

Towards a Sustainable Agri-Food Supply Chain



The agri-food industry is one of the largest manufacturing sectors in many developed and developing countries. This industry requires large volumes of natural resources. This resource requirement has been a key barrier to increasing production proportionately to cater to the increasing global population. Therefore, the agri-food supply chain has gained global attention to find sustainable solutions to solve global food security concerns. Due to the complexities such as high perishability and climate change, food loss has become a major issue and it directly accounts towards food security concerns in the contextual world. We lose approximately one-third of the global food production from human consumption annually with an estimated monetary value of about USD 936 billion [1]. This is estimated without considering the indirect impact on the environment and the additional cost borne by the society to cover this loss.

Sustainable agriculture was a very popular phrase for a long time in Sri Lanka. The domestic agricultural policy was formulated in 2019 and still, it

is at the draft level. Therefore, the local agri-food supply chain is fragmented, and the actions of the value chain actors are isolated. As a result of that, the agricultural sector is facing several issues including post-harvest loss. When it comes to the Sri Lankan agri-food supply chain, we annually lose 270,000 metric tons of vegetables and fruits which has an estimated value of Rs. 20 billion. This is around 30-40% of the total agri-food production in the country [2]. The integration between the supply and the demand is a major pain point that leads to this issue. As an example, due to the lack of a national level cultivation plan to cater for the local demand, farmers cultivate their lands according to their product preferences without a scientific understanding of future demand. This results in over-production for certain crops and farmers end up with huge losses in the end.

Despite several issues, national agendas, and discussions, the conventional agri-food supply chain in Sri Lanka continued with little or no support from the private or government institutes. Farmers continuously used chemical fertilizers for the crops and consumers purchased the products and added that to their meals without much hassle. The sudden move taken in August 2021 by the government, to become the world's first completely organic farming nation is challenged by many domain experts. As per the experts' opinion, this should be established with a bottom-up approach based on traditional farming knowledge, experience, and adaptability with the ecological environment of the farmers. However, still many farmers have not even started the transition process from conventional farming to organic farming and agricultural economists question whether it is a wise move to aim for an overnight shift in policy given the current economic crisis the country is facing due to the mismanagement, corruption of all governments and respective responsible institutes [3]. In spite of this, few motivated farmers made the change with small scale operations by converting to organic farming way earlier than this policy intervention in terms of promoting sustainable agriculture. This was an isolated attempt and it had only a tiny impact towards promoting organic agriculture at the national level. The main issues they faced is sourcing organic fertilisers at the right



Figure 1: LEAF Integrated Farm Management (IFM) Model

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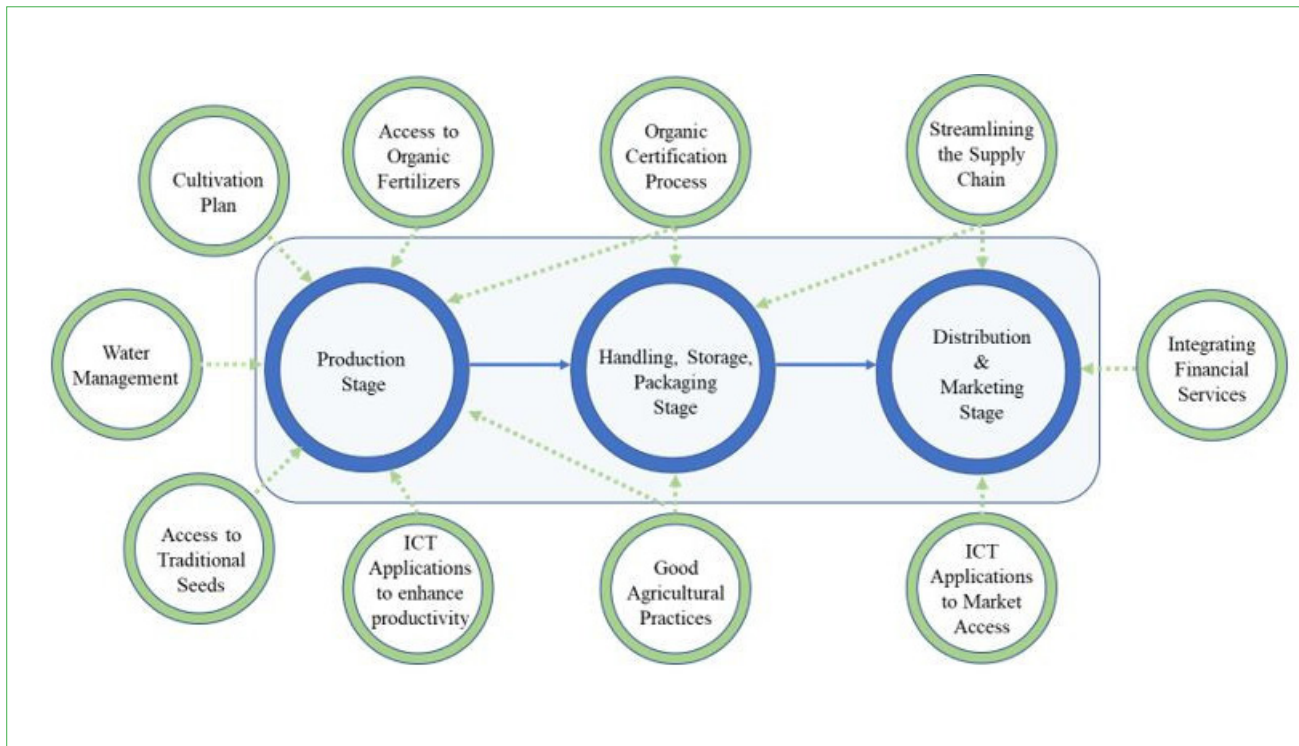


Figure 2: Summary

amount at the right time, water management, and the absence of a national level program [2].

Developing Trincomalee District as a "Sustainable Green District" was a programme initiated by the previous government and it focused on developing inland tank systems to harvest the rainwater and used it for the agriculture and inland fisheries industry. This programme managed to support more than 30,000 farmers to switch to organic cultivation. This was a successful sustainable solution for the issue of water management. However, there is a question on how to manufacture the required amount of organic fertilisers. Compared to conventional agriculture, organic agriculture requires larger volumes of organic fertilizers to be used for an acre. Therefore, sourcing raw materials such as paddy husks, cow dung and sawdust to produce enough organic fertilizers may be difficult, time consuming and expensive. Therefore, developing suitable fertilizer at an affordable price that can be commercialized must be a major concern in promoting sustainable agri-foods in Sri Lanka. Having said this, one of the most significant parts of this thrust is forgotten. That is the need to develop an integrated logistics platform that increases the

accessibility to organic fertilizer to any consumer across the island.

When considering organic farming, seeds used for the cultivation should be traditional varieties of the crop. Genetically improved versions are more responsive to chemical fertilizers rather than organic fertilizers. Therefore, in the cultivation process use of seeds of the traditional varieties will bring more yield than using genetically improved seeds with organic fertilizers [4]. In the current context, it will be difficult to source enough traditional vegetable and fruit seeds due to the popularity of genetically improved seeds with the Green Revolution creating a mismatch between policy and pragmatism. Hence, there should be a strategy to source and distribute an adequate quantity of seeds for the farmers isolated in different regions of the country. During the cultivation period and harvesting period adopting Good Agricultural Practices (GAP) is essential and the use of Integrated Farm Management Models (IFM) will be useful in the decision-making process which will help to enrich the community and the environment [5]. Adding to that, the use of ICT driven applications to get weather updates, advisory services to improve

the yield will be more supportive for the farmers in the production stage. Applying Industry 4.0 technologies such as Internet of Things (IoT) would go a long way in supporting these initiatives as well. Even after that in the handling, processing, packaging, storage, distribution and marketing, there should be a nationally implemented program to ensure the practices followed in each stage [6]. The organic certification process can be the best benchmark to evaluate this and give credibility to the product. Additionally, logistics activities such as transport, inventory management and value adding processes should be optimized and streamlined to ensure the smooth product flow through the supply chain. In that way, the farmer will receive a guaranteed fair price while the consumer is having a quality product at a reasonable price. Introducing ICT platforms for market access is a much needed solution whether the country is adapting to organic farming or not. This would allow product prices to be transparent to the consumers and leverage is offered to the producer of the value chain to negotiation as well. Integrating these platforms with financial services such as online payments, credit-based transactions, and streamlining loan facilities through banks will be major advantages for all the value chain actors in the agri-food supply chain. Helaviru Digital Economic Center is a local example of a digital marketplace that facilitates trade activities for vegetable and fruit products. The Department of Transport & Logistics Management, University of Moratuwa too has local access to an internationally proven non-profit platform that can be rolled out with the necessary support from industry actors.

Continuous effort and scientific research should be extended to develop a sustainable agri-food supply chain and it cannot be changed by a simple policy alteration. There should be an integration between value chain actors across the entire value chain and solutions should be derived concerning their effect on the entire value chain instead of assessing the effect on that isolated stage. The value chain actors should buy in the solutions. In conclusion, when developing a sustainable agri-food supply chain it should be developed with proper planning at the national level considering the local and export market, understanding the complex na-

ture of the system with the integration of proper technological platforms.

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