BRIEFING PAPER

Ensuring Food Security
Regulatory Mechanism in the Era of Digital Agriculture

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Table of Contents

ENSURING FOOD SECURITY: REGULATORY MECHANISM IN THE ERA OF DIGITAL AGRICULTURE

1. EXECUTIVE SUMMARY

1.1 Tackling food insecurity, is a global challenge that has drawn focus and attention of the governments and the policy makers. World leaders and governments have been struggling to evaluate, plan and execute pathways to address food insecurity. Technological advancement in agriculture farming is one way to enhance the food production. However, a data driven policy, tools and ecosystem may further enhance the on and off-farm productivity that will help in improving the global food security.

1.2 This briefing paper highlights the need to develop a global policy initiative for the use of digital technology to address the food insecurity and contributing towards achieving the SDG-2, Zero Hunger.

1.3 Use of digital technology in agriculture ecosystem entails significant challenges, however, which are highlighted in this paper.

2. INTRODUCTION

2.1 What is Food Security:

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. [1]

A family is food secure when its members do not live in hunger or fear of hunger. Food insecurity is often rooted in poverty and has long-term impacts on the ability of families, communities and countries to develop and prosper. Prolonged undernourishment stunts growth, slows cognitive development and increases susceptibility to illness.

[1] https://www.fao.org/3/w3613e/w3613e00.htm

2.2 What is Digital Agriculture:

Digital agriculture, sometimes known as smart farming or e-agriculture, is tools that digitally collect, store, analyze, and share electronic data and/or information in agriculture.[2] It uses big data in food production, combined with the deployment of internet of things (IoT), blockchain technology, artificial intelligence (AI), machine learning, cloud computing, as well as unmanned aerial vehicles (UAVs), and robotics.

IoT devices help in the first phase of this process i.e., data collection. Sensors plugged in tractors and trucks as well as in fields, soil, and plants aid in the collection of real-time data directly from the ground. Second, data analytics integrate the large amount of data collected with other information available in the cloud, such as weather data and pricing models to determine patterns. Finally, these patterns and insights assist in controlling the problem. They help to pinpoint existing issues, like operational inefficiencies and problems with soil quality, and formulate predictive algorithms that can alert even before a problem occurs.

2.3 Example of some of the digital agriculture tools are: Weather forecasting and micro-forecasting, Yield mapping, Variable-rate applications (for water, pesticides, and fertilizers), GPS guidance systems, Tractor and other equipment rental apps, Intelligent warehouse platforms, e-Commerce software, electronic identification tags, Agriculture food marketing and advertising platforms and Technological advances in seed and agriculture-chemical production etc.

2.4 Agriculture Technology companies use abovementioned tools to produce more with less, to make the farming process more efficient, from field monitoring to the food supply chain. It also saves farmers time and money, by automating tasks and replacing much of the labor needed on a farming operation. Over the past ten years, venture capital investment in the agriculture technology sector has grown consistently. In 2020, investment in agriculture technology increased by 45.8% to $7bn, up from $4.8bn in 2019. Then, in 2021, it increased by 61.4% to $11.3bn, representing a peak in the investment, and considerably higher than the $600m in 2012.[3]

2.5 The United Nation estimates that the global population will reach 9.8 billion by 2050, a 2.2 billion increase from now.[4] Ensuring food security for such a large population is and would be real challenge for all the states and governments.

[2] https://en.wikipedia.org/wiki/Digital_agriculture
[3] https://www.retail-insight-network.com/broadcast/agritech-investment-venture-capital-2021/
[4] https://www.un.org/development/desa/en/news/population/world-population-prospects-2017.html

2.6 **United Nations Sustainable Development Goal 2 is "zero hunger" where Target 2.1 states that:**

> "By 2030, **end hunger** and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round."

Target 2.A states that:

> "Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, **technology development** and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries."

2.7 In the present time, use and deployment of digital technologies along the agriculture ecosystem right from the farm stage to the retail is top priority of many developed countries around the world. It helps in ensuring food security and achieving the Sustainable Development Goal 2 of the United Nations (Zero Hunger).

2.8 The Food and Agriculture Organization of the United Nations has described the digitalization process of agriculture as the digital agricultural revolution. This revolution necessitates think tanks and policy makers to reconsider public policies, governance & regulatory environment for effectively governing and addressing new problems and concerns that may arise (e.g., ownership issues, consent of the data owners, contractual obligations of third-party technology providers, privacy, trust, valuation, data transfer and sharing, intellectual rights etc.)

3. DISCUSSIONS

3.1 Constantly growing population and global climate changes, in the context of food security, have necessitated the stakeholders to seek support from technology forces such as IoT, big data, analytics, cloud computing etc.

3.2 Technology innovation in Agriculture sector improves economic growth and social wellbeing, effective harvest and post-harvest practices are minimizing food loss, effective storage and conservation practices increasing the value of harvest

products, identification of high value-added products is improving economic gains for processing and ensuring long shelf-life and enhanced marketing of available foodstuff at competitive prices.

3.3 Agriculture technology companies have reservations in using these technologies due to many factors like data security, privacy, and liability. Interestingly, even knowing the potential benefits to use agriculture tools, the technology companies are hesitant to step forward due to uncertainty as to governance framework concerning use of data and digital tools in agriculture sector.

3.4 The key questions are; to what extent, for what goals and for whose benefit data in agriculture will be used. Technology in itself is neither good nor bad, it is the way in which it is used that determines the effect. Thus, the main challenge is to develop a policy framework that can address the multi-stakeholders' (farmers, technology service providers, governments) concerns with respect to use of data in agriculture farming and its related industries.

3.5 Various countries have developed and implemented regulatory framework for the use and processing of personal data of the natural persons (like General Data Protection Regulation (GDPR) of the European Union). The regulatory framework related to use and processing of personal data (like GDPR) is not applicable in relation to use of agriculture data, firstly for the reason that agriculture data may not necessarily be personal in nature and secondly such framework does not address very peculiar circumstances of use of agriculture data and more importantly the reverse flow of benefits (arising out of use of agriculture data) to the farmers.

3.6 In order to overcome and address the challenges associated with use of agriculture data, the think tanks and policy makers need to consider following pertinent issues before embarking to formulate a policy framework:

Ownership: The data is collected from the farm, once the data is collected then who is the owner of the data. Does the farmer retain ownership rights over the data.

Ownership in turn confers the right to transfer proprietary rights, whether such proprietary rights are also transferred to the technology service providers or to other third parties. As the data is intangible, whether there are any intellectual property rights of the farmer over the data captured from the farm by third party service providers.

Transparency: Farmers must be able to make an informed choice and decision with their absolute free consent. The consent must not be based upon coercion or misrepresentation of essential facts. The third-party service providers are to clearly demonstrate the underlying terms and conditions to the farmers to acquire data from their farms.

Security & Privacy: Data when processed becomes information capable of being generating tangible monetary and non-monetary benefits. Secrecy and privacy of data goes to the very roots of fairness and trust. Sharing and transfer of data must only be based upon pre-agreed terms and conditions where the farmers are pre-informed as to who and how their farm's data will be used and disclosed.

Unfair Market Practices: Collection and processing of data must not be subjected to unfair market practices. Once data is collected, it is prone to misuse like imbalance in price negotiation, manipulation of research outcomes, cumbersome contractual clauses, exclusivity clauses (where framer may not be allowed to share the data with others) etc. Public authorities' intervention may be required to empower the farmers to fight against any such unfair market practices.

Data Valuation: At the time of data collection, it might not be as valuable but after its processing (results of research & development) it may become invaluable for a few stakeholders (in particular the third-party service providers). Therefore, due consideration is to be given at the time of data acquisition from the farmers/farms to work out the value of the data based upon its potential or probable value in future. Further, the valuation mechanism must also be fair and transparent.

Cross-border Transfer and Data Localization: In most of the cases (particularly in the case of developing countries) the acquired agriculture data is to be transferred out of the home country. While there may be legitimate reasons to transfer data to other countries or jurisdictions (like availability of storage, processing and research facilities) however a well-defined mechanism needs to be in place, like localization and an approval/registration regime for data acquires/third party service providers. This is essential for the home jurisdiction (the country of origin of data) so that home jurisdiction may also be able to use the same data.

Dispute Settlement: Collection of agriculture data, its subsequent transfer to other countries and use is no different from any commercial transaction.

Therefore, likelihood of disputes may not be ruled out. A structured and effective dispute settlement mechanism will bring certainty and will help ensuring exporting jurisdiction to enforce its rights (and rights of the home country's farmers).

Standardization: In order to have consistency with respect to collection, transfer and processing of data, it seems necessary to formulate and adopt certain generally acceptable standards. These standards may include protocols on data collection, transfer, standard contractual clauses, privacy & safety measures etc. Adoption of uniform standards across the regions will ease the whole process and would enhance efficiency. Standardization would also help to maintain equilibrium among the developed and developing countries.

3.7 Apart from data issues, use of digital tools (automated applications/robot) by Agriculture enterprise has also raised various other regulatory issues/concerns that policy makers also need to address before formulation of policy framework. Such as inclusion of limitation of liability clause in contract (who is responsible in case of harm cause by autonomous agriculture device), establishing of performance standards, proper certification requirements and regular audits requirements etc.

3.8 For digital inclusiveness of agriculture sector following measures will create an enabling environment for agricultural entrepreneurship:

- adoption of digital agriculture at govt level;
- predictable regulatory environment for investment in ICT;
- the presence of digital infrastructure and network coverage;
- access to financing;
- digital regulations designed around functionality;
- skills development; and
- removal of entry barriers.

3.9 Role of governments cannot be compromised to ensure food security. Collection and use of agriculture data and tools through ICT for research & development, and to know the hidden patterns, correlation and other insights has a direct nexus with function of respective governments to ensure food security for their people. Governments are entrusted to provide an enabler policy, governance and regulatory environment ensuring transparency, equal treatment, oversight and importantly sovereign control over the data/agriculture technology stemming from their jurisdiction. Therefore, as a matter of policy each government is to made available such an enabling and conducive environment.

4. RECOMMENDATIONS

4.1 Food security is a global issue; therefore, a collective wisdom would be a workable solution.

4.2 With reference to use of agriculture technology to help address the food security, there is a need to develop a uniform and globally acceptable policy and governance structure. A structure developed with collective ownership will be sustainable and applicable globally.

4.3 The technology related challenges highlighted in this paper are multi-dimensional (like ownership, security & privacy, unfair market practices, liability, etc.) that are being dealt with differently in different jurisdictions. The main difference in approach and mechanism to address these issues, is owing to governance and legal framework prevailing in each respective jurisdiction. While local (national) governance and legal framework might be enough to address such issues on a national level, the convergence of these issues globally (acquisition of data in one jurisdiction and its processing in other jurisdiction and flow back of benefits arising therefrom to many jurisdictions) requires development of an agreed multilateral framework.

4.4 A reference here may be made to Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization[5]. A similar protocol, concerning use of Agriculture data/tools to have food security, may well bring the nations on one page by means of an agreed ecosystem addressing and resolving all the challenges as are highlighted hereinabove.

4.5 The starting point to reach to the stage of the above suggested multilateral protocol could be development of a comprehensive concept paper to call for attention of the states. An international organization (suitably Food and Agriculture Organization of the United Nations) may take lead in this connection to develop the said concept paper paving the roadmap for the suggested protocol.

[5] https://www.cbd.int/abs/doc/protocol/nagoya-protocol-en.pdf