CONTRACT NO: SAPP/M&E/C/POLICY STUDY -001

Translating the proceedings of the Workshop on Dairy Sector held on January 13-14, 2020 in to a policy paper

Policy Paper

Submitted to

Smallholder Agribusiness Partnerships Programme (SAPP)

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On

October 2022

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Executive Summary

A policy paper was prepared based on the outcome report of the stakeholder consultative workshop titled "Sustainable Dairy Development: A Value Chain Approach." conducted by the Smallholder Agribusiness Partnerships Programme (SAPP) of Sri Lanka, in January 2020. The workshop has targeted to prioritize major issues hindering the progressive functioning and sustainability of dairy value chain of the country. The verification of the findings of the outcome report was carried out with the assistance of national experts who participated as the resource persons in the stakeholder consultative workshop. The consultative workshop has identified seven key nodal points of the dairy value chain which need policy attention for improving the efficiency of dairy value chain. Accordingly, the draft policy paper has been arranged under seven categories, namely Input supply, Extension support, Production, Milk collection & bulking, Processing / value addition, Sales & Marketing and Consumption. This draft paper was validated through a final workshop with the participation of policy makers, implementers, practitioners and leading officials of the dairy sector in October, 2022. The validated policy paper consists of 32 policy recommendations and 33 policy instruments which were proposed in remedying the identified gaps of dairy value chain described seven categories as given in the table below.

Category 1 : Input supply	
1.1 : Feed	
Gaps identified	Inadequacy of roughages of required quality and in quantity
	Unavailability of compound feed for different stages of dairy cattle.
	Restrictions imposed on imports of feeds and feed materials
Policy Recommendations	Ensure quality pasture production in adequate quantities throughout the year, by facilitating the requirement with the consideration as a crop and making adequate lands available
	Facilitate the establishment of commercial fodder farming and conservation as a viable venture.
	Facilitating the supply of adequate nutrient for all stages of dairy cattle
	incentivizing compound feed production
Policy Instruments	Institute a mechanism to grant access to marginal lands for fodder production.
	Introduce capacity development programs to strengthen the pasture and fodder development and conservation programs
	Identify provisions in relevant policies to facilitate the identification of fodder/pasture as crop and utilizing land resources effectively for fodder/pasture production
1.2 : Health	
Gaps identified	High cost of veterinary pharmaceuticals and veterinary service.
	Irregularities in vaccination programs for epidemic diseases
Policy Recommendations	Regulate the prices of veterinary pharmaceuticals to avoid a monopoly,
	promote establishing rapid detection methods for disease diagnosis and prevention
	Ensure the reliable supply of vaccines for common epidemic diseases prevailing in the region, with special attention to the vulnerable regions of the country

Policy Instruments	Update regulations governing production of veterinary pharmaceutical products to enhance competition
	Strengthen local production of commonly used veterinary products for disease prevention and diagnosis (rapid disease diagnosis kits, udder infusions, teat dip solutions etc.)
	Strengthen the local vaccine production programs and activities of the Veterinary Investigation Centers (VICs).
1.3 : Breeding Materials	
Gaps identified	Unavailability of reliable sources to supply production- and health-certified milking cows.
	Low reliability on Artificial Insemination
Policy Recommendations	Ensure genetic improvement of farm cattle and buffalo driven by genomic selection and breeding through the maintenance of dedicated nuclear farms to cater to the needs of the diverse production systems of the country
	Expansion of insemination activities through enhancing AI coverage and implementing efficient stud bull service
	Facilitate the breed improvement program through record keeping and allied facilities for strengthening the progeny testing program, and
	Capacity building for monitoring and evaluation of the breeding programs and success rates of reproductive technologies adopted.
Policy Instruments	Establish a regulatory body with the authority of progress monitoring and decision making with regard to animal breeding.
	Build the capacity of the DAPH to establish a regularly updated database on AI activities.
	Establishment of stud bull centers at regional level as required
	Establish youth training centers at regional levels targeting technological interventions in dairy production including the training of private AI technicians
1.4 : Input levels	
Gaps identified	Unawareness of appropriate levels of inputs in terms of quantity and quality.
	Dependency on free grazing owing to the limitation of lands and cultivated fodder.
Policy Recommendations	Ensure the opportunities for continuing education system for smallholder farmers, and
	Facilitate continuous knowledge sharing process on the up-to-date information and skills pertinent to sustainable dairy cattle production.
Policy Instruments	Revise the mandate of the extension service to accommodate appropriate extension tools in reaching the smallholder producers.
	Introducing commercial models, targeting the youths and women in rural areas to promote the fodder production
Category 2 : Extension Support	
2.1 : Effectiveness of extension service	
Gaps identified	Extension mechanism is not efficient and effective.
	Extension materials are outdated, not readily accessible and not user friendly.
	Extension is not focused on addressing the current issues but general issues, thus not catering to the needs of the stakeholders.

Policy Recommendation	Provide up-to-date techniques and technologies for extension which can attract and sustain the interest of the service provider and the recipient for effective service delivery.
	Assure a sound extension services through private-public-partnerships (PPP) supported by entrepreneurial dimensions
	Assure an efficient mechanism to identify issues pertinent to different farm categories and establish effective mode for upward and downward communication
Policy instruments	Establish a mobile-based agribusiness partnership programmes (APP) to provide 24 hr on-call service to directly communicate farmer, extension service providers, research and development agencies.
	Establish model modal farms/ business models at provincial levels through PPP
	Identify factors affecting the adoption/ use of technologies/ information generated by research system
	Develop and regulate a production-oriented extension service with appropriate extension tools in reaching the smallholder producers (via an App)
2.2 Extension in promoting cottage dairy industry	
Gaps identified	Lack of focus in extension service on product processing at cottage level.
	Lack of promotion on cottage level processing / value addition
	Lack of competent extension workers on product processing
Policy recommendation	Ensure the continuous supply of human resources with up-to-date knowledge to cater to the requirement of the milk product processing targeting different aspects (economics, technical and quality) involved in value chain
Policy instruments	Establish a Dairy Institute/Extension authority as a semi-government agency with financial support from the processors
	Pilot a system to establish special market chain focusing products from cottage industry.
Category 3 : Production Efficiency	
Gaps identified	Low productivity of cows owing to under exploitation of the potential production capacities of crossbred cows.
	Reproductive inefficiencies that lead to long calving interval.
	Unawareness of economies of scale in taking management decisions.
	Lack of facilities for proper disposal of unproductive/ unnecessary animals
	Limited supply of essential inputs including financial support
Policy recommendation	Modernize dairy operations at different scales according to market-driven approach,
	Enhance farm productivity by facilitating and regulating the disposal of unproductive animals
	Facilitate and promote an uninterrupted supply of essential inputs required for sustainable dairy operation, and
	Capacity building of dairy farmers continuously to ensure up-to-date knowledge on the management and economic aspects of farm operations
Policy instruments	Establish a Dairy institute/ training center with branches at regional level.
	Establish a mechanism for farmers who is willing to dispose unproductive animals

	Introduce financial support schemes as a package along with knowledge incentives.
	Provide support to farmer-driven societies which aim for establishment of market-oriented fodder development program
Category 4 : Collection/ Bulking of milk	
Gaps identified	Lack of focus in farm gate level for the milk quality but only the quantity.
	Lack of facilities for testing bacteria and somatic cell counts at key nodal points.
	Absence of encouragement for evening milking which contribute to deterioration of quality of milk (by mixing with morning milk) and volume of milk collection
Policy recommendation	Attract more investments in dairy inputs which will lead to increased production of quality and safe milk production,
	Establish milk quality standards pertinent to farmgate level and those to be maintained in processing plants while promoting the facilities in milk collection and transport
	Promote producer clusters, collection points and chilling centers to reduce the issue of high cost of transportation of milk and curb the milk quality declines during collection/ bulking process.
Policy instruments	Introduce partnership models for on-farm testing of milk with the engagement of processors.
	Introduce grading system/ rewarding system for milk based on microbial and somatic cell counts
	Establish pilot programs to collect evening milk in selected areas of the country with appropriate infrastructure investments (on collection and cooling).
	Introduce a package for milk quality testing to ensure quality of milk entering into the value chain.
Category 5 : Processing/ Value addition	
Gaps identified	Seasonal fluctuation of raw milk leading cold chain machinery to run under capacity or leaving them complete idle.
	Constraints in regional small-scale processing
	High microbial count and poor milk quality
Policy recommendation	Encourage the investments in regional small-scale processing while maintaining the milk quality at the milk platforms.
	Regulate the standards of the milk accepted by the large-scale processors and practice comparable milk rejection policy by all the processors
Policy instruments	Deliver training programs on clean milk production to all the stakeholders, i.e. producers, transporters, collection, and chilling centers with the goal for improved milk quality
	Introduce a subsidized loan scheme to promote small-scale processing and marketing units with commercial orientation
Category 6 : Sales and Marketing	
Gaps identified	Lapses in uniformity in distribution of popular milk products
	Competition from imported products
Policy recommendation	Ensure demand-driven supply of milk and milk products throughout the country

	Strengthen the quantity and quality of locally produced dairy products to become a competitor for the imported products.
	Incentivize the environmentally friendly/ climate smart management actions in production of milk
	Ensure the regulation of the quality of cottage products and processed milk products in small-scale processing units.
Policy instruments	Promote local products among the consumers.
	Establish a regulatory body for quality assurance process of milk and milk products in the market
	Introduce rewarding system for environmentally friendly/ climate smart production
Category 7 : Consumption	
Gaps identified	Absence of quality-based selection of dairy products & low home consumption
	Less attention on shelf life & poor handling of dairy products
	Absence of options for lactose intolerance situations
	Low demand for liquid milk compared to powdered milk
Policy recommendation	An appropriate regulatory mechanism to regulate the quality and safety of the dairy products entering to the market, and
	Labelling of dairy products to educate the consumers on the nutritional aspects and other health benefits of the product
Policy instruments	Promotion of local products among the consumers.
	Establish a dairy center to conduct research and development as well as to feed regulatory bodies regarding the quality assurance process of milk and milk products in the market

The detailed Report

1. Background of the assignment

Realizing the need for policy level interventions in various nodal points of the value chain to uplift the whole dairy sector, the Smallholder Agribusiness Partnerships Programme (SAPP) of Sri Lanka has conducted a dairy stakeholder consultative workshop titled "Sustainable Dairy Development: A Value Chain Approach." in January 2020, with the aim of prioritizing major issues hindering enabling environment for progressing functioning and sustainability of dairy value chain of the country. As presented in the Outcome Report[1], the workshop was attended by around 100 stakeholders representing diverse sectors of the dairy industry: from policy making level to producer level. Thus, the outcomes of the workshop have been contributed by different value chain actors represented by producers, farmer societies and co-operatives, input suppliers, related ministries and government departments, bankers and insurance providers, customs, academia, research and development agencies, and development partners. The Outcome Report highlights that the workshop has attempted to review the status of related policies in Sri Lanka, and the deliberations would be presented to all related policy makers and implementers in the country, for necessary action.

During the workshop the challenges and possible strategic interventions in the dairy value chain were recognized under seven areas (actors/ stages of dairy value chain) namely, (i) Input supply, (ii) Extension service, (iii) Production, (iv) Processing and value addition, (v) Marketing, (vi) Quality and safety of end products, and (vii) Finance and insurance for empowering value chain actors and their activities. These workshop outcomes were further reviewed to identify the major challenges and policy support through post-workshop verifications. Then, the suggestions and recommendations were drawn before translating the findings into a policy paper which accompanied by policy instruments to facilitate the implementation process.

2. The process adopted

With a thorough perusal of the Outcome Report, an Inception Report has been prepared to indicate the process of producing the policy Paper. The verification of the findings of the Outcome Report was initiated according to the workshop outcome summary (Annex 1) produced in the Inception Report. The verification was carried out with the assistance of national experts who contributed at the initial workshop as resource persons, using the distant mode where verbal clarification as well as electronic submissions were obtained.

The details of verification process, which was completed before formulating the policy paper, is given in Annex 2 and the verified information of Outcome of the Policy Workshop are given in Annex 3.

Finally, the policy paper was then verified at a national workshop (Agenda is given in Annex 4) in the presence of policy makers, implementers, practitioners and leading officials of the dairy sector (Annex 5).

[1] Outcome Report on Policy Workshop Dairy Value Chain Development (2021). Smallholder Agribusiness Partnerships Programme (SAPP), Sri Lanka

Policy Paper

Introduction

The dairy sector in Sri Lanka is dominated by smallholders who play the main role in the production sector. Conquered by the dairy sector, around 3.5 million actors depend on the livestock industry in the country[2], where the whole livestock sector contributes around 1% to the total GDP[3], amounting to a value close to 22.5 billion SLR[1]. As estimated a decade ago, approximately 17.9% of family units in Sri Lanka own domesticated animals, and around 70% of them own cattle[1].

The number of milk chilling centers totaling to 283 with 14 main milk processors are contributing to the procurement of 237.9 million liters of milk[4] as of the year 2020. The current picture of the value chain indicates that the dairy value chain is different from other commodities in the broad Agriculture sector of the country owing to its distant/ indirect connectivity of key players in the dairy value chain; for instance, the input suppliers (especially, feed and dairy equipment) and dairy producers are connected through the milk buyers.

Despite drawbacks experienced in the past two years, the dairy sector of the country has made a modest growth during the period of 2009 – 2018 owing to a number of strategic actions introduced and implemented. Notably, the genetic improvement of the local herd, importation of exotic breeds of animals for breeding and production purposes, distribution of high yielding cows, securing investment from the private sector, implementation of artificial insemination service throughout the country, strengthening artificial insemination centres, progeny testing in animal selection, infrastructure development, and modernization of dairy processing facilities.

Milk production in the country is contributed by the National Livestock Development Board (NLDB) farms from the state sector to a mere 3.12% of the total production, while rest comes the contribution of small-scale and large-scale private farms. Among the private dairy farms (more than 95% are smalls-scale producers) only 0.22% of farms have produced more than 50 liters of milk per day in 2018[3]. With the initiative of establishment of medium-scale dairies with the imported breeding animals, the structure of the dairy production farms could have now been changed.

A recent study[5] revealed that the key nodal points of dairy values chain are heavily constrained by inadequacy of milk collection agencies, chilling centers, and low chilling capacities, and have already negatively affected the dairy value chain in certain areas of the country. Nevertheless, potential economic gains of actors have drained out due to low-quality of value-added products, poor quality control practices, poor infrastructure facilities, and lack of product differentiation in the value chain. Owing to the highly perishable nature of milk, proper management of the value chain is important for nutritional preservation, food and financial security of the players, and for achieving the consumer satisfaction. Accordingly, policy interventions are badly needed to fulfill

[2] Food and Agriculture Organization, 2009. Smallholder dairy development: Lessons learned in Asia Available at: http://www.fao.org/3/i0588e/I0588E0 0

[3] DAPH, 2020. Livestock Statistical Bulletin 2019. Department of Animal Production and Health, Sri Lanka

[4] DAPH 2020. Annual Report 2020, Department of Animal Production and Health, Sri Lanka

[5] Wickrama, P. S. S. L.. Sandika, A.L and Jayamanne, V.S. 2020. Quality and Price Variation in the Dairy Value Chian: A Case Study in Monaragala District, Sri Lanka. Sri Lanka Journal of Agriculture & Ecosystems, 2(2), 141-151.

the necessary improvement of the dairy value chain by loosening the tight constraints and curbing the obvious hinders.

The enabling environment at national level is an important consideration to strengthen the dairy development activities of the country, including the value chain. It must encompass many aspects (economic, legal, sociocultural, logistic and ethical) on different scales (local, regional, national and global) and incorporate interactions deriving from the multi-functionality of the livestock. However, given the focus on small-scale producers, it is important to consider the interactions (information, governance) between production and the other functions (aggregation, processing, distribution, etc.) of the value chain. Service and input providers are important stakeholders in most livestock value chains, given the dependency of livestock producers on inputs such as feed, drugs or reproductive materials. This gives input and service providers a key role in chains that support the value-creation process.

Structure of the Policy Paper

This policy paper elaborates the consideration of the dairy value chain development activities considering seven (7) thrust areas which represent the key elements of the chain.

The thrust areas

1. Input Supply
2. Extension Support
3. Production
4. Milk Collection & Bulking
5. Processing / value addition
6. Sales & Marketing
7. Consumption

1. Input supply

The dairy production chain consists of various players, among them the input suppliers play a major role in bringing the production standards of the industry comparable to regional or global levels. Further, the input supply is one of the crucial factors that determines the successful operation of the whole value chain. According to the dairy sector operation of the country, the input at production level consists of a range of supplies including feed, health, breeding materials, mandatory supporting services such as veterinary and extension.

1.1 Feed

- Year-round supply of roughages is a prime requirement of dairy cattle production. The need is to supply both the quantity and quality fulfilling the national requirement considering the variation of availability of roughage supply in different geographical locations and climatic regimes.
- The dry matter requirement for ruminant population of country for a year is estimated to be 4.4 million MT, where 1 million MT dry matter deficit exist in feeding the dairy

herd of the country. According to the Agriculture Census 2014, only 5% of the agricultural land was reported as being used for pasture.

- Though land is a limiting factor in many parts, Dry Zone has a potential for improved fodder production. From the total land area of the country, 63.6% is found in the Dry Zone which receives a bimodal rainfall with the main rains from September to December and subsidiary rains from April to June. During the dry season, the requirement exceeds availability, creating a deficit of about 1.02 million MT, making it the biggest challenge faced by the farmers[6]. Even if excess fodder is produced, it needs to be conserved to ensure year-around supply of feed.
- Dairy meal and calf starter are the common compound feed types available for the dairy animals. The concentrate feed types for different stage of dairy cattle are not available in the market owing to low demand for those feed types. Nevertheless, there are restrictions in imports of feed and feed ingredients that hampers the quality and quantity supply in relation to compound feeds for dairy cattle in the country.
- Existing gaps
    - Inadequacy of roughages of required quality and in quantity
    - Unavailability of compound feed for different stages of dairy cattle.
    - Restrictions imposed on imports of feeds and feed materials

Policy recommendation

- There should be an enabling policy environment to
    - ensure quality pasture production in adequate quantities throughout the year, by facilitating the requirement with the consideration as a crop and making adequate lands available.
    - facilitate the establishment of commercial fodder farming and conservation as a viable venture.
    - facilitate the supply of adequate nutrient for all stages of dairy cattle
    - incentivize compound feed production.

Policy instruments

- Institute a mechanism to grant access to marginal lands for fodder production.
- Introduce capacity development programs to strengthen the pasture and fodder development and conservation programs.
- Identify provisions in relevant policies to facilitate the identification of fodder/pasture as crop and utilizing land resources effectively for fodder/pasture production.

1.2 Health

- Health management is one of the most important factors influencing the development of dairy cattle industry. It is one of the critical factors in maintaining optimum production, reproduction, and genetic improvement of dairy herds. To avoid health

[6] Weerasinghe, WMPB, 2019. Livestock Feeds and Feeding Practices in Sri Lanka. In: Livestock Feeds and Feeding Practices in South Asia (pp.181-206), SAARC Agriculture Centre,

problems in dairy cattle, routine health care procedures should be followed timely and appropriately.

- Veterinary pharmaceuticals and veterinary services are generally costly, though its contribution to total cost of production in dairy operation varies according to the production system[7]. It has been estimated that the most prevailing disease like mastitis could cause significant losses in different nodes in the value chain, especially within farm leading ro production losses, increasing veterinary and drugs cost, losses due to discarded milk and product quality, inefficiencies in labor, materials and investments, loss of animals, etc. Incidences of mastitis in Sri Lanka revealed an estimated annual loss of Rs. 4.3 million, i.e. Rs. 8,303 per cow per annum[8].
- Epidemic diseases such as Bovine Babesiosis, Foot and Mouth Disease, Brucellosis, Black Quarter, etc. require prevention of the outbreaks of contagious diseases, where maintaining acceptable herd immunity is crucial at least at the vulnerable locations. In this context, responsible drug handling and administration are the key. The DAPH has a dedicated service for veterinary pharmaceutical products, namely, the Veterinary Drugs Control Authority (VDCA) which registers all Veterinary Products manufactured or imported to the country. However, the following gaps in the veterinary pharmaceutical industry and provision of veterinary services have been identified as constrains for the smooth functioning of the dairy value chain activities.
    - High cost of veterinary pharmaceuticals and veterinary service.
    - Irregularities in vaccination programs for epidemic diseases.

Policy recommendation

- There should be an enabling policy environment to
    - regulate the prices of veterinary pharmaceuticals to avoid a monopoly,
    - promote establishing rapid detection methods for disease diagnosis and prevention.
    - ensure the reliable supply of vaccines for common epidemic diseases prevailing in the region, with special attention to the vulnerable regions of the country.

Policy instruments

- Update regulations governing production of veterinary pharmaceutical products to enhance competition
- Strengthen local production of commonly used veterinary products for disease prevention and diagnosis (rapid disease diagnosis kits, udder infusions, teat dip solutions etc.)
- Strengthen the local vaccine production programs and activities of the Veterinary Investigation Centers (VICs).

[7] DAPH 2009. Sri Lanka Estimation of Cost of Production of Milk in Different Agro Climatic Zones of Sri Lanka, Livestock Planning and Economics Division, Department of Animal Production and Health, Gatambe, Peradeniya,

[8] Samaraweera, A. M., van der Werf, J. H. J., Boerner, V. and Hermesch, S. 2021. Economic values for production, fertility and mastitis traits for temperate dairy cattle breeds in tropical Sri Lanka. Animal Genetics and Breeding. DOI: 10.1111/jbg.12667

1.3 Breeding materials

- Despite the national priority for dairy development, there is still a long way ahead for Sri Lanka to reach its targets in self-sufficiency in milk. In the year 2021, the domestic milk production was 491 million Litres, which amounted only 38% of the total requirement[3]. Importation of milk and allied products covered the balance to make the per capita availability of 52.81 L of milk.
- The successive governments have taken diverse steps to increase milk production of the country to fulfill nearly half of the country's requirement, as targets for self sufficiency has never been achieved for several decades despite the ambitious target set repeatedly in the past.
- Despite the several strategies to improve milk production adopted by the Government of Sri Lanka, the production level remains without promising signals of directional growth of the dairy industry. Shortage of suitable breeding stock is one of the key constraint among many other affecting the dairy sector development in Sri Lanka. It has been estimated that the state sector livestock farms (NLDB farms) are able to meet only about 20% of the demand.
- The recent initiatives taken in establishing large and medium scale dairy operations were expected to convert dairy from livelihood operation to a profitable industry. A large number of improved breeds and crosses were imported to uplift the genetic potential of the dairy animal population in the country and to fulfill the requirement of improved genetic materials. Though there were clear objectives, achieving them were hindered by several factors, some of which are implementation failures whereas some others are related to limitations of resources, especially the feed base.
- Sri Lanka imports the required doses of semen regularly in addition to the semen production program at the Artificial Insemination (AI) enters. Though the AI program is well established, only 31.2% of the breed able cow population is covered by AI at present. There were 192,372 AIs performed resulting in 57,863 calving in the year 2021[4]. Therefore, the dairy industry is still experiencing the following drawbacks in its primary input level of the value chain.
    - Unavailability of reliable sources to supply production- and health-certified milking cows.
    - Low reliability on Artificial Insemination

Policy recommendation

- There should be a policy environment enabling
    - genetic improvement of farm cattle and buffalo driven by genomic selection and breeding through the maintenance of dedicated nuclear farms to cater to the needs of the diverse production systems of the country,
    - expansion of insemination activities through enhancing AI coverage and also implementing efficient stud bull service
    - facilitate the breed improvement program through record keeping and allied facilities for strengthening the progeny testing program, and

- enhance farm productivity by facilitating and regulating the disposal of unproductive animals.
- capacity building for monitoring and evaluation of the breeding programs and success rates of reproductive technologies adopted.

Policy instruments

- Establish a regulatory body with the authority of progress monitoring and decision making with regard to animal breeding.
- Establish a mechanism for farmers who is willing to dispose unproductive animals.
- Build the capacity of the DAPH to establish a regularly updated database on AI activities.
- Establish youth training centers at regional levels targeting technological interventions in dairy production including the training of private AI technicians

.1.4 Input levels

- The Sri Lankan dairy industry is relying mainly (more than 95%) on smallholdings, in which the production efficiency is critical. Given the fact that the majority of smallholders are from rural area and come under traditional farming activities, making them aware of the advancement of the dairy sector is important as they deal with improved genotypes of dairy breeds.
- Correct input levels matching with the output of animals is a key to sustain the production at all scales of operation, particularly in smallholder operation. However, those operations depend on a limited resource base, and thus, critical and correct decisions must be taken on feeding and management. Farmers should make informed decisions on their livelihood activities.
- Availability of retail input suppliers has helped to address the issue of high cost of transportation of inputs to the farmgate and facilitate to reduce the production-related shocks at farm level.
- Since many smallholder systems practice free-grazing as an easy option in feeding cattle owing to limited land availability within the farmstead, animals are not receiving the required nutrient supply. For instance, the maximum quantity of grass consumption under free grazing is around 15 kg (3.45 kg DM)[9]. Therefore, the crossbreds on free-grazing conditions always stay underfed. In this context, majority of the smallholder farming communities experiencing the following drawbacks;
    - Unawareness of appropriate levels of inputs in terms of quantity and quality.
    - Dependency on free grazing owing to the limitation of lands and cultivated fodder.

[9] https://www.fao.org/partnerships/resource-partners/investing-for-results/news-article/en/c/1158175/

Policy recommendation

- There should be a policy environment to
    - ensure the opportunities for continuing education system for smallholder farmers, and
    - facilitate continuous knowledge sharing process on the up-to-date information and skills pertinent to sustainable dairy cattle production.

Policy instruments

- Revise the mandate of the extension service to accommodate appropriate extension tools in reaching the smallholder producers.
- Introducing commercial models, targeting the youths and women in rural areas to promote the fodder production

2. Extension Support

The extension services of the country are organized according to the commodity or the sector, by relevant departments responsible for the commodity, and research and development institutes. Thus, the primary actor of the livestock sector extension is DAPH. The private sector involvement in the extension support is limited to the commodity that the respective entity deals with. The efforts to integrate the different extension services dealing with food production have made limited progress[10]. The information and communication technologies have faced limitations like poor computer literacy, limited internet access, and lack of support given by senior officials. Hence, reforms are needed, especially on the expansion of agricultural extension partitioners and broadening the extension support beyond the commodity limit to incorporate them to the critical nodal points of the dairy value chain activities.

2.1 Effectiveness of extension service

- The DAPH bears the primary authority in reaching the grassroot level and fulfil the extension needs of producers. However, there are private sector involvement in extension in limited extent in dairy sector to cover the respective stakeholder groups under collection networks.
- Initiative towards introducing fee-levying private agricultural extension services among the commercial farmers is slowly progressing. In addition, extension services based on private–public partnership are being introduced to certain sectors in the country by organizations dealing with agricultural inputs, developmental agencies as well as farmer-based associations, cooperatives, and societies[12].
- The effectiveness of extension services, however, depends on the technology generation, facilitation of commercial scale farming, opening-up of input supply market, changing priorities of food sector, effective perusal of information needs, and transformation from a service into value-laden information.

[10] Wanigasundera, W.A.D.P. and Atapattu, N., 2019. Chapter 5 - Extension reforms in Sri Lanka: lessons and policy options. In Agricultural Extension Reforms in South Asia (Eds. Suresh Chandra Babu and Pramod K. Joshi), 79-98, Academic Press. https://doi.org/10.1016/B978-0-12-818752-4.00005-9.

- The traditional type of extension tools needs to be reassessed in capturing the growing trends in the sector. According to the current context, there are several major drawbacks identified in the whole agricultural extension system in Sri Lanka such as client dissatisfaction, bureaucratic approach, large performance gap, declining investments in extension, and slow adjustment in responding to changing roles[12]. Thus, the following constraints have been identified.
    - Extension mechanism is not efficient and effective.
    - Extension materials are outdated, not readily accessible and not user friendly.
    - Extension is not focused on addressing the current issues but general issues, thus not catering to the needs of the stakeholders.

Policy recommendation

- There should be a policy environment to
    - provide up-to-date techniques and technologies for extension which can attract and sustain the interest of the service provider and the recipient for effective service delivery.
    - assure a sound extension services through private-public-partnerships (PPP) supported by entrepreneurial dimensions.
    - assure an efficient mechanism to identify issues pertinent to different farm categories and establish effective mode for upward and downward communication

Policy instruments

- Establish a mobile-based agribusiness partnership programmes (APP) to provide 24 hr on-call service to directly communicate farmer, extension service providers, research and development agencies.
- Establish model modal farms/ business models at provincial levels through PPP.
- Develop and regulate a production-oriented extension service with appropriate extension tools in reaching the smallholder producers (via an App)

2.2 Extension in promoting cottage dairy industry

- Around 70% of the milk produced in the country is coming from smallholdings[11]. This set-up of the country might have contributed for diverting a considerable proportion of milk towards informal market channels and for family consumption
- Total milk production in the country has increased by 18% from 2020 (414.8 million litres) to 491 million litres in 2021. The quantity of milk collected by the formal milk processors was around 58% of the formal milk market in both years. However, this amount is contributing to the per capita consumption of milk (52.8 litres)[9].
- Though farmers are not used to practice evening milking in most parts of the country, evening -milking is done in certain areas where there is an efficient collection network with

[11] Vidanarachchi, J., Chathurika, H., Dias H., Korale Gedara P., Silva P., Perera K., and Perera, N. (2019). Dairy Industry in Sri Lanka: Current Status and Way Forward for a Sustainable Industry.

infrastructure facilities. Therefore, there is a void to be filled as an opportunity for the collection of evening-milking. Producers in certain areas are willing to collect and sell their evening milk. Processors need to expand evening milk collection for their producers[12] that would increase the volume of milk entering the formal supply chain.

- Encouraging the farmers for cottage level processing is one of the options available for taping more milk from the available resources including the evening milk. However, the following constraints in extension have been identified in this regards.
    - Lack of focus in extension service on product processing at cottage level.
    - Lack of promotion on cottage level processing / value addition
    - Lack of competent extension workers on product processing

Policy recommendation

- There should be a policy environment to
    - ensure the continuous supply of human resources with up-to-date knowledge to cater to the requirement of the milk product processing targeting different aspects (economics, technical and quality) involved in value chain .

Policy instruments

- Establish a Dairy Institute/Extension authority as a semi-government agency with financial support from the processors.
- Pilot a system to establish special market chain focusing products from cottage industry.

3. Production Efficiency

Milk production of the country shows a variation from year-to-year because of external factors, like drought. Dairy and agriculture are complementary enterprises with synergies in the sharing of crop by-products and organic fertilizer. Milk requirement of Sri Lanka is fulfilled by both local production (38% of the requirement) and importation of the powdered milk (62% of the requirement)[13]. Though the level of milk consumption in Sri Lanka is considerably low with per capita consumption of fresh and powdered milk at 110.33 ml per month and 341.36 g per month respectively, the dairy industry is one of the most prominent industries as consuming tea with milk is an essential part of Sri Lankans' daily routine[14]. However, the supply of this essential commodity cannot be fulfilled by the sector though the dairy production is being tagged as the priority production area of the whole livestock sector for past several decades.

[12] Midterm Evaluation of the Market-Oriented Dairy Project, 2020. United States Department of Agriculture. Available at https://pdf.usaid.gov/pdf_docs/PA00WR82.pdf

[13]DAPH 2019. Dairy Bulletin, Livestock Planning and Economics Division, DAPH. Available at http://www.daph.gov.lk/web/images/content_image/publications/other_publications/2020/Dairy_Bull_2018-2019_2020.09.18.pdf

[14] The Government News Portal, 2019. https://www.news.lk/fetures/item/24840-recent-trends-in-milk-production-and-consumption#:~:text=The%20quantity%20of%20milk%20collected,production%20was%20nearly%2065%20percent.

- Dairy production is contributed by both cattle and buffalo (populations of 1.4 and 0.4 million heads, respectively) where the contribution to the total milk production of the latter is only around 16%. The average milk production of the whole country is 3.35 L/cow/day (1-6 L/cow/day)[5]. The production efficiency of the national herd is to be improved targeting the short term and long term strategies to achieve the self-sufficiency in milk production.
- Milk production improvement programs are influenced by various hindering factors; some of which are related to producers (management and scale of operation related issues) whereas some are related to animals (reproductive and health issues).
- The producer-related issues depend both on the internal and external factors. It could be because of externalities such as weather, disease and socio-economic conditions that governs the inputs, etc., and due to internal factors such as unawareness of resource utilization within the system of operation leading specifically to failure of farms to provide sufficient feed and proper animal husbandry under the given system.
- The animal-related issues are mainly the reproductive inefficiencies which are connected to the internal and external factors. Sustainability of a dairy production system entirely depends on efficient reproductive performance of the cow, for both milk production and providing the replacement animals. Given the fact that majority of producers are smallholders, the animals must generate other economical outputs (essentially milk) to sustain the system since the continued supply of these outputs rely totally on the reproduction. Therefore, no dairy production system is sustainable without an acceptable level of reproduction[15]. The timely and efficient delivery of widely used reproductive technologies like artificial insemination are important.
- Small-scale operations need an optimum level of operation that breakeven system where proper identification threshold level of per cow production is important. Unproductive animals have to be removed from the system to make the system sustainable in generating short-term profits and achieving long-term goals.
- Farmers' awareness of these internal and external factors and the scale of operation is a crucial contributor in sustainable dairy operations. In the present context, the following constraints were identified to hinder the expected production targets in dairy production systems in Sri Lanka.

    - Low productivity of cows owing to under exploitation of the potential production capacities of crossbred cows.
    - Reproductive inefficiencies that lead to long calving interval.
    - Unawareness of economies of scale in taking management decisions.
    - Lack of facilities for proper disposal of unproductive/ unnecessary animals
    - Limited supply of essential inputs including financial support.

[15] Perara B.M.O.A and Jayasuriya, M.C.N. 2008. The dairy industry in Sri Lanka: current status and future directions for a greater role in national development. J. Natn. Sci. Foundation Sri Lanka 2008 36 Special issue: Il5-126.

Policy recommendation

- There should be a policy environment to
    - modernize dairy operations at different scales according to market-driven approach,
    - facilitate and promote an uninterrupted supply of essential inputs required for sustainable dairy operation, and
    - capacity building of dairy farmers continuously to ensure up-to-date knowledge on the management and economic aspects of farm operations.

Policy instruments

- Establish a Dairy institute/ training center with branches at regional level.
- Introduce financial support schemes as a package along with knowledge incentives.
- Provide support to farmer-driven societies which aim for establishment of market-oriented fodder development program.

4. **Collection/ Bulking of milk**.

Improvement of the quality of milk entering to the formal market channel starting from the cow to the processing Plant is an important aspect in dairy value chain operation. Since farmers attention on milk is more focused towards the quantity than the quality, the processors need to make more investments in improving quality of milk supplied to the cold chain. Though it goes beyond the point of farm gate, many on-farm activities such as cow comfort/care, shed design, and good hygienic practices are key for improved milk quality. It is important to note that the places for contamination are at the shed, use of plastic cans, and mixing evening milk with the fresh milk of the following morning [10].

- The formal dairy market in Sri Lanka includes farmer-managed societies, small dairy cooperatives, district dairy cooperatives and dairy cooperative unions. Milk from farmers is collected at the local milk collection centers where the collected bulk milk is stored under chilled conditions. At the collecting centre, which is equipped with basic milk testing facilities, farmers are paid for their milk based on the fat% and solid-non-fat% of milk[13].
- There are 283 milk chilling centres in the country, of which 69 are in the Central Province, and 52 in the North Western Province. The total capacity of all chilling centres in Sri Lanka is 1,074,130 litres[9].
- The largest milk collection share is coming from the state-owned milk company, MILCO Pvt. Ltd. which collects around 32% of the milk channeled to formal milk market[9]. There are a few large scale processing companies claimed for the collection of rest of the milk in the formal market which amounted to 165.5 million litres in the year 2019[16]. The majority of these companies have formed their own Farmer Managed Societies (FMS), collecting centres and chilling centres to facilitate the network of collection.
- The private sector engaged in milk collection and processing, due to the low volumes in the production areas, enter into wasteful competition by the different collecting agencies

fighting for the available milk in a given area. Further, the issue is more confounded owing to the lack of other marketing infrastructure, such as chilling tanks and transport vehicles.

- Evening milk collection is limited to only few regions of the country. For instance, in certain areas in the Kurunegala district MILCO collects milk in the evening as well[17]. The main reasons for not practicing evening milk includes non-availability of processor/ collector and the myth that milking in the evening would hurts morning milk yields[10]. Thus, there is an opportunity for increased milk collection with the promotion of evening milking. The collection by processors would increase the volume of milk entering the formal supply chain, and also help filling the gap between volumes of production and collection.
- Milk quality in collection/ bulking is measured in terms of Fat and SNF. The milk collected through formal channels, however, is not up to the international standards in terms of bacteria and somatic cell counts which presents challenges for modernization of the industry. Starting at the farm and throughout the supply chain, the infrastructure is not adequate to protect milk quality measured in low bacteria and somatic cell counts[13,14].
- Several challenges exist in collection/ bulking node of milk value chain could be summarized as follows:
    - Lack of focus in farm gate level for the milk quality but only the quantity.
    - Lack of facilities for testing bacteria and somatic cell counts at key nodal points.
    - Absence of encouragement for evening milking which contribute to deterioration of quality of milk (by mixing with morning milk) and volume of milk collection.

Policy recommendation

- There should be a policy environment to
    - attract more investments in dairy inputs which will lead to increased production of quality and safe milk production,
    - establish milk quality standards pertinent to farmgate level and those to be maintained in processing plants while promoting the facilities in milk collection and transport.
    - promote producer clusters, collection points and chilling centers to reduce the issue of high cost of transportation of milk and curb the milk quality declines during collection/ bulking process.

Policy instruments

- Introduce partnership models for on-farm testing of milk with the engagement of processors.
- Introduce grading system/ rewarding system for milk based on microbial and somatic cell counts
- Establish pilot programs to collect evening milk in selected areas of the country with appropriate infrastructure investments (on collection and cooling).
- Introduce a package for milk quality testing to ensure quality of milk entering into the value chain.

[17] Hitihamu, S., Lurdu, M.D.S. and Bamunuarachchi, B.A.D.S. 2021. Value Chain Analysis of the Milk Industry in Sri Lanka. Research Report No: 237. Hector Kobbekaduwa Agrarian Research and Training Institute 114, Wijerama Mawatha, Colombo 7, Sri Lanka

5. Processing/ Value addition

Improving the milk quality to safeguard the quality of the processed product is a priority to meet the international standards[14].. This also will improve the efficiency of the activities involved in milk processing, including milk collection, transport, and chilling. Under the prevailing situation of the dairy industry of the country improvement in milk quality is a persistent challenge. Processors have not made enough investments needed in improving the milk quality chain. The milk collection system is still under-invested by the processing industry[14,19].

- Most of the milk collectors have their own chilling centres and processing factories and around 75% milk collected will be processed in these factories[18]. The main milk processors are MILCO Pvt. Ltd (32%), Nestle (23%) and Pelwatte Dairies (19%)[9]. The main processed products are skimmed milk, semi-skimmed milk, milk powder, yoghurt, ice cream, curd, ghee, pasteurized milk, UHT milk butter, sterilized milk, flavoured milk, butter milk, and butter oil. These processed products will be distributed to wholesalers and retailers to reach the end users.
- There is a tendency of fluctuation of the quality and quantity of the bulk milk received at the processers depending on the level of standards that each processer maintains in accepting milk to enter their value chain. The issues associated with quality and quantity of milk enters to the value chain are interconnected. Processors were willing to take low quality milk and even adulterated milk because of the shortages in overall milk supply. Thus, there is a low rejection rate by processors[14].
- The quantity of milk collected in the four quarters of 2020 only ranged between 29.4% (in the 3rd quarter) and 21.2% (in the 1st quarter) of the total annual milk production [9]. However, the encouragement for milking the cows during the cropping season will positively effect on milk processing sector to ensure that there is no under capacity operation in value addition process.
- Given the conditions prevail in the field conditions, the following gaps have been identified
    - Seasonal fluctuation of raw milk leading cold chain machinery to run under capacity or leaving them complete idle.
    - Constraints in regional small-scale processing
    - High microbial count and poor milk quality

Policy recommendation

- There should be a policy environment to
    - encourage the investments in regional small-scale processing while maintaining the milk quality at the milk platforms.

[18] Vernooji, A., Houwers, W. and Zijilstra, J. (2015). Old friends – New trends; Emerging business opportunities in the dairy sector of Sri Lanka. Leiystad, Wageningen University & Research Centre, Livestock Research, Livestock Research report 831

- regulate the standards of the milk accepted by the large-scale processors and practice comparable milk rejection policy by all the processors.

Policy instruments

- Deliver training programs on clean milk production to all the stakeholders, i.e. producers, transporters, collection, and chilling centers with the goal for improved milk quality
- Introduce a subsidized loan scheme to promote small-scale processing and marketing units with commercial orientation.

6. Sales and Marketing

Sales of milk and milk products are happening through both private and public organizations working in parallel or tandem with each other. The state sector involvement in sales and marketing could be identified only by MILCO (Pvt) Ltd., which engages in milk collection from farming areas, and processing fresh milk, marketing it under its brand. Most processors use imported milk powder for their products though ideally, all the businesses need to extend their operations to procure fresh milk locally to cater to the developing market segments, such as liquid milk, pasteurized and sterilized milk, flavoured milks and yogurt. Locally procured milk is used for making ice cream and mixed-flavoured fruit drinks[19].

- The milk products distribution is uneven within the country. Except in the supermarkets and limited number of sales outlets, there is no island wide fresh milk marketing network in Sri Lanka, and the fresh milk available in the supermarkets are expensive for the middle and lower income families. Therefore, direct marketing of fresh milk is important[19].
- The large-scale milk processors are engaged in milk processing and distribution. These private sector organizations, including the state-owned company, produce different value-added products and engaged in milk product diversification. These processed products will be distributed through wholesalers and retailers from where the products finally reach domestic consumers.
- The informal collectors are also engaged in value addition, and they also contribute to product diversification in variety of scales, ranging from cottage level to small scale processing units. Those products include popular items such as ice-cream, yoghurt, curd and specially the iced milk packets. However, the quality assurance of these products is crucial because these products are much popular among school children[16].
- Considering the status of pattern of milk sales and marketing of the country, the gaps identified were,

    - Lapses in uniformity in distribution of popular milk products
    - Competition from imported products

[19] Ranaweera, N.F.C., 2009. Sri Lanka: Opportunities for dairy sector growth. In Smallholder dairy development: Lessons learned in Asia. Animal Production and Health Commission for Asia and the Pacific, FAO Regional Office for Asia and the Pacific, Bangkok, January 2009. Available at https://www.fao.org/3/i0588e/I0588E08.htm

Policy recommendation

- There should be a policy environment to
    - ensure demand-driven supply of milk and milk products throughout the country
    - strengthen the quantity and quality of locally produced dairy products to become a competitor for the imported products.
    - incentivize the environmentally friendly/ climate smart management actions in production of milk
    - ensure the regulation of the quality of cottage products and processed milk products in small-scale processing units.

Policy instruments

- Promote local products among the consumers.
- Establish a regulatory body for quality assurance process of milk and milk products in the market.
- Introduce rewarding system for environmentally friendly/ climate smart production

7. Consumption

Milk consumers can be categorized according to the household income levels. Most of the low-income families tend to consume powdered milk compared to fresh milk. Though it tends to vary on a wide range, according to the average monthly household expenditure of all food items, the expenditure for dairy products is 9.4%[14], which is a low share compared to many other countries in the region. However, the general population is aware of the importance of fresh milk consumption.

- High demand for fresh milk consumption exists in the urban and peri-urban areas of the country. In the absence of marketing network for fresh milk, introducing door-to-door milk marketing network will benefit both consumers and producers alike[16].
- Powdered milk consumers show higher preference to purchase domestically produced milk powder and other processed products[20]. However, the supply of domestically produced milk powder is not adequate to meet the demand from consumers. Therefore, it is important to invest more on the expansion of the production possibilities to cater to the demand.
- The consumer awareness in taking informed decision on the type of milk product to be consumed is lacking in majority of communities. However, there is no proper consumer education to appreciate the value of fresh milk and milk products.
- A variety of dairy products, other than the liquid and powdered milk, enter to the market are channeled either through large-scale production lines or the small-scale producers. The quality assurance and the shelf-life of those products have to be attended by the relevant authorities since there is an unfilled gap in this regard.
- Several gaps have thus been identified in relation to milk consumption of country
    - Absence of quality-based selection of dairy products & low home consumption

[20] Jayatissa R.L.N., Wickramasinghe, W.D. and Piyasena Chandrani. 2014. Food Consumption Patterns in Sri Lanka. Research Report No: 172. Hector Kobbekaduwa Agrarian Research and Training Institute 114, Wijerama Mawatha, Colombo 7, Sri Lanka.

- Less attention on shelf life & poor handling of dairy products
- Absence of options for lactose intolerance situations
- Low demand for liquid milk compared to powdered milk

Policy recommendation

- There should be policy environment enabling
    - an appropriate regulatory mechanism to regulate the quality and safety of the dairy products entering to the market, and
    - labelling of dairy products to educate the consumers on the nutritional aspects and other health benefits of the product.

Policy instruments

- Promotion of local products among the consumers.
- Establish a dairy center to conduct research and development as well as to feed regulatory bodies regarding the quality assurance process of milk and milk products in the market.

Annexures

Annex 1

Workshop Verification Summary

Actor/ Stage of the value chain	Focus of the constraint	Whether the cause was identified	Verification to be done with*
1. Input Supply	1.1 Feed	Yes	**Dr. Nimal Chandrasiri**, Former Director General, Department of Animal Production & Health **Dr. Susantha Mallawarachchi,** Director, Hayleys Agro farms
	1.2 Health	Yes	
	1.3 Breeding materials	No	
	1.4 Unawareness about inputs	No	
2. Extension Support	2.1 Regarding processing	Yes	**Dr. Hemali Kothalawela**, Director General, Department of Animal Production & Health **Mr. Indrajith Fernando**, Project Director - New Milk Factory Project at MILCO (Pvt) Ltd.
	2.2 Extension tools	Yes	
	2.3 Coverage of extension		
	2.4 Awareness	Yes	
3. Production	3.1 Under-utilization of materials	Yes	**Dr. Niroshan Gamage**, Director - Livestock Livestock Planning at Ministry of Agriculture. **Mr. Nishantha Jayasuriya**, President, All-Island Dairy Association **Dr. Priyani Mangalika,** Additional Director General (Livestock Development), Department of Animal Production & Health
	3.2 Reproductive issues	Yes	
	3.3 Milking issues	Yes	
	3.4 Economy of scale	Yes	
	3.5 Seasonality	Yes	
	3.6 Disposal of unwanted/ unproductive animals	Yes	
	3.7 Ability of accessing essential inputs	Yes	
4. Milk Collection & Bulking	4.1 Quality	Yes	**Mr. Sunil Gamage,** Former Dy. Director VRI, Consultant Dairy Processing **Mr. Saman Perera,** Head of Local Dairy Development & Sustainability, Fonterra Brands Lanka
	4.2 Inefficiency in collection	Yes	
5. Processing / value addition	5.1 Seasonality	Yes	
	5.2 Machinery	Yes	
	5.3 Milk quality	Yes	
	5.4 Regional processing plants	Yes	
6. Sales & Marketing	6.1 Distribution	Yes	**Ms. Dinesha Samaraweera**, Senior Manager, Nielsen Lanka (Pvt) Ltd
	6.2 Competition	Yes	
7. Consumption	7.1 Quality regulation	Yes	Dr. Priyani Mangalika, Ms. Dinesha Samaraweera
	7.2 Lack of demand for liquid milk	Yes	

* Identified from the list of presenters in the Outcome Report. The verification will be done through personal communication or by arranging on-line discussion as appropriate.

Annex 2

Details of the information verification process

Details of the Expert	Aspects verified	Mode of verification
Dr. Nimal Chandrasiri	All seven aspects and particularly on Input Supply	Over the phone and email communication
Dr. Susantha Mallawarachchi	Input Supply	
Mr. Indrajith Fernando	Extension Support	
Dr. Hemali Kothalawela	Input Supply, Extension Support and Production	
Dr. Niroshan Gamage	Input Supply, Extension Support and Production	
Mr. Nishantha Jayasuriya	All seven aspects	
Dr. Priyani Mangalika	Milk Collection & Bulking, Processing/value addition Sales & Marketing, Consumption	
Mr. Sunil Gamage	All seven aspects and particularly on Milk Collection & Bulking, Processing/value addition	
Mr. Saman Perera	Milk Collection & Bulking, Processing/value addition	

Annex 3

Policy Workshop outcome submitted for verification

Actors / Stages of Value chain	Problem / Constraints	Cause	Strategic intervention	Code for Verification Table
Input supply	**1.** Roughages year-round availability in adequate quantity	**1.** Limited lands, high cost of conservation, technology not adopted	**1.** Increased access to rice straw, Business model for fodder supply, Promotion campaign on use of agro-by-products as cattle feed, Negotiation with DOA, Adaptive R&D on feeding practices.	**Input-1**
	2. Concentrate feed availability for different stage of dairy cattle, Restrictions in feed imports	**2.** Manufacturers produce for only milking cows. Demand low for feed to other stages of cow	**2.** Feed formulation know-how for farmers (Ration formulation tool), Ingredients under tax concession, Tax relaxing for oil extraction machinery.	**Input-2**
	3. High cost of veterinary pharmaceuticals, veterinary service. Unpredictable service on Artificial insemination.	**3.** Monopoly of DAPH provincial staff, Co-ops not involved	**3.** Training para-veterinary staff under co-op system.	**Input-3**
	4. Unavailability of reliable source to supply production and health certified good milking cows.	**4.** No agency with authority back with policy support	**4.** DAPH to maintain nuclear farms for selection and crossbreeding.	**Input-4**
	5. Vaccination for epidemic diseases not regular, not reliable	**5.** No R&D on vaccination by DAPH. Low buffer stock	**5.** Initiate milk processors' contribution for research Inst.	**Input-5**
	6. Farmer not aware of what inputs they need and in what quantities	**6.** Inadequate awareness without practical exposure	**6.** Prepare booklet/handbill on input requirement for different scale of production.	**Input-6**
	7. Farmers rely on free grazing over homestead cultivated fodder, Limited lands	**7.** Maximum quantity of grass consumption under free grazing is around 15 kg (3.45 kg DM) per day on the average. Therefore, crossbreds on free-grazing always underfed.	**7.** Allocate sizable acreage (5 ac.) for youth with other necessary infrastructure to start fodder business model (Policy decision).	**Input-7**

Actors / Stages of Value chain	Problem / Constraints	Cause	Strategic intervention	Code for Verification Table
Extension support	1. Present extension mechanism is not efficient and effective. More focus on production but neglect processing, value addition	1. Lack of competent personals on dairy engineering aspects.	1. Strengthening University Agric. Engineering postgrad. Courses, Exchange visits to local experts, Custom training on specific aspects	**Extension-1**
	2. Cottage level processing neglected.	2. No effective promotion on cottage level processing / value addition	2. Milk co-ops to support for., R&D on cottage, promote and organize special market.	**Extension-2**
	3. Extension materials outdated, in English, not available, not accessible.	3. Lack of interest, lack technological know-how, limited funds, lack of competent personals.	3. Contracting for preparation of materials. Remunerations for public sector experts	**Extension-3**
	4. Extension and processing agents do not address processing problems. Institution responsible for Milk production is DAPH. Promoting policy advocacy and strategies, organization of milk producers, legal framework and trade, promoting milk consumption are not addressed.	4. Extension responsibility on provincial DAPH but benefit to processors.	4. Establishment of Dairy Institute. Exn authority for semi-government agency with financial support from processors.	**Extension-4**
	5. Extension not focused on current issues but general issues	5. No mechanism to identify current issues in the different farm categories. Upward and downward communication means on effective	5. Mobile based APP to communicate directly farmer, extn. agent, R&D agent	**Extension-5**

Actors / Stages of Value chain	Problem / Constraints	Cause	Strategic intervention	Code for Verification Table
Production	1. Potential production capacities of crossbred cows not exploited. Low productivity of cows	1. Deficiencies in nutrition Demotion of genetic vigor due to crossbreeding without considering present exotic blood levels	1. Support for cultivated fodder	**Production-1**
	2. Difficulty in making Second and subsequent pregnancies resulting long calving interval	2. Problems in heat detection and AI time, Brucellosis infected, extensive handling of cows	2. Develop AI database regionally	**Production-2**
	3. Milking is only once a day leading short lactation length	3. No mechanism to dispose evening collected milk	3. Strengthen farmer knowledge, check and screen cows for brucellosis, field chilling tanks	**Production-3**
	4. Economies of scale. Production level of small and medium level farms not economical. Lack of large –scale farms	4. Lack of awareness on cost / benefits	4. Training of VCs on cost-benefit analysis	**Production-4**
	5. Seasonality in production	5. Cropping season overlaps and priority for crops	5. Promote women and youth for harvesting milk	**Production-5**
	6. Birth of high % of male calves	6. Practical difficulties in using sexed semen.	6. Use sexed semen for first time inseminating heifers and first calved cows.	**Production-6**
	7. Difficulty in disposing economically unproductive animals	7. Policy restrictions in disposing dairy cattle and buffaloes	7. Submission of policy proposals	**Production-7**
	8. Limited use of essential inputs	8. Lack of financial needs	8. Effective loan program	**Production-8**

Actors / Stages of Value chain	Problem / Constraints	Cause	Strategic intervention	Code for Verification Table
Collection / Bulking	1. No focus on quality but quantity in collection of milk	1. Competition in milk collection with other competitors	1. Develop partnership models	**Collection-1**
	2. Increased microbial count when reaching processing facility	2. Transport under no refrigeration for long hours	2. Develop payment system based on the microbial count	**Collection-2**
	3. Collection is far below production, Evening milk (high fat%) not collected	3. Poor roads	3. Infrastructure development supports	**Collection-3**
Processing/ Value addition	1. Bulk reception of raw milk fluctuate seasonally leading cold chain machinery to run under capacity or complete idle. Lifespan of the machinery affected	1. During cropping season, no milking is practiced. Short lactation length of cows	1. Initiate processor initiated free extension service door to door	**Processing-1**
	2. High microbial count in bulk	2. Mastitis, exposure of milk with no refrigeration	2. Training on shed management	**Processing-2**
	3. Constraints in regional small-scale processing	3. Lack of small-scale processing units, lack of dairy processing engineers	3. Manpower development in dairy engineering	**Processing-3**
	4. Poor milk quality preventing to go for fermented value addition	4. High microbial count. Incorporation of non-dairy components,	4. Payment based on the quality rather than quantity	**Processing-4**
			5. Small scale processors could be promoted by assisting them with subsidized loan schemes to promote milk bars containing cottage yoghurts, cheese, ice packets, fresh milk etc.	**Processing-5**

Actors / Stages of Value chain	Problem / Constraints	Cause	Strategic intervention	Code for Verification Table
Sales and Marketing	1. High demanding products only to main cities, not uniform	1. Lack of refrigerated transport	1. Tax concession for milk transporting vehicles	**Marketing-1**
	2. Competition from imported products	2. Free access for promotional activities	2. Restriction on powder milk promotion	**Marketing-2**
			3. Provision of loan facilities to establish milk bars and retails shops for the locals in the area.	**Marketing-3**
Consumption	1. Less attention on shelf life of dairy products	1. Health authorities no interest	1. Impose regulations for shelf life considering different products (Ex: Drinking yoghurt, minimum 2.5% fat)	**Consumption-1**
	2. Lactose intolerance	2. Preparation of different products to minimize the effect	2. Extensive awareness and R&D support for new product development.	**Consumption-2**
	3. Low demand for liquid milk and high demand for powdered milk	3. No reliability of the liquid milk due to adulterants	3. Quality based incentives for farmers and promotion campaign for liquid milk consumption.	**Consumption-3**

Annex 4

Policy Workshop Outcome Verified by Experts

1. Actor/ stage of Value chain – Input Supply

Code for Verification	Verification on	Verification statements/ inputs by experts
Input-1	**Problem / Constraints**	Verified
	Cause	1. No additional roughages for conservation.
	Strategic Intervention	1. Include tree fodders and tree legumes as cattle feed in addition to agro-by-products. 2. Forage base improvement with high yielding fodder/grass/ legume varieties
Input-2	**Problem / Constraints**	1. High cost of concentrate feeds.
	Cause	1. High cost for feed ingredients
	Strategic Intervention	2. Increase awareness of farmers and manufacturers
Input-3	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Training of more private AI technicians under co-op system. 2. Promote veterinary Services through processing companies 3. Privatization of livestock extension. 4. Strengthen the implementation of Animal Disease Act
Input-4	**Problem / Constraints**	Verified
	Cause	1. Non-availability of dedicated farm for breeding material production
	Strategic Intervention	1. There is no proper mechanism to certify production status of milking cows 2. Identification of private sector farms as certified breeder farms 3. Strengthen the facilities for implementation of breeding policy guidelines.
Input-5	**Problem / Constraints**	Verified

	Cause	Verified
	Strategic Intervention	1. Not only 'milk processors' but all the stakeholders. 2. Support and strengthen the research and development on vaccine production and commercializing them.
Input-6	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Develop an App to be given to be used by mobile phone other than materials mentioned 2. Strengthening of extension and use private extension staffs 3. Booklets should be available to farmers not only on different scale of production but on different aspects of dairy farming. This responsibility also can be given to the Extension Authority so that it can be industry focused.
Input-7	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Promote commercial fodder market to purchase fodder in the free market 2. A mobile App can be introduced for this as well so that the farmer can work out his cost himself
Additional Inputs/ concerns	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	Verified

2. Actor/ stage of Value chain – Extension support

Code for Verification	Verification on	Verification statements/ inputs by experts
Extension-1	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Extension support is needed to increase milk production first, and then the processing

		2. This problem need not be addressed through the extension service as this requirement is for larger scale farmers and processors who have access to agencies providing engineering and technical services. However, building up human resource in this field is required. 3. Today's focus is solely on "milk as a food". But milk must be prioritized as a (1) substantial economic instrument in farmer sustainability, (2) a tool for gender equality, and (3) a means of increasing the production of our staple rice and other foods.
Extension-2	**Problem / Constraints**	1. Difficult to extend to cottage level
	Cause	1. Difficult to compete with established trade names consumers prefers them
	Strategic Intervention	1. Organize special markets such as schools, welfare associations while maintaining the quality. 2. In some locations, evening milk is not usually collected, and the collecting organizations cite that it is due to a logistic problem. Therefore, the evening milk could be used for cottage level processing
Extension-3	**Problem / Constraints**	1. Extension materials need at regional level too.
	Cause	Verified
	Strategic Intervention	1. Extension materials need to move to an App based mobile mode for easy access in all languages. 2. Already in place 3. Extension materials should come under the responsibility and scope of the Extension Authority. They can hire professionals from public as well as private sector depending on the requirement 4. This should be a three-pronged extension material aimed at three distinct groups. The first group's goal is to promote dairying as a viable economic instrument. (Department of Agrarian Services), the second group is in charge of giving technical advice on increasing milk quantity on the farm. (DAPH), the third group focuses solely on milk quality. MILCO & private milk processors)
Extension-4	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Financial support should be from all stakeholders not only from processors 2. Processors can also do extension activity. 3. Not only financial support from processors but also participation in the management of this authority. Even the farmers can contribute on per liter basis which can be deducted from the milk payment and credited by the respective buyer/processor. Can get an example for this from "Dairy NZ" in New Zealand 4. The Department of Agrarian Services or Agricultural Development Authority, has the mandate to promote livestock and poultry.

		5. Farmer organizations fall within the purview of these organizations. 6. The DAPH's mandate is to stimulate on-farm increase in milk production. 7. These farmers' customers include MILCO and milk processors. As a result, these organizations should advocate for the preservation of milk quality at the farmer level as well as the marketing value chain.
Extension-5	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. All of the issues will be resolved by the three-pronged extension action.

3. Actor/ stage of Value chain – Production

Code for Verification	Verification on	Verification statements/ inputs by experts
Production-1	**Problem / Constraints**	1. High Variability of per cow milk production
	Cause	1. Unavailability of adequate quantity and quality of roughages 2. Wide variable Genotype X Environment interaction
	Strategic Intervention	1. Support for cultivated fodder legume varieties with improved yield potential & better nutritive characteristics. 2. Introduction of TMR feeding 3. Provide an adequate amount of clean and fresh water throughout the day 4. Develop breeding plan. 5. Create a mechanism to lessen the variability of the farm environment. First, the ADA should offer incentives to farmers who improve farm conditions. Second, the ADA promotes input provision to dairy farms by offering incentives to small and medium farm businesses - feed from crop residue (silage) and natural breeding through stud bulls provided by NLDB. Development of a system to breed genotypes to fit the local farm environment. - The DAPH is already collecting information in this area, with assistance from the FAO. This action necessitates the inclusion of a molecular component for quick improvement. - A system for increasing a specific population in order to provide farmers – The NLDB should implement a three-tiered scheme — Elite herd farms, where sires and dams are chosen based on offspring values, Multiplier farms, and commercial production (milk and replacement stocks) farms.

Production-2	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Introduction of system to solve reproduction & breeding problems of cows
Production-3	**Problem / Constraints**	Verified
	Cause	1. Short lactation length is due to disturbed milk production function. No evening milking and Poor feeding
	Strategic Intervention	1. Establish evening milk collection network and field chilling tanks at small-scale level are being addressed. 2. Encourage processors to get involved 3. ADA establishes small milk processing plants with trained personnel. Farmers can bring their milk supplies for processing and marketing. 4. MILCO and Private processor collection points established in villages, purchase silage from private S & M enterprises and make available to farmers.
Production-4	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Smallholder Dairy-Crop integrated farming system is Low-Input system and very profitable as feed is crop residue or from free grazing. - Large commercial operators require to import maize and other inputs. Current situation shows that system is no more sustainable. - The need is to increase the number of cattle heads / smallholder farmer. - With new breeding program mentioned above will increase per cow milk production too
Production-5	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Introduce mechanization 2. Correction of feeding pattern 3. Make dairy management easier as dairy will be integrated into crop farms by women and youth. 4. Plan free grazing programs in pasture lands that have been delineated under the Pasture Land Act of 1983. 5. Increased biodiversity and foliage for cattle planned by ADA, DAPH, DA and Forest Department.

Production-6	**Problem / Constraints**	1. Birth of high % of male calves is not observed in the field
	Cause	Verified
	Strategic Intervention	1. Production of sexed semen locally 2. Sexed semen is made available at a subsidized rate to milk producers in the processing network. The milk processor should bear the subsidy. 3. Cottage milk processors should be provided free sexed semen quotas, which can then be transferred to people who supply milk to the cottage processor.
Production-7	**Problem / Constraints**	Verified
	Cause	1. Farmers find it difficult to maintain more heads in each unit.
	Strategic Intervention	1. These cows may have low production but they are capable of breeding. There is a severe shortage of replacement animals. These unproductive cows can be used to produce replacement stock. Private Entrepreneurs with large lands can operate as replacement stock producers
Production-8	**Problem / Constraints**	1. Inefficiencies in the low-input dairy system
	Cause	1. This system utilizes high-potential genes that are well-suited to a high-input system
	Strategic Intervention	1. Produce a suitable cattle breed to sustain low input system but producing high milk production through available processed crop residue. 2. Suitable breed providing its maximum potential under the low input processed crop residue system of management
Additional Inputs/ concerns	**Problem / Constraints**	1. Insufficient supply and poor quality to encourage consistent cottage industry production
	Cause	1. Poor promotion network
	Strategic Intervention	1. Focused promotion network uniting all parties in the milk value chain. 2. All milk processors are compulsory to have village level collection points and connected networks similar to MILCO.

Actor/ stage of Value chain – Collection/ Bulking

Code for Verification	Verification on	Verification statements/ inputs by experts
Collection-1	**Problem / Constraints**	1. Less focus on quality but quantity in collection of milk. 2. Milk producers fail to meet the quality standards
	Cause	1. Lack of understanding on differences in quality standards to be maintained at farmgate and value chain operation (factory)
	Strategic Intervention	1. All payments of milk need to be based on bacterial load. KQ test. Need to do this at collection center level at the time of procurement. 2. Establish quality standards acceptable for different points in the dairy value chain.
Collection-2	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Establish Milk collection points accessible and strategically located, sheltered, with cooling facilities 2. Develop cooling facilities at regional level
Collection-3	**Problem / Constraints**	Verified
	Cause	1. No cooling facilities at village/regional level to store evening milk
	Strategic Intervention	1. Develop cooling facilities at village/regional level

4. **Actor/ stage of Value chain – Processing/ Value addition**

Code for Verification	Verification on	Verification statements/ inputs by experts
Collection-1	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Involve youth in dairy farming and project dairy farming as a profitable venture.
Collection-2	**Problem / Constraints**	Verified
	Cause	1. Bad Animal Husbandry and milk handling Practices
	Strategic Intervention	1. Incentives for adopting practices that ensure milk safety.
Collection-3	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Establish and promote a national level qualification and program for dairy technology.
Collection-4	**Problem / Constraints**	1. Difficulties in maintaining good manufacturing practices in small-scale processing
	Cause	1. Lack of facilities and knowledge
	Strategic Intervention	1. Awareness programs and provide loans/funds for establish such facilities
Collection-5	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. The small-scale processors already in operation have to be empowered rather than bringing new players into the system

5. **Actor/ stage of Value chain – Sales and Marketing**

Code for Verification	Verification on	Verification statements/ inputs by experts
Marketing-1	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	Verified
Marketing-2	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Include cheese and other chilled dairy products 2. Impose high Taxes for imported milk products
Marketing-3	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	Verified

6. **Actor/ stage of Value chain – Consumption**

Code for Verification	Verification on	Verification statements/ inputs by experts
Consumption-1	**Problem / Constraints**	1. Lack of confidence on the quality of small-scale products
	Cause	1. Lack of guidance for/ knowledge of small-scale entrepreneurs build confidence in consumers about their product
	Strategic Intervention	1. Drinking yoghurt, minimum 2.5% fat is not relevant since the matter is on shelf life and not product composition. 2. Empowering the small-scale producers with proper guidance
Consumption-2	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	Verified
Consumption-3	**Problem / Constraints**	Verified
	Cause	Verified
	Strategic Intervention	1. Give tax concessions for long life milk packaging material. 2. Increase local milk powder production
Additional inputs/ concerns	**Problem / Constraints**	1. Absence of quality-based selection of dairy products & poor handling practices 2. Low home consumption
	Cause	1. Lack of knowledge in consumers about the quality 2. Milk sales are preferable to home consumption and processed products are not Available
	Strategic Intervention	1. Awareness of consumers on handling of dairy foods and their nutritional value through extension & propaganda 2. Develop milk cottage industry with the involvement of Women and Youth entrepreneurs

Annex 5

Agenda of the Workshop

Date: **13.10.2022**
Time: **9:00 AM to 1:30 PM**
Venue: **The View, 1st Floor, Waters Edge, Battaramulla**
Title of Workshop**: Workshop on Presentation of Policy Paper on Dairy Sector**

Program

Inauguration

09:00 AM : Registration and Refreshment

09.30 AM : Lighting of oil lamp and playing National Anthem

09:40AM : Welcome Address and Objective of the Workshop

-Dr. Yasantha Mapatuna, Programme Director-SAPP

09:50AM : **Presentation of Policy Paper on Dairy Sector**
– **Prof. (Mrs.) Pradeepa Silva**

10:15 AM : Guest Speech by **Dr. (Mrs.) K. A. C. H. A. Kothalawala/**Director General, Department of Animal Production and Health

10:25 AM : Guest Speech by **Dr. L.W.N. Samaranayake/**Additional Secretary, Livestock Development

10:35 AM : Chief Guest Speech by **Hon State Minister D.B. Herath,** State Minister of Livestock Development

10:45 AM : **Validation of the recommendation by the stakeholder**
– **Prof. (Mrs.) Pradeepa Silva**

12:30 PM : Follow up action and Concluding Remarks-

Dr. R.M. Herath, M&E Consultant/SAPP

12:45 PM : Lunch

01:30 PM : End of the Workshop

Annex 6

List of participants of Workshop on Presentation of Policy Paper

Date: 13th Oct 2022

1. Hon State Minister of Livestock Development
2. Secretary/ Ministry of Agriculture
3. Secretary/ State Minister of Livestock Development
4. Additional Secretary Technology, Ministry of Agriculture
5. Additional Secretary Development. (Dev II), Ministry of Agriculture
6. Director/ Planning- State Ministry of Livestock Development
7. Additional Secretary/ Livestock Development – State Ministry of Livestock Development
8. Director/Breeding - State Ministry of Livestock Development
9. Director General/ Department of Agriculture -
10. Department of External Resource
11. Department of National Planning
12. CBSL – Development Division
13. Director General/ Department of Animal Production & Health
14. Additional Director General (Planning) - Department of Animal Production & Health
15. Additional Director General (Development) - Department of Animal Production & Health
16. Provincial Directors – Provincial Departments of Animal Production & Health
17. NLDB Chairman & General Manager
18. MILCO chairman & General Manager
19. Promoters
20. Dean Agriculture/ University of Peradeniya
21. Dean Veterinary Medicine and Animal Science/ University of Peradeniya
22. Head; Department of Animal science, FOA/ University of Peradeniya
23. MOD - Market-Oriented Dairy Sri Lanka
24. Chamber of Commerce – Dairy Association (AIDA)
25. Agrinova, Prijee International, Analytical Instruments, Farmlives
26. HARTI representatives
27. District Secretaries (Badulla, Kandy, Ratnapura, Kurunegala)