agricultural regions like Wardha. Method of data collection: A survey using a structured questionnaire was administered to 150 respondents selected at random in selected areas in Wardha. The questionnaire included demographics, knowledge and awareness level, sources of information, and perceptions measured using a Likert scale, complemented with open-ended questions. Data analysis involved descriptive statistics and cross-tabulation to explore relationships between demographic factors and awareness/perception. Findings reveal varying levels of awareness, often linked to education and occupation. Perception is diverse, influenced by perceived benefits and risks, often reflecting knowledge gaps and misinformation. The sources of information and demographic variables influencing attitudes are also determined in the study. Findings will contribute to developing targeted communication strategies and policy for agricultural biotechnology adoption in the region.

INTRODUCTION

Background on Genetically Modified Crops

GM crops, or transgenic crops, are crops that have been created by genetic engineering. It enables addition or modification of genes in a plant to provide it with traits that cannot be obtained by traditional breeding (Hunter, 2014; Zerga, 2019). In 1983 the first gm plant, a tobacco resistant to antibiotics was generated, representing a crucial step towards plant biotechnology (Zerga, 2019). A wide spectrum of GM (genetically modified) crops are developed and commercialized worldwide since then including major crops like Cotton, Soybean, Maize and Canola (Shukla *et al.,* 2018). Such as the insect resistant Bt cotton and Golden Rice which is biofortified with high levels of beta-carotene (Halford & Shewry, 2000). The technology enables breeders to introduce traits like pest resistance, herbicide tolerance, improved nutritional content, and enhanced resilience to environmental stresses more efficiently than conventional methods (Huesing *et al.,* 2016; Zerga, 2019).

Importance and Potential of GM Crops in Agriculture

Supporters state GM crops have enormous capacity to solve global agricultural challenges today with a population that continues to increase and requires sustainable resources. Again, this has the potential to be beneficial for the environment, as their action of conferring traits such as insect resistance (i.e., Bt crops) or herbicide tolerance can reduce the number and volumes of chemical applications (pesticides and herbicides) required and inputs costs to farmers (Klümper & Qaim, 2014). Greater pest tolerance may translate into higher yields, an important factor for food security (Qaim & Kouser, 2013). Biofortified crops, for example Golden Rice, target micronutrient deficiencies which are endemic in some regions of the world (De Steur *et al.,* 2016; Shukla *et al.*, 2018). Second, GM technology may help develop crops that are resistant to drought, salinity, and other climate-related pressures, helping to sustain agriculture in the most vulnerable areas of the globe.

Controversies and Concerns Surrounding GM Crops

While biotech could be good for the environment, GM crops are a topic of controversy and concern all over the world. Criticisms usually focus on biosafety related to human or environmental consequences (Halford & Shewry, 2000; Oluwakemi *et al.,* 2020; Verma, 2013). These worries include allergenicity, horizontal transfer of antibiotic resistance genes (Daniell, 2000), collaterally and unintended effects on non-target organisms, resistance of pest species to Bt toxins, weed resistance to herbicides, and gene flow to wild relatives (Galeano *et al.,* 2010; Halford & Shewry, 2000). Ethical issues are the patenting of life and monopoly of seed by few corporations (Adcock, 2007). Another consumer concern is the compulsory labelling of GM-food items. Despite being widely discussed, many of the concerns have little scientific substantiation (Verma, 2013), but they nonetheless exacerbate public fear and give rise to many regulatory hurdles (Huesing *et*

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al., 2016; Shukla *et al.,* 2018).

Problem Statement and Rationale for the Study

The use and acceptability of GM crops not only rely upon scientific knowledge and legislative recognition but also − and primarily − on the public awareness and attitude (Ampadu-Ameyaw *et al.,* 2020; Huesing *et al.,* 2016). Without public buy-in, policies driven by misinformed fears over technical capabilities will only serve to deter the potential benefits of the technology (Ampadu-Ameyaw *et al.,* 2020; Lü & Chen, 2016; Wunderlich & Gatto, 2015). In regions where digital communications are limited, traditional tools still play an important role in shaping attitudes towards agricultural innovations. In Lanao del Sur, Philippines, traditional media like community radio, field demonstrations and Farmers' Field Schools (FFS) were also found to be very instrumental in closing agricultural knowledge gaps, as 78.7% of extension workers considered them effective or very effective. This further strengthens the importance of quasi-identity based on naturalistic engagement tools like the ones mentioned above in rural Indian context like Wardha, where the trust in the scientific discourse and outreach channels are still fragile (Mala *et al.,* 2025).

There has been considerable controversy about GM crops in India, with Bt cotton getting commercial approval to grow, but food crops like Bt brinjal facing moratoriums or delays (Choudhary *et al.,* 2014; Shukla *et al.,* 2018). Wardha district, Maharashtra, is an agriculture-intensive area and farmers' as well as consumers' views of the region are of interest in relation to the subject of agricultural biotechnology. However, there has been no systematic assessment of the knowledge of the public towards GM crops in such a region and what factors affect their attitudes. This research assesses the void by examining the public perception and awareness among the Wardha district public by proving them the important information for proper dialogue and decision making.

Study Objectives

The study revolved around the following objectives:

- To study the level of knowledge of the public about genetically modified crops in Wardha, Maharashtra.
- To determine the attitude (positive, negative and neutral) of different demographic group towards GM crops.
- To promote science and quell myths about GM crops in the community.
- To examine the effect of demographic variables education, occupation, rural/semi-urban location on knowledge and perception.

LITERATURE REVIEW

Global Overview of GM Crop Adoption and Impact

Genetically modified crops (GM) were rapidly accepted worldwide since its introduction in the mid-1990s, being common mostly in the USA, Brazil, Argentina, Canada and India (Akram *et al.,* 2019; Dunwell, 2014; Smyth, 2014). Herbicide tolerance and insect resistance have been the major traits incorporated, especially in soybean, maize, cotton and canola (Akram *et al.,* 2019; Shukla *et al.,* 2018). Research on the impacts of GM crop adoption have found substantial advantages for farmers such as decreased pesticide use, increased yields, and greater profits across many studies. Such benefits usually seem more visible in the developing countries (Klümper & Qaim, 2014). On the other hand, some studies also warn of possible environmental harm, including (but not limited to) greater use of herbicide in certain areas (e.g., Brazil) (Almeida *et al.,* 2017) and worry over gene flow illustration. GM crops are often controversial with socio-economic, ethical and regulatory aspects often involved in the debate in addition to the scientific assessments. (Adcock, 2007; Verma, 2013).

Public Awareness and Perception of GMOs: International Perspectives

There are also major differences in public awareness and perceptions of genetically modified organisms (GMOs) between countries and demographic groups. Research on public perceptions indicates that citizens usually have little understanding about the science behind GM technology (Ampadu-Ameyaw *et al.,* 2020; Todua & Gogitidze, 2017; Wunderlich & Gatto, 2015). Perceptions are often molded by the perceived costs and benefits, trust in regulatory agencies and the scientific community, media coverage of the science and cultural values (Amin *et al.,* 2014; Hanssen *et al.,* 2018; Verma, 2013; Wunderlich & Gatto, 2015). Negative attitudes arise from worries about health risks, damage to the environment, and corporate monopolies (Ampadu-Ameyaw *et al.,* 2020; Verma, 2013; Zerga, 2019). For instance, some parts of the world especially Europe have taken a very skeptical view on the subject matter, thus adopting much stricter regulations and limited versatility compared to North and South America (Dunwell, 2014). Across the world, calls for GM Food labeling are also a common thread (Ampadu-Ameyaw *et al.,* 2020; Franco-Perez *et al.,* 2020). Research shows that accurate information tends to counter misconceptions and increase acceptance of GM technology (Chrispeels *et al.,* 2019; Zerga, 2019).

Anecdotally, the UAE's agribusiness evolution shows how smart policy and technology investments can alter public confidence in modern farming. In view of the above, agri-communication, innovation spurring, and investment-dedicated public-private partnerships have been given special importance in the National Food Security Strategy 2051 of the country aimed at promoting controlled-environment agriculture and lessening import reliance (Elhabib, 2025). Such proactive strategies not only will address resource constraints but also will contribute towards reducing the gap between public perceptions and national food security.

GM Crops in India: Status, Policies, and Public Discourse

GM crops have an extensive yet controversial history in

India, revolving mainly around Bt cotton, which was cleared for commercial cultivation in 2002 (Choudhary *et al.,* 2014). In many regions, adoption of Bt cotton has been extensive and associated with increased cotton supplies and farmers' incomes Qaim & Kouser, 2013). But the regulatory environment for GM crops has been much more troubled, and GM crops are largely contested in the public space in India, especially with regards to food crops (Choudhary *et al.,* 2014; Shukla *et al.,* 2018). Use of Bt brinjal was even placed under a moratorium in 2010 despite clearance by regulators, highlighting the power of public and stakeholder opinion (Choudhary *et al.,* 2014). Proponents of GM argue for benefits such as increased yields, and reduction in pest and weed damage, whilst opponents use safety, environmental and socio-economic arguments for their cases (Choudhary *et al.,* 2014; Verma, 2013; Zerga, 2019). How much do the Indian people, particularly in farming states such as Maharashtra, weigh the pro- and anti- sides against each other? Navigating these differing viewpoints requires understanding the perspectives of the Indian public, particularly in agricultural states like Maharashtra.

Previous Studies on Public Perception in Rural and Agricultural Communities

Research on public perception of GM crops is frequently conducted in urban or general populations. Yet, better than any other area views in rural and agricultural communities are particularly important because they are directly engaged in or have a vested interest in farming practices. Research from across the globe suggests that attitudes towards GM crops among farmers are linked to expectations of profitability, technical simplicity, and existing information channels (Todua & Gogitidze, 2017). Farmers might be more aware about certain GM crops they grow (for example, Bt cotton in India), but less aware about other GM traits or crops that are not common in their locality. And the discussion in the community level in rural areas, such as agricultural extension services, also will convert the perception of farmers also with local agriculture culture too. Studies suggest that knowledge levels about the underlying technology are not always high, even among those directly involved in agriculture (Ampadu-Ameyaw *et al.,* 2020; Todua & Gogitidze, 2017).

Factors Influencing Perception: The Role of Knowledge, Media, and Trust

There are other factors that help shape public perception of GM crops. Individuals or groups with higher levels of scientific literacy or specific knowledge about GM technology express more positive or less uninformed attitudes, and knowledge level is consistently specified as a determinant. Merely familiarity, without science behind it, does not equate to good attitudes. (Chrispeels *et al.,* 2019; Wunderlich & Gatto, 2015). Media framing so much influences public perception as in many cases media will give contradicting or exaggerated information which will lead to fear or misunderstanding. Another critical factor is trust in the information, including on scientists, government regulatory agencies, and corporations (Hanssen *et al.,* 2018; Herrera-Estrella & Alvarez-Morales, 2001; Verma, 2013). Even with the scientific defenses, low trust in these institutions can breed skepticism (Herrera-Estrella & Alvarez-Morales, 2001). Age, education, culture, risk perception and further demographic and socio-psychological matter of fact, also play a role in developing individual attitudes (Kelly *et al.,* 2020; Todua & Gogitidze, 2017; Verma, 2013).

MATERIALS & METHODS

Study Design

This study used a cross-sectional-descriptive approach. This methodology facilitates the evaluation of public knowledge and attitudes on GM crops in the limited area of Wardha in Maharashtra over a period of time. This study design allows for the combination of quantitative data from all three scales, alongside quantitative demographic data, and qualitative data from open-ended questions. This design is relevant for portraying the present situation of public perception and opinion regarding GM crops in the area of interest.

Study Area: Selection and Justification of Locations in Wardha, Maharashtra

This research was carried out in the Wardha district of Vidarbha region in Maharashtra, India. Wardha is selected because the extent of agriculture is just enormous here, making it a sample creation area in India to understand the opinion of the public about agricultural technology such as GM crops like Bt cotton which are being cultivated in the folks all over Maharashtra. To record the range of perspectives the following distinct locations were selected within Wardha district:

Wardha town (Semi-urban)

Includes people of higher occupation background and access to networks and sources of information.

Sevagram (Semi-urban/Rural interface)

with historical importance; educational institutions and composition of both agricultural and non-agricultural population.

Deoli (A rural Village)

An agricultural village; provide insights about village-level participation and awareness due to direct involvement in farming.

This selection aimed to provide a comparative view of awareness and perception across different levels of urbanization and agricultural engagement within the district.

Sampling Strategy and Determination of Sample Size

Stratified sampling strategy was applied in capturing respondents from each section of the locations/

population chosen. We stratified the population by location (Wardha town, Sevagram, and Deoli) and principal occupations pertinent to the subject (farmers, students, teachers, homemakers, vendors, others). In each stratum, respondents were chosen through convenience sampling due to practical obstacles to obtaining a complete sampling frame across the broad spectrum of occupations. The target households sample was 150, which was planned to be approximately 50 per each of the three selected locations. Sample sizes of this nature are appropriate to give a simple summary of trends in awareness and perceptions in the study area, within the scope of the project and available resources.

Development of the Data Collection Instrument (Questionnaire)

The main instrument used for collecting the data was a structured questionnaire. The questionnaire was written in English and subsequently translated in Marathi (local language) for understanding of all respondents. It has 4 main parts as follows:

Demographic Information

Age, gender, education, occupation, residence and agricultural history (farmer/non-farmer).

Awareness Assessment

A set of questions measuring exposure to the term "genetically modified crops" or "GMOs" concepts (e.g., modifying genes), and examples of GM crops. The questions were in Yes/No/Don't Know format.

Sources of Information

Based on the type of information that the respondents are consulted and where do they obtain information about GM crops (media, government, scientists, farmers, peer group, NGOs).

Perception Measurement

Were measured on a five-point Likert scale (Strongly Agree to Strongly Disagree) to measure attitudes towards various aspects of GM crops, including perceived benefits (e.g., yield increase, less pesticide), perceived risks (e.g., health issues, environmental harm), safety, and desirability for cultivation/consumption.

Open-Ended Questions

Included questions inviting respondents to express their main concerns or positive views about GM crops in their own words, providing qualitative insights.

The questionnaire was piloted with a small group of individuals not included in the final sample to check for clarity, flow, and cultural appropriateness before finalization.

Data Collection Procedure

Data collection was conducted through face-to-face interviews using the finalized Marathi questionnaire. Researchers approached potential respondents in public places, markets, and community centers within the selected locations. For farmers, interactions occurred in farming areas or local community gathering spots. Respondents were informed about the study's purpose, assured of anonymity and confidentiality, and participation was voluntary. Verbal consent was obtained before administering the questionnaire. Interviews were conducted carefully to ensure respondents understood the questions, and responses were recorded accurately. The data collection process was carried out over a specific period to minimize the influence of external events.

Data Analysis Plan

The data collected was coded and entered into the Microsoft Excel Spreadsheet of initial data preprocessing and cleaning. Basic statistical tools were used for statistical analysis.

Descriptive Statistics

Frequencies and percentages were employed to describe demographic profile of respondents, awareness of respondents, sources of information and global perception score for each Likert scale items.

Cross-Tabulation

Cross-tabulation and Chi-square test were used to test the association between demographic factors (education, occupation, area of residence) and level of awareness, and various perception indicators.

Influential Factors

Basic statistical comparisons (e.g. mean difference in perception scores) were made to investigate how factors, such as education level and agricultural background, aye associated with general attitudes.

Qualitative Data Analysis

Open-end responses were transcribed, and were reviewed to identify recurring themes or key messages, which provided additional context and insight for the quantitative findings.

This analysis plan aimed to address the research questions by providing a comprehensive overview of the quantitative data and supplementing it with qualitative insights.

Ethical Considerations

This research study strictly followed the Ethical guidelines for the research which involves human participants. The ethical considerations followed were:

Informed Consent

Respondents were provided with detailed information about the purpose, methods, potential risks (minimal) and benefits of the study. All participation was completely voluntary and verbal consent was acquired from all respondents prior to the interview.

Anonymity and Confidentiality
All responses were recorded anonymously and, without personal identifiable information. All data was handled with strict confidentiality and only used for the purpose of this research.

Voluntary Participation
Respondents were advised that they could withdraw from the study at any time without penalty.

Researcher Behavior
Researchers behaved neutrally and respectfully while collecting data, avoiding any leading questions or influencing responses.
The study ensured the minimal risk to all the participants.

RESULTS & DISCUSSION

Demographic Profile of Respondents
The Study:150 respondents were studied from the 3 selected locations of Wardha. 52% of the sample was females versus 48% males. The age distribution was 30% between (18–30), 45% (31–50) and 25% > 50 years. The educational details show that 20% only had primary education or less, 35% had secondary education, 30% had higher secondary or diploma and 15% had graduate degree or above. Occupation distribution was representative of the study area with 40% as farmers, 20% students, 15% homemakers, 10% as vendors/ small business owners, and 15% in different professions (e.g., teachers, service). The distribution of the samples by location was approximately 33 % from Wardha town, 34 % from Sevagram, and 33 % from Deoli.

Level of Awareness Regarding Genetically Modified Crops
General knowledge of "Genetically Modified Crops" also "GMOs" was moderate (Table 2). Only 45% of the farmers had ever heard of GM crops before the study. Recognition of specific instances, among those who were aware, was less common. For example, 60% of aware participants were aware of Bt cotton but very few know about other GM crops including Golden Rice and herbicide tolerant (HT) soybean. Knowledge of the basic procedure of gene manipulation was low; only 30% of respondents on whom this question was asked could give a reasonable description of what is involved. The level of awareness was significantly higher in Wardha town and Sevagram as compared to Deoli and significantly higher among the respondents with higher educational status and farmers.

Sources of Information about GM Crops
People who responded cited a number of different sources when it came to information about GM crops. Of the respondents that said they were aware of the avian influenza awareness campaign, the top three most cited sources were TV and newspapers (55%); talking with other farmers/community members (40%); and government/agricultural extension workers (25%). Fifteen percent of respondents cited "social media" or "the internet," particularly younger and more educated respondents. NGOs accounted for a mere 5%. Indeed, 40% of the respondents, mostly from the rural sample, reported that they had very little or no specific information about GM crops, even when they knew that Bt cotton was being cultivated.

Overall Perception Towards Genetically Modified Crops
The perceptions towards the Genetically Modified crops neither strictly positive nor negative rather was varied and mostly subtle. The measuring agreements with statements about the GM Crops on Likert scale were:

On Benefits
55% agreed or strongly agreed GM crops can increase yield, 40% agreed GM crops can reduce pesticide use. Positive rating of farmer on yield benefits was higher.

As for Risks
65% worried about long-term health effects, and 50% about environmental effects (like harming beneficial insects). Such concerns were common to demographic groups.

On Consumption Safety
Just 35% agreed that GM food is safe to eat, while 45% disagreed or strongly disagreed and 20% were neutral or unsure.

On Cultivation
50% of farmers were willing to grow GM crops, assuming they brought specific economic benefits and were approved by authorities, while 30% were hesitant feeling GM crops could be risky or there was a problem with cost and / or availability of seeds.
Overall, there was a cautious approach, with perceived risks weighing heavily against acknowledged potential benefits for many respondents.

Influence of Demographic Factors on Awareness and Perception
Statistical analysis revealed significant associations between certain demographic factors and awareness/perception.

Education Level
Higher education levels were associated with higher overall awareness of GM crops (Chi-square $p<0.01$), greater understanding of possible advantages and disadvantages. While fears related to health and environment remained, more educated respondents were also less likely to hold strong negative opinions based merely on fear.

Occupation
Higher awareness of Bt cotton (but not necessarily higher knowledge of GM technology or of other GM crops) than non-farmers of the same level of education.

Farmers' attitudes were more closely related to specific agricultural achievements (return, pest management, cost). Those who were not farmers (especially housewives) had a relatively high level of concern about food safety.

Location

General awareness was greater strikingly at the town of Wardha and Sevagram, rather than in Deoli, the rural village. But the farmers in the rural village who grew Bt cotton had a certain knowledge about that crop that was very immediately acquired and experience based. Perceptions varied according to occupation rather than location but access to sources of information was greater in the semi-urban areas.

Qualitative Insights from Open-Ended Responses

Open-ended questions yielded richer qualitative information. Themes present in participants' responses around their fears included-

- We're not sure what is being altered in the plant, it feels unnatural.
- "Concerned about eating something that is altered in a lab."
- "Said they can lead to diseases later in life, but not sure how."
- "So what's happening to the dirt or the insects?"
- "Seed is expensive we cannot save seed for next year." (primarily farmers)

Favorable views frequently expressed:

- "Bt cotton decreased the spraying for pests." (farmers)
- "If it provides more yield, then is good for farmers." (farmers)
- "Perhaps it can make food healthier or grow in harsh conditions."

Many respondents said they would like more clarity and trustworthiness in information, expressing that they often hear conflicting narratives from various places.

Discussion

In Wardha, people have some knowledge of GM crops, however actual recognition is not relatively high. We asked people for their understanding of such terms as "GMO" or "genetic engineering." Many either said no, or exhibited an obviously puzzled expression. On the other hand, as soon as we mentioned Bt cotton, farmers quickly answered in the affirmative that they do know it. So that part they don't understand in fact, but if they've used the crop they know. This shows that awareness is mainly about direct experience and not book learning or media exposure in Wardha (Ampadu-Ameyaw *et al.,* 2020; Wunderlich & Gatto, 2015). Here education makes a big difference. People who had been to college or had higher education knew more. Likewise, those living in towns knew more than do rural folk. But in any case, even the educated do not really know how this genetic engineering works. Most of the people just heard the things from TV, news, or friends, and sometimes what they heard was misinformation.

But when we looked at how people feel about GM crops, it's a murky picture. Farmers said Bt cotton worked for them — lower spraying, higher yield (Klümper & Qaim, 2014; Qaim & Kouser, 2013). That sounds like a benefit. But many others, including some farmers, had misgivings. Or like, "What if it gives people health problems? or "This is not natural," or "Will it be bad for the soil and the insects?" It's a common form of these types of fears (Verma, 2013). And most people don't say these things guided by science so much as what they hear or feel. And when they're not trusting the information, the fear gets larger. The worst thing, however, can be the modern two-headed hydra of social media and gossip. "Real people said they would like straight and simple answers from someone they trust, not just anyone (Huesing *et al.,* 2016).

Based on the successful agricultural extension models observed in Lanao del Sur and in the UAE, a hybrid outreach approach is suggested. This could be melding community radio, mobile-based advisories (SMS), and seasonal field schools to boost awareness of GM crops. Moreover, content in local dialects, culturally sensitive narratives, and participatory sessions can improve retention of knowledge and trust (Mala *et al.,* 2025; Elhabib, 2025). Policymakers may also examine targeted subsidies and AgriTech engagement, as successfully done in the UAE, to demystify agricultural technologies and achieve wider acceptance among the public.

So, One message is not going to do it for everyone. Farmers, students, and moms at home — all need info that matches their base. "Policymakers must be clear about the rules and tell people the truth." And schools can, after all, teach, these things early, so that future generations don't have the kind of confusion that we seemed to have. If people get information in a simple manner, from local sources and in a language, they understand, awareness will build. Only after that, they might feel secure and willing to use GM crops.

CONCLUSION

Summary of Key Findings

Public awareness of GM crops was moderate but poorly dispersed, usually pertaining to localised instances, such as Bt cotton in Wardha, Maharashtra, instead of the technology as a whole. Awareness is also affected by education level and occupation because as education levels increase, familiarity increases. Perception is a more complicated beast, recognizing potential agrarian benefits, such as actual productivity and minimal pesticide exposure, but famously overshadowed by significant long-term health and environmental safety concerns. As these concerns largely come from not knowing things and therefore a lack of trust, events like reading in the news and talking with friends go a long way. Demographic factors — especially education level and occupational type — influence not only awareness, but also the content of concerns.

Significance of the Study

For their development and adoption, GM crops rely ultimately on the public awareness and perception. This study offers detailed empirical evidence from an important agricultural area in India where the debate about agricultural biotechnology is still raging. The survey shows information deficits in Wardha and the concerns of the public; as such it provides a useful barometer for sentiment within society. It is important that this information be used to design effective communication strategies for all levels and segments of population (farmers, consumers, in less educated areas as well as more educated ones); likewise, those in power need awareness about the social context within which decisions on GM crops are being formulated.

Recommendations for Improving Public Understanding and Policy

The findings suggest several implications:

• Conduct targeted public education campaigns and communications designed to inform and educate the public with credible, accessible information on GM technology, its benefits, risks, and oversight, using local channels (e.g., agricultural extension, village leaders).

• Use clear and scientific-based communication to address specific public concerns including health and environmental safety.

• Strengthen the teaching of science to do with biotech at schools to raise general literacy in science.

• Policy makers need to promote transparency in their regulation of GM crops and engage with stakeholders, which in case of the public enhances trust.

• Fund research on public perception in various geographies and sectors to help gain insights on the drivers of attitudes.

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