



Quality Issues for Sustainable Agriculture

K. Kaur¹, G. S. Gill^{2*},

¹Directorate of Distance Education, Kurukshetra University Kurukshetra, Haryana, INDIA.

²Department of Instrumentation, Kurukshetra University, Kurukshetra, Haryana, INDIA.

*Corresponding Author (Tel: +91-99920-13130, Email: gsgill@kuk.ac.in).

Paper ID: 13A9J

Volume 13 Issue 9

Received 07 April 2022

Received in revised form 13
June 2022

Accepted 20 June 2022

Available online 27 June
2022

Keywords:

Holistic practices;
Assessment; Smallholder;
Organic producer;
Organic agriculture.

Abstract

Agriculture has been addressing the food and nutritional requirements of mankind since time immemorial. Over the ages, agricultural practices have undergone progressive changes to meet the needs of people from time to time. In the recent past, a holistic approach in the form of sustainable agriculture has evolved with a focus on meeting the needs of present and future generations while ensuring economic prosperity, ecological health, and socio-economic equity. The global shift towards sustainable agriculture and food quality drives substantial advancements in resource optimization and environmental protection. In the present article, an attempt has been made to address the quality concerns in agriculture in developing nations with an impetus to make it sustainable.

Disciplinary: Food Quality, Agriculture, Agriculture Economics

©2022 INT TRANS J ENG MANAG SCI TECH.

Cite This Article:

Kaur, K. and Gill, G.S. (2022). Quality Issues for Sustainable Agriculture. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 13(9), 13A9J, 1-6. <http://TUENGR.COM/V13/13A9J.pdf> DOI: 10.14456/ITJEMAST.2022.178

1 Introduction

The use of intensive agriculture practices in developed countries led to a manifold increase in food production for decades and hence the world has witnessed the corporate model of agriculture as a big success. But in the case of developing countries, the agriculture sector is facing a plethora of problems such as small holdings, low levels of farm incomes, underdeveloped rural infrastructure, large-scale unemployment, food security concerns, farmer suicides, deterioration of health and depletion of natural resources due to excessive use of chemical fertilizers and insecticides, increased frequency of natural disasters due to climate change and numerous other region-specific problems. Industrial and service sectors have gotten maximum attention whereas the agriculture sector in the majority of developing nations has not flourished in an optimum and sustainable manner. With millions of farmers being major producers as well as consumers, there is

a dire need to chalk out farmer-centric policies to incentivize them to adopt quality-based agriculture practices. Sustainable agriculture can aptly address these issues which have evolved with time and assumed increased importance due to growing quality and safety concerns in society. This article attempts to highlight the quality issues in the agricultural sector in developing countries.

2 Agriculture Scenario: Past and Present

Decades of revolutionary advancements in the agriculture sector have proven to be insufficient in the current scenario to address the problems of around 80% poverty-ridden people of the world living in rural areas depending directly or indirectly on the agriculture sector for their livelihoods. The fact that problem of hunger and undernourishment is not due to food shortage but also due to the market-driven forces guiding the government policies.

Increased migration of people towards urban areas and the emergence of a middle-class population working in the manufacturing and services sector, changing lifestyles and increased participation of women in the urban workforce have led to the growing demand for processed food. Due to the use of communication tools people are becoming more and more aware of the quality of food being sold to them in any form. They're a great scope for increasing the income levels of millions of farmers by incentivizing them to adopt sustainable agriculture practices and to address food safety and health issues of the masses (Coggins *et.al.*, 2022). The easy availability of handheld devices for providing instant results in terms of quality attributes of agricultural produce will boost the confidence of buyers as well as sellers.

Economic recession along with the food crisis in 2008 and the COVID-19 pandemic has highlighted the agriculture sector as the primary need of humankind (Kohli, 2020). A major study found increased production value even during the recession, employing over 1,20,000 people directly and nearly 10 lakh people indirectly in the primary food processing industry in the European Union (Logatcheva and Galen, 2015). Due to the prevalence of cooking practices among a large population in the world, the unorganized food sector also demands standardization and quality evaluation. Big employers engaged in mass production to get scale economies also face barriers in the form of the uncertainty of market conditions in the future due to heavy investments in automation of production practices. Maloney (2019) mentioned recent studies suggesting that productivity growth in agriculture in developing countries is independent of firm size. The availability of labor-intensive technological support suitable for small land holdings can make even small agricultural farmers efficient ones (Glover *et.al.*, 2019). Governments in developing countries have a necessary role to play in incentivizing all the players, farmers as well as innovators to make agriculture sustainable in the long run. The lack of motivation among small farmers to do away with farm practices that are unsafe for human health and destructive to the natural environment should be aptly addressed. In the present times, there is nothing more valuable than consuming healthy food. Providing safe and quality food, especially in developing countries to the masses will

increase the farm incomes on one hand and the willingness of the processed food consumers to pay more on the other.

3 Motivation

In the present scenario, with the consumer base concerned about food quality and safety, the focus on quality is the top priority for the agriculture sector. The exports from developing countries are facing rejections on arrival due to quality issues and safety concerns. The key factors for rejection of export orders are lack of grading, use of pesticides above the prescribed threshold limits and use of chemicals that are prohibited in the importing nations. For instance, Libya, a major importer of tea from India, imposed a ban on tea imports for five years due to the export of 3000 tonnes of substandard tea in 1998-99. On similar lines, Iraq rejected 23,500 tonnes of wheat due to bad quality (Chandrasekhar, 2001). In 2010, a consignment of table grapes worth rupees 3 billion faced a similar fate when it was found to be containing traces of Chlormequat, a prohibited plant growth regulator. 2000 tonnes of rice were rejected in the US in 2012, on arrival, due presence of pesticide content in the sample above the permissible limits (HT, 2012). Among the major exporters in the food and agriculture sector facing high rejection rates are China, India, Iran, Vietnam, and Turkey (Henson and Holale, 2011).

4 Remedial Measures

To cope with the demands of quality conscious consumer base increasingly concerned about food safety, there is a dire need to address the issues related to the quantification of agricultural produce. Some of the key issues are highlighted in the section to follow.

Traceability - In the recent past, traceability has been established as one of the most effective methods for resolving sanitary and phytosanitary issues. Access to overseas markets is a crucial aspect and any nation and exporters do not want to lose an opportunity due to the high returns associated with it. The product can be assigned a unique code at the first stage of procurement from the farmer this information is preserved as a record. With this system in place, there will be a complete record of the producer from whom even the smallest portion of the bulk consignment has been sourced. This will be a systematic primary step if implemented firmly at the procurement stage in local and domestic markets and compliance with this throughout the supply chain will ensure complete traceability of products from producers to the ultimate buyer.

Instruments for Quality Assessment - The stakeholders in developing countries must draw a synergy through technological advancements in handling the complex problem of food safety and quantification of food quality. There is an emergent need to focus on country-specific, region-specific and crop-specific devices for the quality assessment of food products, both raw and processed. A lot of work has been carried out globally in this direction for the quality assessment of wheat, rice, tea, spices and fruits using optical and spectrophotometric methods (Cayuela and Weiland, 2010; Bourne, 2002, Beghi *et.al.*, 2014). For instance, the biospeckle technique has been widely employed and claimed to be successful in the estimation of acidity, starch, ripeness, juice content and soluble solids in apple fruits at harvest. (Szymanska *et.al.*,2012; Moghaddam *et.al.*,

2016; Torres *et.al.*, 2017). Similarly, extensive work has been carried out in quantification of the quality of dairy, poultry and meat using destructive and non-destructive methods ranging from chemical analysis to hyperspectral imaging and biosensors (Bohigas *et.al.*, 2008; Mukhopadhyay and Gooneratne, 2007; Kamruzzaman *et.al.*, 2013). Most of these works have led to the development of highly efficient devices but in most cases, the devices so developed have been essentially laboratory equipment that could only be operated by experts. The need of the hour is educating the farmers about the increasing importance of food quality as a preliminary step and to pass on existing technology in the hands of farmers in the form of indigenous low-cost portable instruments for the estimation of various parameters used to establish food quality.

Implements and Tools Banks - The establishment of a common pool of farm machinery, equipment and tools at the village/cluster level can suitably suffice the needs of smallholder farmers enabling them to harness the gains of the latest technological advancements in the agricultural field. Such facilities will result in optimal utilization of resources, thereby reducing the cost of production and will reduce the unnecessary financial burden on the smallholder farmers. With access to such technical inputs, farmers will be able to quantify various attributes concerned with the quality of produce at production, pre-harvest and post-harvest stage.

Government Support – Incentive-based support should be provided to the farmers along the lines of the green revolution. With a major share of the farming population being debt-ridden and the dependence of rural masses on the agriculture sector for their livelihood, India cannot afford to have the corporate model of agriculture. But at the same time, smallholder farming needs technologically advanced tools to discourage excessive use of chemicals and fertilizers and enhance the quality of food items being produced at the farms.

Organic agriculture - Organic agriculture is a holistic approach and when complemented by modern technical advancements can serve as an efficient attempt toward environmental sustainability. Presently, SDGs as set by the UN constitute all the major environmental issues demanding immediate attention to save & maintain the planet as a livable place. Organic agriculture has a pivotal role to play in addressing the major environmental problems mentioned in SDGs & it can go a long way to achieve these targets. Given the benefits and scope of organic produce, farmers have the willingness to switch over to it but the complex issues involved in standardization, certification and labelling of organic produce and the lack of proper policy measures to address these issues are the major hurdles to discourage them. Organic agriculture has been as old as mankind, and it is based on the traditional knowledge of natural inter-linkages between crops and the surrounding environment; and this knowledge travels from one generation to the next. The modern concept of organic agriculture evolved during the 1980s (as against the intensive agricultural methods of production) and it requires documentation, monitoring, and evaluation along with provable standards to build confidence among the consumers thereby fetching higher prices. As per the FiBL survey, 2018, India has the largest number of organic producers (8,35,000) in the world followed by Uganda (2,10,352) and Mexico (2,10,000).

Policy measures that can be helpful to promote organic agriculture and encourage farmers, especially small and marginal ones and at the same time build up the trust in organic food among the masses:

- An institution at the national level dedicated to the overall growth and development of the organic sector, chalking out various policies according to regional requirements in the country with diverse farming cultures and different geographical features.
- As per the World of Organic Report 2018, India has the largest number of organic producers in the world but in terms of area under organic cultivation, it lags far behind (only about two percent of the total area). Therefore, there is a dire need to increase the area under organic agriculture by strengthening the confidence of farmers as well as consumers.
- Facts and figures based on authentic data play a significant role in decision-making. Therefore, special efforts should be made for strengthening the data collection and easy accessibility of the required quality data on organic agriculture in India so that proper policies may be developed. It will be a great help to the stakeholders to make well-informed decisions on products and markets as well.
- Due to the large-scale debt problem among Indian farmers, organic agriculture cannot be left to market forces only. Rather the government should come up with a helping hand to instill confidence among them for undertaking organic agriculture.
- Farmers of various remote regions of the country which are organic by default should be made aware of the value of their organic produce and infrastructural facilities like roads, bridges, transportation, etc. should be developed to facilitate the marketing and sales of their products.
- Keeping in view the specialization of different regions in a varied number of products in the country, there is a need to develop a product pricing policy for organic products as in India.
- The conversion period is the very crucial phase wherein farmers should be provided free guidance, training and support so that they may adopt and sustain organic agriculture without losses.
- The certification process should be simplified and less expensive. Farmers should be made aware with the help of special advertisements so that they get their products certified and labelled which will fetch higher prices.
- Special measures should be undertaken to match the production and sales of organic products in international as well as domestic markets. Various demand and supply policies may help to develop purchasing schemes in advance.
- Small and marginal farmers should be encouraged to form cooperatives to provide them

the benefits of various scale economies, enabling direct marketing links between producers and consumers and strengthening their bargaining power.

5 Conclusion

After decades of continuous policy measures to encourage migration out of the agriculture sector, a huge expansion of the industrial sector and urbanization, the food crisis of 2008 along with the recession, it has now been realized that the agriculture sector still has a dominant role to play in providing livelihood to billions of people around the globe. Also, the current COVID-19 pandemic has substantiated the same viewpoint. Among the plethora of problems facing the agriculture sector, the most significant problem is associated with smallholder farming. Out of 570 million farms in the world, more than 475 million farms are smaller than two hectares (Lowder *et.al.*, 2016). It indicates the vital role of smallholder farmers in the agriculture sector worldwide. The concept of sustainable agriculture cannot be envisaged without the participation of this large section of smallholder farmers. But at the same time, the prohibitive cost of sophisticated tools and lack of access to a knowledge base has inhibited smallholder farmers to focus on quality-intensive production practices. There is a dire need to chalk out appropriate policy measures to emphasize agro-ecological procedures and incentivize the adoption of sustainable agricultural practices.

Conclusively, it can be summarized that there is a wide scope of increasing income levels of farmers, especially small and marginal farmers, through the adoption of organic agriculture along with technological support, especially in developing countries. Organic agriculture is capable of not only fetching more prices for its products, but it will also be sustainable in the long run.

6 Availability of Data and Material

Data can be made available by contacting the corresponding author.

7 References

- Arefi, A., Moghaddam, P. A., Hassanpour, A., Mollazade, K., Motlagh, A. M. (2016). Non-destructive identification of mealy apples using biospeckle imaging, *Postharvest Biology and Technology*, 112, 266-276
- Beghi, R., Giovenzana, V., Civelli, R., Malegori, C., Buratti, S., Guidetti, R. (2014). Setting-up of a simplified handheld optical device for decay detection in fresh-cut *Valerianella locusta* L, *Journal of Food Engineering*, 127, 10-15.
- Bohigas, X., Amigó, R., Tejada, J. (2008). Characterisation of sugar content in yoghurt by means of microwave spectroscopy, *Food Research International*, 41, 104-109.
- Bourne, M. (2002). Food texture and viscosity: Concept and measurement. Academic press.
- Camps, C., Christen, D. (2009). Non-destructive assessment of apricot fruit quality by portable visible-near infrared spectroscopy, *LWT - Food Science and Technology*, 42, 1125-1131.
- Cayuela, J. A., Weiland, C. (2010). Intact orange quality prediction with two portable NIR spectrometers, *Postharvest Biology and Technology*, 58, 113-120.
- Coggins, S., McCampbell, M., Sharma, A., Sharma, R., Haefele, S. M., Karki, E., Hetherington, J., Smith, J.

Brown, B. (2022). How have smallholder farmers used digital extension tools? Developer and user voices from Sub-Saharan Africa, South Asia and Southeast Asia, *Global Food Security*, 32, 1-10

Glover, D., Sumberg, J., Ton, G., Andersson, J. Badstue, L. (2019). Rethinking technological change in smallholder agriculture, *Outlook on Agriculture*, 48(3), 169-180.

Henson, S., Holale, E. (2011). What do Border Rejections tell us about Trade Standards Compliance of Developing Countries? Analysis of EU and US Data 2002-2008, *UNIDO Working Paper*, UNIDO, Austria.

Kamruzzaman, M., Elmasry, G., Sun, D.W., Allen, P. (2013). Non-destructive assessment of instrumental and sensory tenderness of lamb meat using NIR hyperspectral imaging, *Food Chemistry*, 141, 389-396.

Kohli, U. (2020). Agriculture can be a saviour in the pandemic-hit economy, The Tribune, 09 June. Chandigarh, India.

Logatcheva, K., M.A. van Galen, (2015). Cornerstone of plant-based food production and the bioeconomy in Europe. Wageningen, *Primary Food Processing*, LEI Wageningen UR (University & Research centre), LEI Report.

Lowder, S. K., Scoet, J., Raney, T. (2016). The Number, Size, and Distribution of Farms, Smallholder Farms, and Family Farms Worldwide, *World Development*, 87, 16-29.

Maloney, W (2019). This is why technology is the future of agriculture, World Bank.

Mukhopadhyay, S. C., Gooneratne, C. P. (2007). A novel planar-type biosensor for Non-invasive meat inspection, *IEEE Sensors Journal*, 7, 1340-1346.

Szymanska-Chargot, M., Adamiak, A., Zdunek, A. (2012). Pre-harvest monitoring of apple fruits development with the use of biospeckle method. *Scientia Horticulturae*, 145, 23-28.

Torres, I., Pérez-Marín, D., De la Haba, M.J., Sánchez, M. T. (2017). Developing universal models for the prediction of physical quality in citrus fruits analysed on-tree using portable NIRS sensors, *Biosystems Engineering*, 153, 140-148.



Dr. K. Kaur is an Assistant Professor of Economics at the Directorate of Distance Education, Kurukshetra University, Kurukshetra, Haryana, India. She got her master's and Ph.D. degrees in Economics from Punjab School of Economics, Guru Nanak Dev University, Amritsar, India. Her research focuses on Industrial Economics and Agricultural Economics.



Dr. G. S. Gill is an Assistant Professor at the Department of Instrumentation, Kurukshetra University, Kurukshetra, Haryana, India. He got his master's degree in Instrumentation Engineering from the School of Instrumentation, D.A.V.V. Indore and a Ph.D. degree in Instrumentation Engineering from Thapar Institute of Engineering and Technology, Patiala, India. His research focuses on Instrumentation and Food Quality.