

REPORT of the Thirty-eighth Session of the Animal Production and Health Commission for Asia and the Pacific (APHCA)

Chiang Mai, Thailand, 3-7 November 2014



THE EIGHTEEN APHCA MEMBER COUNTRIES

AUSTRALIA

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SAMOA

SRI LANKA

THAILAND



Report OF THE THIRTY-EIGHTH SESSION OF THE ANIMAL PRODUCTION AND HEALTH COMMISSION FOR ASIA AND THE PACIFIC (APHCA)

Chiang Mai, Thailand, 3–7 November 2014

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
REGIONAL OFFICE FOR ASIA AND THE PACIFIC
Bangkok, 2014

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RECOMMENDATIONS

The Commission welcomes:

- That the Regional Technical Commissions are considered the Regional priority-setting bodies for the sub-sectors for which they are competent and that their recommendations complement and inform the discussions during the Asia-Pacific Regional Conference on the Programme of Work and the Regional Priority Framework;
- The alignment between FAO's renewed Strategic Objectives, its Programme of Work and Budget and the Commission's activities;
- FAO's support to initiatives of regional relevance such as the formulation of a regional strategic framework for smallholder dairy sector development, regional animal feed resource assessments, awareness raising about antimicrobial resistance risk and management, and the generation and timely sharing of critical information;
- FAO's emphasis on South-South cooperation and participatory consultative processes to address regional priorities as practiced by the Commission since its inception.

The Commission emphasizes that:

- Livestock systems are increasingly important components of global food systems and that today's dietary transition in developing countries is moving significantly faster than it did historically in developed countries;
- The Asian livestock sector is undergoing exceptionally rapid and significant growth and transformation, characterized by industrialization of food animal production, increased use of food grain for feed, growing trade of animal products and by-products, and concentration of animal production, both spatially as well as in terms of market power;
- Seventy percent of the world's poor livestock keepers and 40 percent of the global livestock population reside in the Asia-Pacific Region.

With respect to developments in the Asia-Pacific Region, the Commission is concerned about the:

- Rising regional shortfalls in animal feed and its impact on food security;
- Significant impact of animal diseases on livestock production and trade of animal products;
- Sustained emergence of infectious diseases affecting humans and animals;
- High human burden of endemic zoonotic and food-borne diseases;

- High and rising prevalence of antimicrobial resistance in livestock-associated microorganisms;
- Growing pressure on natural resources (land, water and nutrients) and environmental impact of rapidly growing livestock production;
- The likely effects of climate change including increasing frequency of severe weather events (e.g. droughts, floods) on livestock production and health;
- Exclusion of smallholder livestock keepers from growing markets for high-value agricultural products;
- Inadequate capacity among the member countries in analyzing trade-offs and implementing specific measures to support more sustainable livestock sector development.

Regarding FAO's and the Commission's capacity to support Member countries to address the above issues, the Commission notes that:

- Human and financial resources made available to the Regional Office seem incommensurate with the Office's increase in responsibilities following 'decentralization' and the growing importance of providing strategic guidance for livestock sector development in the Asia-Pacific region;
- FAO staff time is increasingly devoted to field project support rather than to planned programmatic work and provision of the Secretariat functions to the Commission;
- The post of APHCA Liaison Officer has been vacant since June 2014 and that RAP management has not indicated its intentions with respect to this position.

The Commission recommends that FAO:

- Increases the human and financial resources allocated to address the multiple problems associated with the rapidly growing and transforming livestock sector in the region;
- Redresses the work balance of regular FAO staff between field project support and work related to FAO's PWB;
- Maintains and fills the position of APHCA Liaison Officer so as to ensure that FAO can adequately fulfill its role of providing the Commission's Secretariat;
- Continues to support regional initiatives and actions to address problems of transboundary nature (e.g. emerging diseases, feed scarcity, zoonoses, antimicrobial resistance), in close collaboration with related agencies and intergovernmental organizations;
- Capitalizes on its nature of membership organization providing specialized regional fora to promote within- and cross-country collaboration so as to catalyze stakeholder action and investment towards the broader goal of sustainable livestock production;

- Continues to provide the forum for the negotiation of a regional strategic framework for sustainable dairy development to guide countries in the formulation of their national dairy development strategies, policies and programmes;
- Promotes the establishment of an 'independent' multi-stakeholder Dairy Asia platform as mechanism to plan and implement regional, national and sub-national actions within the realm of national dairy development programmes;
- Undertakes renewed efforts to increase APHCA membership.

With respect to the 39th Session, the Commission:

- Appreciates the offer of the Government of Myanmar to host the Session in September 2015; and
- Encourages the invitation of non-APHCA countries from the region as well as international organizations as observers.

Minutes of the 75th Executive Committee Meeting and the 38th Session of APHCA

The 75th Executive Committee Meeting

Monday, 3 November 2014, 16:00 to 17:30 hours

- The meeting was chaired by Dr T. Samdup, delegate from Bhutan and APHCA Chairperson. Present were the delegates from Indonesia, Pakistan, Papua New Guinea, Sri Lanka and Thailand (Vice Chairperson). The meeting was furthermore attended by members of the APHCA Secretariat.
- The Chairperson welcomed the delegates, commended APHCA for its steadfastness and instrumental activities in support of member countries and thanked Thailand for hosting the Session.
- The APHCA Secretary welcomed the delegates and expressed his appreciation for their presence. He informed that all APHCA member countries, with the exception of DPR Korea, had accepted the invitation. The delegate from Bangladesh was prevented from attending due to late nomination by his government and lack of travel funds. The Session would thus be attended by delegates of 16 of the 18 member countries
- The APHCA Secretary informed the ExCom that Dr H. Kugita, Regional Representative, OIE Representation for Asia and the Pacific OIE Representation for Asia and the Pacific would attend the Session as observers. Furthermore, 10 observers from government of Thailand offices (DLD and DPO) would attend the session and workshop.
- The ExCom reviewed and adopted the agenda of the 38th Session and associated, regional workshop on 'Breeding for Milk Production in Tropical / Non-temperate Environments'.
- The ExCom reviewed and approved the minutes of the 74rd Executive Committee Meeting and 37th Session.
- The APHCA Secretary reported on the financial situation of the Commission. At the beginning of 2014 (01.01.2014), the cash balance in the APHCA Trust Fund stood at US\$251 647 plus US\$91 155 of cumulative interest earned. Of the latter, delegates approved the use of interest accumulated up to 31.12.2011, i.e. US\$90 453, for APHCA activities at the 36th Session held in Negombo, Sri Lanka. Thus, on 01.01.2014, the total budget at disposal of APHCA stood at US\$342 100.
- On 31.12.2013, total arrears amounted to US\$73 087.71, of which US\$42 294.00 (nearly 60%) are accounted for by Bangladesh. Contributions for 2014, received up

to 30 September, total US\$91 500.00 (outstanding 2014 contributions total US\$16 800.00; DPRK, India and PNG), while US\$33 281.15 were received in 2014 (up to 30.09.2014) as contributions for 2013. Cumulative arrears up to 1 October of FY 2014 thus amount to US\$56 606.56, which is 20 percent less than the cumulative arrears on 31.12.2013.

- Overall the financial situation of APHCA has remained stable over the past years with the cash balance plus earned interest at disposal of the Commission fluctuating between US\$300 000 and US\$350 000.
- The ExCom noted that Bangladesh had paid its 2013 and 2014 contributions and had furthermore reduced its arrears by transfer of an additional US\$12 000.00 reducing its cumulated arrears from US\$42 294.00 to US\$30 030.00. The ExCom urged the next Chairperson, in conjunction with the Secretariat, to clarify the situation of arrears with Bangladesh as some outstanding contributions (US\$8 794.00) date as far back as 1999 and earlier.
- The ExCom requested the Secretariat to provide written notification of the augmented scale of contributions for 2015 to all delegates so as to allow countries to plan accordingly.
- The APHCA Secretary provided a brief summary overview of activities carried out since the last meeting in Thimphu, Bhutan. Activities of FAO-RAP Livestock Group staff encompassed provision of technical support to 55 field projects (up from 21 in 2012), (co)-organization of 21 conferences, meetings, workshops and other events, representation of FAO and APHCA at 16 events organized by other organizations, capacity building, and knowledge generation and dissemination.
- The major activities carried out in relation to the APHCA workplan for 2014 were (i) the 4th FAO-APHCA/OIE Regional Workshop on Brucellosis Diagnosis and Control in the Asia-Pacific Region (Proficiency Test and Ways Forward), (ii) maintenance of the Asia Dairy Network, (iii) a multi-stakeholder consultative meeting 'Dairy Asia – Towards Sustainability, (iv) facilitation of the preparation of national feed assessment reports by APHCA Member Countries, (v) the establishment of an Asia-Pacific Animal Feed network, (vi) a systematic literature review of antimicrobial resistance in micro-organisms isolated from livestock in South, East and Southeast Asia, (vii) a hands-on antimicrobial susceptibility testing training course for laboratory personnel from ASEAN countries, and (viii) information compilation and dissemination.
- The livestock policy officer, leading the smallholder dairy development activities of FAO and APHCA in the region briefly shared the many activities in the region including the DairyAsia meeting and the proposal to promote Dairy Asia platform under APHCA banner. The platform should have its own governance, rules and procedures (consistent with APHCA and FAO rules). The ExCom encouraged the formation and elaboration of such a platform under APHCA banner and suggested that once the current version of Regional Strategy is refined, APHCA should consider

a launch event in the first half of 2015. The purpose of such an event should be to elaborate 'Regional' actions and initiate a process of forming national or sub-national multi-stakeholder platforms, to define and implement national dairy development programs. ExCom further advised that such a meeting may be held in an APHCA country with significant dairy program experience.

- Given some under-spending to be expected in 2014 vis-à-vis the proposed budget, the Secretary requested permission to carry-over unspent 2014 allocations into 2015 to complete activities planned for 2014 (as was agreed at the 37th Session for 2014). The ExCom agreed to this request.
- The APHCA Secretary provided a brief outline of the thematic thrusts for which APHCA might consider continued support in 2015 and beyond. These thematic thrusts comprise:
 - a. *Smallholder dairy development*: Given the large and growing dairy import bills of many countries in the Asia-Pacific region in combination with the fact that milk production in the region largely stems from small-scale producers, smallholder dairy development could be an effective 'tool' for poverty reduction and rural development.
 - b. *Feed resource management*: Livestock populations in the region are rapidly growing and so is the cost of animal feed ingredients, for which most countries are net importers. Animal feeds and balanced feeding are one of the key elements for sustainable animal production and preliminary work suggests that countries could substantially benefit from making better use of available feed resources.
 - c. *Zoonoses and food safety*: Nine of the 16 priority animal diseases in the Asia-Pacific region are zoonoses (some of which are also food-borne) and, over the past decade, food safety has emerged as a major concern in the region. Brucellosis, endemic in much of South Asia (and in parts of East Asia), is causing serious losses to the livestock sector as well as to the human health sector. With regards to safety of animal source food (ASF), preliminary results of a review of the literature on microbial contamination of ASF indicates that human exposure to food-borne pathogens is likely to be high and might be an important contributor to the elevated burden of gastro-intestinal disease in some of the region's countries.
 - d. *Antimicrobial resistance management*: A systematic review of the literature of antimicrobial resistance (AMR) in South, East and Southeast Asia suggests that the prevalence of AMR in livestock-derived food-borne pathogens and commensals has reached alarming levels. Furthermore, national capacities for AMR surveillance and monitoring of antimicrobial use in food animal production are poorly developed in the region as a whole. Enhancing the capacities for standardized and harmonized veterinary AMR assessments across

APHCA countries would be an important step towards evidence-based AMR risk management.

- e. *Information compilation and dissemination:* At the APHCA Strategy Workshop held in 2012, Member Countries agreed that the Commission should aim to establish itself *as a prime source of information, knowledge, expertise and experience on all aspects of livestock sector development in the Asia-Pacific region*. Given the rapidly changing environment in which food animal production is taking place and the pace at which new information is becoming available (and at which information is becoming obsolete), information management (and networking) should remain one of the Commissions core activities.
- The proposed APHCA workplan and budget for 2015 to cover activities under the above five thematic thrusts amounts to US\$135 000 as follows: (i) smallholder dairy development – US\$35 000; (ii) feed resource management – US\$20,000; (iii) zoonoses and food safety – US\$30 000; (iv) AMR risk management – US\$20 000; and (v) information dissemination and APHCA positioning – US\$30 000. FAO's anticipated contributions to the workplan are estimated at US\$135 000.
- The Secretary informed the ExCom about the response of FAO's legal department to the request for APHCA membership by the Secretariat of the Pacific Community (SPC): "a proposal to allow intergovernmental organizations to become members of the Commission and, therefore, to have the same rights and obligations of those of FAO Members (including the right to vote and other obligations provided in Articles IV and XV of the APHCA Agreement) would be inconsistent with FAO rules as they are currently formulated."
- The Chairperson closed the meeting at 17:30.

The 38th APHCA Session

Tuesday, 4 November 2014

- **Opening:** The 38th APHCA Session was opened by the APHCA Chairperson and the FAO Assistant Director General / Regional Representative for Asia and the Pacific welcomed delegates on behalf of FAO. Delegates from 16 member countries (Australia, Bhutan, India, Indonesia, Iran, Lao PDR, Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Samoa, Sri Lanka, and Thailand) and observers from the OIE Regional Representation for Asia and the Pacific, Tokyo, the Thai Department of Livestock Development (DLD) and the Thai Dairy Promotion Organization (DPO) attended the Session.

- **Adoption of the Agenda:** *The Agenda was adopted.*

- **Election of the Chairperson and Members of the Executive Committee:** *The Executive Committee was elected as follows:*

Chairperson:	Thailand
Vice-chairperson:	Myanmar
Members:	Australia, Indonesia and Mongolia
<i>Ex-officio</i> member:	Bhutan

The outgoing Chairperson, Dr T. Samdup, thanked the delegates for their support and handed over the chairmanship of the Session to Dr T. Wimolporn, Thailand.

- **Approval of the Minutes of the 74th Executive Committee Meeting and the 37th APHCA Session:** *The Minutes were reviewed and approved by the delegates.*

- **Statement of Accounts:** The Secretary presented the status of the APHCA accounts for 2013 and expenditures for 2014. Total expenditure in 2013 was US\$86 114 against an approved budget of US\$140 000. The approved work plan budget for 2014 was US\$135 000 while the 2014 expenditures so far (30 Sept.) amounted to US\$75 621 (APHCA 2014/04). It is envisaged that by the end of 2014 total expenditure will have reached app. US\$100 000. The reason for under-spending is primarily due to co-funding arrangements for activities that were also of interest to other institutions, e.g. OIE's Regional Representation for Asia and the Pacific.

Overall, over the past three years, APHCA's cash balance plus the earned interest disposable for APHCA activities has fluctuated between US\$300 000 and US\$350 000. At the beginning of 2014 (01.01.2014), the cash balance in the APHCA Trust Fund stood at US\$251 647 plus US\$91 155 of cumulative interest earned. Of the latter, delegates approved the use of interest accumulated up to 31.12.2011, i.e. US\$ 90 453, for APHCA activities at the 36th Session held in Negombo, Sri Lanka. Thus, on 01.01.2014, the total budget at disposal of APHCA stood at US\$342 100.

Delegates took note of and approved the statement of accounts.

Contributions for 2014, received up to 30 September, total US\$91 500.00 (outstanding 2014 contributions total US\$16 800.00; DPRK, India and PNG), while US\$33 281.15 were received in 2014 (up to 30.09.2014) as contributions for 2013. Cumulative arrears up to 1 October of FY 2015 thus amount to US\$56 606.56, which is 20 percent less than the cumulative arrears on 31.12.2013.

As expenditures in 2014 are projected to be below the approved budget due to higher than expected co-funding of activities from other sources, the Secretary requested permission by the member countries to utilize unspent 2014 funds for related activities in 2015.

Delegates agreed to the request.

- **Overview of Activities:** The Secretary presented the activities conducted by APHCA and the RAP livestock group (RAP-LG) solely or in collaboration with other groups, irrespective of sources of funding and not limited to APHCA Member countries (APHCA 2014/05).

Since the last Session, the RAP livestock group has been involved in the implementation of 55 country-specific as well as sub-regional (e.g. SAARC, ASEAN, Greater Mekong Sub-Region) projects with animal health and / or animal production components (up from 21 projects in the 2011/12 period). About half of the projects are financed by FAO through its Technical Cooperation Programme (TCP) while the remaining half receive funding from other national or international agencies through uni- or multilateral donor trust funds.

Partly in conjunction with but also in addition to engagement in project implementation staff of the RAP-LG have (co-)organized 21 meetings, workshops and other events. Apart from the current Session and associated workshop on 'breeding for milk in tropical / non-temperate environments', the following three meetings / workshops were organized under FAO-APHCA auspices (i) the *4th FAO-APHCA/OIE/DLD Regional Workshop on Brucellosis Diagnosis and Control in Asia-Pacific Region – Proficiency Testing and Way Forward* (March, Chiang Mai); (ii) the international consultation *Dairy Asia – Towards Sustainability* (June, Bangkok), and (iii) the FAO-APHCA-DLD ASEAN Regional Training Workshop on Antimicrobial Susceptibility Testing of Bacteria Isolated from Farm Animals (October, Bangkok).

In the reporting period, RAP-LG staff attended 15 congresses, symposia, meetings or workshops to (re)present FAO/APHCA and to provide technical expertise.

In line with the Vision of APHCA to establish itself *as a prime source of information, knowledge, expertise and experience on all aspects of livestock sector development in the Asia-Pacific region* formulated at the APHCA Strategy Workshop, the Information Unit has been devoted to augmenting the content of the APHCA website. More than 400 news items have been posted and more than 60 new documents have been uploaded to the APHCA website since the 37th Session. Nearly two million visits and more than 120 000 document downloads have been recorded over the reporting period.

Finally, RAP-LG have commissioned a number of studies in various countries in the region on topics such as animal feed sources, livestock sector development and food security, alternatives to antimicrobial use, antimicrobial resistance, microbial contamination of animal source food etc. Some of these studies have been carried out as part of the projects implemented by RAP-LG while others have been commissioned as part of FAO's Regular Programme.

- **Smallholder Dairy Development:** In view of the growing demand for milk and milk products in the region and the potential of smallholder dairy in contributing towards food security, nutrition, women empowerment and poverty alleviation, smallholder dairy development was selected in 2008 as one of the priority areas for APHCA engagement and investment. Dairy development activities/programmes coordinated from FAO-RAP contribute substantially to FAO's Strategic Objective 2, 'Increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner'. In particular, these activities contribute to Output 20103, 'Organizational and institutional capacities strengthened to support innovation and the transition toward more sustainable production systems'.

The main activities carried out in the thematic area of smallholder dairy development over the reporting period were

- Implementation of project 'Smallholder Dairy Development in Bangladesh, Myanmar and Thailand';
 - Formulation, negotiation and implementation of project 'Dairy Industry Development in Kabul, Logar and Parwan Provinces, Afghanistan';
 - Maintenance of Asia Dairy network;
 - A Multi-stakeholder Consultative meeting 'Dairy Asia—Towards Sustainability' held in Bangkok on 21-23 May 2014; and
 - Consultative formulation of a regional dairy development strategy.
- **Feed Resources Management:** Very few countries in the Asia-Pacific region have sound information on how much feed is available, used and wasted in livestock production chains. Quality assurance in feed analysis laboratories also needs to be improved so that the available feed resources could be efficiently used, leading to higher animal productivity, with minimum release of environment pollutants. In 2013, FAO (AGAS Rome) and APHCA provided guidelines for the preparation of feed assessments and a number of APHCA member countries initiated the preparation of national feed assessments. With the technical support of Rome-based FAO expertise (AGAS), FAO-APHCA organized a regional workshop on 'Animal feed resources and their management in the Asia-Pacific region' in Bangkok in August 2013. The workshop provided a forum, in which the country representatives presented preliminary results of their national feed assessment efforts.

Assembling and disseminating information on national feed resources falls under Strategic Objective 2 of FAO's renewed Strategic Framework contributing to the output *'Relevant data and information assembled, aggregated, integrated and*

disseminated, and new data generated through analyses and monitoring – jointly with partners.’ The main activities carried out in the thematic area of national feed assessments and use over the reporting period were:

- Elaboration of national feed assessment reports;
 - Establishment of an Asia-Pacific Animal Feed Network (APAF network).
- **Animal Health, Zoonoses and Food Safety:** Infectious diseases of animals pose a long-term threat to livestock production, as well to human health, in the region and the world at large. Changing livestock production systems, combined with greater movement of people, animals, goods and services, technology and investments, are challenging regulatory authorities.

Overall, RAP’s activities in the area of animal health, zoonoses and food safety are designed to enhance the impact of programmes in support of the Organization’s overarching global aim of combating hunger, malnutrition and food insecurity. Specifically, the activities contribute to Strategic Objective 2, *Increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner*; Strategic Objective 4, *Enable more inclusive and efficient agricultural and food systems at local, national and international levels*, and Strategic Objective 5, *Increase the resilience of livelihoods to threats and crises*.

Over the reporting period, FAO-RAP carried out a large amount of activities in the area of animal health, zoonoses and food safety management, comprising:

- Support to national efforts to control selected ‘high impact’ diseases present in their country (e.g. FMD, PPR and HPAI) and / or to respond to the risk of specific emerging / re-emerging diseases (e.g. ASF; AIV H7N9);
 - ‘Generic’ enhancement of national disease control systems through capacity building (Field Epidemiology Training Programme for Veterinarians, FETPV, EAHMI, diagnostic laboratories), technology transfer (e.g. animal identification,) and revision of relevant legislative frameworks (e.g. Lao PDR and Mongolia);
 - Fostering regional cooperation and the development of regional approaches and coordination capacity for the control of priority transboundary and emerging diseases (e.g. FMD in SAARC, Avian Influenza H7N9 control, etc.);
 - Promotion of Human – Animal Health Sector collaboration (One Health) for the enhanced control and prevention of endemic zoonotic diseases (particularly rabies) and early detection of emerging zoonoses; and
 - Information generation and dissemination.
- **AMR Management:** The management of AMR associated with food animal production was first tabled as an issue requiring increased national attention and regional coordination at the 36th APHCA Session held in Negombo. At the 37th Session delegates reported on actions undertaken to improve AMR risk management in their countries and agreed that AMR become one of APHCA’s thematic focus areas.

AMR has also been included as topic under FAO Strategic Objective 3 of FAO's renewed Strategic Framework contributing to the work area *'Provision of strategic and technical advice to governments that promote sustainable management of land, water, forests, fisheries and other natural resources.'*

The main activities carried out in the thematic area of AMR over the reporting period were:

- A systematic 'literature review of antimicrobial resistance in zoonotic bacteria from livestock in East, South and Southeast Asia' (Chulalongkorn University);
 - The preparation of a report on 'antimicrobial usage and alternatives for prophylaxis and performance enhancement in pig populations in East and Southeast Asia', taking post-weaning diarrhea (PWD) as specific case study disease (Royal Veterinary College);
 - A regional (ASEAN) laboratory training workshop on 'antimicrobial susceptibility Testing (AST) of bacteria isolated from farm animals' carried out at the Center for Antimicrobial Resistance Monitoring in Food-borne Pathogens of Chulalongkorn University with support from the Royal Thai Department of Livestock Development (DLD); and
 - The formulation of an FAO-TCP entitled 'enhancing national capacities for antimicrobial resistance risk management in animal food production in Thailand' (app. US\$225 000 over 2 years, in approval stage).
- **Country Reports:** Delegates reported on the production trends and challenges faced by their respective dairy industries and outlined the opportunities for international cooperation, with a specific focus on the possible role of APHCA and Dairy Asia in fostering collaboration. The full country reports are provided in the respective Section of the Session report (pages 87 to 167).

Friday, 7 November 2014, morning

➤ **Decisions taken:**

Workplan and budget for 2015: To approve the workplan and budget for 2015 as proposed by the Secretariat in APHCA 2014/06.

The budget, as detailed in the following tables, was approved up to an expenditure of USD 135,000 to support activities falling into five thematic areas: (i) smallholder dairy development, (ii) feed resource management, (iii) zoonoses and food safety, (iv) antimicrobial resistance management, and (v) information dissemination and APHCA positioning.

With regards to zoonoses, delegates proposed the inclusion tuberculosis in addition to brucellosis as second disease of interest with a particular view on smallholder dairy development. Similarly, with respect to food safety, delegates suggested to

take a commodity centered approach, milk being the commodity of choice, and to consider a broad range of health risks associated with milk consumption, such as contamination with mycotoxins and heavy metals in addition to microbial health risks. In the area of antimicrobial resistance management, delegates urged the secretariat to include the provision of guidance on prudent antimicrobial use in food animal production in next year's activities as complement to capacity building in antimicrobial susceptibility testing.

Functional Budget, APHCA TF

Thematic Area	Amount (US\$)
Smallholder Dairy Development	35,000
Feed Resource Management	20,000
Zoonoses and Food Safety	30,000
Antimicrobial Resistance (AMR) Management	20,000
Information Dissemination and APHCA Positioning	30,000
Total	135,000

Operational Budget, APHCA TF and Estimated Contribution of FAO-RAP

Budget Line	APHCA TF	FAO's Estimated Contribution	Total
5011 Salaries Prof.	0	45,000	45,000
5012 Salaries GS	25,000	25,000	50,000
5013 Consultants	35,000	30,000	65,000
5014 Contracts	10,000	25,000	35,000
5020 Locally Contracted Labour	0	0	0
5021 Travel	50,000	10,000	60,000
5023 Training	5,000	0	5,000
5024 Expendable Procurement	5,000	0	5,000
5025 Non-expendable Procurement	0	0	0
5026 Hospitality	1,000	0	1,000
5028 General Operating Expenses	4,000	0	4,000
Total	135,000	135,000	270,000

- **Recommendations emerging from the dairy breeding workshop:** The below recommendations were adopted by the delegates as outcome of the regional workshop on *Breeding for Milk Production in Tropical / Non-temperate Environments*:
- There is felt need for a regional multi-stakeholder platform to promote collaboration and cooperation in dairy development and APHCA should take the initiative of promoting such a platform;
 - The platform should have representation of stakeholders from all levels of the dairy value chain but must be independent in its functioning;
 - The platform would:
 - Facilitate multi-stakeholder dialogue at international, national and local level so as to stimulate sharing of knowledge, interaction, and identification of collaboration and cooperation opportunities,
 - Implement and support joint analyses and assessments to enhance common understanding of dairy sector sustainability;
 - Develop harmonized guidelines, manuals and methodologies;
 - Develop capacity through facilitation of trainings, expert exchanges, study tours, etc
 - Similar national multi stakeholder platforms may be promoted with appropriate linkages with and representation on the regional platform;
 - National focal institutions should be identified to establish the linkage mechanism between national and regional platforms;
 - A regional meeting should be organized within the next three months to:
 - seek endorsement of the strategic framework for sustainable dairy development, and
 - formulate membership modalities and criteria, rules and procedures, scale of contributions, and structure of the regional and national multi-stakeholder platforms;
 - Considering substantial experience of India in smallholder dairy development, such a meeting may best be organized in India.
- **Recommendations emerging from the 38th Session:** The recommendations adopted by the delegates as outcome of the 38th Session are presented on pages v to vii of the Session report.
- **Any other business:** No other business was raised.
- **Next venue and dates:** Myanmar offered to host the 39th Session to be held in 2015, tentatively in the month of September.
- **Closure:** The Chairperson thanked the Secretariat for its commitment and dedicated work since the 37th Session and commended the delegates for their constructive contributions made at the current Session. The Chairperson closed the Session at 11:00.

Timetable and Agenda (APHCA 2014/01)

Timetable

Monday, 3 November

Arrival of delegates

The 75th Executive Committee meeting (for APHCA Executive Committee members – Bhutan (Chair), Thailand (Vice-Chair), Indonesia, Pakistan, Papua New Guinea and Sri Lanka (*ex-officio* member) between 16:00 and 17:00 hours.

Free evening

Tuesday, 4 November

Morning: 38th APHCA Session

08:30 – 09:30	Registration
09:30 – 10:00	Opening Ceremony
10:00 – 10:30	Tea / Coffee Break
10:30 – 12:30	Business Session
12:30 – 14:00	Lunch

Afternoon: 38th APHCA Session

14:00 – 15:30	Business Session (cont.)
15:30 – 16:00	Tea / Coffee Break
16:00 – 17:30	Business Session (cont.)

18:30 – 20:30 Reception dinner hosted by DLD

Wednesday, 5 and Thursday, 6 November

- 5 November: APHCA-DLD-DPO Regional Workshop (topic: Breeding for Milk Production in Tropical / Non-Temperate Environments)
- 5 November: Dinner hosted by APHCA
- 6 November: Workshop-related field trip (whole day) – Animal Nutrition/Feed Center in Lampang, one Dairy Coop (one of the five under the SDDP), RDTC, DPO-Chiang Mai
- 6 November: Dinner (with cultural programme) hosted by DPO

Friday, 7 November

Morning: 38th APHCA Session (cont.)

08:30 – 09:30	Business Session (cont.)
09:30 – 10:00	Tea / coffee break
10:00 – 11:00	Business Session (cont.), adoption of session report and closure
11:30-13:30	Lunch

Overseas guests leave Chiang Mai for Bangkok for his/her connecting flight in that evening or next morning back home

Provisional Agenda

Tuesday, 4 November

08:30 – 09:30	Registration
09:30 – 10:00	Opening Ceremony <ul style="list-style-type: none">- Welcome by APHCA Chairperson- Welcome Address on behalf of FAO by ADG RAP- Opening Address by Guest of Honour- Vote of Thanks, APHCA Secretary
10:00 – 10:30	Tea / Coffee Break
10:30 – 12:30	Business Session, Provisional Agenda Items <ul style="list-style-type: none">- Election of New Chairperson, Vice-Chair and 3 ExCom Members- Adoption of the agenda- Minutes of the 37th Session- Summary statement of APHCA account- Summary of activities performed between Sept. 2013 and Oct. 2014
12:30 – 14:00	Lunch
14:00 – 15:30	<ul style="list-style-type: none">- Activities and results: Smallholder dairy development- Activities and results: Feed resource management- Activities and results: Animal health, zoonoses, food safety and AMR control / management
15:30 – 16:00	Tea / Coffee Break
16:00 – 17:30	<ul style="list-style-type: none">- Country reports: Dairy sector development opportunities and challenges- Items for decision<ul style="list-style-type: none">o Membership requests (if any)o Work plan and budget for FY 2015
18:30 – 20:30	Reception dinner hosted by DLD

Friday, 7 November

- 08:30 – 09:30 Business Session (cont.), Provisional Agenda Items
- Decisions on items tabled for decision
 - Recommendations from breeding for milk workshop
- 09:30 – 10:00 Tea / Coffee Break
- 10:00 – 11:00 Business Session (cont.)
- Overall recommendations
 - Next venue and dates
 - Any other business
 - Adoption of the minutes / report of the session
 - Closure

Provisional Workshop Programme

Wednesday, 5 November

- 08:30 – 09:00 Registration
- 09:00 – 10:45 Opening Session
1. Welcome Address
 2. Opening Address
 3. Keynote Presentation 1: **Leo Dempfle** – Breeding Strategies for Sustainable Dairy Development in Asia [30 mins + 15 discussion]
 4. Keynote Presentation 2: **John Gibson** – On-farm genetic gains and agro-ecological genotype targeting of dairy breeds that are appropriate for smallholders in the tropics [30 mins + 15 discussion]
- 10:45 – 11:15 Coffee / tea break
- 11:15 – 12:30 Country presentation/experiences – South Asia [30 mins + 5 discussion each]
1. India: **Dr KR Trivedi**, NDDB
 2. Sri Lanka: **Dr LWN Samaranayake**, Dept. Animal Production and Health
- 12:30 – 13:30 Lunch
- 13:30 – 14:45 Country presentation/experiences – Southeast Asia [30 mins + 5 discussion each]
1. Philippines: **Dr EB Flores**, Philippines Buffalo Center
 2. Thailand: **Dr S Thamwasorn**, Kasetsart University
- 14:45 – 16:00 *Changing Contours of Asia's Dairy Sector and the Sustainability Imperative* by **V. Ahuja** followed by moderated discussion on 'International cooperation for sustainable dairy development' leading to recommendations to be presented to APHCA delegates in Session on 7th November to endorse and notify.
- 16:00 – 16:30 Tea / Coffee break
- 16:30 – 17:00 Next steps and closure

Dates and Venues (Host Countries) of APHCA Sessions (APHCA 2014/02)

First

Bangkok, Thailand, 7-11 June 1976
Chairman: Dr J.C. Madamba (Philippines)
Vice-Chairman: Dr M.N. Menon (India)
Members of the Executive Committee:
Delegates from Malaysia, Sri Lanka and
Thailand

Second

Kuala Lumpur, Malaysia, 22-26 August 1977
Chairman: Dr S. Thuraisingham (Malaysia)
Vice-Chairman: Dr A. Bandaranayake (Sri
Lanka)
Members of the Executive Committee:
Delegates from Australia, Nepal and Thailand

Third

Bangkok, Thailand, 16-21 July 1978
Chairman: Dr S. Thuraisingham (Malaysia)
Vice-Chairman: Dr A. Bandaranayake (Sri
Lanka)
Members of the Executive Committee:
Delegates from Australia, Philippines and
Thailand

Fourth

Manila, Philippines, 3-7 September 1979
Chairman: Dr S.H. Escudero III (Philippines)
Vice-Chairman: Dr Y. Prased (India)
Members of the Executive Committee:
Delegates from Bangladesh, Malaysia and
Singapore

Fifth

Bangkok, Thailand, 6-11 October 1980
Chairman: Dr Tim Bhannasiri (Thailand)
Vice-Chairman: Dato' Dr Osman bin Din
(Malaysia)
Members of the Executive Committee:
Delegates from India, Indonesia and Sri Lanka

Sixth

Colombo, Sri Lanka, 10-15 August 1981
Chairman: Dr S.B. Dhanapala (Sri Lanka)
Vice-Chairman: Dr J.H. Hutasoit (Indonesia)
Members of the Executive Committee:
Delegates from Australia, India and Malaysia

Seventh

Surabaya, Indonesia, 13-18 December 1982
Chairman: Prof. Dr J.H. Hutasoit (Indonesia)
Vice-Chairman: Dato' Dr Osman bin Din
(Malaysia)
Members of the Executive Committee:
Delegates from India, Philippines and
Thailand

Eighth

Bangkok, Thailand, 3-8 October 1983
Chairman: Dato' Dr Osman bin Din (Malaysia)
Vice-Chairman: Dr O.N. Singh (India)
Members of the Executive Committee:
Delegates from Australia, Bangladesh and
Papua New Guinea

Ninth

New Delhi, In, 8-13 October 1984
Chairman: Dr O.N. Singh (India)
Vice-Chairman: Dr I.G.R. Davis (Australia)
Members of the Executive Committee:
Delegates from Nepal, Singapore and Sri
Lanka

Tenth

Melbourne, Australia, 7-13 October 1985
Chairman: Dr R.W. Gee (Australia)
Vice-Chairman: Dr Giam Choo Hoo
(Singapore)
Members of the Executive Committee:
Delegates from Pakistan, Sri Lanka and
Thailand

Eleventh

Bangkok, Thailand, 7-13 October 1986
Chairman: Dr Giam Choo Hoo (Singapore)
Vice-Chairman: Dr J.A. deS. Siriwardene (Sri Lanka)
Members of the Executive Committee:
Delegates from Iran, Malaysia and Philippines

Thirteenth

Bangkok, Thailand, 25-31 October 1988
Chairman: Dr Vitoon Khumnirdetch (Thailand)
Vice-Chairman: Dr Soehadji (Indonesia)
Members of the Executive Committee:
Delegates from India, Malaysia and Sri Lanka

Fifteenth

Bangkok, Thailand 17-22 October 1990
Chairman: Dr A.M.B.H. Babje (Malaysia)
Vice-Chairman: Dr R.N. Alcasid (Philippines)
Members of the Executive Committee:
Delegates from Australia, Iran and Pakistan

Seventeenth

Manila, Philippines, 17-21 November 1992
Chairman: Dr W A. Geering (Australia)
Vice-Chairman: Dr A.A. Motallebi (Iran)
Members of the Executive Committee:
Delegates from Indonesia, Malaysia and Thailand

Nineteenth

Tehran, Iran, 20-24 November 1994
Chairman: Dr Wipit Chaisrisongkram (Thailand)
Vice-Chairman: Dr S.K. Shrestha (Nepal)
Members of the Executive Committee:
Delegates from Australia, India and Indonesia

Twelfth

Islamabad, Pakistan, 5-10 October 1987
Chairman: Dr M. Anwar Khan (Pakistan)
Vice-Chairman: Dr A. Mustaffa Babjee (Malaysia)
Members of the Executive Committee:
Delegates from India, Philippines and Thailand

Fourteenth

Jakarta, Indonesia, 30 October – November 1989
Chairman: Dr Soehadji (Indonesia)
Vice-Chairman: Dr A.K. Chatterjee (India)
Members of the Executive Committee:
Delegates from Australia, Philippines and Sri Lanka

Sixteenth

Kuala Lumpur, Malaysia, 7-12 October 1991
Chairman: Dr R.N. Alcasid (Philippines)
Vice-Chairman: Dr W.A. Geering (Australia)
Members of the Executive Committee:
Delegates from Iran, Myanmar and Thailand

Eighteenth

Darwin, Australia, 17-20 August 1993
Chairman: Dr A.A. Motallebi (Iran)
Vice-Chairman: Dr Wipit Chaisrisongkram (Thailand)
Members of the Executive Committee:
Delegates from Nepal, Philippines and Singapore

Twentieth

Bangkok, Thailand, 30 August-2 September 1995
Chairman: Dr S.K. Shrestha (Nepal)
Vice-Chairman: Mr K. Rajan (India)
Members of the Executive Committee:
Delegates from Australia, Malaysia and Sri Lanka

Twenty-First

Kathmandu, Nepal, 3-6 March 1997
Chairman: Mr G.R. Patwardhan (India)
Vice-Chairman: Dr A.S. Abeyratne (Sri Lanka)
Members of the Executive Committee:
Delegates from Australia, Indonesia and the Philippines

Twenty-Third

Kochi (Cochin), India, 4-6 September 1999
Chairman: Dr V.K. Taneja (India)
Vice-Chairman: Dr T.A. Abilay (Philippines)
Members of the Executive Committee:
Delegates from Nepal, Papua New Guinea and Thailand

Twenty-Fifth

Manila, Philippines, 24-26 September 2001
Chairman: Dr J.Q. Molina (Philippines)
Vice-Chairman: Dr Mohd Nordin Mohd Nor (Malaysia)
Member of the Executive Committee:
Delegates from Australia, Bhutan, and Thailand

Twenty-Seventh

Lahore, Pakistan, 25-29 August 2003
Chairperson: Dr Rafaqat H. Raja (Pakistan)
Vice-Chairperson: Delegate from Indonesia
Members of the Executive Committee:
Delegates from India, Nepal and Thailand
Ex-Officio Member: Delegate from the Philippines

Twenty-Ninth

Bali, Indonesia, 26-29 September 2005
Chairperson: Dr Mathur Raidy (Indonesia)
Vice-Chairperson: Delegate from Thailand
Members of the Executive Committee:
Delegates from India, Myanmar and Sri Lanka
Ex-Officio Member: Delegate from Pakistan

Twenty-Second

Bangkok, Thailand, 22-24 June 1998
Chairman: Dr S.S.E. Ranawans (Sri Lanka)
Vice-Chairman: Mr G.R. Patwardham (India)
Members of the Executive Committee:
Delegates from Laos, Myanmar and Thailand

Twenty-Forth

Dhaka, Bangladesh, 6-9 November 2000
Chairman: Dr V.K. Taneja (India)
Vice-Chairman: Dr T. A. Abilay (Philippines)
Members of the Executive Committee:
Delegates from Bangladesh, Papua New Guinea and Nepal

Twenty-Sixth

Subang Jaya, Malaysia, 24-26 August 2002
Chairperson: Dr J.Q. Molina (Philippines)
Vice-Chairperson: Dato' Dr Mohd. Nordin Haji Mohd. Nor (Malaysia)
Members of the Executive Committee:
Delegates from Bhutan, Pakistan and Thailand
Ex-Officio Member: Delegate from India

Twenty-Eight

Chiang Mai, Thailand, 27 September – 1 October 2004
Chairperson: Dr Rafaqat H. Raja/Dr M. Afzal (Pakistan)
Vice-Chairperson: Delegate from Indonesia
Members of the Executive Committee:
Delegates from India, Nepal and Thailand

Thirtieth

Luang Prabang, Lao PDR, 22-26 October 2006
Chairperson: Dr Bounkhouang Khambounheuang (Lao PDR)
Vice-Chairperson: Delegate from Sri Lanka
Members of the Executive Committee:
Delegates from India, Myanmar and Thailand
Ex-Officio Member: Delegate from the Indonesia

Thirty-First

Chiang Mai, Thailand, 29 October – 1 November 2007
Chairperson: Dr M.J. Nunn (Australia)
Vice-Chairperson: Delegate from Nepal
Members of the Executive Committee:
Delegates from Bhutan, India and Mongolia
Ex-Officio Member: Delegate from Lao PDR

Thirty-Third

Pokhara, Nepal, 26-28 October 2009
Chairperson: Dr Prabhakar Pathak (Nepal)
Vice-Chairperson: Delegate from Thailand
Members of the Executive Committee:
Delegates from Iran, Malaysia and PNG
Ex-Officio Member: Delegate from Australia

Thirty-Fifth

Cebu, Philippines, 2-4 November 2011
Chairperson: Delegate from the Philippines
Vice-Chairperson: Delegate from Sri Lanka
Members of the Executive Committee:
Delegates from Bangladesh, Myanmar and Samoa
Ex-Officio Member: Delegate from Thailand

Thirty-Seventh

Thimphu, Bhutan, 22-26 September 2013
Chairperson: Delegate from Bhutan
Vice-Chairperson: Delegate from Thailand
Members of the Executive Committee:
Delegates from Indonesia, Pakistan and Papua New Guinea
Ex-Officio Member: Delegate from Sri Lanka

Thirty-Second

Bangkok, Thailand, 27-30 October, 2008
Chairperson: Dr M.J. Nunn (Australia)
Vice-Chairperson: Delegate from Nepal
Members of the Executive Committee:
Delegates from Bhutan, India and Mongolia

Thirty-Forth

Phuket, Thailand, 25-27 October 2010
Chairperson: Mr P Somboonprasert (Thailand)
Vice-Chairperson: Delegate from the Philippines
Members of the Executive Committee:
Delegates from Australia, Samoa and Sri Lanka
Ex-Officio Member: Delegate from Nepal

Thirty-Sixth

Negombo, Sri Lanka, 21-24 October 2012
Chairperson: Sri Lanka
Vice-Chairperson: Delegate from Bhutan
Members of the Executive Committee:
Delegates from Australia, Myanmar and Samoa
Ex-Officio Member: Delegate from the Philippines

List of APHCA Chairpersons by Country (as of 2013)

Australia	4	Lao PDR	1	Philippines	5
Bangladesh	0	Malaysia	5	Samoa	0
Bhutan	1	Mongolia	0	Singapore	1
India	4	Myanmar	0	Sri Lanka	3
Indonesia	3	Nepal	2	Thailand	4
Iran	1	Pakistan	3		
Korea DPR	0	PNG	0		

List of APHCA Executive Committee Members by Country (as of 2013)

Australia	12	Lao PDR	1	Philippines	8
Bangladesh	3	Malaysia	7	Samoa	3
Bhutan	6	Mongolia	2	Singapore	3
India	10	Myanmar	6	Sri Lanka	12
Indonesia	5	Nepal	7	Thailand	17
Iran	4	Pakistan	5		
Korea DPR	0	PNG	4		

Minutes of the 74th Executive Committee Meeting and the 37th APHCA Session (APHCA 2014/03)

The 74th Executive Committee Meeting

Sunday, 22 September 2013, 15:00 to 16:50 hours

- The meeting was chaired by Dr W.K. de Silva, delegate from Sri Lanka. Present were the delegates from Australia, Bhutan (Vice Chairperson), Myanmar, Samoa and The Philippines. The meeting was furthermore attended by members of the APHCA Secretariat.
- The Chairperson welcomed the delegates, commended APHCA for its steadfastness and instrumental activities in support of member countries and thanked Bhutan for hosting the Session.
- The APHCA Secretary welcomed the delegates and expressed his appreciation for their presence. He informed that all APHCA member countries, with the exception of DPR Korea, had accepted the invitation. Unfortunately, the delegate from Mongolia was prevented from attending due to other commitments while the delegates from Iran and Nepal were not able to finalize their travel arrangements in time. The Session would thus be attended by delegates of 14 of the 18 member countries
- The APHCA Secretary informed the ExCom that Dr K. Cokanasiga, Adviser, Animal Health and Production Land Resources Division, Secretariat of the Pacific Community, Dr H. Kugita, Regional Representative, OIE Representation for Asia and the Pacific and Dr T Ishibashi, Deputy Regional Representative, OIE Representation for Asia and the Pacific would attend the Session as observers. Furthermore, 10 observers from government of Bhutan offices would attend the session and workshop.
- The ExCom reviewed and adopted the agenda of the 37th Session and associated, OIE co-funded, regional workshop on zoonoses, food-borne diseases and antimicrobial resistance (AMR) in the Asia-Pacific Region.
- The ExCom reviewed and approved the minutes of the 73rd Executive Committee Meeting and 36th Session.
- The APHCA Secretary reported on the financial situation of the Commission. At the beginning of 2013 (01.01.2013), the cash balance in the APHCA Trust Fund stood at US\$260 810 plus US\$90 850 of cumulative interest earned. A budget revision has been carried out and the earned interest has been transferred into the cash balance. Contributions received for 2013 up to 31 August amount to US\$40 766.86 (outstanding 2013 contributions total US\$49 775.14). Overall the financial situation

of APHCA has remained stable over the past years with the cash balance fluctuating between US\$200 000 and US\$300 000.

- The ExCom noted with disappointment that Bangladesh had still not reduced its considerable arrears and that some other countries were also accumulating arrears, which at the end of 2012 totaled US\$59 551.01 and urged the next Chairperson to take the matter up once again with the Bangladesh and other counterparts.
- The APHCA Secretary provided a brief summary of activities carried out since the last meeting in Negombo, Sri Lanka. Activities of FAO-RAP Livestock Group staff encompassed technical support to more than 30 projects, organization of symposia, meetings, workshops and other events as well as representation of FAO and APHCA at events organized by other organizations. The main activities carried out in relation to the APHCA workplan for 2013 were the organization of an APHCA Expert Meeting '*Towards Standardization and Harmonization of Monitoring of AMU in Livestock and AMR in Livestock-associated Micro-organisms in the Asia-Pacific Region*', a Regional Workshop on '*Animal Feed Resources and their Management in the Asia-Pacific Region*', continuation of work linked to the smallholder dairy development programme, co-organization of the 4th Sustainable Animal Agriculture Development Conference (2013 SAADC), held in Lanzhou, China, and ongoing activities to enhance information dissemination and visibility carried out by the Information Unit. The 4th FAO-APHCA/OIE Regional Workshop on Brucellosis Diagnosis and Control in the Asia-Pacific Region (Proficiency Test and Ways Forward) is planned for December 2013.
- The livestock policy officer, leading the smallholder dairy development activities of FAO and APHCA in the region requested APHCA to endorse the dairy training center established in Chiang Mai, Thailand, under the CFC dairy project as 'regional APHCA dairy training centre'. This would encourage Thai Dairy Promotion Organization to provide funds to upgrade the center through the Thai NCF. A business plan to ensure financial sustainability of the centre would be developed using APHCA TF funds allocated to smallholder dairy development. The ExCom agreed to the request and suggested a close link to be established between the dairy training center and the animal nutrition centre also located in Chiang Mai.
- Given some under-spending to be expected in 2013 vis-à-vis the proposed budget, the Secretary requested permission to carry-over unspent 2013 allocations into 2014 to carry complete activities planned for 2013 (as was agreed at the 36th Session for 2013).
- The APHCA Secretary provided a brief outlook on thematic areas APHCA might consider to systematically address in the coming years. These thematic areas comprise:
 - a. Continued attention to *smallholder dairy development* as an important 'tool' for poverty reduction and rural development.
 - b. Further and refined assessments of the burden and impact of *zoonoses, food-borne diseases and antimicrobial resistance*, building on intensified

collaboration with OIE and WHO, to support decision making on resource allocation of national health systems. In this context, standardization and harmonization of veterinary AMR assessments across APHCA countries would be an important step to obtain a more reliable overview of the true extent of the problem.

- c. Given the rising cost of animal feed and the soaring feed import bill of many APHCA countries, the establishment national *feed resource assessment systems* would be useful for providing some guidance to livestock sector development. Establishment of a common approach for feed resource assessment across interested countries, drawing on national and international expertise, is an area for APHCA engagement as expressed by the national feed experts attending the feed assessment workshop.
 - d. In view of the multiple and complex challenges facing public sector agencies in guiding livestock sector development on a path to a sustainable role in food security and equitable economic development in an increasingly resource-constrained, urbanizing and affluent world, there is a need for *capacity building in livestock sector policy analysis, design and negotiation* across countries at various levels of administration.
- At the 36th Session, the Secretariat was requested to review the scale of contributions (which has been unchanged since 2003) in accordance with the original criteria used for their establishment, maintaining 3 categories and phasing of the increment over successive years. The Secretariat's proposal for a raise in the level of contributions to the 2012 US\$ purchasing power equivalent of the 2003 scale of contributions in two steps (2014 and 2015) was endorsed by the ExCom.
 - The ExCom requested the Secretariat to ask FAO HQ to issue the annual call for funds in the first quarter of the calendar year and urged the Secretariat to continue its practice of copying the call for funds to the national delegate.
 - The ExCom discussed the request for APHCA membership by the Secretariat of the Pacific Community (SPC). The Secretary pointed out that a positive decision would require a slight modification of Article III, para 1, defining eligibility for membership, to broaden the latter to include intergovernmental organisations within the 'Region'. The ExCom was unanimously in favour of granting APHCA membership to SPC and suggested that SPC and other intergovernmental organizations in the region should fall into contribution band A.
 - The proposed APHCA workplan and budget for 2014 amounts to US\$135 000 for six thematic thrusts: (i) smallholder dairy development – US\$25 000 (ii) zoonoses and food safety – US\$20 000 (iii) feed resource management – US\$20,000 (iv) AMR Risk management – US\$20 000 (v) livestock policy capacity development – US\$20 000 and (vi) information dissemination and APHCA positioning – US\$30 000. FAO's anticipated contributions to the workplan are estimated at US\$135 000.
 - The Chairperson closed the meeting at 17:50

The 37th APHCA Session

Monday, 23 September 2013

- **Opening:** The opening of the 37th APHCA Session was presided over by H.E. Lyonpo Yeshey Dorji, Minister, Ministry of Agriculture and Forestry. Delegates from 14 member countries (Australia, Bangladesh, Bhutan, India, Indonesia, Iran, Lao PDR, Malaysia, Myanmar, Pakistan, Philippines, Samoa, Sri Lanka, and Thailand) and observers from the OIE Regional Representation for Asia and the Pacific, Tokyo, and the Secretariat of the Pacific Community (SPC) attended the Session.

- **Adoption of the Agenda:** The Agenda was adopted.

- **Election of the Chairperson and Members of the Executive Committee:** The Executive Committee was elected as follows:

Chairperson:	Bhutan
Vice-chairperson:	Thailand
Members:	Indonesia, Pakistan and Papua New Guinea
<i>Ex-officio</i> member:	Sri Lanka

The outgoing Chairperson, Dr W.K. de Silva, thanked the delegates for their support and handed over the chairmanship of the Session to Dr T. Dorji, Director General a.i., Department of Livestock, MoAF, Bhutan.

- **Approval of the Minutes of the 73rd Executive Committee Meeting and the 36th APHCA Session:** The Minutes were reviewed and approved by the delegates.

- **Statement of Accounts:** The Secretary presented the status of the APHCA accounts for 2012 and expenditures for 2013. The approved budget for 2012 was US\$100 000 while the 2012 expenditures amounted to US\$38 125 (APHCA 2013/04). The reason for this under-spending have primarily been recoveries on the salary of the APHCA IT clerk, who had been seconded to other units in FAO RAP in 2011 and had so far not reimbursed APHCA for the salary outlays.

Overall, over the past three to four years, APHCA's cash balance has fluctuated between US\$200 000 and US\$300 000. At the beginning of 2013 (01.01.2013), the cash balance in the APHCA Trust Fund stood at US\$260 810 plus US\$90 850 of cumulative interest earned. A budget revision has been carried out and the earned interest has been transferred into the cash account at disposal for APHCA activities.

Delegates took note of and approved the statement of accounts for the year 2013.

Contributions received for 2013 so far (31.08.2013) amount to US\$40 766.86 (outstanding 2013 contributions total US\$49 775.14). Cumulative outstanding contributions total US\$105 041.15, nearly 40 percent of which is accounted for by Bangladesh. Expenditures in 2013 are likely to be slightly below the approved budget due to higher than expected co-funding of activities from other sources. The

Secretary requested permission by the member countries to utilize unspent 2013 funds for completion of approved 2013 activities in 2014, to which no objections were raised.

Delegates requested the Chairperson and Secretariat to (i) officially take up the issue of arrears with the respective counterparts and (ii) to invite more countries and intergovernmental organizations in the region to join APHCA.

Delegates furthermore requested the Secretariat to ask FAO-HQ to issue the annual call for funds in the first quarter of a calendar year so as to allow more flexibility in the timing of payment. They also urged the Secretariat to continue its practice of copying the call for funds, usually addressed to the Ministry of Finance, to the national delegate.

- **Overview of Activities:** The Secretary presented the activities conducted by APHCA and the RAP livestock group (RAP-LG) solely or in collaboration with other groups, irrespective of sources of funding and not limited to APHCA Member countries (APHCA 2013/05).

Since the last Session, the RAP livestock group has been involved in the implementation of 38 country-specific as well as sub-regional (e.g. SAARC, ASEAN, Greater Mekong Sub-Region) projects with animal health and / or animal production components (up from 21 projects in the 2011/12 period). About half of the projects are financed by FAO through its Technical Cooperation Programme (TCP) while the remaining half receive funding from other national or international agencies through uni- or multilateral donor trust funds.

Partly in conjunction with but also in addition to engagement in project implementation staff of the RAP-LG have (co-)organized 13 meetings, workshops and other events. Two FAO-APHCA workshops were organized in the reporting period, namely the FAO-APHCA Expert Workshop 'Towards Standardization and Harmonization of Monitoring of AMU in Livestock and AMR in Livestock-associated Micro-organisms in the Asia-Pacific Region' held in Bangkok in May 2013 and the Regional Workshop on 'Animal Feed Resources and their Management in the Asia-Pacific Region', held in Bangkok in August 2013. Furthermore, FAO-APHCA strongly contributed to the organization and implementation of the 'Waste to Worth' workshop held under the overall auspices of the Agenda of Action for Sustainable Livestock Development. In addition, as part of the smallholder dairy development thrust, RAP-LG co-organized the Thailand Celebration of World Milk Day.

In the reporting period, RAP-LG staff attended 16 congresses, symposia, meetings or workshops to (re)present FAO/APHCA and to provide technical expertise. FAO-RAP co-funded the organization of the 4th International Conference on Sustainable Animal Agriculture for Developing Countries (SAADC) held in Lanzhou, China, in July 2013.

In line with the Vision of APHCA to establish itself as a prime source of information, knowledge, expertise and experience on all aspects of livestock sector development

in the Asia-Pacific region formulated at the APHCA Strategy Workshop, the Information Unit has devoted considerable time to further improving the APHCA website. Close to 400 news items, 80 videos and 50 documents have been uploaded since the 36th Session. Nearly 280 000 visits have been recorded in the 11 month period with close to 84 000 document downloads. The site is currently ranked among the top 15% of more than 30 million sites monitored by www.webstats.com.

Finally, RAP-LG have commissioned a number of studies in various countries in the region on topics such as fodder resources, livestock sector developments and food security, livestock and livestock product trade, patterns of livestock product consumption, swine disease emergence, antimicrobial resistance etc. Some of these studies are carried out as part of the projects implemented by RAP-LG while others have been commissioned as part of FAO's Regular Programme.

Smallholder Dairy Network Activities: The Livestock Policy Officer, Dr V. Ahuja, presented a brief overview of the smallholder dairy activities in Asia and the Pacific Region comprising the three regional dairy development interventions:

- Smallholder Dairy Development in Bangladesh, Myanmar and Thailand: Improving the Bargaining Power and Sustainable Livelihoods through the Enhancement of Productivity and Market Access in Dairy (MTF/RAS/CFC/259)
- Enhancing Milk Consumption and Livelihoods through School Milk Programmes Linked to Smallholder Dairy Operations (TCP/RAS/3309 (D), and
- A third supporting intervention, the '**Asia Dairy Network**' funded by APHCA

The overall objective of these interventions is to improve the bargaining power and livelihoods sustainability of smallholder milk producers in participating countries. This objective is to be realized through the attainment of the following main outputs:

- A sustainable 20% improvement in milk productivity and the substitution of dairy imports with improved locally produced milk and dairy products;
- Improved market access for 5 000 smallholder milk producers;
- Improved milk quality in terms of hygiene, fat content, bacteria and TB negative animals;
- Introduction of new technologies for milk processing;
- Strengthened skills and capacity to develop and implement intervention strategies, which are tailored to introduce or expand school milk programmes in rural areas;
- Establishment of an Asian Dairy Network to represent the interests of the smallholder dairy sector in Asia;
- Expanding the remit of the Chiang Mai Dairy Training Centre, currently focussed primarily on national training needs, to a Regional Dairy Training Centre.

A recent mid-term review of the projects concluded that they have made good progress in implementing the activities planned for implementation so far. During the first two years the implementing teams focused on (i) mobilisation, planning, coordination and awareness raising; (ii) coaching and mentoring the three country teams; and (iii) priority field activities. As a result there is compelling evidence of strong ownership of project activities across all three countries along the entire dairy value chain. In terms of achievements to date, the project highlights include launch of school milk activities in Myanmar and Bangladesh, a well coordinated dairy extension programme in Thailand, introduction of Napier Pakchong 1 forage variety in the three countries, dairy farmer trainings and introduction of quality control and improvement systems.

The Asia Dairy Network was launched in a symposium as part of the AAAP Congress in Bangkok in November 2012. Since then the network membership has grown to exceed 200 members. A network coordinator has been appointed, a new website launched and a listserv created for wider communication. An electronic conference is now planned later this year under the auspices of Asia Dairy Network.

As per project plan, the Dairy Training Centre in Chiang Mai has been upgraded. The centre has the capacity to offer training in (i) milk pasteurization, (ii) milk packaging, (iii) drinking yoghurt, ice cream, butter and cheese making, and (iv) milk quality testing and management.

It was proposed that APHCA consider recognizing the Chiang Mai Dairy Training Centre as a Regional Dairy Training Centre that can cater to the training needs of other interested countries in the region. In addition to meeting the growing regional needs, this would also facilitate resource mobilization through APHCA financial mechanisms.

Delegates were favorable to the proposal and endorsed, in principle, the Chiang Mai Dairy Training Centre as a Regional Dairy Training Centre. At the same time, however, the delegates requested the Secretariat to develop (i) a plan of activities / services the regional dairy training center would conduct / provide and (ii) a business plan to ensure long-term financial sustainability of the centre.

- **RAP Animal Health Activities:** The Animal Health Officer, Dr C. Benigno, presented a brief overview of the animal health activities conducted in the past year. The presentation focused on activities under four functional thrusts, namely: capacity building, information sharing, field support and coordination. Capacity building activities were designed to strengthen skills on outbreak investigation, field surveillance, laboratory capacity and use of GIS for animal health planning. Publications on swine health management and guidance documents for H7N9 were also released and shared amongst countries. Field projects on disease specific problems but covering the four functional areas are in place to support individual countries. FAO coordinates closely with partners like the OIE, WHO and regional specialized organizations such as ASEAN, SAARC and SPC to achieve synergies in animal health activities.

APHCA, in collaboration with the OIE Regional Representation for Asia and the Pacific, is continuing to invest in regional capacity building for brucellosis diagnosis. The meeting was informed of the upcoming workshop (December 2013) to discuss the proficiency testing results involving 17 laboratories in the region, carried out under the technical responsibility of the brucellosis laboratory of NIAH Thailand. (The latter completed the OIE twinning programme with ANSES, the OIE and FAO World Reference Laboratory for brucellosis.)

- **Agenda of Action for Sustainable Livestock Sector Development:** The Livestock Policy Officer, Dr V. Ahuja, presented a brief overview of the background, history and the current status of Global Agenda of Action for Sustainable Livestock (GAA). He highlighted that growing resource scarcity has tremendous implications for livestock production in the region and that it is imperative that the sector stakeholders embrace the principle of sustainability in all their actions.

APHCA has been an active partner in shaping the GAA and APHCA Chairpersons have participated in the previous two Multi Stakeholder Platform (MSP) meetings. Dr Ahuja recommended that this practice should continue to the extent possible and that APHCA should not only maintain but even seek to deepen its level of engagement so as to ensure the representation and contribution of regional concerns in the global action.

APHCA delegates endorsed continued engagement in the Agenda of Action as well as the proposal that the APHCA Chairman participate in the next MSP meeting, scheduled in Ottawa, Canada from October 13 to 19, 2013.

- **Country Reports on Actions taken on AMR Management:** Country delegates presented short overviews of national activities to contain the growing threat of antimicrobial resistance. The full country reports are available at the end of this document.

Australia: The Australian Antimicrobial Resistance Prevention and Containment (AMRPC) Steering Group was established in February 2013 to provide high-level governance and leadership on antimicrobial resistance (AMR). The steering group is jointly chaired by the Secretaries of the Department of Health and Ageing (DoHA) and the Department of Agriculture, Fisheries and Forestry (DAFF). The Australian Chief Medical Officer and Chief Veterinary Officer are also members. The group will also oversee the development of a comprehensive National AMR Prevention and Containment Strategy for Australia.

The steering group recently endorsed the overarching framework for the development of the AMR prevention and containment strategy. The key elements of the framework are: (i) Governance, (ii) Surveillance, (iii) Infection prevention and control, (iv) Regulation, (v) International engagement, (vi) Communication (which includes Education, Stakeholder engagement and Partnerships, and (vii) Research.

To develop the strategy, the steering group will consult widely with stakeholders. In July 2013, the Australian One Health AMR Colloquium was convened by the

Australian Commission on Safety Quality in Health Care (ACSQHC) to start this process. The colloquium brought together food animal, animal health and human health experts to discuss key 'One Health' priorities and strategies to address AMR in Australia, with particular reference to surveillance strategies, regulatory measures and the most significant zoonotic AMR risks. The outcomes of the colloquium are being used to assist DoHA and DAFF to identify gaps and set priorities for action, and to develop advice to the steering group on next steps.

Bangladesh: There has been little systematic study of AMR in animal isolates of bacteria with the exception of *Salmonella spp.* and *E. coli*. Available AMR information can be summarized as follows:

- *E. coli*: resistance is seen with tetracycline, aminoglycosides, sulphonamides and ampicillin;
- *Salmonella spp.*: resistant to tetracycline, sulphonamides and streptomycin;
- *Campylobacter*: isolates resistant to erythromycin, tetracycline are found;
- *Enterococci*: found to be resistant against vancomycin, macrolide-lincosamide streptogramin group (tylosin);
- *Staphylococci and other non-enteric bacteria*: antibiotic resistance is quite common.

The main factors contributing to AMR are (i) unregulated manufacture and dispensation of antimicrobials, (ii) use of antibiotics as growth promotants and (iii) truncated antimicrobial therapy.

Although Bangladesh has enhanced its capacity to address the problem in the livestock sector there are still some limitations in this context. Important interventions made by the government that could support AMR management are:

- Establishment of an epidemiological unit in DLS.
- Strengthening support services for disease surveillance and monitoring activities through development projects.
- Regular and frequent coordination meetings between animal and human health sectors.
- Coordinated approach in surveillance and monitoring of zoonoses under One-Health concept.
- Imminent enforcement of the Food Safety Act.
- Certification system for safe food of animal origin.

Bhutan: A high level committee meeting on Antimicrobial Resistance and Antibiotic control in Bhutan was conducted recently. The committee, involving all the relevant stakeholders, developed a consensus that the existing Drug Technical Advisory Committee (DTAC), which acts as an advisory body to the Bhutan Medicine Board, will shoulder the additional responsibilities of National Steering Committee on Antimicrobial Resistance. The DTAC will include the role of the National steering committee on AMR as one of their mandates. The National Steering Committee on AMR will take up the responsibilities of developing a national action plan for AMR

including public awareness and education, information material development and campaigns to improve awareness on AMR.

The Drugs, Vaccines and Equipment Unit of the National Centre for Animal Health have revised the essential veterinary drugs for use in the country and have produced a National Drug Formulary 2013. This formulary includes necessary guidelines for the users. The unit is also responsible to monitor and evaluate the usage of veterinary drugs in the country including quality control and adverse drug reactions. Further, the unit is drafting standard treatment guidelines for the users.

Based on the evaluation of the performance of veterinary services (PVS) through OIE missions, the Royal Government of Bhutan formed a task force to review the existing livestock legislation *vis-à-vis* with other closely related legislation such as the Food Act (2005) and its rules and regulations (2007) as well as the Bhutan Medicine Act of 2003. The revised livestock legislation although in draft stage at the moment will address issues such as developing guidelines and regulations to encourage responsible and prudent use of antimicrobials.

Currently Bhutan does not have a veterinary Statutory Body (VSB). Veterinary Council Act is in draft stage and is being pursued strongly by the Department. VSB is foreseen and will be developed using OIE as a relevant guide. The VSB will eventually require a legislative framework giving required authority over all veterinarians; the role of para-professionals and community animal health workers who will form part of this framework. Thus the development of regulations and guidelines to promote responsible and prudent use of antimicrobials and improvement on policy is expected.

The National Centre for Animal Health, which is also the National Referral Laboratory currently carries out some of the functions of Antimicrobial Resistance. The unit is equipped to carry out Antimicrobial Sensitivity testing using disc diffusion method utilizing CLSI protocol. However, most of the antimicrobial sensitivity testing performed by the unit is treatment based. Very few planned surveys are carried out for antimicrobial resistance. None of the Regional Veterinary Laboratories in the country are equipped to carry out the AMR functions. Therefore, strengthening of these laboratories in terms of skilled human resources and facilities is proposed in the 11th Five Year Plan, which ends in 2018.

India: The impact of AMR on human health has been recognized by all stakeholders in India. These include the Ministry of Health & Family Welfare (Directorate General of Health Services), Ministry of Agriculture (Department of Animal Husbandry, Dairying & Fisheries (DADF), Indian Council of Agricultural Research (ICAR), Council for Scientific and Industrial Research (CSIR), etc, which have initiated programmes considering the relevance of AMR and are motivated to implement projects to address AMR developing very widely amongst microbes isolated from human, livestock, poultry and fish. Other regulatory bodies responsible for the manufacture, standards and use of antimicrobials are motivated to take up the AMR issue at their levels.

In the National Policy for Containment of Antimicrobial Resistance, India 2011, a multidisciplinary and cross sectoral National Task Force Committee was constituted comprising experts from a number of agencies. During the last year this multidisciplinary committee has met several times to develop a number of pertinent guidelines, which will be finalized soon.

India has a huge network of veterinary institutions, research institutions under the Indian Council of Agricultural Research Institutes (ICAR, under Ministry of Agriculture), State Veterinary and Agricultural Universities, which would be directed to initiate awareness about threats of mis-use and over-use of antimicrobials leading to AMR and the impact human health among farmers and farmer organizations; veterinarians, para-veterinarians, veterinary faculty staff members; policy-makers; consumers and civil society. ICAR has a total of 633 Krishi Vigyan Kendras in all districts of the country, which contain multidisciplinary teams that also include animal science, veterinary and fisheries science subject matter specialists, who may initiate awareness programmes amongst farmers once the guidelines are finalised.

There are 250 state laboratories at district and state levels to look after disease diagnosis and surveillance. In addition the ministry has one Central Disease Diagnosis Referral Laboratory and five Regional Disease Diagnosis Referral Laboratories. In addition, ICAR, State Veterinary Agricultural Universities, Research Institutions and national centers have adequate infrastructure and large numbers of competent human resources to take up various issues relating to AMR.

With regard to data on the use of antimicrobials as well as antimicrobial resistance, studies have been undertaken in different institutions throughout the country. A few examples are mentioned here for reference. In a study, more than 80% strains of enterococci of equine origin were found resistant to Vancomycin and 99.6% were multiple-drug resistant in Northern India (Singh et al., *J Infect Dev Ctries* 2009; 3(7):498-503). In a most recent study, it was observed that a large portion of *Staphylococcus spp.* isolates of pig, pig handler and sheep origins were found to be resistant (44-83%) to penicillin in addition to showing variable resistance to other antibiotics (Shome and Shome, 2013, PD-ADMAS Annual report-2012-13, pp31-34).

India is rich in ethno-veterinary medicine and indigenous traditional knowledge (ITKs) with regard to prevention and cure of human and animal diseases. This knowledge has been documented by ICAR institutions.

In addition, various stakeholders in the country are vigorously taking up improved animal husbandry practices, control programmes and bio-security measures to reduce the use of antimicrobials.

Programmes are being arranged to create public awareness as well as awareness in physicians, veterinarians etc. for judicious use of antimicrobials.

Indonesia: An initial pilot AMR monitoring programme was continued in 2012 and 2013, but is still not recognized as programme to monitor antimicrobial resistance in indicator bacteria (*E. coli* & *Salmonella spp.*). Bacterial isolates were collected from

samples of the National Monitoring Programme for Microbial Contamination of Food of Animal Origin (particularly chicken meats) limited to Java Island area. Isolates identified as *E. coli* and *Salmonella spp* were tested for susceptibility to selected antimicrobial drugs (as recommended by OIE). Laboratory testing was done in the National Quality Control Laboratory for Livestock Products. The results are shown in the full report at the end of this document.

A collaborative research proposal in eco-health to formulate a strategy for prudent use of antimicrobials to control antimicrobial resistance in human, animal, and environmental health was developed by a multi-disciplinary group of Asian researchers during 2011 to 2012. In 2013, the proposal was approved by IDRC which is funding a three-year research programme, starting at the end of this 2013. The collaborative research team involved in the project consists of veterinarians, medical doctors and socio-economic experts.

Communication between veterinarians in the Ministry of Agriculture and medical doctors from Ministry of Health with regard to AMR is being initiated under the Indonesia Antimicrobial Watch program.

Lao PDR: Lao PDR considers AMR as an important issue and recognized the need to revise current measures that govern the import, production, marketing and use of antimicrobials. Currently, Lao PDR has five legal documents which contain comprehensive provisions that regulate the production, importation, exportation, distribution and use of antimicrobials but do not provide a legal basis for implementing AMR monitoring and control as recommended by international organizations.

In 2003, Lao PDR established a Food and Drug Committee, which consists of multi-sectoral agencies including representatives from the human and animal health sector. Unfortunately, this committee has not functioned very well and this year its role is under revision. Lao PDR has also assigned National Focal Points for Veterinary Products with OIE. However, for surveillance and management of AMR Lao PDR needs to improve:

- Microbiology laboratory facilities;
- Competency of human resources;
- Budget allocations for AMR monitoring/surveillance
- Coordination between parties (government, hospitals, research institutions and clinicians) to develop an integrated system of AMR management.

Lao PDR's overall expectation is to develop a system that can survey and collect data on antimicrobial resistance in relevant animal pathogens and quantities of antimicrobial agents used in food producing animals at the national level following international standards. Lao PDR is highly committed to AMR risk management and requests FAO, APHCA, OIE and WHO to seek opportunities to assist Lao PDR to develop an AMR monitoring system meeting international requirements.

Malaysia: Malaysia has formulated an AMR Action Plan comprising seven major lines of activity: (i) awareness campaigns, (ii) establishment of MIC testing capacity for AMR assessments, (iii) AMR information dissemination, (iv) promotion of collaborative AMR research, (v) capacity building and harmonization of laboratory methods / protocols, (vi) development of a national AMR surveillance programme for poultry at farm and processing plant level and (vii) establishment of a joint AMR working group comprising representatives of the Department of Veterinary Services and the Ministry of Health.

Myanmar: Research on AMR has been ongoing at the University of Veterinary sciences but not much has been done to undertake a nationwide situational analysis. Establishment of a National Task Force is still in the organizing phase. The development and implementation of communication and public awareness on AMU and AMR is under negotiation within the department. In addition, review and development of improved practical legislation and regulatory framework are in process. However, although the legislation has not yet been updated, the national assay laboratory has been upgraded by increasing and providing training to staff and other facilities have been equipped for the detection of AMR. Systematic monitoring and surveillance of AMU and AMR is under discussion within the department.

Pakistan: AMR is currently not recognized as a major issue in Pakistan. Some recent reports have, however, indicated that a number of pathogens are becoming resistant to drugs used in animal production. The development of AMR has been observed specifically for the treatment and recovery time of the animal diseases like mastitis, staphylococcal and streptococcal infections, foot rot, navel illness, pneumonia, uro-genital tract infections, etc. Causative pathogens have developed resistance even to third generation antibiotics. The situation has become more complicated because some zoonotic pathogens originating from animals have also acquired resistance against several drugs used for their treatment in human patients.

Papua New Guinea: The incidence of antimicrobial resistance is not quantifiable in PNG given that neither the public health and animal health sectors are properly resourced and empowered to address the problem. However since AMR is a global issue, there is momentum in PNG currently to address this through policy developments such as the National Medicines Policy, the Food Safety Policy and the Public Health Act review that are currently underway. The animal health sector is fully engaged in these developments to ensure that issues of AMR are properly addressed.

Philippines: The Department of Health (DoH) and the Department of Agriculture (DA) are collaborating to address the risk of AMR and have formed a technical working group (TWG) as well as an Interagency Committee on AMR (ICAMR). The latter, in addition to DoH and DA, comprises representatives of the Department of the Interior and the Department of Science and Technology. The TWG has proposed the issuance of an Executive Order entitled 'Developing a Comprehensive and

Sustainable National Plan to Combat Antimicrobial Resistance in the Philippines', which will require approval and endorsement by the President.

In the meantime, DA has promoted a risk and HACCP-based inspection system for animal feeds, conducted seminars for veterinary drug and feed suppliers to raise awareness about AMR and is strengthening its regulatory activities. The current administration is promoting organic agriculture, which, while not directly addressing AMR risk, might indirectly mitigate the latter.

Samoa: A key recommendation that was raised in the 36th APHCA Session highlighted the need to introduce AMR as a technical issue for public awareness into existing mandatory food regulating authorities and committees. To date, there has been no effort by MAF to see this through. However over the last year, the Animal Production and Health Division (APHD), MAF, has made several attempts to link up with the Ministry of Health, particularly the Public Health Division. Unfortunately, there has been very poor feedback from MOH and a lack of willingness to share information and collaborate.

There are three main sources of veterinary drugs in Samoa, which include the Ministry of Agriculture and Fisheries, the Animal Protection Society (APS) and the Agricultural Store. MAF uses veterinary medicines to treat sick or injured livestock at the discretion of the Government Veterinarian and trained para-veterinarians. The medicines include five main groups of antibiotics, which all require that individual cases complete the recommended course of antibiotics. The Agriculture Store only dispenses anthelmintics and vitamins. This has a low risk implication for AMR development, but instead implicates anthelmintic resistance, which is a separate yet common problem in the livestock industry in Samoa now. The APS deals mainly with small animals and also administers and dispenses antibiotics at the discretion of their veterinarian.

APHD aims to collect information from the latter two organizations on their dispensary of veterinary drugs and integrate this information into the Ministry's animal health database.

There is currently no formal legislation to regulate the use and dispensation of veterinary medicines, which will be one of the key activities in APHD's annual work plan for 2013 – 2014.

Sri Lanka: The Department of Animal Health and Production (DAHP) has recognized the importance of AMR and residues in food of animal origin and is in the process of updating the regulations of the Animal Diseases and Animal Feed Acts pertaining to antimicrobials. DAHP has prohibited the use of therapeutic antibiotics in feed, is screening selected poultry pathogens (*E. coli*, *Campylobacter spp.* and *C. perfringens*) for AMR and has strengthened the controlling of illegal antibiotic sales.

Thailand: in May 2013, the National Committee on Preparedness, Prevention and Resolution of Emerging Infectious Diseases appointed by Prime Minister in July 2012 and chaired by Deputy Prime Minister had established the Sub-Committee on

Prevention, Control and Resolution of Antimicrobial-Resistant Pathogens. The Sub-Committee composes of relevant personnel working on animal health and public health from public, private and academic sectors. It is chaired by the permanent secretary of the Ministry of Public Health with the secretary team composed of the Directors General from Department of Disease Control, Department of Medical Services, Department of Medical Sciences and Department of Livestock Development and the Dean of Faculty of Medicine Siriraj Hospital.

The DLD is amending the existing DLD Working Group on Antimicrobial-Resistant Organisms and Genetics in Animals, Animal Products and Farm Environment, which was established in 2011, to include more relevant private and academic sectors in order to support and put into practice the action plan of the Sub-Committee on Prevention, Control and Resolution of Antimicrobial-Resistant Pathogens in the field of animals.

In collaboration with the Center for Antimicrobial Resistance Monitoring in Foodborne Pathogens (in cooperation with WHO), Faculty of Veterinary Science, Chulalongkorn University, DLD organized a workshop to harmonize the laboratory techniques for AMR testing of the nine DLD laboratories.

Meanwhile, Ministry of Agriculture and Cooperatives is going to issue a Notification under the Feed Quality Control Act to prohibit mixing of animal feed with pharma chemicals, salt of pharma chemicals and semi-processed pharma chemicals which are used for manufacturing of medicines for treatment, relief, cure or prevention of human and animal disease or illness. The draft notification has already passed the public hearing.

Communication and public awareness on AMU and AMR has been raised through:

- Training on antimicrobial resistance in foodborne pathogens for ASEAN universities, 26-30 Aug 2013 by the Faculty of Veterinary Science, Chulalongkorn University; and
- International seminar “Strides on antimicrobial resistance in livestock” in Thailand Lab 2013 exhibition, 29 Aug 2013 at BITEC Bangna, Bangkok

- **Country Reports on National Currency Funds:** Country delegates briefly reported on the status of the National APHCA Currency Fund and other financing mechanisms available to support activities in line with the APHCA work programme. Bhutan and Thailand are the only two APHCA member countries that have established a specific fund to support APHCA activities. In many countries establishment of a specific fund is severely constrained by administrative rules and regulations. However, most countries have incorporated specific activities, e.g. AMR awareness raising, improvement of AMR testing capacity into their regular operating budgets. In addition to the budget earmarked for specific activities, some countries can access budget allocations for ‘international cooperation’, which can be used to support ‘networking’ activities.

- **Request for APHCA Membership by SPC:** SPC officially requested membership of APHCA through letter of the Deputy Director General of 21 June 2013 (APHCA 2013/06). Dr K. Cokanasiga, animal health and production advisor of SPC provided some background on SPC and its request for APHCA membership.

The Secretary pointed out that a positive decision would require a slight modification of Article III, para 1, defining eligibility for membership, to broaden the latter to include intergovernmental organizations within the 'Region'.

- **Scale of Contributions:** At the 36th Session, the secretariat was requested to review the scale of contributions in accordance with the original criteria used for their establishment, maintaining 3 categories and phasing of the increment over successive years. The secretary presented the proposed scale of contributions for 2014 and 2015 and explained the rationale behind the proposal (APHCA 2013/06).
- **Proposed 2014 Workplan and Budget:** The Secretary presented the proposed workplan and budget for 2014. The proposed budget for 2014 amounts to US\$135 000 for six thematic thrusts: (i) smallholder dairy development – US\$25 000 (ii) zoonoses and food safety – US\$20 000 (iii) feed resource management – US\$20,000 (iv) AMR Risk management – US\$20 000 (v) livestock policy capacity development – US\$20 000 and (vi) information dissemination and APHCA positioning – US\$30 000. FAO's anticipated contributions to the workplan are estimated at US\$135 000. The operational breakdown as well as FAO's anticipated contributions to the workplan are detailed in APHCA 2013/06.

Thursday, 26 September 2013, morning

- **Decisions taken:** The delegates attending the Session, representing more than a two-thirds majority of the membership of the Commission, unanimously agreed on the following:

SPC membership: To amend the APHCA Agreement to open membership to intergovernmental organizations within the APHCA region (Article III, para 1) and to accept SPC as new APHCA member. It was furthermore decided that Intergovernmental organizations should fall into Group A in the scale of contributions.

Scale of contributions: To adopt the scale of contributions proposed by the Secretariat for 2014 and 2015 as follows:

Group	Countries	2014	2015
A	Australia, China, India, Japan, New Zealand	12 000	14 000
B	Afghanistan, Bangladesh, Indonesia, Iran, Rep. Korea, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam	7 500	8 400
C	Bhutan, Cambodia, Fiji, Lao PDR, Maldives, Mauritius, Mongolia, Nepal, PNG, Singapore, DPRK, Samoa	2 400	2 750

Workplan and budget for 2014: To approve the workplan and budget for 2014 as proposed by the Secretariat and detailed in the tables below.

Operational Budget, APHCA TF and Estimated Contribution of FAO-RAP

Budget line	APHCA TF	FAO's Estimated Contribution	Total
5011 Salaries Prof.	0	45,000	45,000
5012 Salaries GS	25,000	25,000	50,000
5013 Consultants	26,000	30,000	56,000
5014 Contracts	30,000	25,000	55,000
5020 Locally Contracted Labour	1,000	0	1,000
5021 Travel	46,000	10,000	56,000
5023 Training	0	0	0
5024 Expendable Procurement	1,000	0	1,000
5025 Non-expendable Procurement	0	0	0
5026 Hospitality	2,000	0	2,000
5028 GOE	4,000	0	4,000
Total	135,000	135,000	270,000

Functional Budget, APHCA TF

Activity / Thematic Area	Amount (US\$)
Smallholder Dairy Development	25,000
Feed Resource Management	20,000
Zoonoses and Food Safety	20,000
Antimicrobial Resistance (AMR) Management	20,000
Livestock Policy Capacity Development Plan	20,000
Information Dissemination and APHCA Positioning	30,000
Total	135,000

- **Any other business:** The Secretary informed delegates that FAO-APHCA and the OIE Regional Representation for Asia and the Pacific had engaged in discussions to identify areas for close collaboration and joint activities, which would not duplicate activities carried out within the ambit of existing initiatives. Three areas for close collaboration and joint activities have been identified, namely: (i) brucellosis, (ii) AMR management, and (iii) 'neglected zoonoses'.

With regards to brucellosis, the intention of FAO-APHCA and the OIE Regional Representation is to build on the long-standing joint capacity building activities in brucellosis diagnostics and move forward to jointly promote the intensification of national and regional control activities. Veterinary AMR management is an issue of strong mutual interest and close collaboration would exploit the complementarity of the two organizations, with OIE focusing on the development of standards (and

guidelines) and collection of antimicrobial usage data, while FAO-APHCA would focus on supporting countries in their endeavour to comply with the international standards. A first common step in the area of 'neglected zoonoses' would be a deeper joint assessment of country priorities, building on work done by FAO and ILRI (zoonotic disease burden) and OIE in 2012 (country priorities), and subsequent targeting of a limited number of zoonoses, so far not addressed by international programmes.

Delegates welcomed the proposed collaboration and recommended FAO and OIE to engage with the respective authorities in the member countries and to foster a systematic and inclusive assessment process.

The Chairperson, fully acknowledging the significance of animal health issues in the region, made a strong plea for FAO-APHCA not to exclusively direct its efforts animal health issues but to also address important problems in the area of animal production, such as animal feeding and nutrition, and value chain development.

- **Next venue and dates:** Thailand proposed to host the 38th Session putting forward Chiang Mai as preferred venue. For climatic, cultural and fiscal reasons early November 2014 would be the most suitable time for the Session.

Delegates welcomed Thailand's offer to host the 38th Session in November 2014. It was agreed that the Technical Meeting held in conjunction with the Session should focus on animal nutrition / feeding and smallholder dairy value chains.

The Malaysian delegate offered to explore the possibility of Malaysia hosting the 39th Session in 2015.

- **Closure:** The Chairperson thanked the Secretariat for its commitment and dedicated work since the 36th Session and commended the delegates for their constructive contributions made at the current Session. He urged APHCA members to increase 'ownership of their' Commission and welcomed SPC as new prospective member, hoping that APHCA membership would further expand. The Chairperson closed the Session at 10:30.

Summary Statement of APHCA Account (APHCA 2014/04)

Cash Balance as of 1 January 2014

TRUST FUND No. 9167.00 – MTF/INT/005/MUL

Funds received up to 31.12.2012	US\$
3051 Contributions received	2,490,507
3052 Cumulative interest earned***	90,850
Total	2,581,357
Funds received in 2013	
3051 Contributions received	76,951
3052 Interest earned in 2013*****	305
Total	77,256
Funds received up to 31.12.2013	
3051 Contributions received	2,567,458
3052 Cumulative interest earned***	91,155
Total	2,658,613
Expenditures	
Expenditures up to 31.12.2012	2,229,697
Expenditures in 2013 (Jan. to Dec.)	86,114
Total	2,315,811
Effective cash balance (without interest earned) as of 01.01.2014	251,647

*** N.B. Interests, although received into the account, **cannot** be spent without approval of APHCA members. Therefore the effective cash balance is calculated on the contributions received (without interest) minus expenditures. However, at the 36th Session held in Negombo, Sri Lanka, delegates approved the use of interest accumulated up to 31.12.2011, namely US\$90 453, for APHCA activities.

Expenditures in 2013

Budget line	US\$
5012 Salaries General Service	10,829
5013 Consultants	13,588
5014 Contracts	0
5020 Locally Contracted Labour	-653
5021 Travel	56,655
5023 Training	1,129
5024 Expendable Procurement	3,317
5026 Hospitality	0
5028 General Operating Expenses	1,248
Total Expenditure	86,114

Status of Contributions

Oracle Activity: TF RAPXD TFAA97AA89142, Status as of 31.12.2013

Member Country	Outstanding 31/12/2012	Contribution due for 2013	Contributions received 2013	Outstanding 31/12/2013
Australia	0.00	10,724.00	10,724.00	0.00
Bangladesh	35,792.00	6,502.00		42,294.00
Bhutan	0.00	2,128.00	2,128.00	0.00
India	0.00	10,724.00	10,294.44	429.56
Indonesia	0.00	6,502.00	6,502.00	0.00
Iran	6,502.00	6,502.00	13,004.00	0.00
Korea DPR	2,128.00	2,128.00	2,128.00	2,128.00
Lao PDR	2,128.00	2,128.00	4,256.00	0.00
Malaysia	0.00	6,502.00		6,502.00
Mongolia	0.00	2,128.00	2,128.00	0.00
Myanmar	0.00	2,128.00	2,128.00	0.00
Nepal	0.00	2,128.00	2,128.00	0.00
Pakistan	13,095.15	6,502.00		19,597.15
PNG	9.00	2,128.00		2,137.00
Philippines	0.00	6,502.00	6,502.00	0.00
Samoa	-128.14*	2,128.00	1,999.86	0.00
Sri Lanka	25.00	6,502.00	6,527.00	0.00
Thailand	0.00	6,502.00	6,502.00	0.00
Total	59,551.01	90,488.00	76,951.30	73,087.71

*Note: Samoa figure revised vis-à-vis previous report

Oracle Activity: TF RAPXD TFAA97AA89142, Status as of 30.09.2014

Member Country	Outstanding 31/12/2013	Contribution due for 2014	Contributions received 2014	Outstanding 30/09/2014
Australia	0.00	12,000.00	12,000.00	0.00
Bangladesh	42,294.00	7,500.00	19,764.00	30,030.00
Bhutan	0.00	2,400.00	4,800.00	-2,400.00
India	429.56	12,000.00		12,429.56
Indonesia	0.00	7,500.00	7,500.00	0.00
Iran	0.00	7,500.00	7,500.00	0.00
Korea DPR	2,128.00	2,400.00		4,528.00
Lao PDR	0.00	2,400.00	2,400.00	0.00
Malaysia	6,502.00	7,500.00	14,002.00	0.00
Mongolia	0.00	2,400.00	2,400.00	0.00
Myanmar	0.00	7,500.00	7,500.00	0.00
Nepal	0.00	2,400.00	2,400.00	0.00
Pakistan	19,597.15	7,500.00	19,615.15	7,482.00
PNG	2,137.00	2,400.00		4,537.00
Philippines	0.00	7,500.00	7,500.00	0.00
Samoa	0.00	2,400.00	2,400.00	0.00
Sri Lanka	0.00	7,500.00	7,500.00	0.00
Thailand	0.00	7,500.00	7,500.00	0.00
Total	60,083.71	108,300.00	124,781.15	56,606.56

*Note: Outstanding up to 31.12.2010: US\$23,040.48; up to 31.12.2011: US\$44,934.20; up to 31.12.2012: US\$59,551.01, up to 31.12.2013: US\$73,087.71

Approved Budget for 2014 and Expenditures to 30.09.2014

Budget line	Approved budget	Expended¹ on 30.09.2014	Balance
5011 Salaries Prof.	0	0	0
5012 Salaries GS	25,000	24,472	528
5013 Consultants	26,000	22,856	3,144
5014 Contracts	30,000	0	30,000
5020 Locally Contracted Labour	1,000	0	1,000
5021 Travel	46,000	17,629	28,371
5023 Training	0	3,767	-3,767
5024 Expendable Procurement	1,000	5,265	-4,265
5025 Non-expendable Procurement	0	1,372	-1,372
5026 Hospitality	2,000	0	2,000
5028 General Operating Expenses	4,000	260	3,740
Total	135,000	75,621	59,379

¹ Including commitments

Scale of Contributions for 2014

Member Country	Amount (US\$)*
Australia	12,000.00
Bangladesh	7,500.00
Bhutan	2,400.00
India	12,000.00
Indonesia	7,500.00
Iran	7,500.00
Korea DPR**	2,400.00
Lao PDR	2,400.00
Malaysia	7,500.00
Mongolia	2,400.00
Myanmar	7,500.00
Nepal	2,400.00
Pakistan	7,500.00
PNG	2,400.00
Philippines	7,500.00
Samoa	2,400.00
Sri Lanka	7,500.00
Thailand	7,500.00
TOTAL	108,300.00

* Note: This scale of contributions has come into effect in 2014 (and is due to increase for 2015 in accordance with the decision taken at the 37th Session)

** Note: Korea DPR became a member of APHCA effective 2010

Scale of Contributions for 2015

Group	Countries	Contribution	Total
A	Australia, India	14,000	28,000
B	Bangladesh, Indonesia, Iran, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand	8,400	75,600
C	Bhutan, Lao PDR, Mongolia, Nepal, PNG, DPRK, Samoa	2,750	19,250
TOTAL			122,850

Activity Report (APHCA 2014/05)

Introduction

The following provides a general overview of the activities carried out by the RAP livestock group in the livestock sector in the APHCA region – i.e. not limited to APHCA member countries nor to the thematic areas specifically supported by the APHCA trust fund – since the last Session in Thimphu, Bhutan, 22-26 September 2013. Activities carried out by the RAP livestock group are funded from a variety of sources, such as the APHCA trust fund (TF), FAO's regular programme (RP), FAO's technical cooperation programme (TCP) as well as unilateral and multilateral donor trust funds. The RAP livestock group supports and is supported by colleagues from RAP ECTAD and FAO HQ and also greatly benefits from support and contacts provided by the FAO country offices.

In accordance with FAO's revised overall strategic objectives, the Asia-Pacific livestock programme aims to maximize livestock's contribution to attaining food security and reducing poverty while at the same time enhancing resilience and sustainability and reducing health risks to humans and animals (including the threat from antimicrobial resistance).

FAO's work in the region builds on strong partnerships with international 'sister' organizations through the regional and sub-regional offices of OIE, and the WHO offices for Southeast Asia (SEARO) and for the Western Pacific (WIPRO) and is carried out in close consultation with national counterpart institutions of Member Countries, fostered through FAO country offices.

APHCA, provides a long-standing forum for information exchange, mutual support, and coordination of collective action in the livestock sector. FAO-RAP provides the Secretariat while a half-time position of IT clerk is financed from the APHCA TF.

Personnel (RAP Livestock Group)

- Joachim Otte, Senior Animal Production and Health Officer and Secretary of APHCA
- Carolyn Benigno, Animal Health Officer
- Vinod Ahuja, Livestock Policy Officer
- Vishnu Songkitti, APHCA Liaison Officer (retired in mid-2014, position unfilled)
- Yupaporn Simuangngam, APHCA IT Clerk
- Tuanchai Laisakun, Administrative Assistant

The following overview of activities carried out since the last APHCA Session comprises two main sections: the first lists activities (and outputs) by their nature, e.g. servicing of projects, preparation of meetings, etc. while the second section reports on activities and outputs in relation to thematic areas, with special attention to those supported by APHCA TF funding or in-kind contributions.

Field Projects Supported by RAP Livestock Group

FAO Technical Cooperation Programme (TCP) – National Projects

- TCP/AFG/3403 (TCPF) – Afghanistan Poultry Policy and Strategy Development [VA]
- TCP/BGD/3302 – Establishment of Livestock Health Care System at Kotalipara and Tungipara Upazilas in the Gopalganj District (closed) [CB]
- OSRO/BGD/202/USA – Strengthening National Capacity to Respond to Highly Pathogenic Avian Influenza (HPAI) and Emerging and Re-Emerging Diseases in Bangladesh [VA]
- GTFS/BGD/041/ITA – Food Security through Enhanced Agricultural Production, Diversified Sources of Income, Value Addition and Marketing of Bangladesh [VA]
- TCP/CMB/3505 – Curricula and Capacity Development of the Faculty of Veterinary Medicine of the Royal University of Agriculture [CB]
- TCP/CPR/3501 – Developing Prevention and Control Strategies for African Swine Fever (ASF) in China [CB]
- TCP/DRK/3405 – Emergency Assistance for Strengthening FMD Control Capacity in DPRK [CB]
- TCP/IND/3402 – Support for Piloting Integrated Smallholder Livestock Rearing Interventions in two States of India, and Documenting and Disseminating Successful Smallholder Livestock Rearing Interventions under the South Asia Pro-Poor Livestock Policy Programme [JO]
- TCP/MDV/3401 – Support to Strengthening Animal Quarantine System in the Maldives [CB]
- TCP/MDV/3402 – Support for the Development of a Domestic Egg Industry in the Maldives [VA]
- TCP/MYA/3402 (TCPF) – Formulation of Project Proposal: Animal Feeding Strategies for Improved Livestock Production in Myanmar (closed) [VA]
- TCP/MYA/3502 – Support for Animal Feeding Strategies for Improved Livestock Production in Myanmar [VA]
- TCP/SRL/3501 – Promotion of Appropriate Feeding Techniques to Exploit Productivity in Dairying [JO]

- TCP/SRL/350 – Technical Assistance to Improve FMD Vaccine Production in Sri Lanka [CB]
- TCP/THA/3401 – Enhancement of Beef Productivity through Animal Identification and Traceability [CB]
- TCP/VIE/3302 (TCPF) – Formulation of Project Proposal: Developing a Livestock Policy Analysis and Monitoring System in Viet Nam (closed) [VA]
- TCP/VIE/3501 – Development of a Livestock Policy Analysis and Monitoring System in Viet Nam [VA]
- TCP/VIE/3404 – Strengthening Institutional Capacity for Intersectoral Collaboration and Coordination and Communication for Effective Prevention and Control of Rabies in Viet Nam [CB]

FAO Technical Cooperation Programme (TCP) – Regional Projects

- TCP/RAS/3309 – Enhancing Milk Consumption and Livelihoods through School Milk Programmes (Bangladesh, Myanmar and Thailand) [VA]
- TCP/RAS/3406(E) – Emergency Assistance for Surveillance of Influenza A (H7N9) Virus in Poultry and Animal Populations in Southeast Asia [CB]
- TCP/RAS/3407(E) – Emergency Assistance for Surveillance of Influenza A (H7N9) Virus in Poultry and Animal Populations in South Asia [CB]
- TCP/INT/3402(E) – Emergency Support to Global and Coordinated Response to Influenza A (H7N9) Virus in Poultry and other Animals [CB]
- TCP/RAS/3405 – Institutional Capacity Strengthening for Analysis, Design and Dissemination of Policy Approaches to Address Risk and Vulnerability of the Rural Poor at the Country Level (Cambodia, Lao PDR, Nepal and Viet Nam) [VA]
- TCP/RAS/3507 – Building Policy Capacity Towards Sustainable Livestock Sector Development (Indonesia, Lao PDR and Thailand) [VA]

Bi-lateral and Multi-lateral Donor Funding – National

- UTF/AFG/079/AFG – Dairy Industry Development in Kabul, Logar and Parwan Provinces [VA]
- GCP/BGD/048/USA – Improving Food Security of Women and Children by Enhancing Backyard and Small-Scale Poultry Production in the Southern Delta Region in Bangladesh [VA]
- MTF/BGD/052/RBK – Linking School Milk with Smallholder Dairy Development in Tala, Sathkira, Bangladesh [VA]
- OSRO/CMB/101/EC – Improving Food Security and Market Linkages for Smallholders in Otdar Meanchey and Preah Vihear Provinces in Cambodia [JO]

- OSRO/INS/302/WPA – Assistance to Government of Indonesia for the Effective and Humane Control of Rabies in Indonesia with Special Emphasis in Flores and Lembata Islands [CB]
- OSRO/INS/104/USA – Assistance for the Control of Rabies in Indonesia [CB]
- UTF/LAO/019/LAO – Technical Assistance for the Development of the SPS-related Legal Framework in the Lao People's Democratic Republic [CB]
- GCP/MYA/021/OPS – Improved Farmer Livelihoods through Improved Animal Health and Production Services (closed) [JO]
- UTF/MON/009/MON – Mongolia Integrated Livestock-based Livelihoods Support Programme (ILBLSP) [JO]
- OSRO/MYA/402/FRA – Enhancement of Food Security and Resilience for Conflict Affected Communities in Northern Rakhine State, Myanmar [VA]
- UTF/NEP/073/NEP – Nepal Agriculture and Food Security Project [JO]
- GCP/PAK/402/CHA – Emergency Support to Protect the Livestock Affected by the North Waziristan Crisis through Provision of Critical Veterinary Supplies and Feed [JO]
- GCP/PAK/403/BEL – (SFERA) Emergency Support to Protect the Livestock Affected by the North Waziristan Crisis through Provision of Critical Veterinary Supplies and Feed [JO]
- GCP/PAK/113/USA – Balochistan Agriculture Project [JO]
- GCP/PAK/123/USA – Support to Increase Sustainable Livestock Production – PCP of FMD in the Islamic Republic of Pakistan [CB]
- GCP/PAK/127/USA – Progressive Control of PPR in Pakistan [CB]
- OSRO/PAK/304/UK – Support for the Recovery of Agriculture Based Livelihoods of Vulnerable Farmers Affected by 2012 Floods of Sindh and Balochistan Province in Pakistan [JO]
- OSRO/PAK/206/UN – To Restore and Protect the Livelihoods and Empower the Poor and Vulnerable Peasants (Men, Women, Boys and Girls) Dependent on Feudal and Tribal Landholding and Farming Systems and Affected by Droughts, Floods and Insecurity [JO]
- CP/SRL/062/EC – Poverty Reduction through Agricultural Development [JO]
- CERF 14-R-FAO-021 – Emergency Control of FMD of Livestock in Sri Lanka [CB]
- UNTS/THA/033/UNO – United Nations Joint Programme on Integrated Highland Livelihood Development in Mae Hong Son Province (closed) [VS]
- OSRO/VIE/401/WPA – Strengthening Institutional Capacity for Intersectoral Collaboration and Coordination and Communication for Effective Prevention and Control of Rabies in Viet Nam [CB]

Bi-lateral and Multi-lateral Donor Funding – Regional

- MTF/RAS/CFC/259 – Improving the Bargaining Power and Sustainable Livelihoods through the Enhancement of Productivity and Market Access in Dairy (Bangladesh, Myanmar and Thailand) [VA]
- GCP/RAS/244/ITA – Sub-regional Environmental Animal Health Management Initiative for Smallholder Production in Southeast Asia, Phase 3 (closed) [CB]
- GCP/RAS/283/ROK – FMD Control in Southeast Asia (Cambodia, Lao PDR and Viet Nam) through Application of the Progressive Control Pathway [CB]
- GCP /RAS/276/IFA – Pro-Poor Policy Approaches to Address Risk and Vulnerability at the Country Level [VA]
- OSRO/GLO/102/AUL – Partnership on Global Animal Health and Biosecurity Initiatives (Bangladesh, Philippines, Thailand, Viet Nam) (closed) [CB]
- OSRO/RAS/901/EC – Improvement of Regional Capacities for Prevention, Control and Eradication of Highly Pathogenic and Emerging Diseases including Highly Pathogenic Avian Influenza in the ASEAN and SAARC Countries [CB]
- GCP/RAS/279/JPN – Information Sharing for Transboundary Animal Diseases in Asia [CB]
- OSRO/INT/02/USA – IDENTIFY: Support for Strengthening Animal Health Laboratory Capacities in Hot Spot Regions to Combat Zoonotic Diseases that Pose a Significant Public Health Threat [CB]
- OSRO/INT/001/USA – Characterizing Influenza Viruses Posing Risks as the Next Global Pandemic [CB]
- USAID supported projects on HPAI (Bangladesh, Cambodia, China, Indonesia, Myanmar, Nepal, Viet Nam) [CB]

Pipeline Projects

- TCP-funding, Thailand – Enhancing National Capacities for Antimicrobial Resistance Risk Management in Animal Food Production in Thailand [JO]
- EC-funding, DPRK – Improving Food and Nutrition Security through Sustainable Agriculture [JO]

Meetings, Workshops and Events (Co-)Organized

- Sep. 2013, World School Milk Day Celebrations in Bangladesh and Thailand [VA]
- Sep. 2013, Sirajganj, Bangladesh, Training for Trainers on Advanced Dairy Farm Management [VA]

- Sep. 2013 Savar, Dhaka, Scientific Seminar on Livestock Feeding and Nutrition: Global Perspective and Options for Bangladesh [VA]
- Dec. 2013, Chiang Mai and Lampun, Thailand, Outreach Training on Dairy Management, Farm Hygiene, Farm Sanitation Check and Milk Quality Control, Dairy Performance Recording, and Farm Economic Recording in Thailand [VA]
- Dec. 2013, First E-Learning on Feeding Management of Dairy Cattle in the Tropics [VA]
- Dec. 2013, E-Conference on Feeding of By-Products on Smallholder Dairy Farms in Asia and Other Tropical Regions [VA]
- Jan. 2014, Chiang Mai, Thailand, International Training on Practical Dairy Processing [VA]
- Jan. 2014, Chiang Mai, Thailand, National Training on Cheese, Yoghurt and Ice Cream [VA]
- Jan. 2014, Chiang Mai, Thailand, Exhibition on Dairy Processing [VA]
- Feb. 2014, various locations in Bangladesh, Outreach training on Rearing and Management of Dairy Cows, Feeding, Hygienic Management, Hygienic Milking, Milk Handling, Grass Cultivation in Bangladesh [VA]
- Feb. 2014, Pattaya, Thailand, Training Workshop on Emergency Preparedness and Contingency Planning for Avian Influenza A (H7N9) [CB]
- Mar. 2014, Ulaan Baatar, Mongolia, 32nd FAO Regional Conference for Asia and the Pacific [JO]
- Mar. 2014, Chiang Mai, Thailand, 4th FAO-APHC/OIE/DLD Regional Workshop on Brucellosis Diagnosis and Control in Asia-Pacific Region – Proficiency Testing and Way Forward [VS]
- Mar. 2014, Second E-Learning on Feeding Management of Dairy Cattle in the Tropics [VA]
- Apr. 2014, National Training Workshop on Dairy Feeding Management in Thailand [VA]
- May 2014, Bangkok, Thailand, International Consultation: Dairy Asia – Towards Sustainability [VA, JO]
- Jul. 2014, Bangkok, Thailand, 8th FAO/OIE Regional Steering Committee Meeting on GF-TADs for Asia and the Pacific back to back with the 5th Meeting of the HPED Steering Committee Meeting [CB]
- Oct. 2014, Bangkok, Thailand, FAO-APHC-DLD ASEAN Regional Training Workshop on Antimicrobial Susceptibility Testing (AST) of Bacteria Isolated from Farm Animals [JO]

- Oct. 2014, Yangon, Myanmar, Workshop Training on Milk Quality, Milk Testing and Dairy Processing in Myanmar [VA]
- Oct. 2014, Nadi, Fiji, One Health Meeting for the Pacific [CB]
- Nov. 2014, Chiang Mai, Thailand, 38th APHCA Session and Regional FAO-APHCA OIE Workshop on Breeding for Milk Production in Tropical / Non-Temperate Environments [CB, JO & VA]

Congresses, Symposia, Meetings and Workshops Attended

- Nov. 2013, Hanoi, Viet Nam, Keynote Address at the Conference on Hi-Tech Applications and Sustainable Development of Fresh Milk in Viet Nam [VA]
- Mar. 2014, Bangkok, Thailand. Keynote Speech at Food and Agricultural Business Committee Seminar 2014 [VA]
- Mar. 2014, Nay Pyi Taw, Myanmar, 20th Meeting of the OIE Sub-Commission for FMD in Southeast Asia and China [CB]
- Apr. 2014, Penang, Malaysia, ILRI Regional Stakeholder Meeting: Livestock Research for Development in East and Southeast Asia [JO]
- Apr. 2014, Bangkok, Thailand, Keynote Speech at the Performing Nature Symposium [VA]
- Apr. 2014, Bangkok, Thailand, Keynote Speech at the ASEAN Feed and Rice Symposium [VA]
- Apr. 2014, Male, Maldives, Inception meeting for the project 'Support for Development of Egg Industry in Maldives' (TCP/MDV/3402) [VA]
- May 2014, Singapore, 22nd Meeting of the ASEAN Working Group on Livestock [CB]
- Jun. 2014, Kuching, Malaysia, Keynote Speech at the 1st ASEAN Regional Conference on Animal Production [JO]
- Jun. 2014, Chiang Mai, Thailand, Workshop on Relevant International Standards for Dog Rabies [CB]
- Jul. 2014, Kandy, Sri Lanka, Inception Workshop of FAO-TCP project 'Promotion of Appropriate Feeding Techniques to Exploit Productivity in Dairying' (TCP/SRL/3501) [JO]
- Jul. 2014, Manila, Philippines, Presentation at the Responsible Business Forum [VA]
- Aug. 2014, Chiang Rai, Thailand, 17th SEACFMD National Coordinators Meeting [CB]
- Sep. 2014, Anseong, Republic of Korea, Joint 2014 International Workshop on Veterinary Epidemiology [CB]
- Oct. 2014, Ho Chi Minh City, Viet Nam, Joint SEACFMD LabNet and EpiNet Meeting [CB]

Publications (hard and/or soft copy)

- Report of the Thirty-seventh Session of the Animal Production and Health Commission for Asia and the Pacific (APHCA) (RAP Publication 2013/12)
- Utilization of Fruit and Vegetable Wastes as Livestock Feed and as Substrates for Generation of Other Value-added Products
- Feeding Dairy Cattle in the Tropics: A Manual for Trainers and Practitioners
- Golden Rules for Smallholder Dairy Farming in the Tropics [English, Thai, Myanmar and Bangla versions]
- Assessment of Ruminant Supply Chains in Mongolia
- Proceedings of the E-Conference on The Feeding of By-Products on Smallholder Dairy Farms in Asia and Other Tropical Regions
- Asia Dairy Goat Country Reports (Australia, China, India, Indonesia, Iran, Japan, Malaysia, Pakistan, Philippines, Thailand, and Viet Nam)
- A Review of Antimicrobial Usage and Alternatives for Prophylaxis and Performance Enhancement in Pig Populations in East and Southeast Asia
- Bangladesh Dairy: A Performance Profile
- Proceedings: Dairy Asia — Towards Sustainability; International Consultation held in Bangkok, Thailand, 21-23 May 2014
- Proceedings: EAHMI Conference 2013 – Use of Environmental Animal Health Management Strategies for Decision Making; Conference held in Makati City, Philippines, 18-19 September 2013 (RAP Publication 2014/11)

Studies / Papers under Preparation

- An Analytical Framework for Integrated Animal Disease Impact Assessment: Applications to FMD in the Greater Mekong Sub-Region (under final peer review)
- A Review of Antimicrobial Resistance in Bacterial Micro-organisms Isolated from Livestock and Livestock Products in the Asia-Pacific Region (under final peer review)
- Dairy Asia: Elements of a Regional Strategy for Sustainable Dairy Development in Asia (ongoing; first draft completed and peer reviewed)
- A Review of Microbial Contamination of Animal Source Food in East, South and Southeast Asia (first draft)

Smallholder Dairy Development

The Asian dairy sector is on the cusp of transformation. Consumption of milk and milk products has grown rapidly in the region making Asia the strongest growing region for dairy product consumption during the last three decades. While production has responded strongly to growing demand, supply continues to fall short of demand. Recent OECD-FAO Agricultural Outlook estimates that the demand for milk and milk products in the region will reach almost 320 million tonnes by the year 2021. This means the region will need to increase milk availability by another 50 million tonnes within this decade.

This growth is happening at a time when concerns about resource scarcity, climate change and the need for equitable economic development are becoming more and more important. In this changing landscape, meeting future challenges of food and nutrition security requires substantial investment in improved resource use efficiencies, development of appropriate technologies; and control along the value chain in a manner that facilitates integration of environmental, public health, economic profitability and social and economic equity goals. This requires a series of actions, including capacity development and information dissemination in support of adopting good production practices; better feeding and breeding strategies to increase productivity; developing tools, methods and systems to monitor animal, public and environmental health.

In view of the growing demand for milk and milk products in the region and the potential of smallholder dairy in contributing towards food security, nutrition, women empowerment and poverty alleviation, smallholder dairy development was selected in 2008 as one of the priority areas for APHCA engagement and investment. Dairy development activities/programmes coordinated from FAO-RAP contribute substantially to FAO's Strategic Objective 2, 'Increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner'. In particular, these activities contribute to Output 20103, 'Organizational and institutional capacities strengthened to support innovation and the transition toward more sustainable production systems'.

Activities carried out in the thematic area of smallholder dairy development over the reporting period were:

- Implementation of project 'Smallholder Dairy Development in Bangladesh, Myanmar and Thailand';
- Formulation, negotiation and implementation of project 'Dairy Industry Development in Kabul, Logar and Parwan Provinces, Afghanistan';
- Maintenance of Asia Dairy network;
- A Multi-stakeholder Consultative meeting 'Dairy Asia—Towards Sustainability' held in Bangkok on 21-23 May 2014; and
- Consultative formulation of a regional dairy development strategy.

Smallholder dairy development project: The project ‘Smallholder Dairy Development in Bangladesh, Myanmar and Thailand’ (SDDP), commenced in February 2011, is progressing well with continuing strong stakeholder ownership across all the three countries and along the entire dairy value chain. The project has invested systematically in farmer education, technology transfer and capacity development activities at all levels of value chain.

In Bangladesh, the project launched a school milk pilot programme in August 2013. The pilot targets 2 000 children and provides 200 ml locally procured pasteurized fresh milk to primary grade children on all school days. Arrangements have been made to ensure a cold chain that extends up to the school and appropriate testing, quality control and monitoring procedures. A fund has been created named as ‘*School Milk Students Awareness Fund*’ in seven schools implementing a school milk programme. Every student participating in the pilot is contributing one Bangladeshi Taka every school day per packet of milk received. The fund will be utilized for the nutrition, health and environment awareness activities at the school level. Another school milk pilot project, supported by FAO, Rabobank and Milk Vita, was launched in Satkhira District in southern Bangladesh in April 2014. The project installed a small pouch-filling pasteurization plant with other equipment in Satkhira. In this pilot 2 000 primary school children are receiving a 200 ml packet of pasteurized milk six days in a week.

In Myanmar, SDDP has worked with two key partners, LBVD and MDA /MLF, towards strengthening of farmer groups and enhancing sustainable dairy service delivery; forage production and outreach training, and improved hygienic milk handling. In most cases, milk processors had operated without official certification on quality control before the beginning of the project but now, with the support of the project, some processors have received the certificate of good hygiene from Myanmar’s FDA.

A study tour to Thailand was organized for SDDP participants. The study tour has benefitted Myanmar entrepreneurs immensely and several entrepreneurs have now made their own investment to put in place equipment and processes for improving milk quality.

FAO/LBVD/MLF/MDA have sustained the School Milk Programme in 2013-2014 academic years through the contribution of Myanmar dairy processors and well-wishers. In total, 11 600 primary school children in Mandalay and Yangon Region have been receiving 200 ml of milk. Tetra Pak, in collaboration with the Government of Myanmar, has been also distributing imported UHT milk (180 ml) to 45 000 students in Nay Pyi Taw Council, Mandalay Region and Yangon Region. The local government of Mandalay Region also provided financial support to the school milk programme. CP Company is providing UHT milk to the students from Kayah State and Chin state. In addition, other townships in different Regions and States have shown interest in implementing school milk programmes in their own way.

In Thailand, the project continues to benefit from excellent cooperation from national counterparts and other partners. Key highlights in Thailand included dairy feeding

interventions and dairy extension service provision; monitoring and improvement of milk quality, grass stock production of Napier Pakchong 1 (including the outreach training on grass cultivation and utilization) and capitalization on the cheese market potential. The Chiang Mai Dairy Cooperative managed to maintain their cheese production throughout the year.

In addition to catering to emerging regional demand for training in dairy processing, the regional dairy training center continues to play an important role in providing training and expertise to processors, students and other interested stakeholders. The Dairy Farming Promotion Organization of Thailand has agreed to provide financial assistance in support of centre activities through the APHCA national currency fund.

A detailed progress report on the project was prepared and discussed during the third Regional Dairy Task Force meeting in May 2014 in Bangkok and is available from the project team.

Dairy Industry Development in Kabul, Logar and Parwan Provinces, Afghanistan: The project commenced in February 2014 and is expected to run until February 2020. Funded by IFAD (International Fund for International Development) the project will invest in milk collection, processing and marketing through formation of primary and secondary cooperatives federated in the Kabul Milk Union. The project has four components namely (i) National Capacity Development, (ii) Institutional Development, (iii) Women's Development and (iv) Enterprise Development. It aims to reach out to about 3 000 households.

Asia Dairy Network: The Asia Dairy Network (ADN) was established in 2012 by APHCA as part of a Smallholder Dairy Development Program supported by FAO and the Common Fund for Commodities (CFC). The main objective of this network is to improve the communication between the various dairy industry stakeholders in the Asia region so as to facilitate in the sharing of knowledge and experiences. More specifically, the network aims to

- Facilitate an increase in productivity, quality and profitability, in an environmentally sustainable manner, at all points along the dairy value chain in Asia.
- Facilitate the collection and dissemination of high quality information and knowledge relevant to dairy development in Asia.
- Enhance the recognition of the contribution of small holder dairy farming to household food security and overall socio-economic wellbeing in Asia, and the importance of the contribution of women.
- Enhance the global visibility of the Asian dairy sector

A website (www.dairyasia.org) has been established to serve as a repository of technical and strategic knowledge. The website recorded 670 000 'visits' over the last nine months. In addition to providing access to documents, the website promotes interactive discussion among members through an open forum. The forum provides an opportunity

to the members (or any dairy stakeholders for that matter) to seek answers to their questions on any dairy-related matters. Initially, these can be specific technical questions about production technology, regional dairy policy, or ways to improve technology transfer. In the future, discussions will be expanded to cover a wide range of topics along the dairy value chain, including capacity building and milk processing and marketing as well as production technology.

In December 2013, the network conducted an E-Conference on *The role of agro-industrial and forestry by-products in the feeding of dairy animals in Asia and other tropical regions*. Over a 4-week period, 530 participants from at least 33 countries participated in this forum and the proceedings were published on the Dairy Asia website.

In December 2013, March 2014, and September 2014, three E-Learning programmes (four weeks each) were conducted on *Feeding management of smallholder dairy cattle in tropical Asia*. Approximately 20 participants registered for each programme. The programmes were divided in 16 modules and each programme included three interactive skype sessions.

Meeting ‘Dairy Asia—Towards Sustainability’: FAO-RAP, in conjunction with Animal Production and Health Division (AGA) of FAO, the Global Agenda for Sustainable Livestock (GASL), Dairy Farming Promotion Organization of Thailand (DPO), Department of Livestock Development, Royal Thai Government, (DLD) and other partners, organized a consultative multi-stakeholder meeting ‘Dairy Asia—Towards Sustainability’ held in Bangkok on 21-23 May 2014. Close to 100 participants from 20 countries attended the meeting. Participants comprised representatives from governments, national and international research agencies, civil society organizations, multilateral institutions, think tanks, private sector and regional and global networks. Details of the meeting, programme, participants, presentations and the final report, can be found on the APHCA and Dairy Asia websites.

The meeting recognized the growing importance of Asia in the global production and consumption of milk and the changing landscape of dairy sector within the region. It was further recognized that average farm size (number of dairy animals) in the region remains small in comparison to dairy farms in the developed world and that this presents a unique opportunity for dairy sector development to significantly contribute to overall socio-economic development.

Extensive discussions also took place on establishing a multi-stakeholder platform to facilitate regional cooperation and collaboration. There was consensus that such a platform would add substantial value towards promoting ground level action in pursuit of sustainability objectives. The participants agreed to continue the dialogue on the formation of a Dairy Asia Platform. In addition, the meeting advised to develop a strategy paper for sustainable dairy development in the region.

Strategy for Regional Dairy Development: In response to the recommendations of the Dairy Asia meeting, a draft strategy paper has been prepared by a drafting group

composed of representatives of various institutions present at the meeting. The draft paper can be downloaded from Dairy Asia and APHCA websites and is currently going through a larger consultative process.

Feed Resources Management

Feed is a key element in livestock production, often representing up to 70 percent of total production cost. Feed is one the main drivers of livestock production systems and can determine the financial viability of the livestock enterprise. Feed production and use affects animal health and welfare, reproductive efficiency, land use and land use change, water use, the environment, and product quality and safety, among others. Given the importance of feed for animal production, accurate assessments of current and future supply and demand of livestock feed are needed for national food security policy formulation and planning of the livestock sector, as well as for determining environmentally sustainable stocking rates. Equally important to achieve these is the availability of detailed information on how feed resources are used in different livestock production systems (termed as feeding systems) in the country. Information on feeding systems also assist countries in generating more accurate greenhouse gas inventories.

Very few countries in the Asia-Pacific region have sound information on how much feed is available, used and wasted in livestock production chains. Quality assurance in feed analysis laboratories also needs to be improved so that the available feed resources could be efficiently used, leading to higher animal productivity, with minimum release of environment pollutants. In 2013, FAO (AGAS Rome) and APHCA provided guidelines for the preparation of feed assessments and a number of APHCA member countries initiated the preparation of national feed assessments. With the technical support of Rome-based FAO expertise (AGAS), FAO-APHCA organized a regional workshop on 'Animal feed resources and their management in the Asia-Pacific region' in Bangkok in August 2013. The workshop provided a forum, in which the country representatives presented preliminary results of their national feed assessment efforts.

Assembling and disseminating information on national feed resources falls under Strategic Objective 2 of FAO's renewed Strategic Framework contributing to the output '*Relevant data and information assembled, aggregated, integrated and disseminated, and new data generated through analyses and monitoring – jointly with partners.*' The activities carried out in the thematic area of national feed assessments and use over the reporting period were:

- Elaboration of national feed assessment reports;
- Strengthening quality assurance in feed analysis laboratories; and
- Establishment of an Asia-Pacific Animal Feed Network (APAF network).

National feed assessment reports: A number of national feed assessment reports prepared by Member Countries (Bangladesh, Bhutan, India, Indonesia, Pakistan and Thailand) have been finalized after several rounds of peer review involving FAO-HQ (AGAS), FAO-RAP and independent experts while several others are at an advanced stage of preparation (Nepal, Mongolia and Sri Lanka). The following are some of the highlights emerging from a comparative analysis of the six completed national feed assessment reports:

- Despite 'globalization', Asia's livestock production systems are diverse across countries and are driven by local feed resource supply. Mixed crop-livestock systems are very important across Asia and are expected to continue to play an important role in meeting the demands of animal products in Asia in the near future.
- Diversity in national feed supply among countries is large. Bangladesh, India and Pakistan, for example, source about 60 percent of ruminant feed from crop residues. In Thailand, roughly 50 percent of ruminant feed is derived from grain and oilseed by-products, while in Mongolia 90 percent of the ruminant feed is provided by pasture land.
- Detailed mapping of feeding systems suggest presence of diverse feeding systems in different regions of a country, diversity being higher in ruminant production systems than in monogastric production systems.
- Feed deficits in terms of dry matter, crude protein and metabolizable energy are a common feature in Asian countries, and most countries in Asia import more feed ingredients than they export. Thailand is deficient only in crude protein.
- Grain use in ruminant production is very small. Forage, grazing and crop residues are their main feed resource.
- Competition for feed grains will increase in the future due to expanding commercial dairy, feedlot and poultry farming.
- Most feed grains are used in intensive poultry systems and maize is the main feed grain. In some countries e.g. Pakistan and Thailand >70 percent of maize produced is used as feed.
- Overall, grain wastage exceeds the quantity used as feed in the six Asian countries investigated so far.
- The human-edible protein output : human-edible protein input ratio is highest for sheep and goats and lowest for intensive poultry.

It is anticipated that all reports can be finalized and published before the end of the year 2014. Furthermore, it is envisaged to put in place a process of continued improvement and update of existing national feed assessments while hopefully some of the countries that have so far not initiated their national feed assessment will join the activity.

Strengthening quality assurance in feed analysis laboratories: Seven staff members of feed analysis laboratories from five countries (India, Afghanistan, China, Malaysia, Bangladesh and Nepal) participated in a two-month on-line course on 'Quality Assurance in Animal Feed Analysis Laboratories' organized by FAO-HQ (AGAS) jointly with TAMU (Texas A&M University, USA). All participants were issued certificates of successful completion. Furthermore, 13 feed analysis laboratories from five APHCA countries (Bangladesh, India, Indonesia, Pakistan and Thailand) participated in 'Feed Analysis Proficiency Testing', organized by FAO-HQ (AGAS) in collaboration with International Analytical Group, Vienna, Austria. The test results will become available in November 2014. These efforts will strengthen quality control systems in APHCA countries, leading to generation of sound data on nutritional quality of feed ingredients and feeds.

Asia-Pacific Animal Feed Resource Network: The Asia-Pacific animal feed resource network (APAF-network) has been established in mid-2014 and currently has established research partnership with institutions from 16 countries in the Asia-Pacific region (see <http://apaf-network.org/index.php/research-partnerships>). The network is envisaged as a **regional feed resources** network which:

- links researchers, institutions related to feed resources, feed companies and other stakeholders such as farmers, civil societies including NGOs, extension workers, livestock development departments, academics and consumers in the livestock supply chain; and
- provides facts, figures and information about feed resources and their efficient management for use by academia, industry, intergovernmental organizations, and national public sector agencies in support of sustainable development of the livestock sector.

FAO has formally contracted a Dr M. Uddin from Bangladesh Agricultural University as network coordinator to initiate organizational activities, while FAO-HQ (AGAS) and FAO-RAP act as advisory bodies. The network is expected to produce the following outputs:

- Feed (resource) inventory with regular updates on yearly basis;
- Assessment and forecast of feed demand and supply (feed balances);
- Price information on feeds and feed ingredients;
- Trade figures for feeds and feed ingredients (both intra and inter-regional);
- Definition and characterization of feeding systems;
- Guidelines on feed resource management at farm, national, and regional levels;
- Databases and models.

The network team is currently working on the development and population of a database for variables required for the estimation of national feed resources and feed demand, drawing on the feed assessment reports produced by APHCA member

countries. The database and models for the estimation on feed availability as well as feed demand will be reviewed at a workshop of network partners envisaged for early 2015.

Zoonoses and Food Safety (incl. Animal Health Activities)

Infectious diseases of animals pose a long-term threat to livestock production, as well to human health, in the region and the world at large. Changing livestock production systems, combined with greater movement of people, animals, goods and services, technology and investments, are challenging regulatory authorities. These not only have to keep abreast of these changes, but are also required to make the necessary adjustments, such as defining and enforcing good farming practices and implementing timely, effective and efficient disease control measures.

Livestock sector developments in the Asia-Pacific region are creating a fertile ground for the emergence of animal diseases, some of which may have zoonotic potential, and call for increased investments in animal health management capacities. Animal health management strategies need to be informed by a good understanding of the differential and localized costs of disease outbreaks, the role of production and marketing systems in generating and dispersing pathogens, and the role of policymakers and regulatory authorities in addressing these issues. Better information about the direct and indirect costs of animal diseases for producers, industries, consumers, as well as to the economy as a whole needs to be generated and translated into greater awareness and commitment to disease control by all concerned.

The management of animal diseases, zoonoses and food safety in the Asia-Pacific region is generally weak due to poor regulatory systems and heterogeneity in the capacity (and motivation) of (local) animal health services to detect and respond to disease outbreaks. Outdated and sometimes weak legislative capacity and institutional deficiencies in Asia and the Pacific make it almost impossible to monitor cross-border animal movements and to implement border control and other disease management measures at national and regional levels.

FAO-RAP is addressing zoonoses and food safety, along with other animal health issues in the Asia-Pacific region, through a number of animal health platforms (APHCA, EMPRES, ECTAD, CMC-AH, OFFLU and GF-TADS), which follow a 'best fit' mechanism in collaborating with various stakeholders. Activities in the area of animal health, zoonoses and food safety cover four functional work areas, namely: (i) coordination, (ii) capacity building, (iii) information generation and sharing and (iv) implementation of specific disease control programmes.

The main diseases / pathogens of concern with regards to food animal production in the Asia-Pacific region are listed in the table below.

Priority animal diseases in the Asia-Pacific region by livestock species

Disease	Poultry	Pigs	Cattle	Sheep/Goat
ASF ¹		x		
Anthrax ²			x	
Avian Influenza ^{1,2}	x			
Brucellosis ^{2,3}			x	x
BSE ^{2,3}			x	
CSF ¹		x		
FMD ¹		x	x	x
HS			x	
Leptospirosis ²		x	x	
NCD ¹	x			
Nipah ²		x		
PPR ¹				x
PRRS ¹		x		
Rabies ²		x	x	x
Salmonellosis ^{2,3}	x	x	x	x
Tuberculosis ^{2,3}			x	

¹ Transboundary animal disease; ² Zoonotic disease; ³ Disease of food safety concern

Overall, the activities in the area of animal health, zoonoses and food safety are designed to enhance the impact of programmes in support of the Organization's overarching global aim of combating hunger, malnutrition and food insecurity. Specifically, the activities contribute to Strategic Objective 2, *Increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner*; Strategic Objective 4, *Enable more inclusive and efficient agricultural and food systems at local, national and international levels*, and Strategic Objective 5, *Increase the resilience of livelihoods to threats and crises*.

Over the reporting period, FAO-RAP carried out a large amount of activities in the area of animal health, zoonoses and food safety management, comprising:

- Support to national efforts to control selected 'high impact' diseases present in their country (e.g. FMD, PPR and HPAI) and / or to respond to the risk of specific emerging / re-emerging diseases (e.g. ASF; AIV H7N9);
- 'Generic' enhancement of national disease control systems through capacity building (Field Epidemiology Training Programme for Veterinarians, FETPV, EAHMI, diagnostic laboratories), technology transfer (e.g. animal identification,) and revision of relevant legislative frameworks (e.g. Lao PDR and Mongolia);
- Fostering regional cooperation and the development of regional approaches and coordination capacity for the control of priority transboundary and emerging diseases (e.g. FMD in SAARC, Avian Influenza H7N9 control, etc.);

- Promotion of Human – Animal Health Sector collaboration (One Health) for the enhanced control and prevention of endemic zoonotic diseases (particularly rabies) and early detection of emerging zoonoses; and
- Information generation and dissemination.

Support to specific national disease control programmes: From the list of projects supported by the RAP Livestock group, at least 20 address animal health issues. The national and regional projects either support a specific disease control programme or provide cross cutting functions. The main disease specific control programmes supported are:

- ***FMD control:*** One of the major tools to FMD control under the Global FMD control strategy is the use of the FMD Progressive Control Pathway (FMD-PCP). The FMD-PCP offers a structured 5-stage approach to FMD control, from the beginning up to the point where a country can submit a dossier to the OIE for official recognition of freedom from FMD. The FAO FMD control projects are designed for recipient countries to follow the PCP. Countries in South and Southeast Asia undertook a self assessment of their current PCP status. Except for India, which is in Stage 3, most South Asian countries are in end Stage 1 to Stage 2. For Southeast Asia, Lao PDR and Cambodia are near completion of Stage 1 while Viet Nam, Thailand, Malaysia are in Stage 3.
- ***Rabies control:*** FAO has become increasingly involved with rabies control and has become an active member of the Partners for Rabies Prevention (PRP), an informal network of a broad range of public and private stakeholders working in the field of rabies prevention and control. By raising awareness, contributing to the development of the Rabies-blue-print (www.rabiesblueprint.com) and by bringing together stakeholders from different sectors, FAO is assisting countries in Southeast Asia and South Asia in the design and implementation of rabies control programmes, in addition to developing and distributing educational materials, promoting World Rabies Day and fostering operational research. Given that highly effective rabies vaccines and diagnostics are presently available, FAO emphasizes that eradication of canine and human rabies can be achieved with commitment, resources, proper planning and coordination. This has been proven by successful efforts in Bali, Indonesia, where a rabies campaign led to a drastic reduction in cases and good progress towards elimination.
- ***Avian influenza control and prevention:*** As the threat of H5N1 continues, and the regional effort to control the disease progresses, there remain critical areas, which continue to provide an avenue for emergence of the disease. The recent epizooning of H5N1 in Asia has shown that there are geographical areas where closely related viruses are circulating and where frequent incursion or exchange took place. The situation is complicated by the continual emergence of new threats in the form of low pathogenic strains, which may not have significant impact on poultry, but have caused human deaths, such as H7N9. The presence of many unknowns in the equation also make the disease more challenging. Accordingly,

the presence of other strains of animal influenza, H5N2, H5N6, H5N8 in the region could potentially overwhelm animal health systems. FAO continues to support the H5N1 endemic countries and the H7N9 high risk countries emphasizing emergency preparedness, market value chains and cross border cooperation.

'Generic' enhancement of disease control capacity: To implement and sustain disease control initiatives, capacities of countries need to be strengthened. Hence the following activities aim to harness the strengths and resources available in the region allowing countries to improve their generic capacity to address disease risks.

- ***Field epidemiology training programme for veterinarians (FETPV):*** The FETPV two-year training programme continues to be run with the DLD of Thailand taking the lead in handling the programme. Graduates from the region have returned to their respective countries and have been instrumental in leading the epidemiology aspect in their areas of work. Satellite programmes have been established in Cambodia, China, Lao PDR and Viet Nam.
- ***Laboratory capacity building:*** Since 2010, at least 12 laboratories in Asia have been participating in the Regional Quality Assurance and Proficiency Testing Programme aiming to improve the quality of their diagnostic services. Apart from animal diseases, zoonotic diseases for which the quality of diagnostic services has been improved include influenza H5N1 and rabies. Diagnosis of H7 has been included in the programme recently and brucellosis will be included by 2014. At least 29 laboratories of 10 countries have participated the Regional Biosafety Improvement Programme since 2010. Shortfalls and gaps in the biosafety system in these laboratories have been identified and corrected.
- ***FAO-APHCA/OIE/DLD regional workshop on brucellosis diagnosis and control:*** The workshop, jointly organized by FAO-APHCA, OIE and DLD, was held in Chiang Mai from 19 to 21 March with the objectives of (i) providing an update on the brucellosis situation, including its epidemiology, in Asia and the Pacific; (ii) presenting and analyzing the proficiency test (PT) results obtained from the participating laboratories/ countries; and (iii) promoting collaboration on diagnosis and control of brucellosis in the Region. The workshop was attended by veterinary officers from 14 countries in the Asia-Pacific region while Australia, China PR and Fiji were represented by observers.

The main conclusions reached at the workshop were that:

- Continuous efforts are still required to improve/strengthen the laboratory diagnosis capacity for brucellosis taking into consideration the epidemiological situation in animals and humans in each country.
- There is a need to: (i) strengthen information sharing on the epidemiological situation of Brucellosis in the region, (ii) establish a regional laboratory network, and (iii) promote regional collaboration on disease diagnosis and control.

All participating countries fully supported Thai NIAH applying both to: (i) APHCA for endorsement as an APHCA Regional Brucellosis Laboratory/Center at the forthcoming 38th APHCA Session; and (ii) the OIE, under the standard OIE procedure for designation as an OIE Reference Laboratory for Brucellosis, possibly at an OIE World Assembly of Delegates in the near future.

Details of the workshop programme, participants, presentations including an overview of the results of the laboratory proficiency tests and the full set of conclusions and recommendations can be found under the 'events' tab on the APHCA website.

Fostering regional cooperation: FAO has continued to collaborate closely with the technical partners, OIE and WHO especially with recent developments on emerging pathogens such as the H7N9. Collaboration with the regional organizations such as ASEAN, SAARC and SPC has remained strong. The main achievements over the past year have been:

- ***Establishment of regional support units in ASEAN and SAARC:*** FAO, with the support of the EU-HPED programme, assisted in the establishment of the regional support units (RSU) in ASEAN and SAARC. The RSUs are manned by nationals from the respective sub-regions with the ASEAN RSU hosted by FAO RAP and the SAARC RSU hosted by FAO in Kathmandu, Nepal. The establishment of the RSUs follows the GF-TADs structure of regarding ASEAN and SAARC as Regional Specialized Organizations (RSO) with each RSO housing an RSU. Mechanisms to retain the RSUs without the EU-HPED support, which will end by December this year, have been put in place.
- ***Establishment of the ASEAN Collaborating Center on Animal Health and Zoonoses (ACCAHZ):*** ACCAHZ is an offshoot of the ASEAN RSU establishment through the FAO EU-HPED programme and is envisioned to take the place of the RSU. ACCAHZ has been proposed, endorsed and approved at the highest levels of the ASEAN hierarchy. hence it is purely owned by ASEAN with hosting and cost arrangements agreed amongst the countries. Malaysia has signaled its willingness to host the ACCAHZ for the first four years followed by Thailand which will host it for the next four years.
- ***Development of regional strategic frameworks for ASEAN and SAARC:*** Another mechanism to sustain the gains from the support provided by the EU HPED programme was the development of regional strategic frameworks both for ASEAN and SAARC, aimed at strengthening the policy and coordination for laboratory and epidemiology capacity development at the regional level. The activities agreed upon by the veterinary epidemiology consortium as well as the laboratory directors forum are guided by these strategic frameworks.

Promotion of Human – Animal Health Sector collaboration: Given most emerging diseases affecting humans are of animal origin and given the high human costs of zoonotic diseases in the Asia-Pacific region, FAO is strongly committed to the promotion

of intimate collaboration between the human and animal health sectors, i.e. the implementation of a 'One Health' approach. The main activities in this area are:

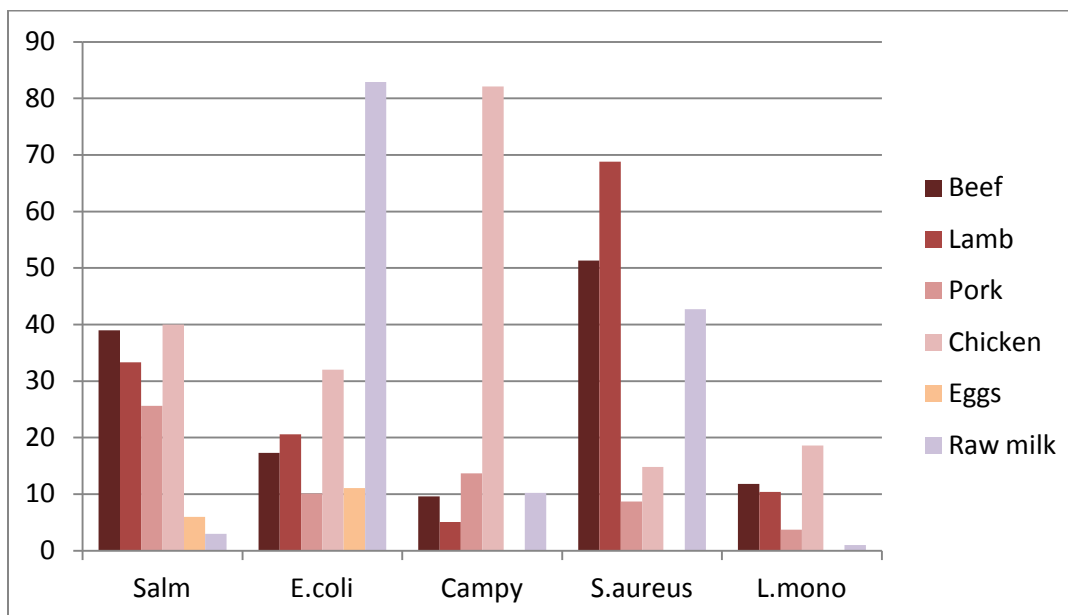
- ***Tripartite meeting on collaboration in zoonosis control:*** To promote the concept of One Health, the technical agencies (FAO, OIE, WHO) first met in 2010 to plan how One Health can be operationalized at the country level. Succeeding annual meetings focused on the implementation of One Health in terms of establishing a coordination mechanism to promote activities jointly conducted by both human and animal health sectors. The fifth Tripartite meeting, to be held in November 2014 in Thailand, will be hosted by FAO. The meeting will focus on emerging avian influenza threats, provide updates on rabies control and AMR work and will review progress in cross-sectoral coordination within countries.
- ***Rabies control:*** Rabies has been selected as the priority disease to be tackled under the tripartite collaboration. FAO uses and promotes the step-wise approach for the elimination of rabies (SARE) in all rabies control initiatives. The SARE was developed by FAO in coordination with the Global Alliance for Rabies Control (GARC) and is similar to the Progressive Control Pathway being applied for FMD control. The SARE is composed of six stages, ranging from Stage 0, where no information on rabies is available in a suspected rabies-endemic area, to Stage 5, where valid and timely epidemiological surveillance data confirm the progressive elimination of rabies in humans and canines. The SARE principle was shared during the drafting of the ASEAN Rabies Elimination Strategy. At present, FAO is involved in rabies control projects in Viet Nam and Indonesia.
- ***One Health implementation in SAPA:*** The Pacific Island Countries through the Secretariat of the Pacific Community have commenced activities on One Health promotion and advocacy with the assistance of FAO. The thrust for now is to introduce the concept of One Health and to advocate for the adoption and implementation of One Health on the ground.

Information generation and dissemination: Information related to animal health, zoonoses and food safety has been generated through collaboration with national research institutes while information exchange / dissemination occurs through multiple and diverse mechanisms. The main results and information exchange pathways are listed in the following:

- ***Review of microbial contamination of animal source foods in the Asia-Pacific region:*** Currently, there is a dearth of systematically collected, reliable data on the prevalence of microbial contamination of animal source food (meat, milk, eggs) in the Asia-Pacific region. As contaminated food of animal origin is an important cause of food-borne illness on the one hand, and serves as a means of transmission of AMR genes from microorganisms associated with food animals to those associated with humans, literature review of the topic was commissioned to obtain an initial overview of the situation.

The review includes peer-reviewed journal articles and governmental documents published over the past 5 years (from 2009-2014) so as to cover the most current developments in the field. Searches were restricted to English publications and peer-reviewed scientific literature was preferentially used. Preliminary results of the aggregated contamination rates of various unprocessed animal-derived foods with selected micro-organisms are presented in the graph below.

Proportion (%) of samples of unprocessed animal sourced food contaminated with selected microorganisms capable of causing food-borne illness



Contamination with *Salmonella enterica* is found to be close to 40 percent in beef and chicken meat and between 25 and 35 percent in lamb and pork. On aggregate, more than 80 percent of unprocessed chicken meat samples have been found to be contaminated with *Campylobacter spp.* while the situation is similar with *E. coli* in raw milk.

Although results are only preliminary, the review provides evidence of substantial contamination rates of unprocessed animal derived food with major bacterial pathogens in the Asia Pacific region and corroborates the widely held opinion that animal products are an important source of risk of food-borne disease.

- **Veterinary epidemiology consortium:** The veterinary epidemiology consortium, composed of research and academic institutions working in the region on capacity building, research, extension, etc., continues to meet under the leadership of FAO. The consortium meetings are venues for consortium members to plan and complement activities in the region and inform countries of current programmes being implemented by consortium members.

- **Laboratory directors' forum:** The laboratory directors' forum, established in 2012, meets annually and at its last meeting discussed issues of laboratory bio-security and bio-safety for personnel. Among other things, laboratory directors agreed to have their bio-safety cabinets calibrated and to have personnel working on rabies diagnosis vaccinated against rabies.
- **FAO-RAP website:** Meeting reports and publications are all uploaded to the FAO-RAP website (www.fao.org/asiapacific/en/). Some topics of interest are GF-TADs and EU-HPED meeting, value chains, the ACCAHZ, the EAHMI conference, laboratory meetings, and several meetings on avian influenza.

Antimicrobial (AMR) Resistance Management

The management of AMR associated with food animal production was first tabled as an issue requiring increased national attention and regional coordination at the 36th APHCA Session held in Negombo. At the 37th Session delegates reported on actions undertaken to improve AMR risk management in their countries and agreed that AMR become one of APHCA's thematic focus areas.

AMR has also been included as topic under FAO Strategic Objective 3 of FAO's renewed Strategic Framework contributing to the work area '*Provision of strategic and technical advice to governments that promote sustainable management of land, water, forests, fisheries and other natural resources.*'

Activities carried out in the thematic area of AMR over the reporting period were:

- A systematic 'literature review of antimicrobial resistance in zoonotic bacteria from livestock in East, South and Southeast Asia' (Chulalongkorn University);
- The preparation of a report on 'antimicrobial usage and alternatives for prophylaxis and performance enhancement in pig populations in East and Southeast Asia', taking post-weaning diarrhea (PWD) as specific case study disease (Royal Veterinary College);
- Contribution to an estimate of 'antibiotic use in Chinese swine and broiler poultry production' carried out by Johns Hopkins Bloomberg School of Public Health;
- A regional (ASEAN) laboratory training workshop on 'antimicrobial susceptibility Testing (AST) of bacteria isolated from farm animals' carried out at the Center for Antimicrobial Resistance Monitoring in Food-borne Pathogens of Chulalongkorn University with support from the Royal Thai Department of Livestock Development (DLD); and
- The formulation of an FAO-TCP entitled 'enhancing national capacities for antimicrobial resistance risk management in animal food production in Thailand' (app. US\$225 000 over 2 years, in approval stage).

AMR literature review: Although analysis and interpretation of the data found in the literature were constrained by a substantial number of shortcomings in many of the individual studies, the results, when aggregated in broad categories of AMR level 'ratings' provided by the European Food Safety Authority (EFSA) - resistance level $\leq 10\%$ = 'low'; $>10\%$ to 20% = 'moderate'; $>20\%$ to 50% = 'high'; $>50\%$ to 70% = 'very high'; and $>70\%$ = 'extremely high' - to selected compounds obtained for the same bacterium isolated from poultry and pigs (in overlapping but different sets of studies) as well as those of related but different bacterial species (e.g. *C. jejuni* and *C. coli*; *E. faecalis* and *E. faecium*; *Salmonella* and *E. coli*) isolated from the same host class were very consistent. The broad estimates of the level of AMR in different bacteria from various livestock species thus appear quite robust and, if fairly accurate, provide ample reason for concern.

For illustrative purposes, the following tables present the results of the literature review for *E. coli* isolated from poultry and pigs in East, South and Southeast Asia and provide a comparison to AMR results for *E. coli* isolated from the same animal species in countries which have implemented national AMR monitoring programmes.

AMR (%) to selected antimicrobials in *E. coli* isolates from poultry in East, South and Southeast Asia (AS) and in countries with national AMR monitoring programmes

Class	Compound	AS	AU ¹	NZ ²	US ³	DK ⁴	NL ⁵	FI ⁶
AMI	Gentamicin	21	0	0	43	0	9	0
	Kanamycin	29			6		9	3
	Streptomycin	34		10	49	11	58	14
CEP	Ceftiofur	8	0	0	10	2		1
	Cephalothin	34		2				
PEN	Amoxicillin	59		5	12			
	Ampicillin	67	33		22	20	70	6
PHE	Chloramph.	41	2	1	1	0	16	0
	Florfenicol	27	3			0	1	0
POL	Colistin	1				0		
QUI	Ciprofloxacin	51	0		<0.5	8	50	2
	Nalidixic acid	53	2	6	3	8	50	2
SUL	Sulfamethox.	40		31			61	8
TET	Oxytetracycline	70	44					
	Tetracycline	61		12	43	8	51	7
TRI	Trimethoprim	24		7		10	51	2
	Trim-Sulfa	75	27		6			

Low: $\leq 10\%$	Mod.: $>10\%$ to 20%	High: $>20\%$ to 50%	V. High: $>50\%$ to 70%	Ex. high: $>70\%$
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¹ AU: DAFF 2007; ² NZ: MAF 2011; ³ US: NARMS 2010; ⁴ DK: DANMAP 2012; ⁵ NL: MARAN 2013; ⁶ FI: FINRES-VET 2007-2009

AMR (%) to selected antimicrobial compounds in *E. coli* isolates from pigs in East, South and Southeast Asia (AS) and in countries with national AMR monitoring programmes

Class	Compound	AS	AU ¹	NZ ²	US ³	DK ⁴	NL ⁵	FI ⁶	SW ⁷
AMI	Gentamicin	24	3	0	1	1	2	0	1
	Kanamycin	36			1		1	0	1
	Streptomycin	66		32	15	42	60	15	16
CEP	Ceftiofur	<1	0	0		1		0	
	Cephalothin	18		2					
PEN	Amoxicillin	57		9	0				
	Ampicillin	57	35		13	29	25	7	13
PHE	Chloramph.	47	44	10	3	3	12	0	4
	Florfenicol	36	34			1	1	1	0
POL	Colistin	5				0			0
QUI	Ciprofloxacin	31	0		0	1	1	1	2
	Nalidixic acid	36	5	1	0	1	1	1	2
SUL	Sulfamethox.	60		33			45	12	
TET	Oxytetracycline	70	76						
	Tetracycline	87		49	47	36	56	18	8
TRI	Trimethoprim	26		8		22	37	12	11
	Trim-Sulfa	76	33						

Low: ≤10%	Mod.: >10% to 20%	High: >20% to 50%	V. High: >50% to 70%	Ex. high: >70%
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¹ AU: DAFF 2007; ² NZ: MAF 2011; ³ US: NARMS 2011 (pork); ⁴ DK: DANMAP 2012; ⁵ NL: MARAN 2013; ⁶ FI: FINRES-VET 2007-2009; ⁷ SW: SVARM 2011

For *E. coli* isolates from poultry, the pooled estimate of AMR across the study region fell into the categories of ‘high’ to ‘extremely high’ for 15 of the 17 compounds (from nine classes) used for comparison. ‘Low’ levels of AMR were only found for the 3rd generation cephalosporin ceftiofur and for colistin, representative of the polymyxin class. The pattern of AMR in *E. coli* isolates from pigs was very similar to that in poultry isolates and ‘high’ to ‘extremely high’ rates of AMR were found for 14 of the 17 compounds in the comparison. Resistance to chloramphenicol was estimated as ‘high’ and resistance to trimethoprim-sulfa as ‘extremely high’ both in isolates from poultry and from pigs. Comparison of the pooled AMR estimates in *E. coli* isolates from poultry and pigs in East, South and Southeast Asia with those from systematic AMR monitoring efforts in high income countries revealed that for most compounds used for comparison they fell into the highest observed resistance category.

The document is currently under revision of the publications committee of FAO’s regional office for Asia and the Pacific. The lead researcher is expected to present the results of the study at the upcoming Animal Health Conference in Shanghai on 4 November.

As an outcome of the 24th Session of FAO’s Committee on Agriculture (COAG), held in Rome from 29 September to 3 October, FAO was requested to provide a report on antimicrobial resistance and the role of FAO, OIE, WHO and other relevant partners,

detailing action and budget, in line with FAO's Strategic Framework, to be submitted to the FAO Council and Conference, including a draft resolution. FAO-RAP has been asked to participate in the task force that will oversee the preparation of the document and draft resolution.

Alternatives to antimicrobial use in pig production: A review of studies on alternatives to antimicrobials carried out in East and Southeast Asia indicates that some probiotics such as *Lactobacillus* spp., *Bacillus* spp., *Enterococcus* spp. or yeast culture, when added to pig feed at specific concentrations, can improve growth rates and prevent the occurrence of enteric diseases such as post weaning diarrhoea. Some studies even showed that they produce similar rates of growth to piglets given antibiotics. Plant based alternatives, such as bamboo charcoal, bamboo vinegar or fermented soy beans, have also been investigated and proved to have a beneficial effect on growth comparable to animals fed with antibiotics.

Overall, the studies reviewed in the report provide evidence that a variety of alternative approaches can promote growth and prevent diarrhoea to a certain extent. However, it has to be noted that for some of these approaches the results are contradictory between studies and that most of them are rarely as effective as antibiotics.

Research efforts are therefore still needed to identify effective alternatives to antibiotics for promoting growth and preventing disease. The report identifies three main research needs, namely (i) enhancing the comparability of experimental studies by producing guidelines for conducting experimental studies aiming at identifying alternatives to antibiotic usage in pigs, (ii) considering the cost of the alternatives in experimental study designs to assess their cost-effectiveness or their cost-benefit and (iii) conducting qualitative surveys among farmers to explore their rationale for using antibiotics and / or their alternatives and to identify the perceived barriers to the adoption of these alternatives.

Estimate of antibiotic use in China's pig and poultry industry: China now has the largest poultry and pig industries in the world and the Chinese production model has changed from traditional smallholder systems to large industrial units with the use of antibiotics in feeds. The specific antibiotic use in the Chinese food animal production is unclear, but high quantities of antibiotics are likely to be used because of reports of high concentrations of antibiotics in animal waste and surface waters surrounding animal feeding operations. This report provides an estimate of the volume of antibiotics used for swine and poultry production by adopting a model developed in the US for estimating drug use in feed for poultry and swine production to estimate overall antibiotic use as well as antibiotic use by class. It is calculated that more than 30 000 tons of antibiotics are used annually in China's production of swine and poultry. The highest quantities of antibiotic class use by weight are tetracyclines in swine and coccidiostats in poultry. The report is currently under peer review.

ASEAN AST laboratory workshop: Systematic testing of pathogens and commensals from livestock for antimicrobial susceptibility (AST) has not yet been established as a routine task of most public veterinary services in ASEAN while the results of AST studies

carried out by academic institutions are often difficult to compare due to methodological differences. These shortcomings have been highlighted in the past APHCA Sessions and animal health services of APHCA members are taking steps to address the issue. The intention of the 4-day training workshop (funded from FAO Regular Program budget and Thailand's DLD) was to familiarize laboratory staff from ASEAN member countries with different AST methods, to provide a forum for the exchange of professional experience, to develop an initial sampling plan and to work towards a degree of standardization of AST protocols in ASEAN countries.

The training programme was developed and implemented by Dr S. Simjee, Co-Chair Clinical and Laboratory Standards Institute (CLSI) Sub-Committee on Veterinary Antimicrobial Susceptibility Testing, Assoc. Prof. Dr R. Chuanchuen, and Dr T. Luangtongkum, both from CUARM and the Department of Veterinary Public Health, Faculty of Veterinary Science, Chulalongkorn University. The course was attended by 22 laboratory staff from eight of the ten ASEAN countries, namely Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand, and Viet Nam.

The course revealed that proficiency in AST in personnel from animal health related public institutions is in its early stages (all represented laboratories only use disk diffusion to assess AMR) and that much 'learning by doing' is still required for the various laboratories to reach a level where they produce reliable results. It was agreed that CUARM would perform a 'ring test' in early 2015 to assess the capacity of the participants' laboratories and to offer a second training course for the participants of the first course to refresh and deepen their experience.

It is also envisaged to organize a similar course for laboratory personnel of SAARC countries in 2015.

Livestock Policy Capacity Development Plan

Increases in human population and disposable income in the Asia-Pacific region are driving an unprecedented rise in demand for meat, milk and eggs, a rise, which is expected to continue over the next decades. So far, the sector has been adapting to this tremendous increase in demand in several ways including increasing livestock numbers, shifting towards shorter-cycle species, accelerating production cycles, consolidating into larger farming units characterized by high-input, high-output and spatial concentration near feed sources; and vertically integrating throughout trans-national supply chains.

The rapid expansion of and structural changes in Asia's livestock sectors have ensured increased supplies of animal sources food (ASF) for Asia's growing and more affluent populations. This process has however, also led to several negative developments including environmental degradation, pollution and influx of high levels of drug residues into the environment; emergence of antibiotic-resistant strains of bacteria; loss of biodiversity; acceleration of climate change through livestock-associated emission of green house gases; the loss and genetic dilution of local and adapted breeds due to

import of commercial exotic breeds; and marginalization of smallholder livestock keepers, for whom livestock rearing remains a key livelihood and risk-mitigation activity.

There is growing concern within and outside the government that the policies guiding livestock sector development are not keeping pace with changing sector structure and market demands. Furthermore, governments in the region are not well positioned to evaluate the impacts of policy action (or inaction) and to assess ways of course correction. There are persistent constraints to capturing evolving sector dynamics in policy discussions and articulating most appropriate responses. Externalities of livestock sector development such as support of rural livelihoods, pressure on natural resources, biodiversity loss, climate change, etc. do not get sufficient policy attention.

Although departments of various governments in the region do recognize the need for improved livestock policy analysis and formulation capacity, significant constraints continue to exist in integrating national and global knowledge to develop realistic approaches to dealing with rapidly changing contexts. The limited policy analysis capabilities and the inability of existing arrangements to draw upon expertise in related disciplines have been recognized by FAO and APHCA as major problems to be addressed through the provision of targeted investments.

Livestock policy capacity development contributes directly towards addressing the critical areas identified in FAO's strategic framework, in particular, Strategic Objective 1, 'Contribute to eradication of hunger, food insecurity and malnutrition', and Strategic Objective 2, 'Increase and improve provision of goods and services from agriculture, forestry and fishery in a sustainable manner'. Within these strategic objectives, the activities most directly contribute to following organizational outputs:

- *Strategic Objective 1:* member countries and their development partners adopt and implement evidence based and inclusive governance mechanisms for eradicating food insecurity and malnutrition, and member countries and their development partners formulate, implement, monitor and evaluate policies, programs, investments and legislation to eradicate food insecurity and malnutrition.
- *Strategic Objective 2:* stakeholders in member countries strengthen governance - the policies, laws, management frameworks and institutions that are needed to support producers and resource managers - in the process towards greater sustainability of agricultural sector production systems, and stakeholders make evidence based decisions in the planning and management of the agricultural sectors and natural resources to support the transition to sustainable agricultural production systems.

In view of the foregoing, a project proposal was prepared and submitted to FAO Technical Cooperation program for funding. The project titled 'Building Policy Capacity for Sustainable Livestock Sector Development in Asia' covers Indonesia, Thailand and Lao PDR and aims to produce:

- A set of capacity building tools, training programs and a high level advocacy event to enhanced capacity in the East and South-East Asia Region in the analysis and formulation of livestock sector policies and programs to balance multiple goals within the context of transforming livestock production and marketing systems,
- Livestock sector policy and implementation plans formulated/reformulated for three countries based on sound data analysis and wide stakeholder consultations, and
- A permanent policy platform with a clear modus operandi for normative and on-demand work to implement the livestock policy and the implementation plan.

The project was reviewed critically at FAO RAP and in FAO HQ and was approved with a total financing outlay of USD435 000. The envisioned duration of the project is September 2014 to August 2016.

Information Dissemination and APHCA Positioning

In line with the Vision of APHCA to establish itself *as a prime source of information, knowledge, expertise and experience on all aspects of livestock sector development in the Asia-Pacific region* formulated at the APHCA Strategy Workshop in 2012, considerable time has been devoted to maintenance and improvement of the APHCA website. The activity contributes to the output 'Relevant data and information assembled, aggregated, integrated and disseminated, and new data generated through analyses and monitoring – jointly with partners' falling under FAO's Strategic Objective 2, 'Increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner'.

The current 'content' and 'activity' of the APHCA website is summarized in the table below.

Content of APHCA website, visits and downloads – cumulative 30.09.12 to 30.09.2014

Item	30.09.12	31.08.13	30.09.14	Diff. 13/14
News items posted	87	482	911	421
Uploaded documents	146	194	257	63
Links to videos	0	82	94	12
Links to institutional web-sites	142	158	181	23
Unique visitors	na	4,588	12,532	7,944
Visits	39,222	319,026	2,221,764	1,902,738
Downloads	28,714	112,645	233,740	121,095

Over the 13-month period from 31 August 2013 to 30 September 2014, the site received slightly more than 1.9 million visits, i.e. an average of more than 100 000 visits per month, which constitutes an increase of around 600 percent compared to the previous reporting period. The number of recorded unique visitors rose from 4 588 to 12 532, an

increase of nearly 8 000 visitors. Forty-nine percent of the visitors reside in APHCA member countries.

Around 120 000 document downloads were recorded over the 13-month period. The three most frequently downloaded documents by document category are presented in the table below.

Most frequently downloaded documents by category

Document type	Title	Year of Publication	Downloads 2013/14
Book	Meat Processing Technology	2007	657
	Economics of Livestock Sector Development	2012	488
	Livestock in a Changing Landscape, Vol. II	2010	484
Guide / Manual	Designing and Implementing Livestock Value Chain Studies	2012	598
	Foot and Mouth Disease Control	2006	431
	Quality Assurance for Animal Feed Laboratories	2011	401
Proceedings	4 th International Conference on Sustainable Animal Agriculture, Lanzhou, China	2013	39 836
	1 st Asia Dairy Goat Conference, Kuala Lumpur, Malaysia	2012	8 985
	1 st ASEAN Conference on Animal Production, Kuching, Malaysia	2014	3 313
Working Paper / Study	Smallholder Livestock Production Programme (Cambodia)	2007	906
	Non-Conventional Feed Resources in Asia and the Pacific	1985	743
	Quantitative Risk Assessment of HPAI H5N1 Virus Release via Cock Fighting Activities	2011	635
Research Brief	Pro-Poor Disease Risk Reduction for Smallholder Poultry Supply Chains in Cambodia	2012	464
	Investing in Livestock Sector Development for Poverty Reduction	2013	445
	Antimicrobial Use in Livestock Production and Antimicrobial Resistance in the Asia-Pacific Region	2012	368

Hardcopies and CD-ROMs of FAO and APHCA publications have been distributed upon request and in conjunction with workshops and meetings.

The APHCA web-site has established itself as an important point of access to current and historical information about the livestock sector in the Asia-Pacific region and provides its membership a powerful means to disseminate and receive information about livestock sector issues in the region.

Work Planned up to End 2014

- 12 – 13 November 2014, Delhi, India, Mid-term Review of TCP/IND/3402 [JO]
- 17 November 2014, Beijing, China, ASF Policy Meeting (TCP/CPR/3501) [CB]
- 18 – 20 November 2014, Beijing, China, FAO/OIE Workshop on Swine Diseases in Asia
- 24 – 26 November 2014, Bangkok, Thailand, 5th Tripartite Meeting on Collaboration in Zoonoses [CB]
- 27 – 28 November 2014, Bangkok, Thailand, Meeting of National Project Officers under the ROK FMD Project (GCP/RAS/283/ROK) [CB]
- 17 – 18 December 2014, Bangkok, Thailand, Closing Workshop of the H7N9 regional TCPs (TCP/RAS/3406 and TCP/RAS/3407) [CB]

Proposed Activities and APHCA Budget for 2015 (APHCA 2014/06)

Proposed Activities for 2015

The activities proposed for APHCA funding support fall into five of the established thematic activity thrusts, namely:

➤ **Smallholder Dairy Development**

Under this thrust, the main activities would focus on (i) the provision of continued support to and expansion of the Asia Dairy Network and (ii) facilitation of the establishment of the Dairy Asia Platform as mechanism to foster facilitate regional cooperation and collaboration in the area of dairy development.

➤ **Feed Resource Management**

The main activity under this thrust for which APHCA TF support is sought is to ensure coordination and expansion of the APAF network and the development of appropriate data capture, storage and processing tools.

➤ **Zoonoses and Food Safety**

APHCA has a long history of promoting the laboratory capacities for brucellosis diagnosis but these rarely translate into national control programmes. The organization of a 'regional brucellosis control strategy' workshop, jointly with other relevant national and international agencies, is thus one of the activities envisaged under the 'zoonoses and food safety' thrust.

Given the apparent high rates of microbial contamination of animal source foods in the region, coupled with high rates of AMR in selected food-borne pathogens, a second activity proposed under this thematic area is an assessment of the burden of (animal source) food-borne diseases in the APHCA region.

➤ **Antimicrobial Resistance (AMR) Management**

Although many countries in the region are taking regulatory steps to address AMR, development of the capacity for the generation of reliable and representative information on the extent of the phenomenon is not sufficiently high on the agenda of most agencies. It is thus proposed to organize a second, advanced, AST training course for countries in the ASEAN region and a first, hands-on AST laboratory training course for countries in the SAARC region.

➤ Information Dissemination and APHCA Positioning

The main activity under this thematic area is the maintenance and continuous updating of the APHCA website, preparation of promotional material, enhancing APHCA visibility at meetings and events as well as contributions to the organization of the latter. The main cost for this activity is the half-time position of APHCA IT clerk.

Proposed APHCA Trust Fund Budget for 2015

Functional Budget, APHCA TF

Thematic Area	Amount (US\$)
Smallholder Dairy Development	35,000
Feed Resource Management	20,000
Zoonoses and Food Safety	30,000
Antimicrobial Resistance (AMR) Management	20,000
Information Dissemination and APHCA Positioning	30,000
Total	135,000

Operational Budget, APHCA TF and Estimated Contribution of FAO-RAP

Budget Line	APHCA TF	FAO's Estimated Contribution	Total
5011 Salaries Prof.	0	45,000	45,000
5012 Salaries GS	25,000	25,000	50,000
5013 Consultants	35,000	30,000	65,000
5014 Contracts	10,000	25,000	35,000
5020 Locally Contracted Labour	0	0	0
5021 Travel	50,000	10,000	60,000
5023 Training	5,000	0	5,000
5024 Expendable Procurement	5,000	0	5,000
5025 Non-expendable Procurement	0	0	0
5026 Hospitality	1,000	0	1,000
5028 General Operating Expenses	4,000	0	4,000
Total	135,000	135,000	270,000

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Country Reports

Australia

The Australian Dairy Industry

The Australian dairy industry is Australia's third largest rural industry, producing around 9 200 million litres of milk annually. The supply chain was worth approximately \$13.3 billion in 2012–13 (including production, processing, export and retail). It is estimated that the dairy industry directly employs around 43 000 people on-farm and in dairy companies. The Australian dairy industry is characterised by predominately pasture based, family owned farms, producing a world-class product range which meets the highest standards of quality and food safety.

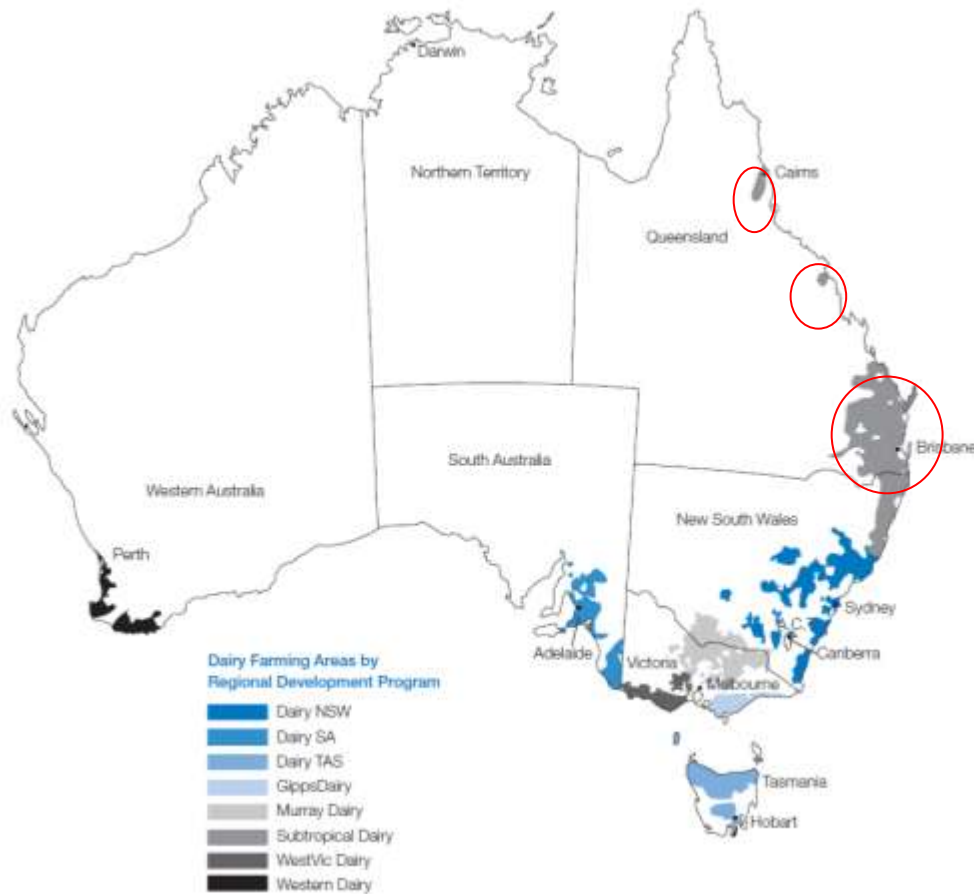
Australia is the world's fourth largest exporter of dairy products after New Zealand, the European Union and the United States. Forty per cent of domestic production is exported.

The industry was deregulated in 2000, which has allowed the Australian dairy industry to achieve considerable improvements in farm productivity through the adoption of new technologies and management practices, along with structural changes within the industry. Even though there has been a decline in dairy farm numbers, this has not translated to a decline in milk production. Annual average milk production per cow has virtually doubled from 2 848 litres in 1979–80 to 5 448 litres in 2009–2010 to 5 525 litres in 2012–13.

Dairy farmers have adapted production systems to suit their local environment and these systems include combinations of rain-fed and irrigated pasture, supplementary grain and concentrate feeding, and feedlot production, which comprises around two percent of dairy farms in Australia.

Australia's dairy industry is considered a "two-speed" industry. Northern New South Wales, Queensland and Western Australia predominately supply the domestic drinking milk market, while southern regions such as Victoria and Tasmania focus on export production. [Figure A](#) provides an overview of Australia's dairy regions.

Figure A. Australian dairy regions



Regions that have temperate climatic conditions, with moderate to high rainfall, such as that of Tasmania, southeastern Australia, northern New South Wales and southeast Queensland provide the best conditions for optimal milk production per cow.

The Queensland Dairy Industry

Australia's sub-tropical and tropical dairy producing region is focussed in Queensland and is located between the Darling Downs (west of Toowoomba), Central Queensland (Rockhampton), North Queensland (Malanda) and South East Coastal (between Gympie and Brisbane) regions. It is generally indicated by the red circles depicted at [Figure A](#).

Production and Price

The Queensland dairy industry predominantly supplies the domestic drinking milk market. It has an average herd size of around 194 cows and an average annual milk production per cow of around 4 574 litres. There are 475 dairy farms in Queensland, with around 80 of these located in the more tropical regions of central and far north Queensland.

The number of registered dairy farms in Queensland has been in decline for the past three decades. This decline is a long term trend observed in the agriculture sector, particularly in regions where price volatility, high input costs and extreme climatic events have led to some farmers choosing to exit the industry. This contraction in dairy farm numbers has led to productivity growth for the region as less efficient farming management systems become obsolete leaving larger, innovative, more efficient production and farm business management systems.

The Queensland dairy industry is a high-cost milk production area. This is reflected by the small scale of many dairy farm operations, requirements for year-round milk supply, high land costs, and the need to supplement less digestible tropical forage in herd diets¹.

The dairy industry in Queensland contributes approximately five per cent of total national milk production, or around 460 million litres of milk annually. As it predominately supplies the domestic fresh milk market, the demand for year-round milk supply is high. This affects farm productivity and profitability (or lack of) because purchased feed inputs and other costs of production are usually higher than in more seasonal production systems.

In 2013–14, the typical farmgate price in Queensland was 53.4 cents per litre. The 2014–15 farmgate prices in Queensland are forecast to remain steady, or increase by around one to three per cent².

A comparison of the Queensland dairy industry to the other Australian states is provided in Table 1, below.

Table 1. 2013-14 Australian Dairy Industry Snapshot – by State

State	Farm Number	Herd Size	Annual Production/Cow (L)	Cost of Production (cents/L)	Farmgate Milk Price (cents/L)
Qld	475	194	4 574	57.95	53.4
Vic	4 268	261	5 566	41.22	51.0
NSW	710	277	5 002	49.62	51.0
Tas	435	349	5 400	42.55	54.1
SA	270	278	6 724	39.14	49.6
WA	156	385	5 336	42.79	46.8
Nationally	6 314	290	5 471	45.50	51.3

Source: Dairy Australia In Focus 2014

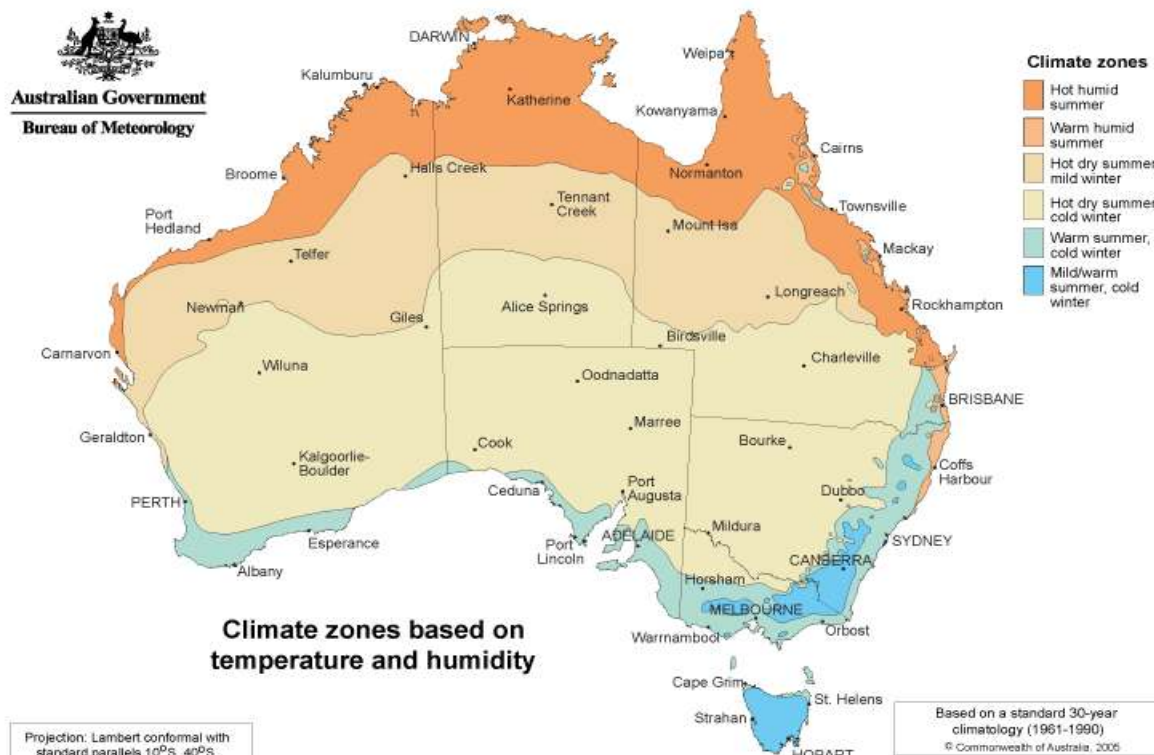
¹ Source: NDI draft report 'Changing market dynamics'; July 2014.

² Source: Dairy Australia In Focus 2014.

Climate

The Queensland dairy industry is considered to be tropical in its climate. Average yearly temperatures in Queensland are around 24.4°C and an average maximum temperature of 31°C. During the 12-months ending 30 June 2014, much of south east Queensland recorded severely deficient to well below average rainfall, while regions along the tropical north Queensland coast recorded average rainfall. During this same period maximum temperatures were between 1 and 2.5°C above normal across south east Queensland, with regions along the tropical north Queensland coast recorded close to average temperatures during the 12-months ending 30 June 2014. A general overview of regional climates is outlined at [Figure B](#).

Figure B: Climate Zones



Trade and Consumption

Domestically, there is an increase in demand for fresh milk in Queensland as its population is increasing. This local demand is currently exceeding production levels of fresh milk by farmers in the region. In 2013–14 Queensland dairy farmers produced 433 million litres of milk, and drinking milk sales in the state for the same year was 554 million litres³. Manufacturers in the region are meeting this increased demand via transportation of milk from southern states.

³ Source: Dairy Australia In Focus 2014

Key Opportunities and Challenges

1. Opportunities

The Australian dairy industry remains at the forefront of agricultural productivity and international competitiveness. However, it continues to seek out opportunities to ensure its productivity and profitability into the future. Opportunities for the Australian dairy industry include:

Increased access to emerging markets in Asia: The Australian Government continues to work to increase market access for agricultural sectors, including the dairy industry, to key Asian markets. These markets have considerable potential for consumption growth as incomes rise and diets become more ‘westernised’.

Establishment of local brands and direct source arrangements: More recently, a number of dairy farmers and dairy industry representative groups have sought to establish direct-source contracts with major retailers. The establishment of these direct source contracts has brought about the introduction of regional brands, such as ‘Farmer’s Own’ and ‘SADA Fresh’ and has returned the Murray-Goulburn Cooperative’s ‘Devondale’ brand to major retailer’s shelves.

These direct-source contracts have provided a degree of price certainty for dairy farmers in domestic producing regions. However, the long-term impacts of these contracts are yet to be determined.

2. Challenges

Dairy farmers face a range of challenges, which vary regionally. For farmers in the tropical dairy regions of Australia, challenges include the discounting strategies of major supermarkets; increased input costs; barriers to market access; and seasonality of milk production, or climatic volatility.

Discounting strategies of major supermarkets: The discounting strategies of the major supermarkets have raised concerns among producers about production risks. Industry representative bodies have suggested that strategies, such as \$1 per litre milk campaigns, pose a risk to supply as it forces farmgate milk prices below the cost of production. In response to these concerns the Australian Government supported two senate inquiries in 2010 and 2011. The Inquiries found no market distortions and that consumers would benefit from the retail strategies.

The Australian Government is undertaking a ‘root and branch’ review of competition law. The review aims to examine the broader competition framework to ensure that it continues to play a role as a significant driver of productivity and to ensure that the current laws are operating as intended and are effective for all businesses. A final report from the review is anticipated to be completed in early 2015.

Increased input costs: Over time the cost of inputs used to produce milk has increased. Electricity; fodder, particularly during periods of drought or lower rainfall; and labour have all become more expensive. For dairy farmers in Australia, purchased fodder is the largest single cash cost (fodder includes purchased grain, hay and prepared stockfeed) for dairy farmers in Australia. From 2008–09 to 2012–13, purchased fodder accounted for 26 per cent of the total milk production cost, on average. Tropical pasture and forage is generally less digestible than temperate regions, resulting in increased feed supplement requirements.

Input costs can also be influenced by access to infrastructure (for example good roads, refrigeration, pasteurisation and packaging) and supportive industries such as labour, tradesmen, technicians and veterinary services. Tropical diseases of cattle including tick borne diseases such as babesiosis and anaplasmosis can also be a constraint.

Another significant input cost is power or electricity. The Australian Government has acknowledged that under the Carbon Tax, dairy farmers would face additional costs of around \$1 365 to the electricity cost of running a dairy shed for a year, and up to \$6 980 for the larger dairy farms. Reports indicated that processors would be required to pay around \$14 million more for energy under the Carbon Tax. The Australian Government has addressed the concern of dairy farmers by removing the Carbon Tax completely.

Dairy Australia, the dairy industry services body, has conducted more than 1 155 farm energy assessments for dairy farmers nationally. These assessments have reduced both energy costs to the farmer and carbon dioxide emissions.

Barriers to market access: Global dairy markets are affected by a range of barriers to market access and trade-distorting practices by competitors and importing countries including tariffs and quotas, technical requirements, export subsidies and excessive government intervention and domestic support.

Dairy Australia estimates that Australian dairy exports attract in excess of \$200 million in direct tariff charges each year as products enter destination markets. This has a direct impact on revenue and profitability for Australian farmers⁴.

The dairy industries of many importing countries are also protected through a range of non-tariff barriers to trade. These may include restrictive customs procedures, port of entry inspections, product testing, factory inspections and stringent veterinary certificate requirements. These barriers result in lower volumes of trade and/or reduced product returns from higher supply costs or lower market prices. The removal of unnecessary or unjustified Technical Barriers to Trade (TBTs) would generate substantial

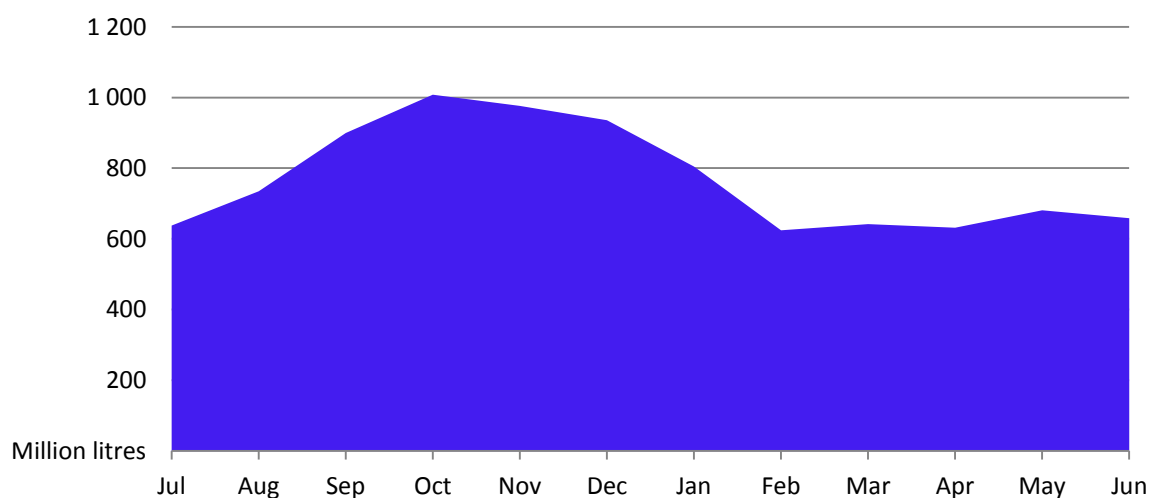
⁴ Source: Trade and the Australian Dairy Industry, 2013.

gains for the dairy industry. A recent analysis funded by Dairy Australia found that the total value of all TBT impacts for Australian dairy products is \$1.57 billion⁵.

The Australian Government continues to facilitate access to overseas markets for Australia's dairy industry through its work in negotiating Free Trade Agreements. Recent finalisation of the Korea-Australia Free Trade Agreement and the Japan-Australia Economic Partnership Agreement will help to deliver a significant boost to Australian farmers. The Australian Government continues to work on a range of other agreements, including the Trans-Pacific Partnership Agreement and the China-Australia Free Trade Agreement to ensure these barriers to trade are eliminated.

Seasonality of milk production: Raw milk production in Australia is seasonal, with production conditions reaching the optimum during October, and progressively declining from summer months into the cooler months of May and June (Figure C). This is particularly marked in the tropics where the dry season (March – October) results in significant feed and water shortages. This seasonal fluctuation in raw milk production poses a risk for dairy processors and manufacturers that are required to meet contracted supply arrangements, regardless of variations in production levels across the year.

Figure C. Seasonality of milk production in Australia, 2013–14 (million litres)

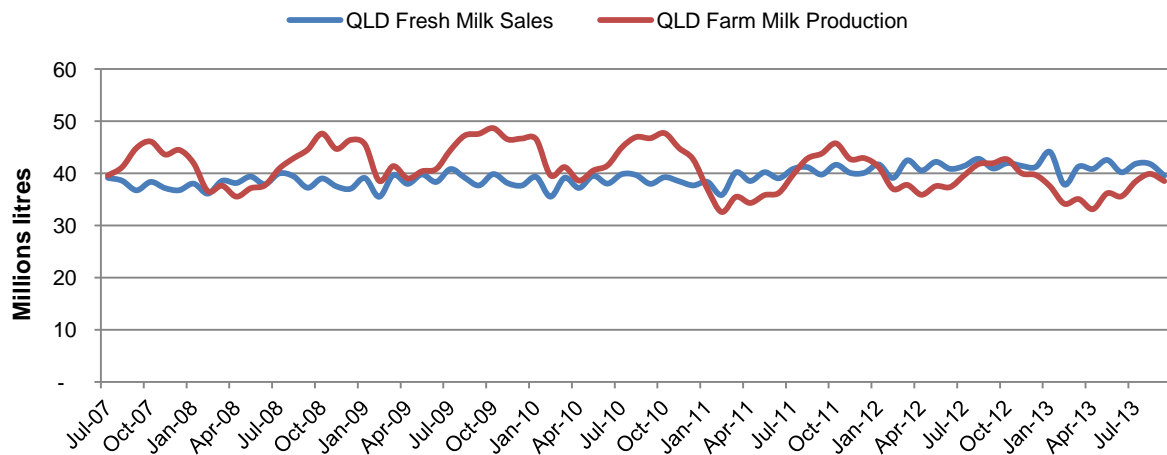


The seasonal nature of raw milk production results in periods of excess supply and shortfalls particularly in domestic drinking milk markets, such as Queensland. In these situations, processors send market signals to farmers with a two-tiered contract pricing system, which pays farmers a higher price per litre for tier-one milk, and a lower price for tier-two milk, which is excess to contract requirements.

⁵ Aggregation of comparative impacts reported in the publication “Comparative evaluation of technical barriers to trade for Australian dairy products”, David Harris and Ian Shaw, July 2014.

The gap between Queensland's total farm milk production and its total fresh milk sales has increased in recent years, potentially affecting processor / manufacturer returns (Figure D).

Figure D. Queensland fresh milk sales and farm milk production 2007–2013



Source: Dairy Australia; 2014

Farmers producing milk for the domestic drinking market such as those in Queensland have limited ability to expand their businesses beyond the drinking market due to a lack of processing plants. Many processing plants have closed in these regions since deregulation in 2000. This means there is limited scope for processing excess milk, leaving farmers in these regions with little opportunity to absorb price fluctuations or to 'hold out' for a better price.

Climate: In addition to the climate related challenges outlined in the 'Seasonality of milk production' section, generally high tropical ambient temperatures can cause heat stress in dairy cattle and this needs to be managed to avoid illness, lower fertility rates, and production losses. Cows eat less during times of hot weather, which can reduce milk production by 10 to 24 per cent. To compensate for this, farmers must increase the amount of starch and high quality fibre in the diet to maintain stable rumen and energy levels.

To reduce the heat stress for cows, farmers in tropical regions also build shelters for the cows, install water sprinklers and fans in the dairy and adjust milking times to cooler parts of the day.

Furthermore the wet season can produce cyclones and floods with associated losses depending on their severity. Cows are often unable to be milked during extreme weather events, which cut electricity supply and lead to animal health issues such as mastitis and lameness. Farmers in these regions must be prepared for such events with alternative electricity sources, fodder reserves which remain dry and dry stand-off areas which preserve the pasture base.

Other countries: The challenges can be greater still in developing countries where some diseases and pests that are exotic to Australia, such as brucellosis (*Brucella abortus*) and screwworm fly, thrive. Also in some countries cultural practices and education levels may not initially fit well with the intensive husbandry requirements of dairy production, such as twice daily milking and close observation of post-partum and pregnant cows necessary for high reproductive rates and efficient milk production.

Potential Areas for International Cooperation

Due to Australia's small domestic capacity for Research and Development (R&D) relative to larger economies, it is important for the Australian dairy industry to pursue international R&D research projects. The Australian dairy industry is currently engaged in a range of collaborative initiatives, with support from the Australian Government, Dairy Australia and the relevant state and territory governments.

For example, scholarship programmes, such as Dairy Australia's recently announced 'South-East Asia Scholarship Program' will see up to 15 South East Asian dairy representatives being hosted in Australia to learn about Australian dairy manufacturing and processing systems. This program, co-funded by Dairy Australia and the Victorian Department of Environment and Primary Industries (DEPI), is also supported through the Australian Government's provision of \$19 million in matching funds annually to Dairy Australia for RD&E. The scholarship program, to begin in 2015, will be tailored to meet the South East Asian region's needs, with a rotating focus on different aspects of dairy practice each year. This program builds on other successful scholarship programs facilitated by Dairy Australia in China and Japan.

The Australian Government has also established long-standing agreements with Japan and China to host annual dairy talks. These talks facilitate an exchange of information about the Japanese, Chinese and Australian dairy industries. They provide excellent opportunity to gain further understanding of the challenges and opportunities facing each country's dairy industry.

The Department of Foreign Affairs and Trade's agency - the Australian Centre for International Agricultural Research (ACIAR) continues to facilitate a range of collaborative research projects in developing countries, including in South East Asia. ACIAR's mandate is to plan, fund and manage projects across a broad range of agricultural and development areas. Approximately three quarters of the Centre's research budget is allocated to bilateral collaborative development-related research between Australia and developing countries. Projects funded by ACIAR address problems of mutual interest and benefit to developing countries and Australia, through fields in which Australia, or international agricultural research centres, have comparative advantage. Completed projects include *Integrated crop and dairy systems in Tibet Autonomous Region, PR China* and *Improving dairy production in Pakistan through improved extension services*.

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Bhutan

I. The Current Dairy Farming Scenario

Cattle rearing is ubiquitous among rural farming communities. From the total rural household of 84 441 (ADB and NSB 2013), almost 52 436 households (DOL 2014) rear cattle for multiple reasons: milk production, draft, farm yard manure production, and meat. The multiple function of cattle led to evolution of two cattle rearing systems – the transhumant herding dominated by native breeds and sedenterized stall fed system dominated by exotic breeds and their crosses – to enable farmers to optimally utilize and integrate cattle in their farming system. Transhumant herding, although in decline, is still common; hence, 75% of the cattle population still constitutes local breed: Siri cattle and Mithun and their respective back crosses; the suitable breeds for production of draft animals. The remaining 25% are exotic breeds: Jersey, Brown Swiss and their respective crosses.

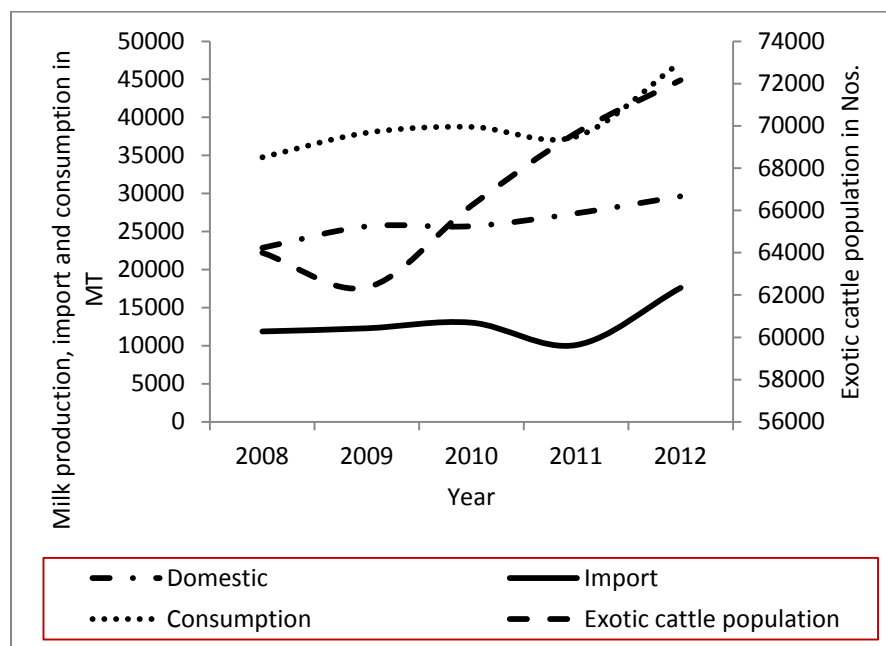


Figure 1. Production, import and consumption trends of milk and population trends of exotic cattle

With increasing consumption of fresh milk (8% per annum) between 2008 to 2012; the exotic cattle population correspondingly increased by 3% per annum during the same period to fulfill the increasing demand. The domestic production increased by 6.2% per annum (Figure 1). Despite increased domestic production, it met only 62% of the demand (DOL 2013). The remaining demands were met through import. In 2012 alone, Nu.⁶ 870 million worth of milk and milk products were imported with the highest import

⁶ 1 US\$ = Nu. 60

attributed to milk powder – worth of Nu. 511 million (DOL 2013). There is zero export of milk partly due to available market within the country and also due to relatively high production cost, estimated to Nu. 23 per liter, which make it less competitive for export markets.

The increasing demand of milk and shortage of household labour is triggering a gradual shift of herders from the transhumant way of herding to sedenterized farming. Along with the gradual shift of farming systems, relevant institutions, both government and non-government, have made the required adjustments to facilitate inputs, production, processing, marketing and other support services. Currently, these services are delivered through an institutional set up as illustrated in Figure 2.

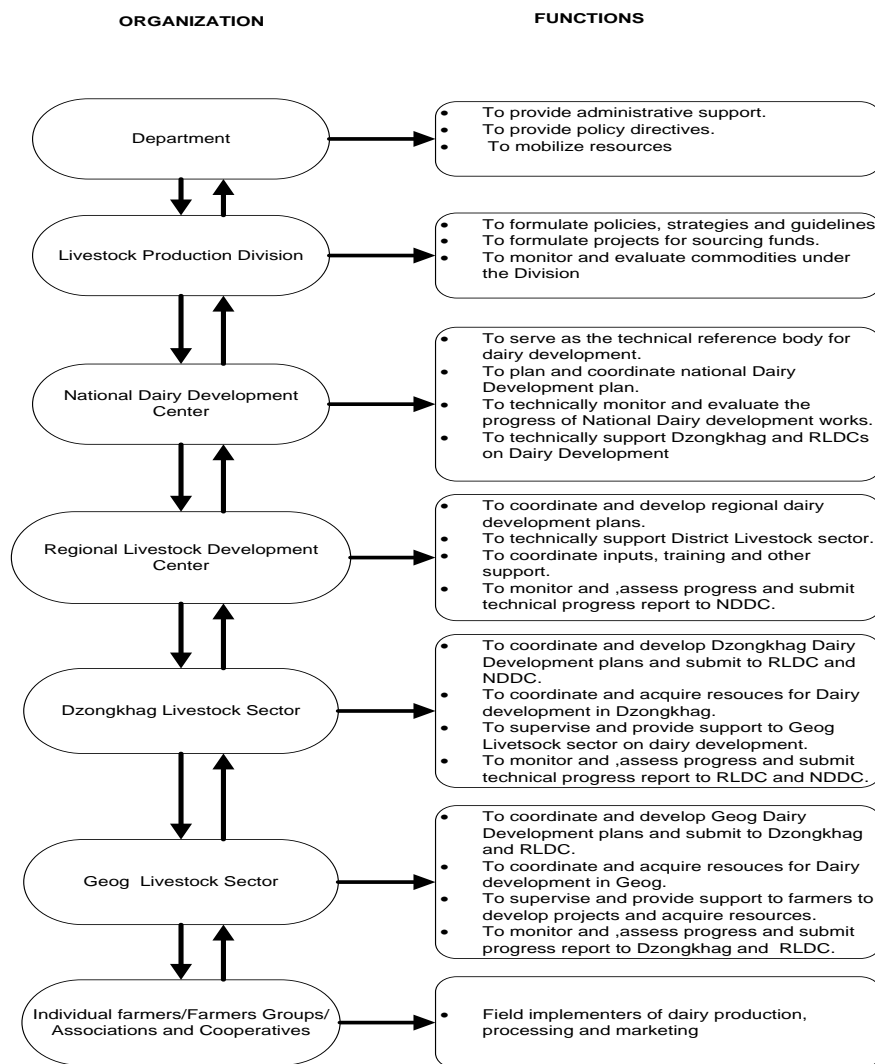


Figure 2. Dairy development institutions and respective functions

Animal health services are delivered through the network of Dzongkhag⁷ veterinary hospitals and Geog⁸ extension centers with technical backstopping from National Center of Animal Health (NCAH) and Region Livestock Development Center (RLDC).

With increasing demand and, accordingly, the necessary adjustment of institutions, the roles of stakeholders at field level are gaining more importance. Therefore, field institutions such as farmers groups, associations and cooperatives require strengthening; backed by decentralized authorities with responsibility for the adequate distribution of resources for the effective facilitation and acceleration of dairy development. Currently, there are 135 functional dairy groups and associations distributed across the country spearheading the reform in the dairy value chain, right from production to consumption. It is supported by 205 Livestock Extension offices, catering for Artificial Insemination (AI), health and pasture development services. But more needs to be done, either by expansion of existing groups or by the creation of additional groups to produce and make accessible the recommended amount of milk (200gram/day/person). The average milk consumption of 2012 was 178 grams/day/person, which is lower than the recommended amount.

II. Key Opportunities and Challenges

The escalation of milk consumption could be due to changes in food habits, wherein, increasingly livestock products are consumed due to better affordability. According to the Bhutan Living Standard survey report of 2012, at least 20% of average consumption expenditure is made on dairy products. Taking into account just the population growth rate – estimated at 1.4% (NSB 2007) – as influencing factor for increasing milk demand; annual milk consumption is projected to be 55 570 MT (Figure 3.).

The increasing demand for milk and milk products provides an opportunity for enhancing domestic production and diversification of dairy products. In line with the demand, dairy development is gradually shifting towards commercialization supported by enabling policies such as: leasing of Government Reserve Forest Land for farming; priority lending support for rural enterprise through the Business Opportunity and Information Center (BOIC); Physical marketing support to be rendered in collaboration with the Food Corporation of Bhutan Limited (FCBL). Furthermore, two private processing units: one in the east under Kofuku International Private Limited (KIPL) and other in the West under Zimdra Food Private Limited provides opportunity to link small scale and sedenterized dairy farmers with large scale processors. Besides, the natural diverse agro ecological zone favours seasonal production and trading of dairy products and other essential inputs for farm operations.

⁷ Dzongkhag: District

⁸ Geog: Subdistrict

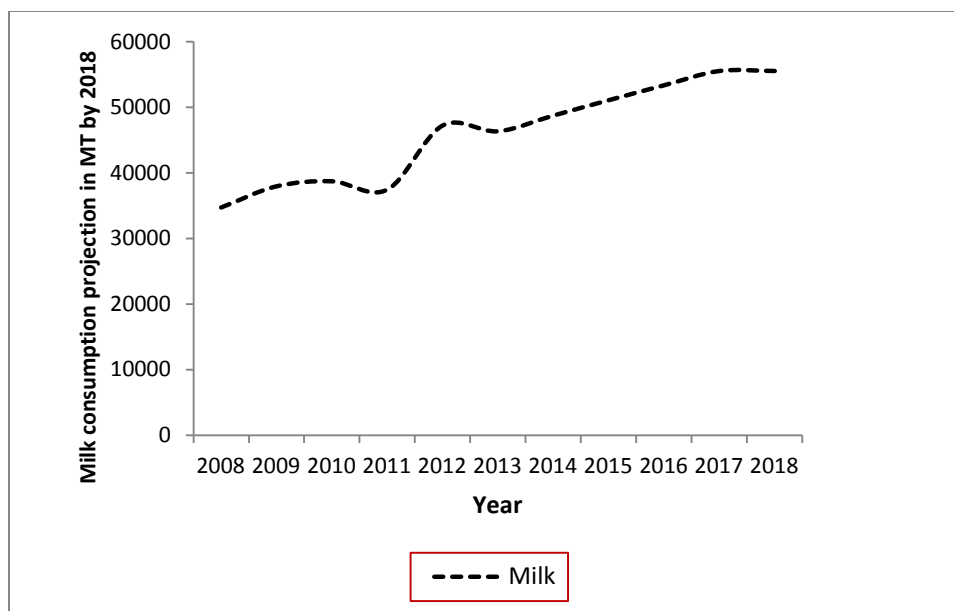


Figure 3. Milk consumption projection in MT by 2018

Source: Summary report on accelerated Livestock Development Program (DOL)

While the opportunities are immense, there are equally notable challenges as listed hereunder:

1. Poor road connectivity and limited access of rural producer to market

Poor access to markets and processing units and lack of cold chain facilities are the major limiting factors to pursue milk production on a large scale. Although every effort with priority is being given to enhance road connectivity to the rural poor, the total length of road is only 9 491.5 km (NSB 2014). The marketing constraints are further compounded by the lack of efficient public transport. Under the current scenario, only 20% of rural households use public transport. The remote location of households also hinders timely delivery of livestock support services: medicines, feeds, breeding materials and other requirements.

2. Limited stock of quality breeding stocks

The native breed and their crosses, which constitute 75% of the population, are generally poor producers of milk with an average daily production of 1.08 kg; whereas, Jersey crosses and Brown Swiss crosses produce 3.03 kg and 2.07 kg per day respectively (Wangdi, Mindu et al. 2014). To attain the target annual milk production of 50 550 MT by 2018, at least 9 462 head of milch cows of good performance will be required, which cannot be produced within from the existing pool of cattle within the country. Hence, quite a number of good stock will need to be procured from other countries, preferably from the neighbouring regions.

AI is promoted for breed improvement (102 AI centers), however, the coverage and performance is below expectation with an average of 7 inseminations per month (NDDC 2013). To expedite breed improvement work, the performance of AI centres has to be

enhanced with rigorous monitoring and placement of competent AI technicians. Moreover, MOET and Oestrus synchronization, which is planned to be initiated, has to be pursued by setting up appropriate facilities with competent personnel. Other dairy breeds besides the Jersey and Brown Swiss could be explored to provide a wider choice for farmers.

3. Lack of appropriate institute to train farmers on dairy production and management

Empirical knowledge on rearing of cattle in general is quite rich among traditional herders. However, while transitioning from the mobile to a sedenterized farming system - especially to intensive farming, farmers lack adequate knowledge on farm production and management. Basic management skills are provided by extension agents but this is not adequate. There is a need for a proper institute with higher capabilities and an appropriate curriculum to train farmers on intensive farm management.

4. Lack of knowledge and skills on processing and product standards

The lack of knowledge on farm production and management has led to poor standards of farming and development of farm products. The establishment of standards without educating farmers about the benefits for consumer safety, animal welfare and added economic incentives is futile - as experienced so far. It is, therefore, vital to train farmers, not only on farm management, but also on processing and marketing norms and ethics for the adoption and implementation of common standards.

5. Lack of knowledge on strategic setup of groups and cooperatives

Farmers groups, associations and cooperatives are formed to strengthen their performance through joint pooling and sharing of resources, enabling them to gain better command of the dairy value chain and pricing through a mass voice. However, the results so far, indicate otherwise, many finding it difficult to exist as groups and rather preferring to operate as individuals. Therefore the training of members, as well as the executive member, is crucial to strategically maintaining a group for future and long-term benefits.

III. Potential Areas of International Cooperation and Role of APHCA/Dairy Asia

The potential for international cooperation are:

1. Sharing of germplasm

Among member countries of APHCA, there is a wealth of diverse livestock germplasm. With emphasis on the common interest for regional growth and stability through livestock production, APHCA could facilitate the sharing of germplasm at least among member countries in order to attain self-reliance of livestock products and alleviate rural poverty through livestock interventions.

2. Technical assistance on processing and packaging of dairy products

With improved incomes, the demand for value added products is increasing. While demand could be met by trading among member countries, the production of value added products within the country would be more sustainable and secure in the long run. Hence, APHCA, as a common platform could facilitate mobilizing technical assistance to set up small to medium scale processing units in remote locations to motivate milk producers in such places by having an assured market.

3. Capacity development on farm production, management and farming standards

Basic skills on farm management delivered by extension agents are not adequate - especially for commercial farmers. The existing institute (Rural Training and Development Center) has a limited capacity to train commercial farmers on production, management and development of farming standards. In depth training on commercial aspects could be facilitated by APHCA in some relevant institutions such as the Regional Dairy Development Training Center in Chiang Mai or in any other place.

4. Capacity development for executive members of farmers' groups, associations and cooperatives

Based on experience, the viability of farmers' groups, associations, and cooperatives largely depends on the leadership of executive members. It is, therefore, vital to train the executive members on the strategic management of groups. There are many highly reputed groups and cooperatives within the member countries of APHCA. The executives of such groups or subject matter specialists could be arranged, with APHCA's support, to train on the initiation and management of farmers' groups, association, and cooperatives.

5. Promotion of climate smart dairy interventions

Livestock in general, and cattle farming in particular, is attributed with serious emissions of GHG gas. It has become a global concern and many international and regional development agencies and universities are devising mitigation measures along the entire dairy value chain. APHCA could provide a platform to link with the relevant agencies - to share knowledge and to promote compatible mitigation measures to make dairy farming not only economically viable but socially acceptable and environmentally sustainable.

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India

Introduction

Livestock production is an important sub-sector of Indian agricultural economy and plays a multifaceted role in providing livelihood support to the rural population. The livestock sector, apart from contributing to the national economy in general and to the agricultural economy in particular, also provides employment generation opportunities, asset creation, coping mechanisms against crop failure and social and financial security.

The contribution of the livestock sector in agriculture in terms of output, increased from 17.3% during 1980-81 to 28.4% in 2009-10. Similarly, the contribution of the sector to the National GDP has been around 5% over the years despite pronounced variation observed in the contribution of the crop sector to National GDP, indicating the stability of the livestock sector.

Livestock production systems in India are mostly based on low cost agricultural residues, agro- byproducts and traditional technologies, primarily for the production of milk, draft power, meat, eggs, fiber etc. About 70 million rural households own livestock of one species or another and 60 million among them own cattle and/or buffaloes. Resource poor small and marginal farmers and landless labourers own 71% of cattle, 63% of buffaloes, 66% of small ruminants and 70% of pigs.

In the rural areas, most of the livestock rearing activities are handled by women. As many as 75 million women are engaged in the livestock sector as against 15 million men. There is an increasing trend towards the participation of women in livestock development activities. This has led to the empowerment of women-headed households in the rural communities.

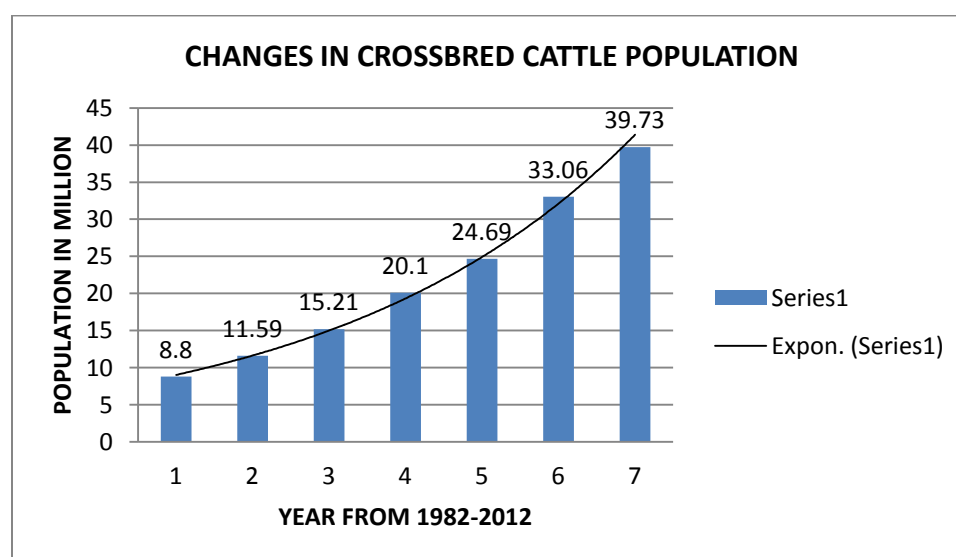
India stands first in terms of the bovine population having 20% of the world's population. In spite of India's position as the highest producer of milk, productivity of bovines is very poor. It is only 1 538 kg/year as compared to the world average of 2 219 kg/year. This is mainly due to low genetic potential for milk production of our non-descript bovines and poor levels of nutrition.

Trends in bovine populations

Cattle and buffalo rearing has been a traditional livelihood in India and is closely linked to the agricultural economy. India with 190.9 million cattle (as per 19th Livestock Census 2007) has 14.4% of the world cattle population. Out of this, 39.7 million are crossbred, which is 20.8% of the total cattle population. Between 2007 and 2012, the crossbred population increased by 20.2%.

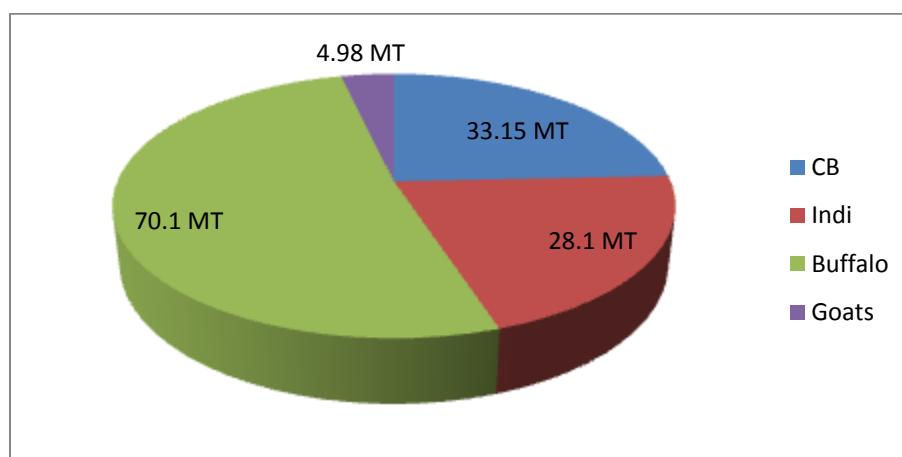
The changes within the cattle population over the last two decades indicate a radical shift in the priority of the farming community from production of work animals to milk production. The proportion of the female in the population increased steadily from 1972

onwards. Between 1987 and 2012, the number of working males in the cattle population declined sharply by 25.5% (16.65 million) and among females the proportion of adult females increased gradually. However, the proportion of indigenous cows declined by 8.9% between 2007 and 2012 and a phenomenal growth in the number of crossbreds was seen. The total number of crossbreds grew from 8.8 million in 1982 to 39.7 million in 2007.



During 2013, about 44.2 million cattle were in milk and were contributing 61.2 million tonnes of milk, which was about 44.5% of the total milk produced in the country during the same period.

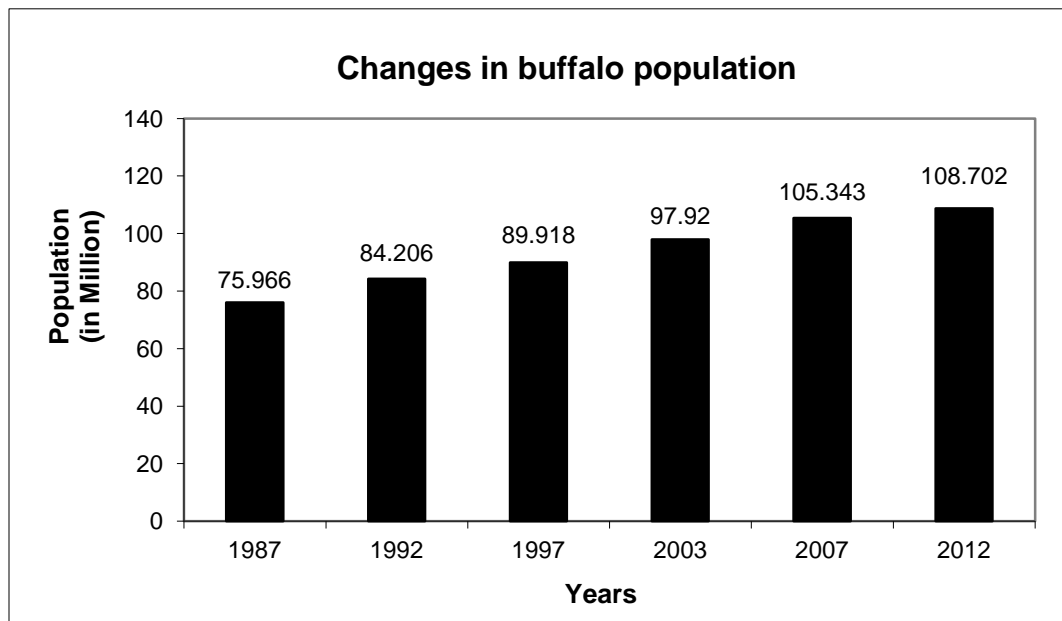
Milk Production by Different Categories of Animals (million tonnes)



India has 108.3 million buffaloes, which is 56.1% of the world buffalo population and during 2009 about 59.2 million tonnes of milk was contributed by them, which was

about 51.6% of the total milk produced in the country. This shows the higher significance of buffaloes in milk production in the country.

The buffalo population in the country is increasing at a steady rate with a slight increase in productivity. Out of the total buffalo population in the country more than 50% are breedable females, indicating the preference of the farmers for rearing buffaloes for milk production. Among the States, Uttar Pradesh, Andhra Pradesh, Madhya Pradesh, Rajasthan and Punjab have the largest buffalo populations and, together, they accounted for nearly 60% of the buffalo population of the country in 2012. The eastern region has less than 10% of the buffalo population with swamp buffalo being included basically for draught purposes. No efforts have been made by these States to develop the swamp buffalo population. Thus buffaloes are not playing a significant role in milk production in this region.



Cattle and buffalo genetic resources

Cattle: The cattle genetic resources of India are represented by 37 recognized breeds. Most of the cattle breeds are suited for draught power but produce little milk. Indigenous animals are sturdy, are endowed with quality of heat tolerance, resistance to diseases and ability to thrive under extreme nutritional stress. These breeds are classified into three categories – milch breeds, like Sahiwal, Red Sindhi, Gir and Rathi which calve between 40 to 50 months and produce 1 500 to 2 000 kg in a lactation and have a calving interval of 15 to 18 months; dual purpose breeds like Tharparkar, Hariana, Kankrej, Ongole, Deoni, Gaolao, Krishna Valley and Mewati which first calve between 45 to 55 months, produce between 600 to 1 500 kg of milk and have a calving interval between 15 to 20 months; and draft breeds like Kangayam, Hallikar and Khillari.

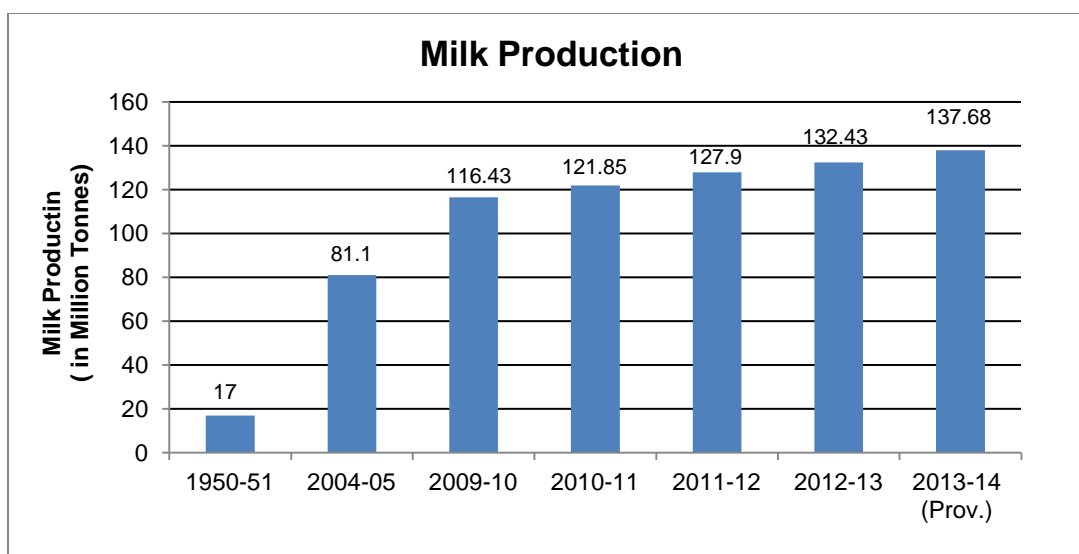
The remaining 80% of the cattle are non-descript, which first calve at an age of 60 months, and produce about 500 kg in a lactation and have a calving interval between 20 to 24 months. Buffalo genetic resources of India are represented by 11 well-recognized breeds.

Buffalo: The buffalo genetic resources of India are represented by 13 recognised breeds. Murrah is the breed of choice and is used widely in the country grading up the non-descript buffalo population. Bhadawari is having its breeding tract in UP (Agra, Mathura) and is well known for its high milk fat percentage. In this breed, milk fat ranges from 6 to 14%. Jaffarabadi is a well-known breed of Gujarat. Mehsana (Gujarat), Nagpuri (Maharashtra), Nili-Ravi (Punjab), Pandharpuri (Maharashtra), Surti (Gujarat), Toda (Tamil Nadu), Marathwada (Maharashtra), Chilika (Orissa) and Banni (Gujarat) are all recognized breeds(in regions).

Milk production and productivity of bovines

India ranks first among the world's milk producing nations. India has been the leading producer of milk since 1998. The milk production in India during the period 1950-51 to 2013-14, has increased from 17.0 million tonnes to 137.6 million tonnes. Milk production has been growing at about 4.2% per year over the five years ending 2013-14, which amounts to an average annual incremental production of about 5.1 million tonnes. Growth in milk production has been higher than that of the population growth resulting in a consistent increase in the per capita availability.

The *per capita* availability of milk which was 130 grams per day during 1950-51 has increased to 302 grams per day for 2013-14 which is more than the 186 grams estimated for Asia and the world average of 294 grams but, however, less than that of developed countries estimated at 831 grams per day. As per FAO, the average annual growth in milk production in the world during last decade was 2.2%, whereas, domestic milk production in India grew at the rate of 4.2%. The estimates of yield rate of milk (in Kg/day) for crossbred cows, non-descript cows and buffalo during 2013-14 are 6.8, 2.5 and 4.9 respectively.



Demand for milk

Presently, about 48% of milk production is consumed locally in the villages and the balance is sold. About 30% of the milk sold is handled by the organised sector and the remaining 70% by the unorganised sector. Out of the 30% handled by the organised sector, about 16% is handled by the cooperative sector.

As per the **assessment made by Planning Commission in 2002**, the domestic demand for milk by 2021-22 is expected to be 172.2 million tonnes. As per the Economic Survey, 2010-11, the domestic demand for milk is growing at about 6 million tonnes per year whereas the compound annual growth rate (CAGR) in milk production over the last 10 years ending 2009-10 works out at 4.2%. The growth in milk production in the country has been about 4.65% per annum in the last five years and this growth has generally been able to meet the demand. The same document states that with higher growth of the economy, increase in population and increased health consciousness among the populace, the demand for milk and milk products is expected to increase. It is expected that a larger proportion of income will be spent on milk and milk products. Further, urban centres will demand more and more processed and packaged dairy products but, in the rural areas, people may still prefer to purchase from local milkmen. On the above assessment made by the Planning Commission, NDDB has clarified that to meet the requirement of nearly 180 million tonnes of milk in 2021-22, production of milk will have to rise annually on an average of six million tonnes over the next ten years. Milk production would need to grow at around 4% per annum from the current level to reach a production of 180 million tonnes in 2021-22.

The Planning Commission estimated demands for milk (in 2002) at the end of 11th (2011-12), 12th (2016-17) and 13th plan (2021-22) are 118.1 million metric tonnes (MMT), 142.6 MMT and 172.2 MMT respectively. The projected domestic demand for milk and milk production estimated by NDDB for the next 5 years is given below:

India's projected milk demand and production 2011-12 to 2016-17 (million tonnes)

Year	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Milk demand	125	130	136	142	148	155
Milk production	127	132	138	144	150	157

Breeding policy

A broad framework of the breeding policy was prepared by the Government of India and circulated to all States as a broad guideline to formulate their own breeding policy. The framework envisages crossbreeding of non-descript cattle population with exotic breeds - Jersey and HF with the level of exotic inheritance being limited to 50%, selective breeding of indigenous stock in their breeding tracts and use of recognised indigenous breeds for upgrading indigenous non-descript stock.

Breeding network

Semen production: There are 51 semen stations, 37 with the central and state governments, 8 with cooperatives, 3 with National Dairy Development Board (NDDB), and 1 with an NGO and 1 private. These semen stations together in 2013-14 produced some 81 million doses – 7 % of local breeds, 33% exotic (HF and Jersey), 30% crossbred, and 30% buffalo. Out of these 51 semen stations, 44 have been graded as 'A' and 'B'. 42 semen stations have obtained ISO certification. All the semen stations in the country are following the Minimum Standard Protocol formulated by the Government of India for semen production.

AI delivery: There are 94 000 AI centres, 70 000 government, 15 000 cooperative and 7 000 NGOs / private carrying out, in all, about 60 million inseminations annually.

AI coverage: At present 25% of the breedable bovine females are under AI coverage. Present conception rate ranges between 30 and 35%. The remaining breedable bovine females are covered through scrub bulls of unknown genetic merit. Only 21 700 bulls of known dams' genetic potential are available for natural service.

Challenges in Dairy Development

Notwithstanding past success, the Indian dairy sector is facing renewed productivity challenges today. These include:

- **Shortage of feed and fodder:** A large gap exists between the requirement and the availability of feeds and fodder in the country. The mainstay of Indian dairy cattle and buffalos are straws and other dry fodder, with green fodder as a supplement, and concentrate feeds as available. De-oiled cakes/meals are a major ingredient of the cattle feed which constitutes about 60% to 70% cost of production of milk.
- **Animals with low productivity:** Milk production in India is largely a low input-low output system owing to a large number of non-descript indigenous breeds still

being reared for milk. The emphasis has been on crossbreeding, with limited attention to the improvement of indigenous breeds.

- **Poor AI coverage:** Coverage of artificial Insemination among breedable animals is very poor. Artificial insemination (AI) programmes could cover only about 20% of the nationwide breedable animals with low conception rates (less than 50%).
- **Lack of effective extension services:** Extension service delivery has been very weak in the livestock sector due to inadequacy of resources and the lack of expertise to conceive and operate technology transfer packages.
- **Lack of robust regulatory systems:** Absence of a robust regulatory framework that sets standards and protocols for semen production and delivery of AI services for a long time has affected the quality. Absence of standards and labelling requirements for production and sale of cattle feed continues to be an area of concern.
- **Environmental sustainability.** (i) Overgrazing threatens the sustainability of common property resources (pastures, grasslands, forests) considered to be the primary source of feeding for smallholders' livestock. (ii) High-yielding dairy animals require additional supply of feed and fodder and would put increasing pressure on land and water resources. (iii) Larger bovine production causes green house gas emissions (methane) and pollution of waterways.
- **Need for value addition in milk:** GDP growth has influenced in increasing demand for milk and value added milk products. Further, with the increase in the procurement price by the dairy industry (including cooperatives), average milk procurement by the organized sector has increased from about 54 million litres per day (LLPD) to about 750 LLPD during the last two years. A pro-rata growth in processing capacity is the need of the hour.
- **Lack of cold chain infrastructure:** Cold chain infrastructure to preserve the milk from farm gate to the point of consumption is lacking in most States. Only about 7% of total milk produced and 33% of milk procurement by the organized sector is chilled to prevent bacteriological contamination.

Opportunities

Notwithstanding the challenges, there is a great opportunity to increase milk production and make dairying a means of sustainable livelihood for the farmers.

- **Scope for productivity enhancement:** While India is the highest producer of milk, productivity per animal is very poor. It is only 1 525 kg/year as compared to the world average of 2 159 kg/year. There is significant scope for improving productivity from 3.1 kg/day average milk yield of Indian cows against a world average of 6.4 kg/day. Less than 20% of cattle are crossbred with relatively high milk yields, while the vast proportion is indigenous cattle with very low milk

yields. Productivity is low mainly due to poor nutrition, low genetic potential for milk production, and the slow pace of genetic improvement programs. While R&D efforts have highlighted micronutrient deficiencies at local levels, limited attention has been paid to increasing availability of area specific mineral mixtures, by-pass protein, or enriched crop residues in the form of blocks, pellets etc. With the implementation of National Dairy Plan I (NDP-I) and the National Programme for Bovine Breeding and Dairy Development (NPBBDD) and the National Livestock Mission (NLM) laying emphasis on scientific breeding, greater coverage of AI using semen of high genetic merit and scientific nutrition with balanced feed along with area specific mineral mixtures productivity of animals is expected to improve significantly.

- **Scope for expanding the organised sector:** About half of the milk produced is marketed, with only about 30% of the marketed milk handled by the organized sector. Small producers are particularly affected as they are forced to sell their marketable surplus to informal traders who, during the flush production season, often offer less than market prices or even decline to procure output. Also, from a health and food safety perspective, milk processed and marketed by the organized sector is safer and less likely to be contaminated. A key development priority therefore is increasing the role of the organized sector in the share of milk handled. Whereas in advanced economies more than 90% of the milk is processed by the organized sector, in India this figure is only about 16%. Scaling up the reach of the organized sector in a manner consistent with food safety norms is an important element of ensuring safe milk for consumers. This is an area of focus through the various schemes of the Government and is expected to connect the dairy farmers with markets.
- **Growing demand:** The consumer demand for milk is growing in the country fuelled by rising incomes and a preference for animal proteins. A large section of the vegetarian population meets its requirement for protein from milk and milk products and this demand is expected to grow.

Steps taken to Enhance Productivity

As Agriculture, including Animal Husbandry, Dairying and Fisheries is a State subject, the emphasis of the Department has been on supplementing efforts of the State Governments in the development of these sectors. The Department has been providing assistance to the State Governments for the control of animal diseases, scientific management and upgrading of genetic resources, increasing the availability of nutritious feed and fodder, sustainable development, the expansion of cooperative networks and the creation of infrastructure for preserving, processing and marketing milk and milk products.

Dairy development schemes

National programme for bovine breeding and dairy development (NPBBDD): A new Scheme named as 'National Programme for Bovine Breeding and Dairy Development (NPBBDD)' has been launched by merging four existing schemes being implemented during the 11th Plan namely, Intensive Dairy Development Programme (IDDP), Strengthening Infrastructure for Quality & Clean Milk Production (SIQ&CMP), Assistance to Cooperatives and National Project for Cattle & Buffalo Breeding with the budget provision of Rs. 18 billion for implementation during 12th Plan.

The NPBBDD has been launched in February 2014 as a comprehensive and scientific programme having two components: a) National Programme for Bovine Breeding (NPBB) and b) National Programme for Dairy Development (NPDD) with the following objectives:

National Programme for Bovine Breeding (NPBB):

- I. To arrange quality Artificial Insemination services at farmers' doorstep;
- II. To bring all breedable females under organised breeding through Artificial Insemination or natural service using germplasm of high genetic merits;
- III. To conserve, develop and proliferate selected indigenous bovine breeds of high socio-economic importance;
- IV. To provide quality breeding inputs in breeding tracts of important indigenous breeds so as to prevent the breeds from deterioration and extinction.

National Programme for Dairy Development (NPDD):

- I. To create and strengthen infrastructure for production of quality milk including cold chain infrastructure linking the farmer to the consumer;
- II. To create and strengthen infrastructure for procurement, processing and marketing of milk;
- III. To create training infrastructure for training of dairy farmers;
- IV. To strengthen dairy cooperative societies/Producers Companies at village level;
- V. To increase milk production by providing technical input services like cattle-feed, and mineral mixture etc;
- VI. To assist in rehabilitation of potentially viable milk federations/unions.

National Dairy Plan-I: With the twin objective of increasing productivity of milch animals and provide rural producers greater access to organized milk processing sector, national dairy plan was launched in March 2013 as World Bank (IDA) assisted Central Sector Scheme of GoI with an outlay of Rs. 2 242 Crore implemented by National Dairy Development Board focussing on 14 major milk producing States (15 states with formation of Telangana, namely - Uttar Pradesh, Punjab, Haryana, Gujarat, Rajasthan, Madhya Pradesh, Bihar, West Bengal, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Orissa , Kerala), which account for more than 90% of the country's milk production and over 87% of the breedable cattle and buffalo population and 98% of the

country's fodder resources. However, benefits of NDP I will be available across the country.

Dairy entrepreneurship development scheme (DEDS): Dairy Entrepreneurship Development Scheme (DEDS) launched in September 2010 with the objective for promotion of private investment in dairy sector in order to increase milk production in the country and helping in poverty reduction through self-employment opportunities. DEDS is being implemented through the National Bank for Rural Development (NABARD) which provides financial assistance to commercially bankable projects with loans from Commercial, Cooperative, Urban and Rural banks. DEDS envisages back ended capital subsidy of 25% of the project cost to the beneficiaries of general category and 33.3% of the project cost to SC & ST beneficiaries.

Way Forward

The following would be the areas of focus going ahead for dairy development in the country through the dairy development schemes being implemented by the Department:

- Increase Milk production to meet projected demand of 150 million tonnes by 2016-17 and 200 million tonnes by 2020.
- Extension of AI coverage from the present level of 20% to 35% of the breedable bovine females through establishment of 30 000 MAITRIs (Multi-Purpose AI Technicians in Rural India).
- Conservation and development of indigenous breeds
- Expansion of Organized Milk Market to provide greater access to dairy farmers for their milk produced.
- Expansion of dairy cooperative network by setting up of additional Dairy cooperatives societies, milk shed areas and new milk routes.
- Increase Chilling capacity by establishing bulk milk coolers in villages.
- Strengthening of milk processing infrastructure.
- Promotion of entrepreneurship in the dairy sector
- Upgrading skills of farmers and technical manpower through:
 - Formulation of uniform training module and duration of training;
 - Accreditation of Artificial Insemination Training Centres;
 - Training and retraining of AI technicians at accredited AI training institutes;
 - Refresher training of professionals at reputed training centres.
- Synergized Implementation of NPBBDD, NDP-I and DEDS for inclusive dairy development with schemes of other Departments.
- Quality control and certification of bulls and services at semen stations.
- Creation of national database on breeding programmes, milk procurement, milk processing and value addition.

Indonesia

Introduction

The population of Indonesia was about 250 million in 2013 so that there is large demand for food to fulfill the market's basic needs. According to Act No 18, 2012 about Food, it is mentioned that the State has an obligation to provide sufficient food that is safe, nutritionally adequate both at national and regional level to the individual at all times by utilising resources, institutional and local culture.

Food can be sourced from biological resources and is products of agriculture, forestry, fishery and livestock. The livestock products are meat, eggs, and milks. Within 2010 – 2014, the production and consumption of milk are shown in Table 1.

Table 1. Milk production and consumption ('000 tonnes)

Description	Year				
	2009	2010	2011	2012	2013
Milk production	827.3	909.5	974.7	959.7	786.8
Milk consumption	2 198.0	2 471.5	2 677.1	2 893.3	3 234.6

Source: Livestock and Animal Health Statistic, 2014

From the above table, it can be seen that the domestic demand could not be met by domestic production so that it has been fulfilled by imports.

Consumption of milk in Indonesia is still dominated by powdered milk and condensed milk, rather than fresh milk. One of the reasons is the lack of supply of fresh milk throughout Indonesia.

Milk Production

Domestic production of fresh milk is still concentrated in Java island. East Java is the biggest producer, followed by the provinces of Central Java, *Yogyakarta* and West Java.

Part of the production of fresh milk comes from small herds of 1 to 3 cows. There is also fresh milk production from buffaloes and goats that currently still lack attention from the government, so that is not recorded in national statistics.

The structure of fresh milk of other than dairy cattle is characterised in terms of competition and marketing with the dairy buffalo centred on North *Sumatera*, West *Sumatera*, *Nusa Tenggara Barat* and South *Sulawesi*. The main areas of dairy goat production cover West Java, Central Java and East Java

Eighty percent of milk production is supplied to the milk processing industry through dairy cattle rural unit cooperatives and the other 20% is managed and processed and marketed directly to the customer.

The development of dairy cattle, buffalo and goat populations in Indonesia over the last 5 years (2009 – 2013) is shown in Table 2.

Table 2. Dairy cattle, buffalo and goat populations, 2009 to 2013

Livestock	Year				
	2009	2010	2011	2012	2013
Dairy cattle	474 701	488 448	597 213	611 939	444 266
Buffalo	1 932 927	1 999 604	1 305 078	1 438 294	1 109 636
Goat	15 815 317	16 619 599	16 946 186	17 905 862	18 500 322

Source: Livestock and Animal Health Statistics 2014

The main factor of livestock development is the availability of livestock breeds. The existence of subsystem livestock breeding has strategic role to increase the amount and quality of livestock breeds to provide food from livestock

However, the problems facing the development of livestock breeding are: (1) availability of suitable dairy breeds is not fulfilling the needs; (2) the quality of most livestock breeds is not matched by the management standards and the business acumen of farmers, which is not optimal. (3) the roles of the private breeders and government breeding centers are still limited.

To solve the above problems, considerable effort is required to increase the number and quality of the dairy animals as well as the business ability of dairy farmers by implementing and developing livestock breeding sustainably on the basis of local resources.

The availability of frozen semen and embryos as well as bulls for artificial insemination center has been able to fulfill the needs of domestic demand.

National Breeding Efforts

One of the national breeding centres managed by the government is *Baturraden* Dairy Cattle Breeding Center. Located on the slopes of Mount *Slamet*, *Baturraden* has 4 farms with a total area of 241.06 ha, with the following details:

1. Tegalsari farm (area 34.2 ha)

Consists of: free stall stables and housing capacity for 564 heads, equipped with a milking parlour / milking machines capacity for 16 cows at one time, a Total Mix Ratio machine, and an exercise area.

2. Limpakuwus farm (area 96.8 ha)

Consists of: free stall stables with a capacity of 360 head, mooring stables for 70, calf stables for 220 head, a milking parlour capacity of 24 heads / milking period (20 minutes).

3. *Munggangsari* farm (area 10.1 ha; training center)

Consists of a meeting room, classroom and dormitory

4. *Manggala* farm (area 100 ha; rearing unit)

Consists of: free stall stables capacity of 300 head, 20 ha of grazing, 15 ha of forage, offices and the home office.

Baturraden in the operational demonstration of activities applying animal welfare based farm management, such as: (1) free from hunger and thirst; (2) free from discomfort; (3) free from pain, injury and disease; (4) free from fear and stress; (5) free to express natural behaviour.

The provision and quality improvement of livestock breed resources and the increase in milk production of dairy cattle through progeny testing has been implemented since 2004.

Provincial locations of progeny testing are West Java, Central Java, Yogyakarta, and East Java. Government agencies involved in Progeny Testing are: (1) *Baturraden* Breeding Center, *Cipelang* Embryo Transfer Center, *Singosari* and *Lembang* Artificial of Insemination Centres; (2) Provincial Livestock Services (West Java, Central Java, East Java and *Yogyakarta*); (3) District Livestock Services (*West Bandung, Bandung, Garut, Sumedang, Bogor, Sukabumi, Indramayu, Sleman, Semarang, Klaten, Boyolali, Banyumas, Temanggung, Kediri, Blitar, Malang, Jombang and Tulungagung*).

Progeny test participants are: (1) Province Dairy Cattle Breeding Centres (West Java, Central Java, East Java); (2) Dairy Cattle Rural Unit Cooperatives (West Java, Central Java, *Yogyakarta* and East Java); (3) Dairy cattle private companies.

The role of *Baturraden* breeding centre in Progeny Testing is to: (1) Carry out the test; (2) provide guidance / training to field officers; (3) conduct technical meetings with stakeholders; (4) collect and process the recorded data into the data base of the national dairy Progeny test; (5) evaluate the implementation of the national Progeny test; (6) implement, monitor and to disseminate information regarding progeny test benefits.

So far, 8 selected proven bulls have been produced, as follows: (1) Bullionary Code: 30665; (2) Farrel Code: 30686; (3) Filmore Code: 30687; (4) Formerly Code: 30662; (5) Flaunt Code: 30694; (6) Florean Code: 30691; (7) Fokker Code: 30697; (8) Hostromsy Code: 30664. Average milk production is over 5 000 kg of milk per lactation per proven bull.

In the framework of the future development of dairy cattle breeding, a pilot project will start in 2015 in four selected districts that are potential locations of dairy cattle: *West Bandung, Klaten, Malang and Padang Panjang*. This activity will take place over several years, forming a new region of dairy cattle breeding.

Associated with the development of the dairy sector cooperation and collaboration with other countries is expected to be implemented, as follows:

- (1) Develop cooperation in enhancing the competence of human resources, both farmer and facilitator to manage the business of breeding cattle and milk handling.
- (2) Develop cooperation in animal health, especially in handling of dairy cattle health.
- (3) Indonesia offering investment opportunities in dairy cattle breeding and milk processing.
- (4) Indonesia offering frozen semen of proven dairy cattle bulls. This offer is related to the status of Indonesia, which has been declared free of Foot and Mouth Disease (FMD) by OIE. In addition to producing and offering frozen semen of dairy cattle, the two Artificial Insemination Centers, *Singosari* and *Lembang*, also produce frozen semen of the Simmental and Limousin breeds.
- (5) Indonesia provides and offers a wide range of international training related to artificial insemination technology performed at *Singosari* Artificial Insemination Center.
- (6) Develop the cooperation in dairy cattle breeding research.

Iran

Section I: The Setting

Iran has a size of approximately 1 650 000 square kilometers spanning a diverse range of climates: temperate, non-temperate, tropical, mountainous and desert. The total population of cattle in Iran is estimated at 8 600 000 of which 1 200 000 are registered and constitute the small and household nomadic livestock.

The Iranian people are of nomadic ancestry, interested in keeping and breeding livestock and therefore there is a huge tendency amongst the Iranians to breed livestock either in small or very large herds. However, industrialization and modernization have considerably influenced the dairy industry.

Livestock products in Iran are produced by two sources: (i) big farms, which have been built based on modern technology; and (ii) small rural and nomadic farms, which host the majority of total livestock population.

In countries with a similar geographic and eco-systematic situation as Iran, the growth of farm production depends upon ranches. Consequently, particular attention should be paid to environmental problems that affect ranches. Since this may be beyond the capability of a single country, cooperation with other countries and international institutions is required.

The capacity of Iran's milk production is around 12 million tonnes but the actual production is around 9.5 million tonnes. Of this, 4.5 tonnes are used to produce various milk products and the rest is consumed directly.

The *per capita* consumption of milk in Iran is 70-80 litres per year, which is much lower than the recommended amount. In order to provide appropriate healthy nutrition, the government and the private section in Iran aim to increase milk production. However there are still challenges and obstacles, which will be discussed later.

There are no statistics available about the amount of milk exported while milk products and butter are extensively imported.

Milk is bought from the farmers for about 39 cents per litre by the governmental milk processing factories while the private sector pays slightly more. The price is, however, not economical for the farmer given the high costs of feed and other inputs.

To address this problem, the government and private sector are working together either to raise the price of milk or to reduce the production costs.

The number of milk processing factories producing milk products is so numerous that some of them are not operating at present.

Section II: Key Opportunities and Challenges

Iran has a unique potential for agricultural and livestock production. There is a vast motivated human resource in agricultural fields. This factor along with suitable fields plays a key role in a sustainable development. Since Iran already possesses all these factors, it has a unique opportunity to make progress and thrive in agriculture and livestock in the future provided that these capabilities are properly realized. The obstacles and issues in the development and growth are:

The continued drought in the past 10-12 years has hit the agricultural sector and the livestock section - in particular, those belonging to the nomads.

Crippling sanctions, which have been imposed on various economic sectors including agriculture. This has limited the access to new technologies - in particular, modern irrigation technologies. As a result irrigation is conducted with traditional methods, which extensively waste precious water.

In order to overcome the above challenges, the country requires scientific management to properly utilize water resources. This can only if sanctions are lifted so that new irrigation systems can be imported.

Most of the Iranian agricultural fields are small and fragmented. To increase agricultural and livestock production there is a need to merge fields according to the food requirements. There should be a strategic change in the methods of agriculture and in the systems and products requiring less water.

Iran also possesses a unique location where the country has water routes, flight connections and roads to key parts of the world. This offers an opportunity for trading and business.

Section III: Potential Areas for International Cooperation and Role of APHCA/Dairy Asia

Given Iran's excellent condition for its rich agricultural, natural and human resources and geopolitical situation, international cooperation and investments can prove valuable. Organizations such as FAO and APHCA can play a significant role in this regard by advising on various development plans. These organizations can facilitate the lifting of international sanctions. This should be combined with a guarantee coming from the Iranian government to assure the security and safety for investments.

Nowadays countries like China, India, South Korea and Japan considerably benefit from international relationships to implement developmental plans and therefore can serve as proper examples for other developing Asian countries. What should be noted about China, India, Japan and South Korea is their collaboration with international organizations in implementing international development programs and providing safety and security for international investments.

Lao PDR

Section I: The setting

Livestock production in Lao PDR is firmly based in the smallholder sector with more than 95% of all animals being raised by smallholder farmers and there are only a small number of commercial pig and poultry farms in peri-urban areas of Vientiane Capital and other larger cities. Cattle, buffalos, pigs, chickens and goats are the most important livestock species in the country. Dairy cattle are very rare and there is only one dairy farm in the country – Nabong Dairy Farm. The dairy farm was built in 1981 with the support of the Cuban government. The farm, which covers 505 hectares of grazing and agricultural land, is situated 30 km east of Vientiane Capital, the capital of Lao PDR. Cattle pens, milking parlour, stores and offices were constructed and pasture established to cater for 400 dairy cows. In 1983, the total number of 100 HF dairy cows, 10 bulls and 2 horses were imported from Republic of Cuba to Lao PDR. All staff was trained in Cuba and also farm workers were trained at the farm by Cuban experts. The milk production in the farm was started in 1985 and there was no processing plant at the time.

In 1992, Nabong dairy farm was rented by Nabong Farm Co., Ltd (NAFCO), the Lao-Swedish Joint Venture Company and the member of Burapha Group, as part of the privatization process. In November 1992 a formal contract for 20 year lease was signed between the Company and Ministry of Finance. Since April 1992, the Company has prepared the farm for dairy production. In May 1994, the farm started to produce pasteurized milk based on the 20 head of dairy cattle remaining from the Cuban period. In April 1995, the first truckload (12 heads) of dairy cattle imported from Thailand arrived at the farm and some 140 head of dairy cattle were imported from Thailand. The total herd today includes 170 milking cows, one bull, 15 heifers, and 30 female calves. Every year NAFCO sold an average of 850 liters of dairy products per day. From 1998 and till today this figure has been constantly decreasing and in 2010 the average sale figure is about 50 liters per day (see Figure 1).

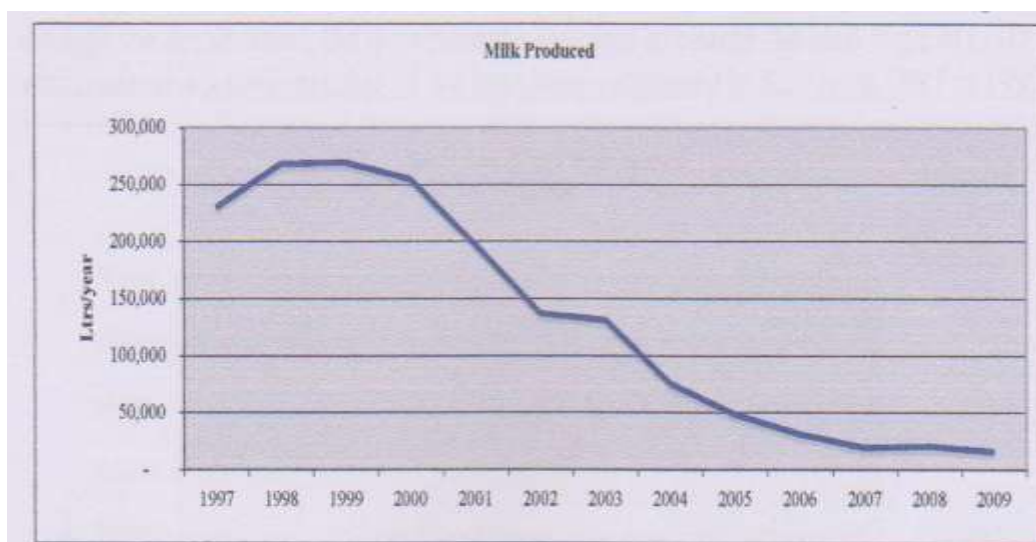


Figure 1. Annual milk production of NAFCO farm

The company will invest in new dairy cows and milking equipment around USD 90 000 over 5 years (2012-2016) (Source: NAFCO, 2011). Milk production will increase to over 900 liters per day and the main markets are Vientiane Capital and Luang Prabang.

Milk and milk products do not belong to traditional diet in Lao PDR. However, the demand for dairy products in urban areas is increasing from year to year. According to the report of FAO, the consumption of milk in Lao PDR will increase from 21 400 tons in 2000 to 31 800 tons in 2015 while the production capacity is estimated to achieve only 10 500 tons or 27% of the demand in 2015. Therefore, Lao PDR will remain dependent on imports of milk and milk products to meet the demands of domestic consumers.

During the past few years, the dairy products imported are gradually increasing mainly from Thailand, Viet Nam, China and also Australia and New Zealand (see table below).

Table 1. Dairy imports 2010 to 2012

	2010		2011		2012	
Dairy products	Quantity (Tons)	Value (1000\$)	Quantity (Tons)	Value (1000\$)	Quantity (Tons)	Value (1000\$)
Milk whole cond., buttermilk, acid milk, curdle	2,654	4,870	3,948	8,125	11,252	30,371

Source: FAO, 2013

The price per tonne of imported dairy products is gradually increasing (see table below):

	2010	2011	2012
Unit price per ton (US\$)	1,743	2,025	2,699
Imported value (US\$1 000)	4,870	8,125	30,371

Source: FAO, 2013

It can be observed that dairy cattle have attracted interest among livestock producers in Lao PDR. The above reasons could be the key factor. Recently, some livestock producers and individual farmers have imported dairy cattle from neighboring countries to keep for trial purposes. These people usually keep 10 to 20 dairy cattle and the milk is used for self-consumption and the surplus is sold to their neighbors and acquaintances.

Section II: Key Opportunities and Challenges

Opportunities:

1. The government encourages the private sector to invest in livestock production including the dairy industry.
2. Lao Government has amended the foreign investment law.
 - Profit tax rate of 20% for foreign invested companies;
 - Import duty of 1% on equipment and materials for use in an enterprise;
 - Investors will be entitled to a profit tax exemption for 2 – 7 years (depend on investment zones);
 - Project approval set at 60 days;
 - Foreign investment may be wholly-owned or a joint venture with a minimum 30% investment;
 - 'One-stop shop' for investors at the DDFI;
3. The landscape and land availability will facilitate the development of dairy industry (there are 580 119 ha of natural pasture in the country).
4. National Policy to promote Livestock production has been drafted by the Department of Livestock and fishery (DLF) and this is entering to government agenda for endorsement.
5. Agriculture Development Strategy up to 2025 of Lao PDR set to develop dairy industry in the country.
6. The demand of milk in domestic and regional markets.

Challenges:

1. Lack of hardware for dairy industry in the country will require high capital investment.
2. Encouraging private sector investment in dairying along the post-harvest value chain.
3. High cost of animal feed could hinder price competition with imported milk.
4. The incidence of animal diseases could threaten the health of dairy cattle.
5. Livestock farmers in Lao PDR have no experience in keeping dairy cattle.
6. The conversion of land for cash crops and industrial trees may limit the land availability for livestock production.

Section III: Potential Areas for International Cooperation and Role of APHCA/Dairy Asia

The dairy industry in Lao PDR is lagging behind other countries in the region. In order to respond to the efforts of the Ministry of Agriculture and Forestry, the Department of Livestock and Fisheries (DLF) is taking all necessary actions to restart the development of the dairy industry in the country. Among these, the DLF is seeking technical cooperation with neighboring countries in order to upgrade knowledge and skills of government staff regarding milk production and promoting domestic and international enterprises to invest in the dairy industry. All in all, Lao PDR needs assistance and cooperation from other countries in the region to develop its dairy industry.

Malaysia

Section I: The Setting

Overview of the dairy industry in Malaysia

The Dairy Development Program (DDP) in Malaysia was started in 1974 as part of New Economic Policy to reduce poverty and increase production of agriculture products. Under DDP, the dairy program is implemented with a package approach through Milk Collecting Centre (MCC) whereby various services to the farmers have been implemented by the government. Although the main force behind the dairy development is the government, implementation strategies have been geared towards a market driven industry.

Total milk production was 70.87 million litres in 2012, with the statistic including milk from cattle, goats and buffaloes. Milk production from dairy cattle, monitored by MCC, in Peninsular Malaysia increased from 6.1 million litres to 11.4 million litres in 1987, and then remained stable until 2009, when milk production started to increase. Per capita consumption of dairy products showed a decrease from 50.84 kg in 2004 to 18.12 kg in 2012. The self-sufficiency level of milk products has increased to 9.29 % in 2012, when Sabah has become major contributing state to milk production in Malaysia. All locally milk produced is for the domestic market, either been sold directly to the consumer or restaurants, or processed as pasteurized milk by milk processing plants.

In 2009, the government launched the Economic Transformation Program (ETP) to elevate the country to developed-nation status through implementation of National Key Economic Areas (NKEA). Under NKEA Agriculture, Dairy Cluster development has become one of the selected sectors of economic opportunities for the private sector to become involved. The objective of the Dairy Cluster in NKEA is to produce 107 million litres in 2020 for the local market. This opportunity has created a demand for restructuring the dairy industry towards sustainable milk production and good dairy cattle management. Emphasis on the free market and quality milk has also become factors contributing to the expansion of the industry.

Due to the many limiting factors for a sustainable dairy industry in Malaysia, it was recognized that local production of fresh milk will be maintained to meet domestic demand, while the major part of the demand for milk products will continue to be met by imports.

Dairy production

The number of dairy farmers has decreased from 1 568 farmers in 1983 to 833 farmers in 2012. Most dairy farms in Malaysia are small with less than 30 cows (88% of total dairy farms). Due to the difficulty in acquiring suitable land for farming, most dairy farmers adopt semi-intensive and intensive systems. This requires intensification in feeding management and dependency on concentrate feeding, although some farmers

produce their own mixed feed or Total Mixed Ration. Most farmers produce milk for fresh products, while a few farmers market their milk for other specialized milk products such as ice cream.

Milk price has been regulated by the government from a maximum price of RM 0.77 per litre in 1985 to RM2.00 per litre in 2009. After commencing the Dairy Cluster program (EPP13#) under NKEA, the milk processing company and dairy anchor company have been given freedom to negotiate the milk price with the farmers or dairy cooperatives. Although, some issues on fair marketing and milk quality have surfaced, the initiative is providing a necessary jump towards a more market-driven industry.

Section II: Key Opportunities and Challenges

- a) ***Increase in feed cost:*** Feed for livestock has become an integral part of farming communities – more so today as more farmers adopt intensive farming practices. There has been an increase in feed and feeding costs for dairy cattle. The main contributor to the increased cost is the price of palm kernel concentrate, which has been used successfully by Malaysian farmers since the 1980s after intensive research. Palm kernel concentrate has become an export commodity and the price depends on global market demand. Nevertheless, globalization has also introduced other feeds from other countries that have never been used before - such as alfalfa hay, which provide alternative feeds to dairy farmers.
- b) ***Constraints in human resources:*** Small-scale farmers usually work alone or with family. Training and experience by practice has been providing the tools necessary to upgrade and develop farmers' skills. However, much bigger farms of medium size or commercial scale require additional human resources to ensure the smooth running of the farm. Malaysian farmers have become dependent on unskilled foreign workers especially in the farming sector due to what appears a seemingly unattractive profession and hard working job by the local work force. Consequently, few local people are engaged to work on the farm. Foreign workers have a limited duration for working, which necessitates the farmers to train new workers frequently. Repeated changes of the foreign workers impedes developments in the farm unless the farmers themselves closely monitor and supervise.
- c) ***Limited land for dairy farming:*** Many farmers do not own land for farming, especially in Peninsular Malaysia. Some farmers rent the land, while others were allocated land from the agriculture reserve land or undeveloped government land. However, the size of land required by the farming community also competes with other industries including areas for housing. Due to these challenges, different ways to efficiently utilize land has to be implemented. An initiative to accommodate dairy farming in urban areas has been discussed, as well as maximizing the usage of the existing farming area.

- d) **Disease status:** Malaysia is not free from some animal diseases including Foot and Mouth Disease (FMD) and Brucellosis that are important for a farm's economy and trade. The devastating effect was observed in the dairy industry when multiple FMD outbreaks reduced the number of milking cows and milk production. Although disease control programmes have been carried out, the potential incursion from infected livestock or its products is ever present. It is important for neighbours and trade partners to jointly discuss issues concerning disease control as the increase in demand either for livestock or its products could potentially create an environment for dubious activities.
- e) **Sustainability of dairy breeding programme:** In the 1980's Malaysia conducted research to study crossbred cattle that are suitable for a tropical climate which resulted in Mafriwal breed introduced to farmers. The breed is suitable for Malaysia and relatively easy to rear. However, milk production of the Mafriwal is relatively low compared to temperate cattle, which is not desired by farmers. Thus, selection of desirable traits for dairy cattle in the tropics is important depending on the type of husbandry system and the goal of the business, rather than adaptability alone.

Section III: Potential Areas for International Cooperation and Role of APHCA/Dairy Asia

The dairy industry in Malaysia is small compared to neighbouring countries like Thailand and Indonesia. Although DDP has been implemented for the past four decades, there is not much improvement in terms of milk volume produced or import dependency. However, the policy to increase farmers' income provided sufficient grounds to enhance and ensure efficiency in dairy farming in Malaysia.

There are areas important for international cooperation:

1. **Breeding and genetic improvement of dairy cattle:** Most dairy breeding cattle are imported from Australia, New Zealand and Thailand. Locally bred dairy cattle are cheaper, but are not enough to produce the targeted milk production. Cooperation in breeding and genetic improvement programmes in tropical countries could be beneficial for all countries.
2. **Farmers cooperative collaboration:** Farmers cooperatives involvement in the dairy industry has been emphasized in the past five years to ensure a market-driven industry and to provide institutions for farmers' development. However, progress toward agribusiness is not as expected. It is believed that the cooperatives could learn from counterparts in other countries about a sustainable dairy industry.
3. **Technology and livestock management adaptation:** Many technologies have been used successfully in other countries, but could not be implemented in Malaysia. Some of the technologies require skilled technicians and support services that are not available in the country. Adaptation of suitable technologies

and management systems are also important for farmers. Knowledge and skill from both farmers and experts is essential and much sought after in order to continue progress in dairy industry.

Conclusion

The success of the dairy industry requires cooperation between both farmers and authorities involved in the industry. Furthermore, cooperation with business partners regardless of country would be beneficial to provide sustainable and profitable businesses among industry players.

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Mongolia

Section I: The Setting

Introduction

Mongolia is a developing country with a small population and vast territory where traditional pastoral nomadic livelihoods coexist with modern urban lifestyles. The livestock sector contributes more than one-fifth of GDP. The dairy sector was, and remains, a key economic sector. The livelihoods and wellbeing of the majority of Mongolia's people still depend largely on livestock in general and on meat and milk in particular. Milk is one of the important staple foods of Mongolians. In the short warm summer season, it is produced in great abundance by herding households (small-scale producers). Only milk from cattle is industrially processed while milk from other types of livestock is consumed directly or converted to a wide range of traditional products.

Current situation of the dairy sector

In the socialist period, Mongolia used to be self-sufficient in milk. Currently the dairy sector is undergoing transitional challenges from a command economy to a free market economy. After the collapse of the dairy industry, large intensive dairy farms were broken into small dairy units with 10 to 30 cows managed by smallholders. The pastoral livestock sector does not fully meet the demand of urban centres for dairy products due to poor infrastructure and short lactation period of local cattle breeds as well as low milk yield per cow.

As a result, the urban population has a severe shortage of fresh milk in spring and winter months. To meet urban demand for dairy products, Mongolia imports dairy products mainly UHT milk. For instance, in 2012 the cost of importing dairy products was US\$44.2 million, which was equal to 120.0 million litres of liquid whole milk. (Ministry of Industry and Agriculture, 2013)

Table 1. Milk production in Mongolia ('000 tonnes)

Item	2000	2010	2011	2012	2013
Total milk production	375.6	338.4	458.6	511.0	575.2
Processed milk	1.7	33.8	42.7	53.2	63.1
Processed milk in %	0.4	10.0	9.3	10.4	10.9
Imported milk	7.6	28.9	36.9	38.6	34.0

Source: Mongolian State Statistical Year Book, 2012

Statistics on total milk production, imports of milk and processed milk are given in Table 1 and show a small proportion of total milk is processed due to seasonal supply and poor milk collection infrastructure. Imported milk has increased by almost 5 times since 2000.

The Mongolian population enjoys a high *per capita* consumption of milk, comparable to other countries, thanks to its high livestock population. However, there is a particularly large gap between the milk production in rural and in urban area. Annual milk consumption in urban centres is 58 kg Liquid Milk Equivalent (LME) per person, about one-quarter of the consumption in rural areas, at 200 kg.

Currently Mongolian milk producers are classified as traditional herder households and peri-urban households or farms. Nearly all milk is produced by these herding households and consumed directly by them or converted into traditional dairy products. Approximately 10% of total milk comes from peri-urban semi-intensive/intensive farms and households through the formal chain.

Charts 1 and 2 show the milk production structures in Mongolia: the informal and dairy chains that link small herders and dairy farmers with consumers in large urban areas and smaller *aimag* (provincial) centres. (Baseline Survey-GCSP/MON/001/JPN Dairy Food Security Project, 2005)

Chart 1. Milk flow for provincial centres

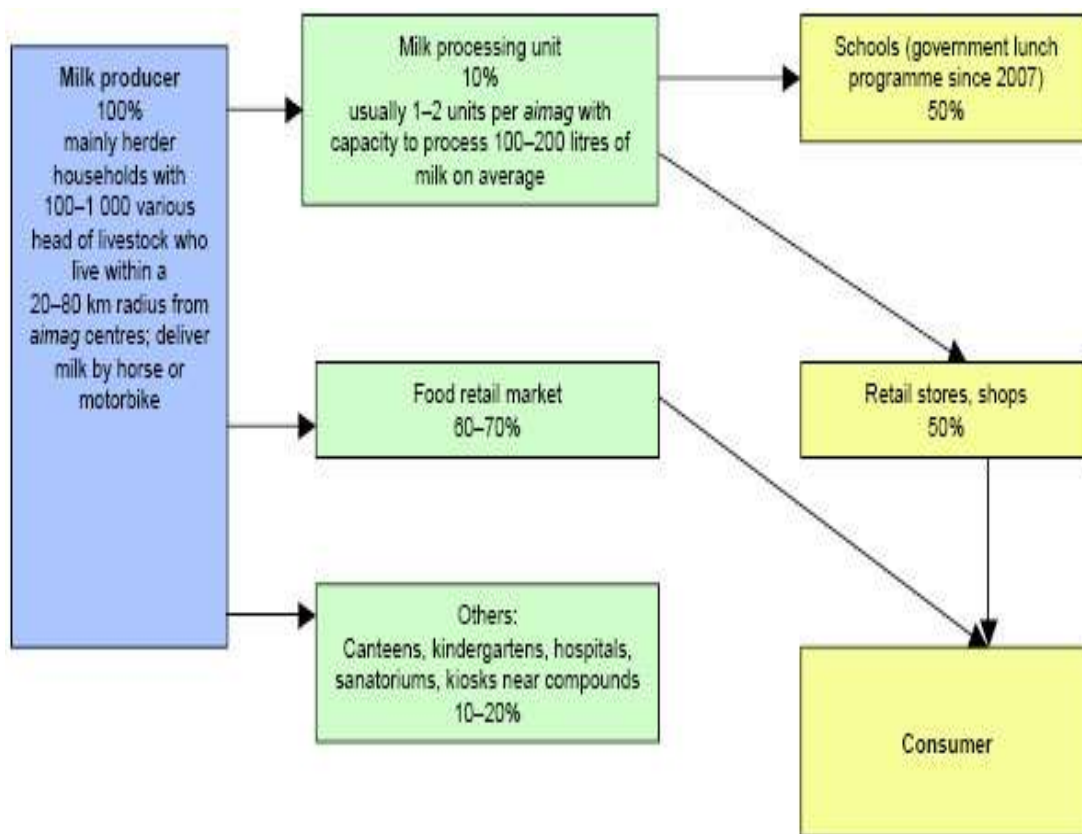
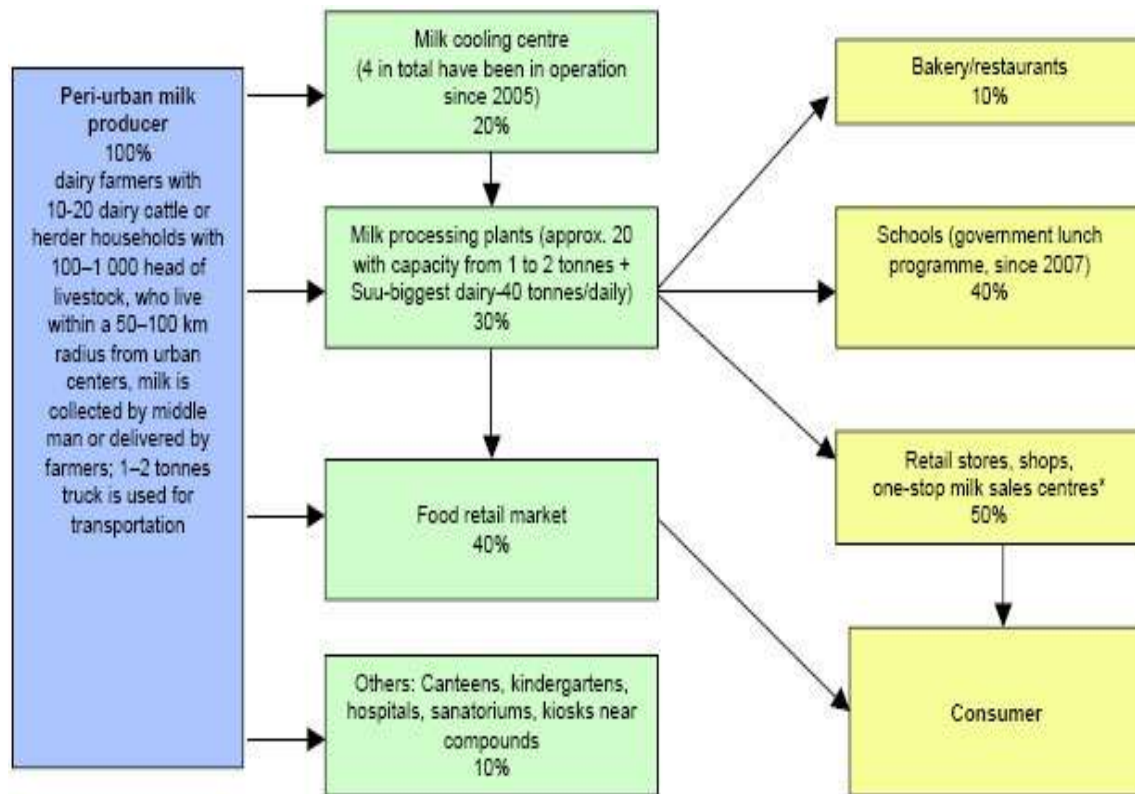


Chart 2. Milk flow for large urban centres



Milk pricing

Pricing is not dependent on the fat content of the milk. Since the move to a market economy in the 1990s, milk prices are no longer centrally set and fluctuate according to supply and demand. Farm-gate and consumer prices vary considerably according to season and to how far milk producers are from the market. Small milk producers are reported to be the most profitable type of farmers in Mongolia (World Bank, 2004). In 2007, milk producers linked to formal markets received between 150 and 300 tögrög (US12–25cents) per litre for milk in summer, when 80 percent of the milk supply is produced. In winter they were paid between 350 and 500 tögrög (29-42USD cents) per litre.

Semi-intensive dairy sector

In this sector, cows are housed in insulated shelters in winter with supplementary feeds such as bran and natural hay and, in summer, are grazed exclusively on open pastures months with some bran. Milking is mainly by hand while a few farms use a portable milking machine. Milk yield is low and ranges from 2000 to 2400 l/year. Most of the cows kept in semi-intensive farms are crossbreds of Mongolian cattle with Simmental, Brown Swiss or Holstein. According to the statistics, the numbers of semi-intensive dairy farms have been steadily increasing - from 410 in 2008 to 901 in 2011.

Intensive dairy sector

In winter, cows are kept in warm barns and fed with silage, hay and concentrates with limited grazing under this system. In summer time, cows are mostly kept in fenced pastures with some supplements. Due to the current mining boom in the country, national companies are investing in intensive dairying by constructing large intensive dairy farms, importing breeding stock and frozen semen of exotic dairy breeds with high genetic potential such as Holstein, Montbéliarde and Brown Swiss. However the current intensive dairy sector is still small and is in the re-building stage.

Section II: Key Opportunities and Challenges

Major milk production and consumption challenges include: i) a relatively small domestic market for processed milk and dairy products; ii) a huge disparity between rural (at 200 kg per year) and urban (at 58 kg per year) consumption of milk; iii) poor-quality milk and lack of consumer confidence in locally processed milk and dairy products; iv) over-reliance on imports for urban markets and v) lack of fresh milk in urban areas vi) lack of infrastructure for traditional households to reach central markets.

As a response to the increasing imports of dairy products, the need is to stabilise the milk price in major urban centres, reduce the disparity in milk consumption between rural and urban populations and better utilize surplus summer milk from the traditional livestock system. Therefore, the Mongolian government has started to undertake the following measures through the National Dairy program:

- With government budgetary support, establishing 25 large intensive dairy units with 50 to 300 cows in peri-urban areas (within a 50–100-km radius) of three big cities - *Ulaanbaatar*, *Darhan* and *Erdenet* in order to increase urban milk supply and improve milk quality by reducing post harvest losses by 2020;
- Providing soft loans for establishing new cow barns and purchasing breeding stock domestically or from abroad to support small milk producers in peri-urban areas;
- Establish milk cooling chains and milk processing plants in rural areas with government support by creating credit lines in the commercial banks in order to improve milk quality and the outreach to major urban markets.

Technical challenges include; poor cattle breed improvement, lack of good quality feeds and provision of animal breeding and veterinary services for dairy farms and small milk producers:

Poor cattle breed improvement. The genetic quality of the dairy herd is declining. When the large scale intensive dairy farms were broken up, their cattle were distributed to a variety of owners and the breeding system largely collapsed because there was no profitable market for high productivity stock. Therefore many small farmers used back crossing to the local breed negatively impacting productivity per animal since native cattle have low milk yield, 300 l of milk per 4 months lactation. Lack of access to the quantity and quality of animal feed necessary to support improved breeds in the

Mongolian livestock production environment with its harsh climate means that only half of the genetic potential of imported dairy breeds is used.

The national gene bank provides semen and Artificial Insemination (AI) supplies including liquid nitrogen to dairy farms. Demand for AI services is increasing due to the development of dairy and beef small-scale farms in peri-urban areas. In response to the demand, government has allocated funding for a reproductive and molecular biotechnology centre, which is now under construction. However current demand is low and work needs to be done to raise awareness of the services available and the benefits of investing in AI. With the support of FAO a TCP was implemented (2008-2010) which set up a dairy cattle genetic improvement scheme. Responsibilities for running the scheme are defined and, currently, data collection and performance recording of dairy and multipurpose cattle is managed with government funding on a regular basis.

Key constraints to breed improvement are:

- Lack of access to tried and tested improved breeds;
- Reluctance of herders to invest in breed improvement (preference is to increase animal numbers);
- The need for specialized extension services to assist herders willing to invest in improved breeds.

Poor feed and fodder management. During winter/spring periods dairy cows are supplemented with hay, silage and crop residues. Mongolia used to produce a large quantity of silage prepared from cultivated fodders in the former State-run farms. During recent years the production has drastically decreased due to the high cost of production, machinery and imported forage seeds. The use of compound feeds is very limited in Mongolia because most ingredients are imported. Winter and spring feeding is insufficient to maintain the weight and condition of lactating animals but the farmers' experience is that the cows will regain condition during the summer grazing season.

Cattle health. One of the main public health risks for the dairy sector is brucellosis because of poor control. Most milk used by rural residents is unprocessed and not tested for major diseases harmful to humans. Brucellosis incidents are reportedly increasing in rural areas. No comprehensive survey on bovine brucellosis has been done. Mass vaccination against brucellosis has been initiated in Mongolia and some other diseases are also controlled by vaccination.

Currently, the participation of the private sector in dairy sector development is on the increase. Most of the capital requirements should be provided by the private sector and bank lending but the Government has a key role to play, particularly in improving the relevant legal environment and in supporting trials, demonstrations and information transfer.

Section III: Potential Areas for International Cooperation and Role of APHCA/Dairy Asia

The key opportunities available to the Mongolian dairy industry are: i) high *per capita* consumption, ii) large milking herds, iii) vast grasslands, iv) substitution of imports, v) export potential for “clean” milk to nearby milk-deficit markets, all of which provide incentives to overcome the present *constraints*: i) low milch animal productivity due to poor breeding services and feeding management ii) poor-quality milk and hygiene; iii) lack of market access for milk producers, iv) obsolete infrastructure and equipment, v) lack of up-to-date technical know-how and skills.

Since milk is one of the traditional staple foods for Mongolians, the Government is investing in milk collection infrastructure, establishing modern dairies and importing breeding stock with high genetic potential. However limited investment has been made in the dairy sector so far to improve dairy farm management and capacity building of farmers and extension services. Consequently we have identified the following potential areas for international cooperation with technical assistance of APHCA: establishing dairy training centres for small farmers/households to improve their management skills on milk hygiene; feeding and breeding, conducting experiments/demonstrations on growing fodder plants for silage and other feeds; improving brucellosis control in dairy farms.

Myanmar

Brief Overview of Trends and Issues in Production

Myanmar dairy production structure

Statistics provided by the Livestock Breeding and Veterinary Department, show the total cattle population of Myanmar to be 22 million. Among this figure, a total of 520 300 head of crossbred dairy cattle of mostly Holstein Friesian crosses are being kept in small to commercial scale farms. Eighty five percent of total crossbred cattle are owned by the small holder farmers. Out of this figure, 200 000 head are lactating animals which account for 40% of the total crossbred dairy population. Most of the male dairy calves go for meat production. At present, due to various reasons, milk production of crossbred animals is quite low with an average daily yield of 5 - 6.5 kg for 305 days lactation. The local breed of cattle are low milk producers with an average yield of less than 1.6 – 2.0 kg per day for 200 days lactation. Farmers feed their animals mostly on seasonal grasses and rice straw as roughage and crop by-products such as oil seed cakes, bran and pea middling as concentrates. Although pasture establishment and fodder management have been considered, it will have some limitations such as land use policy and land availability. Natural grazing is practiced for local cattle but crossbred animals are usually tethered.

Production and consumption of milk and milk products

In Myanmar, the average daily milk production is estimated to be 4 200 metric tonnes in 2013-2014 from the local and crossbred dairy animals. The milk production is irregular due to seasonal variation and it is expected to be higher in the rainy season but lower in summer. Usually, private owned Sweetened Condensed Milk factories take up 80% of the milk produced by smallholding farms. The remaining 20% of milk goes to the local market as homemade products such as local cheese, sweet milk balls and yogurt. Due to the limited uptake of milk by the factories due to its limited processing capacity and own market demand, whenever milk production is very high, farmers might have some difficulties in selling the milk.

Increasing population and income, together with the increasing popularity of dairy products in developing countries are key factors behind the strong demand in the medium term. In Myanmar, in 2012-2013, a total of 1.32 million metric tonnes of raw milk was produced and *per capita* consumption was 26.3 kg. It is also estimated that 442 small and medium scale dairy factories produced 34 675 metric tonnes of sweetened condensed milk and 185 metric tonnes of milk powder in the same year. Due to the insufficient local production, 41 739 metric tonnes of milk and milk products were imported (at a cost of 47.94 million USD) from the countries as shown in Table 1.

Table 1. Dairy products imported to Myanmar and countries of origin

No.	Dairy Product	Imported from
1	Milk powder	New Zealand, Singapore, Malaysia, Philippines and China
2	Sweetened condensed milk	Singapore, Malaysia and Thailand
3	Evaporated milk	Singapore and Malaysia
4	UHT milk and yogurt	Australia, Singapore, Malaysia, Thailand and China
5	Butter, cheese, ice-cream	New Zealand, Australia, Singapore, Malaysia, Thailand and China

Cost of production and milk price

The production cost of milk from the individual farm varies according to the number of milking animals raised, milk yield, farm gate price of milk, type of feed used, price and availability of feedstuffs, lactation period, age and body condition score and the amount of advanced loan received from the milk collectors or dairy factory; ie, if the farmer received a loan in advance, he will get a lower milk price than the current price. There are different systems of selling milk from the farmers to buyers as shown in Table 2.

Table 2. Milk pricing along the dairy chain

No.	System of selling milk from	Milk price (USD/kg)
1	Farmer to collector	0.40-0.43
2	Farmer to processor	0.55-0.65
3	Collector to processor	0.55-0.65
4	Farmer to tea shop, bakery and cold drink shop	0.60-0.80
5	Farmer selling milk directly to consumer	0.80-1.00

Consumer price varies by the type of dairy product and name of the product brand as follows:

No.	Type of milk product	Consumer price (USD/litre)
1	Fresh raw milk	1.0-1.1
2	Pasteurized milk	1.2-1.4
3	UHT milk	1.4-1.7
4	Yogurt	2.5-2.7
5	Sweetened Condensed Milk (Liquid, locally produced, in kg)	1.5-2.0
6	Sweetened Condensed Milk (Solid block, locally produced, in kg)	2.5-3.0

Key Opportunities and Challenges

Cereals are still at the core of human diets, but growing incomes, urbanization and changes in eating habits contribute to the transition to diets that are higher in protein, fats and sugar. In this scenario, in the next decade, livestock production including dairy

products is projected to grow at higher rates than crop production. Therefore the following could be the opportunities for Myanmar dairy sector;

- Productivity gain
- Quality gain
- Substituting imports
- Human nutrition and health
- Income
- Job creation

Objectives of the Myanmar dairy sector

The national milk requirement in 2015-2016 is projected as 1.56 million metric tonnes to feed the estimated growing population of 52 million. Healthy and hygienic milk production is crucial for the Myanmar dairy sector. The Livestock Breeding and Veterinary Department has laid down the following objectives:

- To improve the genetic potential of existing dairy animals
- To improve milk quality through the upgrading of laboratory facilities
- To produce the milk required with acceptable quality
- To expand the school milk programme
- To improve the livelihoods of the rural populace through dairy farming

Role and responsibilities of institutions

There are some institutions which deal with livestock sector such as the Livestock Breeding and Veterinary Department under the Ministry of Livestock Fishery and Rural Development, the University of Veterinary Science, Myanmar Veterinary Council, Myanmar Veterinary Association, Myanmar Livestock Federation and Myanmar National Dairy Development Board. The Livestock Breeding and Veterinary Department has been taking the leading role for policy and regulating the mechanisms of animal health and production related issues.

Current and expected production of milk

In 2010-2011, milk production was shown to be 1.32 million metric tonnes and in 2015-2016, it is expected that the production should be 1.56 million metric tonnes. During the 6 years period, the annual increment of milk production will be 3.0%.

Current market structures and target for next 10 years

There is limited or unorganized market structures in the buying of raw milk and selling of value added milk products. Dairy farmers sell milk to the local dairy factories or directly to the milk market. Very few local processors practice milk quality control procedures and payment is based on the pricing policy but, for the majority, there is no quality control on the raw milk.

Consumer education

Consumer awareness campaigns started in 2004 by LBVD when FAO launched the SSDTT project along with school milk programme done by milk processor itself. Various

education programmes have been launched through posters, pamphlets and broadcasting programmes such as radio and television.

Food safety

Food Safety standards have been developed by the Department of Health under the Ministry of Health and food safety laboratories established in the cities of the states and regions. For the establishment of the milk processing facilities, LBVD has developed **ASEAN Criteria for Accreditation of Milk Processing Establishment**. All milk processing factories must have been examined by the LBVD and finished milk products must be examined by FDA for whether it is suitable or not for human consumption. Milk quality testing equipment has been installed in the disease diagnostic laboratories in Yangon and Mandalay with the support of the Myanmar-New Zealand Excellent Dairy Project. Two of the milk processing plants have been approved by FDA for milk quality control facilities. Food safety procedures should be expanded on a country wide scale to achieve good public health.

Trade

The demand for milk in Myanmar will increase from 1.32 million metric tonnes in 2010-2011 to 1.56 million metric tonnes in 2015-2016 which is an 18.2% increment to achieve the expected goal. The ASEAN Economic Community (AEC) trade agreement in 2015 will increase competitiveness for both the local milk products and imported ones.

Technical capacity

The technical support services in Myanmar are not focussed on improving productivity and profitability on the farm and mostly focus on animal health and artificial insemination issues. Technical support for processing and handling of milk is limited. It is important that technical capacity from farm to table is developed.

Public health

Milk hygiene issues are still limited by consumer knowledge, farmer care and lack of processor demand. LBVD is starting to take responsibility for managing the risks to farmer and public health and a Consumer Protection Law has been issued by the state.

Environmental challenges

Due to the climate change scenario, limited availability of forage and competitiveness in concentrates for the dairy animals are one of the environmental challenges, while the unavailability of well adapted tropical dairy breeds is a second challenge.

Potential Areas for International Cooperation and Collaboration with Other Countries

Food and Agriculture Organization of the United Nations

To improve the dairy sector of Myanmar, FAO has provided different dairy development programmes as follows:

No.	Project title	Period	Funding (USD)
1	Small Scale Dairy Technology Transfer Training Project	03/2004-03/2006	356 000
2	Dairy Cattle Improvement Project	06/2008-12/2009	358 000
3	Integrated Approach for Enhancing Cattle Productivity	01/2005-12/2006	400 000

New Zealand Government

The project Phase I is taking place from March 2014 to August 2015 and Phase II will be from September 2015 to December 2019 with the support of 4 million USD. The project has been designed in the area of pasture and fodder development, farming management including dairy reproduction and nutrition, milk quality control and extension work.

Department of Livestock Development, Thailand

DLD in Thailand also serves as a collaborating partner for LBVD and MLF by providing various training programmes and materials.

Other potential partners

Other potential partners to support dairy sector development include: International Atomic Energy Agency (IAEA); World Animal Health Organization (OIE); Japan International Cooperation Agency (JICA); Myanmar National Dairy Development Board; Myanmar Livestock Federation; Myanmar Veterinary Council; Myanmar Veterinary Association and other private sector actors

The dairy sector is an integral part of farming systems and it can directly and indirectly contribute employment opportunities, improved food security not only for the farm households but also for the country's populace and assisting poverty alleviation through rural development programmes thereby increasing the country's GDP growth.

Conclusion

Within the context of the Myanmar dairy sector, it is found that a small group of farmer, farmer/processors and processors, are investing heavily in developing their businesses and making good progress with the existing capacity. Although the dairy industry is moving forward, it also has some constraints including poor genetic potential, limited feed availability, inadequate health care service, limited cold chain facilities, poor transportation, and an unorganized marketing system. It is recommended that:

- Private sector actors should be given priority in dairy production with low interest bank loans (1-3%), encouraging public and private sector partnerships

and investments, strengthening cooperation between private organizations, NGOs with the government sector

- A high yielding dairy breed should be developed which could be well adapted to tropical climate through genetic improvement.
- feed and fodder production is Increased. It may be partially achieved by introducing HYV fodder cultivation.
- Veterinary care and services to the farm owners should be strengthened.
- The price of milk should be fixed at a reasonable level and the milk marketing system should be improved by the intervention of the government. Cold chain facilities should be created for the farmer to ensure the marketing of their product.
- Improvements should be made to communication, power, water supply and modern storage facilities for dairy products.
- Dairy products branding, labeling and advertising should be introduced.
- Powdered milk imports should be reduced to encourage dairying in Myanmar. A National Milk Development Co-operation should be established.

Nepal

Introduction

Agriculture is the mainstay of Nepalese people and livestock is an important, integral part of the Nepalese system of agriculture. Livestock provides a major source of nutrition and household cash income, and thus have a significant place in the national economy of Nepal. Livestock contributes 26% to total agriculture GDP, of which the contribution of the dairy sector is 62.6% (DLS, 2014). With respect to total GDP, the livestock sector contributes about 13%, the contribution of dairy being about 9%. The Nepalese rural farmer considers the dairy animal as the living bank for their livelihood. It is estimated that about 13 million NRS is transferred daily to rural areas from urban areas due to the sale of liquid milk (NDDDB, 2013). The livestock production systems are characterized broadly by their multipurpose, multi-species nature and their close integration with cropping systems. Milk is produced by the farmer in a subsistence manner for making their livelihood (Rajbhandary and Sherchand, 2011). The recent trend shows a very positive phenomenon in dairy sector due to the increase in commercial dairy farmers in the country. Dairy farming is becoming the choice of rural and educated unemployed youth. Present per capita consumption of liquid milk is 51 litres per annum, which is far below South Asian, Asian and global standards. However, the demand for milk and milk products is increasing by 12% annually.

Present Status of Dairy Industry in Nepal

Cows and buffaloes are the major dairy species. The populations of cattle and buffalo are 7.41 million and 5.14 million respectively (MOAD, 2014). Improved or crossbred cattle and buffalo populations are nearly 15% and 30 % respectively of the total populations (DLS, 2014). The crossbred population is mostly concentrated in the peri-urban areas of the hill and terai region with comparatively better infrastructure and marketing facilities. Holstein Friesian and Jersey are the predominant exotic breeds of dairy cattle introduced in Nepal for genetic improvement of indigenous cattle, whereas Murrah is the only exotic buffalo breed introduced for the same purpose. Indigenous cattle are generally poor in milk production with average productivity of 450 litres per lactation for cattle and 900 litres for buffaloes. Despite the low productivity, they are being kept for manure, draught power for agricultural operations and for religious purposes. The value of indigenous cattle as dairy animals for commercialization is very poor. However, their utility for production of crossbred dairy cattle using frozen semen is tremendous. They have their unique nature and are considered to be resistant against diseases and parasites e.g. indigenous cattle are not affected by ticks. Achhami cattle, the smallest cattle breed in the world is found the western hilly district of Nepal and capable of producing high volumes of milk in relation to their body size in adverse environmental conditions and with poor management. Yak are reared throughout the northern belt of Nepal and its population is nearly 65 thousand.

Average total milk production of Nepal is 1.697 million MT per year. Buffaloes contribute the highest volume of milk i.e. 70% of total milk production while cows contribute 30% of total milk production (DLS, 2014). The low productivity is mainly due to low genetic potential, shortage of quality feed and fodder and lower health status of dairy animals. There is seasonal fluctuation in milk production, which affects the supply of pasteurized milk in the market (Flush season; August-September to January-February; lean season; remaining months of the year). The ratio of lean to flush season production is about 1:3 in most of the country. This seasonal fluctuation is considered to be due to the seasonal breeding pattern of buffaloes and the availability of green forage in the monsoon season.

Milk is the major product of the dairy industry while yak provide cheese, churpi, paneer, curd, ghee, and sweets as important dairy products with good market values.

The demand for milk and milk products is increasing yearly at the rate of 12% because of increasing urban population and increasing consumption. The gradual switch by the urban population to dairy products like paneer, cheese, different flavoured liquid milk and ice cream is creating this increase in demand. The established dairy industries are presently running at less than half of their capacity. It is estimated that the total deficit of milk is 500,000 litres per day.

The milk price is determined by the government through the National Dairy Development Board but dairy farmers claim this to be far below the cost of production. The average per litre price of milk was 0.427 US\$ a litre in 2011-12 and 0.709 US\$ per l in 2012-13 (MOAD, 2014). The payment mechanism to the farmers for milk is totally based on Fat and SNF percentages rather than any measure of hygienic quality.

Channels of milk marketing consist of collection of milk in the collection centres of both the Dairy Development Corporation (DDC) and private dairies through milk producers' cooperatives. The milk is then transferred to processing centers in urban areas, where it is either pasteurized or converted to different kinds of dairy products and sold in the urban centres. About 15% of the total milk produced in the country is believed to be marketed through formal marketing channels. Private sector investment in the dairy industry has increased in last the 10 years and the private sector share has increased to more than 60% of the total milk marketed in the formal sector. Kathmandu is the major market for processed milk (70%), the rest being sold in other urban city centres. It has been estimated that 35% of the milk produced is sold in the informal markets (door to door supplies, hotel and restaurant supplies, etc). The remaining 45% is assumed either to be consumed at household level or used for producing ghee and other products either for home consumption or for sale. The government owned Dairy Development Corporation is the biggest player in the dairy industry. It operates throughout the country with more than 1,150 milk producers' cooperative societies, 8 milk distribution projects and one skim milk powder plant with a capacity of 3 MT SMP production per day. The capacity of this plant is going to be increased to 6 MT per day from this year (Annual Report DDC, 2013-14). There are two more SMP plants in the private sector namely Chitwan Milk Ltd and Sujal Dairy, with daily production capacities of 15 tons and

10 tons respectively. The share of the private sector in milk processing is increasing with the private sector business increasing from 2% in 1980s to 60% in the current year. In Nepal, altogether about 744 dairy processing industries are operating in different capacities (Babu Kaji Panta, 2010). There are four dairy processing industries with more than 50 000 litres daily milk processing capacity, 10 industries with 10 000 to 50 000 litres milk processing capacities, 30 with processing capacities of 1 000-10 000 liters and about 700 with 1 000 litres daily milk processing capacities (Rajendra Prasad Shrestha, 2009).

Dairy cooperatives are the most organized and successful local level farmers' institutions in the country. There are about 1,800 milk cooperatives functioning in 62 districts and are organized into district milk producer's cooperative unions in 38 districts. (Personal Communication, National Milk Producers Cooperative Association).

Opportunities for the Dairy Industry

Tremendous opportunities exist in the dairy sector in Nepal. As milk is the choice of the majority of the population, there is great demand of milk and milk products in local markets. The milk that is transferred via the formal sector is not enough to meet the capacity of the existing dairy industry. It is estimated that there is daily deficit of liquid milk of 500 thousand litres of milk. Dairy animals are distributed throughout the country in all the ecozones from terai to hill. So this is one of the sectors through which all the people could be included in the development stream and it can also play a significant role in food and nutrition security and help in poverty alleviation.

Due to access to the global market and the availability of communication media, the demand for milk and milk products is increasing by 12%, while the growth of milk production per annum is only 3 to 4%. This shows that there is ample opportunity to reduce this gap of demand by increasing supply through local production. Dairy business and commercial dairy farming is very popular among the educated youth and in those returning from jobs abroad. This provides the opportunity of sound growth in the dairy sector in days to come. The geo-location of Nepal between two heavily populated nations, China and India, each with a great demand for dairy products provides a very good potential market for milk produced in Nepal, provided it can compete both in quality and price. Growth of the private dairy industry and priority given by the government to the dairy sector has created a congenial environment for both commercial livestock production and dairy businesses. The recent policies endorsed by governments for the promotion of the dairy sector e.g. subsidies in bank loan interest by 4% and on insurance premium by 75%, subsidies for commercial dairy farming, agribusiness promotion and mechanization policies confirm the opportunities for growth of the dairy industry in Nepal.

Challenges for the Dairy Industry

Despite having a great opportunity for the development of the dairy sector in Nepal, there are several challenges as well. Some of these challenges are as follows:

1. Majority of the dairy farms are smallholders with 1 to 3 head of cattle or buffalo, for which the economies of scale of production do not exist.
2. Large and less productive indigenous dairy animals in the country, which cannot be slaughtered due to religious beliefs and it requires longterm planning to obtain sufficient replacements from the improved productive population.
3. Small scattered land holding size (<0.7 ha/HH), making difficulties for forage production for dairy animals.
4. Nepal experiences about 36% feed deficit for its livestock population. Existing laws and regulations prohibit forest use by commercial dairy farmers. Per-capita land distribution among the dairy farmers is much less so, unless forage based dairy farming could be promoted, it is very difficult to compete in the global market.
5. Shortage and problems of timely delivery of critical inputs for dairy production – such as good breed of animal, forage seed, credit and service deliveries.
6. Less milk in the formal market due to which the dairy industry is running at half-capacity due to the unavailability of whole milk and are, therefore, likely to close.
7. Due to lack of knowhow on quality milk production, the actual quality of milk to the formal market is very poor.
8. Production of milk in the country is not at a uniform level throughout the year with a huge gap in milk availability between the two seasons (lean and flush seasons).
9. As the farmers do not want to keep dry animals, good productive buffaloes are sold for slaughter to urban areas causing a serious loss of good genetic material.
10. Shortage of dairy animals to cater for the needs of developing large commercial dairy farms is one of the big bottlenecks for development.
11. Shortage of labour in dairy farming has recently emerged as a problem due to the migration of the labour force to foreign countries - especially the Middle East.
12. Inadequate breeding services both artificial insemination and natural service due to a shortage of both an AI service and breeding bulls.
13. Animal health problems are also a serious threat to the dairy sector. Diseases like FMD, mastitis are causing heavy losses. The unavailability of vaccines, problems in the cold chain, emergence of new strains of viruses are causing difficulties in the control of these diseases. Lack of well-equipped laboratories, skilled technicians is also major hurdle in disease control.
14. Difficult geographical terrain, poor accessibility and connection to markets with scattered dairy pockets are also among the challenges to be faced for the development of the dairy sector.

Potential Areas for International Cooperation and Role of APHCA/Dairy Asia

International cooperation with the dairy sector in Nepal began in 1952 with assistance from FAO for the establishment of a Yak cheese factory in Rasuwa district. Besides FAO, bilateral assistance from different countries and international organizations has made a

remarkable contribution in the development of the dairy sector of Nepal. The sector is facing several constraints for which external assistance is required for resolution.

Looking at the challenges, the following areas have potential for working together with international agencies like FAO in the future.

1. DCIP programme that has been successfully completed with FAO assistance in the dairy sector has given very good results for the selection of good quality bull mothers. These selected bull mothers are being used by the National Breeding centre to produce quality semen. The government has been implementing BGIP (Buffalo Genetic Improvement Programme) with its own resources based on the same modality. This type of programme needs to be continued.

2. Nepal is seriously lacking in productive breeds of both cattle and buffaloes in the market. 15 to 20 years back, there was no restriction on imports of livestock from India, but now India has put a ban on the export of livestock especially cattle and buffaloes, so assistance to establish resource centres for the supply of both cow and buffalo heifers in PPP modality could be extremely beneficial for the Nepalese dairy industry.

3. Nepal is always facing problems in supplies of liquid nitrogen and of quality semen for its AI services. Strengthening of AI laboratories in different regions and setting up of liquid Nitrogen plants in different regions with capacity building of technicians could be another important area for future cooperation.

4. Technical assistance for newer breeding technology for Nepal eg. sexed semen production, embryo transfer could also be future possible avenue of cooperation.

5. Technologies to reduce the cost of production in the dairy sector are very much needed in the present context. Assistance to establish a Total Mixed Ration Plant in PPP approaches both to government and the private sector would benefit many dairy farmers.

6. Nepal is facing the threat from several different economic diseases. FMD is the most serious problem for the dairy industry. The lack of vaccine for the control programme of FMD is a limiting factor, which needs to be overcome by the production of FMD vaccine within the country.

7. Nepal, being member of WTO, has both challenges and opportunities for the export of dairy products. Lack of a well-equipped laboratory to overcome the problems of sanitary and phyto-sanitary issues forms a technical barrier to trade. Assistance and cooperation from the international community in the field of laboratory establishment, strengthening quarantine services, good management practices, certification and export of products is critical.

8. Live animal markets are operating in a traditional way with no basic market infrastructure facilities due to which both buyers and sellers are suffering. Due to the lack of facilities and proper management, live animal markets are becoming a potential source for disease transmission. Future cooperation for the development of live animal markets in different potential areas could be very beneficial for Nepal.

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Pakistan

Section I: The Setting

Dairy sector is one of the vibrant and significant segment in agrarian economy of Pakistan. As a leading milk producing country in the world, its estimated gross annual milk production is 51 million tons (2013-14). Despite the huge milk production, the dairy sector is hardly meeting the local demand for milk for the rapidly growing 188.02 million human population of the country. The livestock including the dairy sector is gaining momentum by contributing approximately 56% of the agricultural value added and 11.8% to the national GDP.

In 2013-14, the national herd comprised of 39.7 million cattle; 34.6 million buffaloes; 66.6 million goats; 29.1 million sheep and one million camels. Buffalo and cattle are the main dairy animals; however milk production is also contributed by goats/ sheep and camels. The average household holding size is 2-3 cattle/buffalo and 5-6 sheep/goat per family. Pakistan is home to important river buffalo breeds including Nili/Ravi (Punjab) and Kundi (Sindh). Apart from famous dairy cattle of Sahiwal and Red Sindhi, dairy cattle crossbreds in Pakistan have been generally produced as a result of crossing with highly improved breeds with local less productive breeds (exotic/ local) to increase milk production. The dairy production systems of Pakistan lie in a climate, which varies with altitude and type of vegetation. Based on the physiography, geology, climate and agricultural land use, the country can be divided into 10 agro-ecological zones. The total geographical area of Pakistan is 79.61 million hectares (ha). The cropped area is 22.0 million ha (28%), of which 17.8 million ha is irrigated, and the remainder is rainfed. The main water sources in the country are rivers, groundwater and rainfall. Drought conditions can affect more than 50% of the normal water supply during certain years.

The dairy sector of Pakistan thrives on a huge investment base with the major share coming from the landless/small land holding farmers. The hallmark of the dairy economy is the dominance of small and subsistence unorganized dairy farmers practicing dairy as a part of mixed agricultural farming. More than 8 million rural families engaged in livestock production derive 30-40% of their income from livestock. It reflects its inherent potential for generating economic activity and employment besides supplementing high value animal origin protein for human consumption.

The contribution of the rural areas in total milk production is about 80%, whereas the share of peri-urban and urban areas is 15% and 5% respectively. At present, per capita availability of milk is 223 liters per annum (611 ml/day). The rapidly increasing growth of human population, urbanization and increased per capita income are the key stimuli for the rising demand for dairy and milk products. Milk production in Pakistan has shown a consistently increasing trend during the last two decades. Milk production increased by 3.5% during 2013-14 compared to the previous year. Despite a significant recent increase in total milk production, the trend of milk prices have been upwards mainly

because of increasing input costs. Generally four types of dairy production systems are followed in Pakistan:

- Rural smallholder subsistence farming;
- Rural market oriented smallholder farming;
- Rural commercial farming; and
- Peri urban / urban commercial farming

About 80% of the total milk production in Pakistan is available for human consumption. The difference between production and consumption is on account of 15% wastage during faulty handling due to the non-availability of sufficient cooling facilities, infrastructure and transportation facilities and 5% is used for calf feeding. Generally, milk produced in Pakistan is marketed through local milkmen (*Gawallas*) and milk vendor shops and people prefer to consume fresh boiled milk and *Dahi* (yogurt). The production and consumption of milk and milk products in Pakistan are characterized by considerable seasonal variations. Milk production is at its peak level during the winter months and at a minimum in the summer, when temperatures are high and availability of fodder is limited. By contrast, milk consumption is at its peak in the summer. In recent years, the dairy sector of Pakistan has been undergoing a radical change by transforming from subsistence farming to corporate dairy farming. This phenomenon is opening up new opportunities for the processed dairy industry and exports of surplus.

Despite having 51 million tons of annual gross milk production, only 4-5% of the total milk production is processed at the 20 milk / dairy processing plants currently operating in the private sector and producing approximately 2.5 million tons of processed milk annually. These milk/ dairy processing plants are producing a variety of processed dairy products like UHT milk, pasteurized milk, dried milk powder, condensed milk, butter, plain and flavoured yogurt, ice cream, cheese, cream, butter oil etc. The rapidly developing dairy processing industry is however faced with challenges of less-than sufficient milk supplies, costly packaging and distribution besides the low consumption of processed/ tetra pack milk and dairy products in the country. This is in contrast to developed countries, where the corporate dairy sector is based on commercial interests and is usually more apt in following modern practices for increased profitability. In Pakistan, the newly emerged milk/dairy processors facilitate the primary producer (farmer) by providing services for adding value to their raw product which stems from a rural subsistence setting and, as yet, with un-tapped potential. There is a desperate need to fill the gap for institutional financing in rural areas. Dairy micro-finance and dairy loan schemes for farmers could assist through micro-financing and diversifying dairy loans portfolios in favour of smallholder farmers.

The major issues in production include genetically low producing dairy animals (cattle/ buffaloes) with late maturity and prolonged calving interval, insufficient feed and fodder resources, lack of good husbandry practices and documentation, inadequate veterinary services and professional managerial skills, lack of research and extension facilities/ services especially for breeding and genetics, besides subsistence farming based on

conventional practices and inferior infrastructure, high cost of inputs, unorganized marketing system and unnecessary involvement of middle men.

Realizing the significance of the dairy sector in terms of its contribution to GDP, employment and importance to serve as a vehicle to alleviate poverty especially among the rural population, the Government of Pakistan identified the dairy sector as one of the key sectors for development on a priority basis. The current strategy of the Government for the development of the dairy and livestock sector is based upon improving productivity per unit animal rather than increasing animal numbers.

Section II. Key Opportunities and Challenges

The dairy sector mostly operates in the informal economy based on traditional dairy husbandry practices. The government attaches high priority to the development of the livestock / dairy sector and realizes its significant role in the agrarian economy and rural socio economic uplift. The Federal Government allowed the importation of high yielding exotic dairy breeds of cattle. During the period from 2008-09 to 2012-13, a total of 25,375 high milk producing exotic cattle were imported from Australia with an average milk production of 25-30 liters per day. In order to enhance and improve the milk production of non-descript cattle and crossbreds, the importation of exotic bovine semen and embryos of high milk producing animals are also allowed for genetic up-gradation. Moreover, importing dairy processing machinery, cattle feed premix and calf milk replacer at subsidized duty rates are allowed in order to benefit the dairy sector.

Consumer education and food safety is an emerging yardstick in the realm of food trade. There is a worldwide concern that food should meet the dietary requirements of the people without causing any deleterious effects on their health. Food of animal origin, such as milk and its products, are easily contaminated and therefore categorized as high risk food products. Pakistan, being signatory to a number of agreements under WTO, OIE, and related organizations attaches a very high priority to safe trade and technical capacity on issues of food safety and public health. However, the country is faced with the of improving food safety and reducing food borne illness. Globally, food-borne illnesses are a growing public health problem because of gaps in the way food is produced/processed based on local culture or consumers' preferences. The government, through the Ministry of Health and its relevant Ministries in the Provinces, is making every effort to address the issue throughout the food supply chain to maximize food safety. While the Pure Food Rules of 1965 and Ordinance of 1960 govern the dairy sector, the federal structure of regulatory framework has gaps for food safety management in the dairy industry and the mixing of authority and powers between provincial and municipal governments need addressing for more effective enforcement.

In view of the fact that other businesses are facing competitiveness issues with tight profit margins, the dairy sector in Pakistan still offers good opportunities to the investors and market players to undertake viable farming projects and earn high returns on their investments. Plentiful opportunities are available in the dairy farming business

and dairy processing industry to integrate and produce high value added products that would not only cater to the domestic demand of a large customer base, but may also provide opportunities for exporting them to international markets where food security is a rising concern.

The dairy sector in Pakistan also offers enormous opportunity to foreign investors for the establishment of joint ventures for the production of quality *Halal* dairy products particularly dried milk powder and infant formula milk for which a great demand also exists in neighboring countries. Likewise, dairy processing has considerable room for product diversification and technology development for meeting the competitive demand of the local and international markets. Similarly, the increasing demand for livestock products and processed foods leaves a tremendous gap in the supply and demand situation which can be addressed through international cooperation and by major investments, bringing in technologies for enhanced production and processing, setting up large breeding / cross bred farms, salvaging young calves besides the semen production units and increased artificial insemination services in the dairy sector. Moreover, opportunities exist in developing the milk collection and supply chain. Investment in the dairy sector is usually profit-driven and Pakistan occupies a unique position among the countries with the lowest cost of production due to cheaper labour suggesting profitability from milk and meat production as well as processing. A number of other opportunities offered by the rapidly transforming dairy sector of Pakistan include:

- Developing and building linkages for small subsistence dairy farmers with the commercial milk market.
- Milk market growth and infrastructure development in order to attract good quality and wholesome milk for the dairy processing industry and consumers.
- Introduction and emphasis on increased production of various varieties of year round fodders and adoption of fodder preservation techniques like silage and hay making.
- Capacity building to improve existing dairy animal feed and breed to promote fodder preservation techniques and artificial insemination in the country.
- Cooperation for the induction of private investors into the field of a dairy animal herd registration system to furnish a basis for genetic improvement.
- Awareness raising, promotion and development of dairy business at the grass roots level with the help of the dairy sector agencies and milk processing industry to provide a solid platform for more investment in the sector resulting in the creation of competition among the dairy industry for better quality milk products and for supporting farmers to grow their dairy business.
- Joint ventures with Pakistan Dairy Development Company (PDDC) and Livestock Dairy Development Board (LDDDB) to cater for the international market needs.

Papua New Guinea

Introduction

Papua New Guinea Tourism Authority introduced PNG as “*The land of Unexpected*” due to the beauty and scenery, culture and topography the country can offer.

The land mass is 462 square km, of which 80% is land and 20% of sea covered. There are more than 700 local languages or dialects and associated different cultural or social groups. Three major languages are used for communications, English as an official language, Pidgin and Motu at community level. However, the latter two are now becoming more popular with educational programmes. The 2010 national population census revealed a population of over 7.5 million people.

Domestic Livestock Production System

Several farming systems are practiced as sole livestock estates, mixed with cropping and integrated with crops, mostly with plantations like copra with livestock. Where mixed with crops, the crop may be used for stock feed or an alternative, for example, sugar cane and beef or oil palm and beef.

Livestock species

Domestic livestock production consists primarily of beef, poultry, and pigs and, to very limited extent, sheep and goats.

Dairy Farming

Virtually all the milk and milk products are imported, either from New Zealand or Australia. Historically, there was a dairy establishment near Port Moresby known as Tanuba Ice Cream but this unfortunately ceased operation in the 1970s. Milk and milk products were imported and reconstituted at that establishment. Some dairy animals from Australia were imported by the same firm but were susceptible to babesiosis, a tick borne blood parasite.

A Christian Leadership Training Centre in Banz, in the Highlands of Papua New Guinea operated a reasonably sized dairy farm in a Papua New Guinea context. For reasons known only to the Training Centre, dairying was stopped and more emphasis placed on poultry, for both meat and eggs.

The only dairy farm in existence is located in the second largest city, Lae. It is operated by the Evangelical Brotherhood Church Inc. and was established in 1964 when the training college was established.

Originally the animals were imported from Australia, mostly the Jersey breed. Besides the Jersey, another breed known as Ninescape is in use.

The total herd size is 137 heads of cattle, consisting of 39 milkers, 52 dried off cows, 25 weanlings, 15 calves and 6 bulls of which two are mature.

Milking is carried out in a small shed using three milking machines (see Figures 1 and 2).



Figure 1: Milking shed



Figure 2: Milking

The farm produces between 250 to 300 litres of milk per day. The milk and milk products are sold in the local supermarkets and to individuals. The products include milk, chocolate, yogurt, cream and butter.



Figure 3: Milk products

The farm is operated by six personnel, one manager, one maintenance and four cowmen.



Figure 4: Farm work force

Future of Dairy Farming

It is not known at present if there is going to be development in dairy farming. However, some rumours suggest that an Australian company is considering establishing a dairy farm near Port Moresby. No details are available regarding this proposal.

For a dairy farm to be successful, people have to be educated in dairy farming as this is a new type of farming. Most people are used to cash cropping, raising pigs, poultry and beef type of farming. A good example is the government funded cattle ranges some years in the past. These were managed by expatriates and when they left after independence, the local managers took over and due to lack of experience the ranges were run down. As of the present, there are only possibly about four large beef cattle ranges.

Philippines

Section I: The Setting

The dairy supply situation in the Philippines is dominated by imports and local production consists of a small percentage of the total dairy supply. Cattle, water buffaloes, and goats are the main animals used in dairy production with a few agencies assisting smallholder and small to medium scale dairy production enterprises. However, the last five years witnessed an increasing, albeit modest, trend as the local market for different dairy-based products has gradually gained popularity.

Total dairy supply is dominated by imports. New Zealand, the United States of America, Australia, and France are the top sources of the dairy imports with New Zealand having the biggest share. Imports accounted for 94.1% of the total dairy supply in 2013. This figure had been steady between 94% and 95% for the last five years though the actual volume is on an upward trend for the last three years. Table 1 shows the dairy supply trend for the last five years.

Table 1. Philippine dairy supply 2009 to 2013 (quantities in million kg)

Particulars	2009	2010	2011	2012	2013
Local Production	14.41	15.86	16.45	18.45	19.46
Imports	286.18	319.17	300.68	305.45	309.06
%	95.21	95.27	94.81	94.30	94.08
Value (CIF, million USD)	466.72	729.03	847.68	763.84	857.19
Gross Supply	300.59	335.03	317.13	323.90	328.52
Exports	27.63	34.68	38.96	18.10	6.88

In terms of trade, imported milk products are processed into high value products then exported to several countries. The Philippines produces milk and cream, butter, cheese, and curd for export. Total dairy exports in 2013 amounted to more than USD 55 million. Major countries taking in these products are the United States, Malaysia, Thailand, and Indonesia.

Local production is steadily increasing. The average annual increase is around 8 percent, though 2012 to 2013 posted only a 5 percent increase. This increase is brought about by the proportionate increase in animals milked. In 2013, dairy cattle accounted for 48% of all animals milked followed by water buffaloes at 40.4% and goats at 11.6%. In terms of production, dairy cattle produced 65.2% of local production, water buffalo 32%, and goats 2.8% respectively. Table 2 shows the local milk production trend.

Table 2. Milk production, animals milked and dairy cattle imports 2009 to 2013

Particulars	2009	2010	2011	2012	2013
Production (million kg)	14.41	15.86	16.45	18.45	19.46
Animals milked (Head)	8 940	9 257	9 786	10 748	11 834
Live Dairy Cattle Imports (Head)	812	490	869	2 159	None

This situation clearly shows that the main issue that limits dairy production is the availability of dairy animals. This has been very dependent on the live animal and frozen semen imports by the government. However, the number of animals imported is very small to stimulate a bigger milk production. It was only in 2012 that the number of imported live dairy cattle reached over 2 000 head. In the previous three years, annual importations did not even reach one thousand head.

In the Philippines, the National Dairy Authority (NDA) is mandated to develop the dairy industry. Also, the Philippine Carabao Center (PCC) is charged with the promotion of the water buffalo (Carabao) for the purpose of milk and meat production. Both Swamp and Riverine buffalo are often referred to as 'Carabao'. The Bureau of Animal Industry supports dairy goat production. All three agencies are the main channels of public investment in the development of the dairy industry. All these agencies derive their funds from the national government.

At the local level, provincial and municipal governments have made their own decisions regarding the development of their respective local dairy industries. Some local governments have vigorously promoted dairy-based products and even consider these as their trademark products under the "One Town, One Product" programme (OTOP).

In terms of the structure of dairy production, rural cooperatives, associations, and other farmer groups, whether at the local or national level, have been at the forefront. The Dairy Confederation of the Philippines is the main umbrella organization of dairy cooperatives, associations, and processors.

Private sector engagement in the dairy production became pronounced in 2012 with NDA's Dairy Multiplier Farm (DMF) Programme. This programme provided an opportunity for the private farms and entrepreneurs to avail themselves of the government dairy animal loan programme which, previously, was particularly extended mainly to smallholder farmers. The DMF programme has provided most of the gains in production in the last few years. Table 3 shows that the marked increase in NDA-assisted production coincided with the establishment of these dairy multiplier farms. Breaking the NDA-assisted production into the three major geographical regions in the Philippines, it is in Luzon that the increase in milk production has been very pronounced followed by Mindanao and Visayas.

Table 3. Milk production distribution (in 1 000 kg)

Particulars	2009	2010	2011	2012	2013
Total National Production	14 410.00	15 860.00	16 450.00	18 450.00	19 460.00
NDA-Assisted Dairy Projects	10 224.32	11 145.14	11 558.71	13 501.92	14 421.57
Luzon	5 397.08	5 849.56	6 174.12	6 987.36	7 810.87
Visayas	1 902.37	1 948.84	2 103.44	2 528.03	2 555.42
Mindanao	2 924.87	3 346.74	3 281.15	3 986.53	4 055.28
% Share of NDA-Assisted Projects	71%	70%	70%	73%	74%

Another issue is the low productivity level of the dairy animals. At present, the average production is 2 400 litres/year. There are some areas where the average production is higher. In South Luzon, average production is above 3 000 litres/year while, in the same area, private farms average 4 500 litres/year. These differences translate in the differences of management as the availability of feedstuffs suitable for intensive dairy production differs from region to region as well as by season. The cost of production averages USD 0.38 (PHP 17.0). There are also regional differences as more efficient farms can lower their overheads to achieve a cost of USD 0.27 (PHP 12.0).

In terms of prices, the differences lie on the market to which a particular production unit is catering. The farm gate price of raw milk is USD 0.53 (PHP 24.0). There are buyers who pay a much higher price. At present, the most popular market is the coffee shop market wherein international brands like Starbucks and Seattle's Best have provided a market for local dairy producers.

Adding to the government's involvement in the promotion of milk consumption is the school milk feeding programme carried out as a national or local undertaking. In this situation, local production is stimulated by the state-sponsored feeding programme as more milk will be required for this activity.

Section II: Key Opportunities and Challenges

Trade

Dairy is among the least protected commodities in the Philippines. Milk and milk products can easily enter the country due to its low tariff rate of 1%-3%. The Philippines' inclusion in the World Trade Organization (WTO) and the impending ASEAN Economic Community(AEC) is seen to open the country to more milk products. However, this has not been a problem as the need for locally produced milk had been increasing. Though there may be ready-to-drink milk products coming in the country, the milk drinking population, though very small at present, will continue to require fresh milk.

Food Safety

Recently, the Philippine legislature has enacted the Food Safety Law in which it has identified the NDA as the main regulator for dairy production. In order to meet this challenge, NDA has reconfigured itself to be capable of implementing the provisions of the new law.

Production and Technical Capacity

NDA and PCC are both continuously seeking to improve the productivity of the animals as well as the efficiency of dairy farms. PCC is likely to continue to perform researches on dairy production while NDA will handle development efforts at the farm level. NDA and PCC will also continue to cooperate with local and international bodies to improve extension and technical capabilities.

Environmental Challenges

At present, NDA has been looking into assuring a steady supply of animal feeds to dairy producers through loan and technical programmes as it is realised that the adaptation to changes in climate will have to be focused on the supply of animal feeds.

Section III: Potential Areas for International Cooperation and the Role of APHCA / Dairy Asia

International cooperation can be centred on the areas of improvement of production efficiencies through improved feeding management and herd improvement. Another area can be market development through a link with the consuming public.

APHCA/Dairy Asia can be a regional forum to promote smallholder dairy production. While it was mentioned earlier in this paper that there had been a recent participation of private sector investors, it is still the smallholder dairy farms that are providing much of production.

Samoa

Section I: The Setting

History of the Samoan Dairy Industry

Unofficial records of initial dairy production activities in Samoa date back to around the late 1960s when the Roman Catholic Church owned dairy farms, which were managed by the European missionaries. One dairy farm each in Savai'i and Upolu islands respectively were established as part of the church boarding schools. Students attending the schools received hands on experience in hand milking of cows, of pasteurization and packaging as part of their educational curriculum and most of the milk produced was used for the students. There are no official records found on dairy stock numbers and other milk production aspects of this initial dairy activity.

After the influence of the Roman Catholic Church in dairying, the government of Samoa through WSTEC and, at some later stage, the Department of Agriculture and Forestry (DAF) took over dairy farm production and milk processing roles in the late 1970s and early 1980s. This contributed to the establishment of the Livestock Division, which now has become the Animal Production and Health Division (APHD) of the Ministry of Agriculture and Fisheries (MAF). Much of the development was supported through funding and technical assistance rendered by some international donor funding organizations - mainly IFAD and FAO. Much of the development was implemented to upgrade the government dairy farm at Vaea through a pasture improvement programme and selecting the best performing dairy breeders available as well as installing supporting infrastructure such as holding yards, milking and pasteurizing machines. In the early 1980s, the milk collection role was still carried out at the Vaea Dairy Farm but the pasteurization and packaging roles were carried out at the Food Processing Laboratory located in the University of the South Pacific (USP) compound at Alafua. There are also no official records found on dairy stock numbers and milk production.

The combined influence of IFAD and DAF has extended efforts to develop dairy and milk production in the village level as part of the outreach awareness programme. Selected women's committees were identified and supplied with dairy livestock to develop small-scale dairy farms. The initiative was to find out the potential of dairy farming and milk production as an income generating activity for village women and to produce and make fresh milk available in order to promote healthy human nutrition. There are no official records found on dairy stock numbers and milk production from this programme.

The availability of some dairy breeding animals at government farms through a cattle shipment from Australia in the early 1990s prompted FAO to revive the development of the dairy industry through funding a pilot dairy project. One component of the project training programme includes the selection of a group of dairy farmers from both Upolu and Savaii islands as target farmers to participate in several aspects of the training programme including taking part in overseas study tours held in conjunction with the Fiji

dairy industry. Several members of the group possess mixed dairy beef bred cattle, which are now commonly referred to as the 'local breed'.

Much of the development towards the making of the local breed cattle was due to the uncontrolled breeding of dairy cattle that were used in women committees' dairy farms with different beef bred cattle available. Another objective of the project was to establish a dairy farmers' cooperative in order to have administration and management requirements organized and to put in place a functional and workable milk supply chain from farms to consumers. This objective was unsuccessful mainly because: farmers were not really committed; inconsistent but usually low quantity of milk produced as most farms had very few milking cattle. In addition, cattle were raised and maintained under poor pastures conditions without appropriate supplementation and most farmers were reluctant to hand milk cows on a regular basis. In most cases, cows were milked twice a day and production was in the range of 5-10 litres per cow per day. Since there was no organized supply chain and most farmers were struggling to sell milk within the village, milk production was based on how much milk the family could consume on a daily basis. Events of bacterial contamination of raw milk before pasteurizing were commonly found indicating poor hygienic conditions during the milking process as there was no reliable water supply available on most farms. Other areas that were covered under the project's farmers training programme include hands on skills and practices on milking techniques, pasteurization, silage and feed block making and basic techniques in processing by-products such as yoghurt, butter, etc. Up to the present, only one recipient who has taken part in the project is still continuing with dairying and still under the small-scale dairy farming category.

At present, APHD still has possession of some good quality dairy breeders but plays no major role in dairying and milk production.

Trends and Issues

- Previous efforts towards the development of the local dairy industry were mainly initiated through foreign influences (donor funded projects);
- At present, despite MAF still holding some good quality dairy breeders, its dairy related mandates are on a demonstration basis only i.e. producing a set amount of milk when cows are lactating and selling fresh milk within the ministry;
- Semi commercial dairy farms that were operating in the past have failed to achieve economic viability largely due to poor administration and management systems, unskilled manpower and no supporting policies to enhance efficient cost recovery practices;
- Dairy related females available and used were from beef and dairy crosses and any focus on the development and maintenance of a the nucleus dairy breeding herd to serve the national dairy industry has always been undervalued;
- High cost of capital investment as most equipments and tools are to be powered and imported - including milking machines, pasteurizers, processing equipments and packaging materials;

- Lack of consumer education and an effective public awareness programme to promote dairy production and milk consumption at all levels of education;
- To a large extent, the potential to generate opportunities for rural employment from dairy production was never realized - possibly due to having mainly small scale and short lived dairy farms;
- Small scale dairy farm practices in the past has overlooked the economic impacts as a result of social and cultural attributes embracing the traditional village life style (the project has targeted the involvement of women to run small dairy farm projects whereas the culture regards men as the main working group on farms and milking cows on a Sunday in the traditional village is generally not acceptable).
- Village based small scale dairy farmers always lack business management skills and vision as, in most cases, milking cows is solely to meet private household demand for milk. Also, previous donor funded projects failed to provide functional and workable milk collection strategies based on the positioning and accessibility of different small farms in the villages and therefore this lead to several farmers aiming to produce an amount of milk sufficient for family needs as there was no guaranteed market for surplus milk;
- Samoa, at large, is still maintaining its strong tea/milk drinking culture (milk is mixed with hot tea, coffee, etc) despite on-going nutritional campaigns and public health commitments in promoting fresh milk consumption;
- Findings from previous FAO dairy production projects carried out in the mid 1990s found a litre of the locally produced milk sold at the village stores for \$2.00 SAT in contrast to the \$2.50 SAT price for an imported milk carton. However, bottled local milk often became spoilt quickly as 'used beverage glass bottles' were the containers for local milk sold in the shops. At present, a litre of local produced milk is estimated to cost about \$4.10 SAT on a farm-gate basis which is a 100% increase compared to 10 years ago;
- Estimated landed costs of imported milk and milk by-products recorded in 2007 and 2012 were about \$18M SAT and \$21M SAT respectively. Imported milk and milk by products are worth about 36% of the total landed costs for imported meat. Only about 18kg is the average milk consumption per capita. Most of the imported milk and milk by products are from New Zealand.

Section II: Key Opportunities and Challenges

Emerging opportunities over next 10 years would be:

- Improving production and marketing of the locally produced milk and milk by products including the establishment of organic dairy and milk production
- Generating rural farm revenues through the marketing of local produced milk and milk by products
- Generating farm employment at the village level through dairy and milk production
- Reducing the importation of milk and milk by products
- Exporting locally produced milk and milk by products

- Improving public health through increased consumption of locally produced milk
- Improving the technical capacity and skills in dairy and milk production
- Increasing private sector investment in dairying and milk processing ventures
- Increasing the supply of locally fresh milk and milk by products
- Improving the supply of locally made animal feeds

The learning experience from past dairying performance in Samoa can be used as baseline indicators to demonstrate the potential challenges which are relevant to develop motives that would lead towards the revival of development and upgrading of the national dairy industry. Some of the major challenges included:

1. *Potential dairy players*

Identify existing committed beef farmers who are keen to incorporate dairy production into their existing operations under a commercial approach. This will avoid efforts to reinvent new dairy farms as land is a critical factor. It might be worth targeting several smallholders beef farms with breeding cow numbers ranging from 5 to 10. Also, incorporating dairy operation into existing beef farms will maximize the use of existing farm structures and facilities such as fencing, stockyards, pastures, roads, water supply system, manpower, etc.

2. *Dairying mission statement and objectives*

The government to provide workable policies and strategies capable of providing a vision leading towards better understanding of the benefits and opportunities of efficient dairy production systems.

The government must promote the dairy concept as another village based agricultural option and demonstrate the positive impacts that it could contribute to the village economy through the creation of rural employment. In addition, information as to how it can contribute to the national economy by producing a healthy food source (milk) and reducing milk and milk by products imports.

3. *Government support*

The sustainability of supplying proven high quality dairy breeders depends much on how the government maintains development towards building up a nucleus herd of elite dairy breeders. Therefore, there is a need for the government to design workable policies to ensure that the required maximum genetic gain is achievable across all levels of the dairy farming sector.

4. *Private sector investment and market supply chain*

The government should also encourage the engagement of the private sector in commercial dairy and milk production. Given that most farms are small scale then the government's role is to develop a workable strategy capable of integrating farmers into a cost efficient cooperative so that farmers are empowered to regulate the price associated with the supply of milk along the milk supply chain.

5. *Milk import substitution*

The existing value of imported milk and milk by products has indicated opportunities and prospects for dairying and milk production in Samoa. However, for effective

substitution, locally produced milk must maintain its competitiveness and consistency in terms of supply volumes, quality and price. In this regard, the government should provide incentives and relevant support to develop competitiveness in the production and marketing of locally produced milk and milk by products. The government should strengthen its applied research role to support technical training requirements relevant to enhancing improved economic long-term viability and competitiveness of dairy farming and milk processing operations.

6. *Technical capacity support*

The government should be responsible for providing a full capacity extension service to build support for dairy farmers and milk processors on all relevant technical areas. Farmers training programmes must be hands-on and skills based. Another important technical area that must be addressed is to provide recommended animal hygiene and welfare practices and to demonstrate their impact on the supply chain and consumer preferences. It is also important to address how dairy production and milk processing operations are to be adjusted in order to comply with existing environmental safeguard requirements.

In order to deliver this technical requirement efficiently, technical staff of APHD must have prior training and be fully equipped with the necessary knowledge and skills. The dissemination of technical knowledge in dairy production and trade must be developed as a collective responsibility involving not only the MAF/APHD but also other technical and training institutes with similar mandates such as the University of the South Pacific, National University of Samoa and line ministries such as the Ministry of Health, Ministry of Education, Sports and Culture and the Ministry of Natural Resources and Environment.

Section III: Potential Areas for International Cooperation and Role of APHCA / Dairy Asia

From the Samoan dairying perspective, learning positive and negative practical dairying experiences from other countries benefits Samoa in many instances - especially when there is very limited development taking place on dairy and milk production in the country, despite positive developments in other livestock production systems. It is also beneficial to learn how different countries progressed in terms of:

- Agricultural development including animal research and health development capacity
- Technology adoption including skills and technical capacity
- Trade strengths, weaknesses, threats and opportunities including bio-security and environmental issues
- Public health status including nutrition and food safety issues
- Educational development capacity including effective public awareness, etc.

Facilitation of international cooperation is recommended to be one major focus of APHCA/Dairy Asia Pacific. That is, having APHCA as the focal point to mediate effective communication for collaboration and cooperation at the regional level especially when

dealing with priority areas that required funding assistance and technical knowledge support from relevant international donor funding partners. In the Samoan dairy production case, it is highly recommended that APHCA should play a leading role to request FAO to reinstate funding assistance to revive dairy production through the Telefood Scheme as the first step up at the redevelopment stage. Other means that can be used to facilitate international cooperation are through having regular technical training workshops, study tours, meetings where dairy experts and farmers from different parts of the region gather to share and learn on latest research findings and technology development and to share experiences so that the relevant information is discussed and disseminated thoroughly.

Sri Lanka

Introduction

Being a small Island located in the tropics, Sri Lanka experiences a hot humid climate with two peaks of seasonal rain fall. Its area is about 65 000 square kilometers. The annual rain fall of the country varies between 900mm in low areas in the north west and south eastern and 6 000 mm in the western border of hill country. This rainy pattern maintains greenery throughout the year except in few months in the dry zone. The temperature across the country varies between 5°C in the hills and 33°C in dry coastal areas. The relative humidity of the country is very high (Daytime 70% and at night 90%).

Ancient Sri Lankans had a habit of consuming milk products such as curds and ghee rather than drinking milk. The local cattle breed available in those days belonged to the *Bos indicus* group, which had low milk production with high fat content and were used for draught power and manure. Currently, the use of cattle for draught power is rarely found and the use of manure directly as a fertilizer or as the main component of compost is becoming popular under the organic farming.

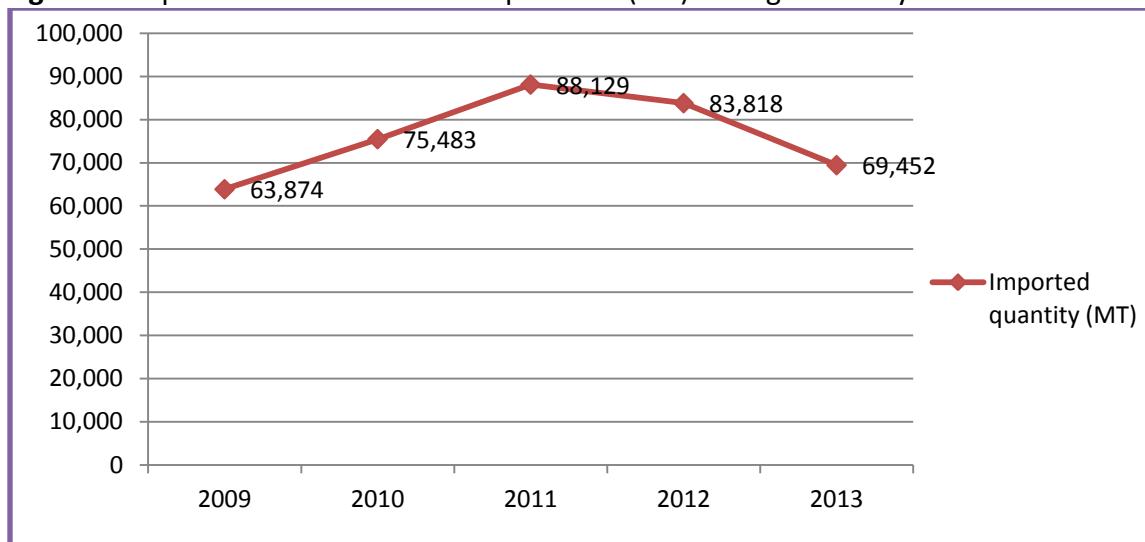
Nevertheless, dairy farming is presently a popular venture with an objective of producing milk and it provides a supplementary source of income to nearly 250 000 smallholders.

The government of Sri Lanka also has paid attention to develop the dairy sector since milk and milk products have been identified as an important protein source that can be made easily available in rural villages where the incidence of malnutrition of pregnant mothers and children is significant. Also, the government needs to reduce the high foreign exchange expenditure which is more than Rs 35 000 million annually for milk and its by-products.

However due to the consequences of the liberal economy which started in 1978 the ordinary livestock farmer could not stand up to the challenges of the market. Subsequently, the ordinary farmer started leaving the dairy sector and the young generation migrated to the urban and sub urban areas to find easier sources of income generated as the result of the economic expansion under the new market system.

Because of this, the gap between consumer demand for milk and the local milk production increased remarkably. This gap between demand and production was fully filled by imported milk powder and other milk products. Hence, the amount of milk powder imported has continuously increased for last two decades and is now up to 88 129 (MT) (Figure 1).

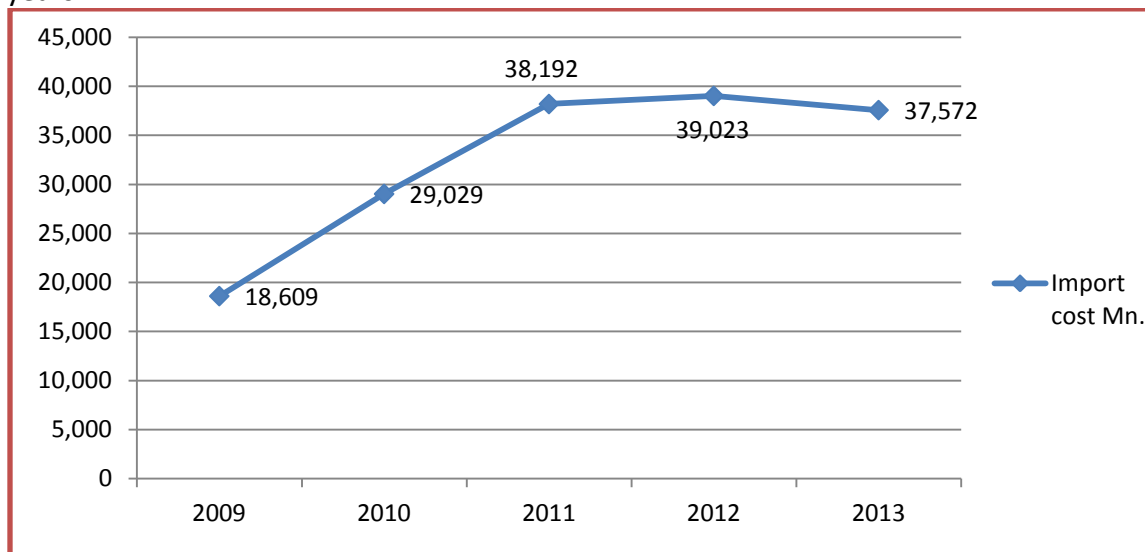
Figure 1. Importation of milk and milk products (MT) during last five years



(Source – Ministry of Livestock and Rural community Development)

The outcome of the continuous increase of demand is that the production gap caused an increase of the annual government budget for importing milk and milk products. 18 609 Mn Rupees was spent on importing milk and milk products in the year 2009 and this amount has increased to 39 023 Mn rupees in 2012. The escalation of milk prices in the international market and the fluctuation of foreign currencies also have affected this huge increase of importation cost (Figure 2).

Figure 2. The cost for importation of milk and milk products (Mn SL Rs) during last five years



(Source – Ministry of Livestock and Rural community Development)

Trends and Issues

Milk production

The milk production of cattle and buffalos is highly related to the environmental factors. The tropical environment does not favour dairy farming. The productivity of dairy farming is directly bound with factors such as available cattle breeds and their production potential, feeds and feeding practices, veterinary and health services, available breeding techniques for breed improvement, management practices, farm gate milk price, environmental factors, attitudes of people, farming system, and marketing facilities etc.

The present cattle and buffalo populations of the country are 1.26 million and 0.47 million respectively. There is an increasing trend in the percentage of upgraded dairy animals, including dairy buffalo. The present upgraded dairy cattle percentage is about 60 -65% of the total cattle population.

The Department of Animal Production and Health (DAPH) is conducting an effective artificial insemination programme with the objective of increasing milk production. It was started in 1937 and, currently, it is operated through about 350 field veterinary offices in the country. The number of inseminations has gradually increased and 216 000 inseminations were performed in 2013. Annually 35 000 genetically upgraded heifers are added to the national cattle population. The DAPH has implemented a salvage programme for AI born upgraded heifer calves to avoid deaths and to keep the age at first calving below 30 months of age.

The Pedigree and Performance Recording Scheme (PPRS) maintains the records of selected herds in wet zone, Dry intermediate zone and Dry zone of the country. About 280 different herds which have been categorized as small, medium and large with approximately 9 000 total animals are recording currently under this programme. The objective of this PPRS programme is to select high yielding animals in the field based on their Estimated Breeding Values and to use these selected locally adapted genes for the improvement of local cattle population.

The analyzed data revealed that the milking cow % among the adult cattle group in these three farm categories is 21%, 28% and 51% respectively although the profitable level for the same measure in developed countries is 80%. A lower number of milking animals in the average herd is a serious issue with regard to the profitability and sustainability of these farms. The percentage should be increased up to 70% at least under Sri Lankan conditions in order to sustain a profitable dairy system.

The present government manifesto 'Mahinda Chintana' has clearly stated that the country needs to achieve self-sufficiency in milk by 2016. The government has recently imported 2 000 cattle, Jersey and Friesian with higher production potential from Australia to manage them as a nucleus herd providing new genes to the population.

At present, local milk production is a growing trend and annual milk production has reached 320 million litres. The estimated current requirement of milk in the country is 784 million litres, which means that the coverage is 41% of the total milk requirements.

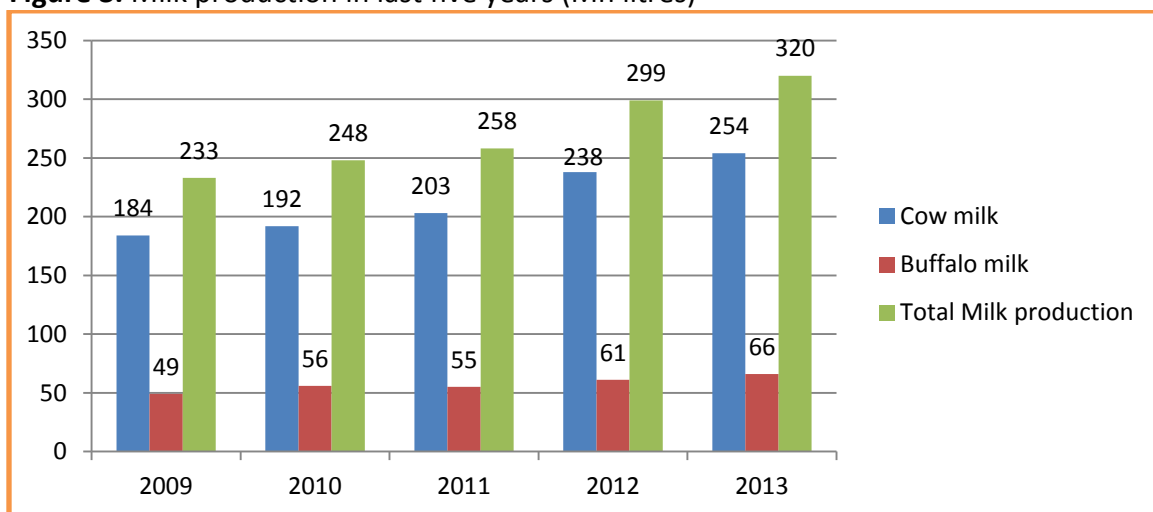
This figure was 20% in 2005 and this achievement has been acquired within an 8-year period. It is a positive indicator about the possibility of achieving the target of self-sufficiency in milk in the near future.

Although the national cattle and buffalo population has been constant over the past years, milk production is showing a constant 21% improvement during the same period (since 2005). These figures show that 'per animal' production has improved as a result of both better genetic and feeding management.

In parallel to the improvement of milk production, there should be a programme to increase milk quality improvement since this is important with regard to public health.

The buffalo milk contribution to national milk production has remained at the 20% level since 1998. For two thirds of the country the environment is favourable for buffalo farming. Hence there is a good opportunity for increasing buffalo milk production.

Figure 3. Milk production in last five years (Mn litres)



(Source –Department of census and statistics)

In conclusion it is found that there are following trends and issues in relation to the milk production in the country.

Trends

1. The government gives priority to dairy development and included it in a policy document with the objective of reducing the import bill for milk and milk products.
2. 60 – 65% of the animals in the population are upgraded cattle for milk.
3. There is a good buffalo population in the dry zone of the country.
4. A well-established AI net work and veterinary extension service is available in the country.
5. Consumers are aware of the importance of milk quality.
6. Dairy is a profitable industry.
7. The government is in a position to recruit new field officers and veterinarians.

8. Local consumers like to consume local milk and milk products due to the recent issues regarding imported milk powder.
9. The government is planning to import cattle that have better production potential.

Issues

1. There is no organized programme to enhance buffalo milk production.
2. The implementation problems of suitable breeding programmes connected with imported animals.
3. Low technical manpower (expert) for the Animal breeding, health and extension activities.
4. Low percentage of cows in milk.
5. Lack of transport facilities for veterinarians and staff.
6. High treatment costs.
7. Low average Conception Rates performance by AI.
8. Lack of high yielding animals adapted to the local environment.
9. Hot and humid environment.
10. Low keeping quality of milk.
11. Low milk price.
12. Threats of new diseases arriving.
13. Disease outbreaks.

Milk consumption

Dairy farming contributes to the nourishment of rural farm families and it is useful to feed fresh milk to children and pregnant mothers to reduce the malnutrition in the rural villages. The daily per capita consumption of milk is 180 ml as recommended by the Medical Research Institute (MRI). While consumption of milk is increasing over the years due to economical growth of the country, the *per capita* consumption of milk per day is still below 100 ml. The expected *per capita* consumption of milk based on the local production and total milk collection is shown in Table 1.

Table 1. *Per capita* availability of milk based on total production

Description	2010	2011	2012	2013
Estimated human population	20.67	20.86	20.26	21.0
Total milk production (Mn liters)	248	258	299	320
<i>Per capita</i> availability of milk due to local production (ml)	32.87	33.8	40.43	41.7
Total milk requirement if the per day consumption is 100 ml (Mn liters)	754.4	761.3	739.4	766.5

(Sources Department of census and statistics)

Trends

1. There is growing demand for locally produced milk.
2. Consumer likes to consume quality milk and milk products.
3. Higher demand for reconstituted milk than fresh milk.
4. Government has banned the advertising of powdered milk in the media.

Issues

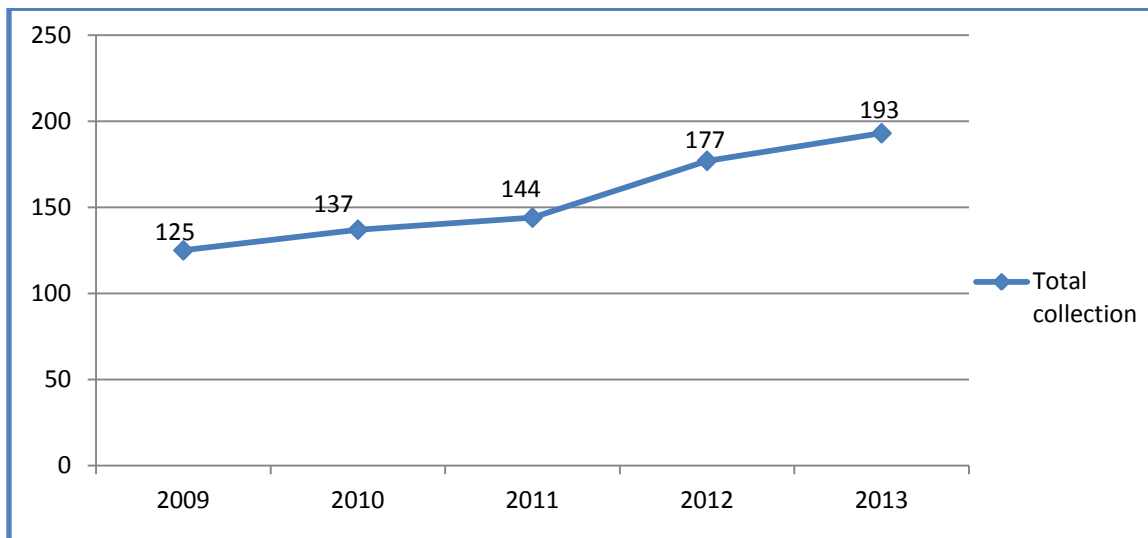
1. Medical doctors promote drinking reconstituted rather than fresh milk.
2. Low keeping quality of fresh milk due to high bacterial counts.
3. Myths regarding fresh milk consumption.
4. High cost of liquid milk for the ordinary consumer.

Milk collection and marketing

The milk collection network is to be strengthened to distribute fresh and processed milk to the millions of consumers in order to increase the milk consumption. This process is currently being operated by state owned and private companies. The major limitation encountered in this process is the high collection cost due to the distance between farms and between production and processing sites.

Milk collection has significantly increased since 2009 and it reached the 60% level of total milk production in 2013. This progress was achieved through the interventions of both state and the private sector by increasing the milk storing (chilling) and transport facilities. Electricity is available for over 90% of households simplifying the provision of chilling facilities.

Figure 4. Formal milk collection (Mn liters)



(Source – Ministry of Livestock and Rural community Development)

Milk marketing varies considerably depending on the location of the farm, farm gate price, availability of collecting points, attitude of farmers and availability of milk processing facility. Formal milk market is usually organized through milk cooperatives and small farmer groups. Usually large cooperatives are having their own milk

processing plants and sales outlets. These cooperatives pay good farm gate price and other benefits to the farmers such as loans to develop their farm infrastructure etc.

Trends

1. Both public and private sector are involved in milk collection and pricing.
2. The government is expanding the milk collection and processing capacity.
3. Both Government and Private companies are involved in production promotion, quality milk production, farmer awareness etc.
4. Farmers are willing to milk twice per day, morning and evening.
5. A large collection network is available in the country.

Issues

1. Keeping quality of milk is not up to standard.
2. Farmer awareness on improving the keeping quality and pricing of milk is inadequate.
3. Milk chilling facilities are insufficient at the field level.
4. Unreliable milk collections by local milk processors.
5. Milk processing capacities are not sufficient.
6. Milk collecting centre activities are not transparent.
7. Milk adulteration is frequent.
8. High cost of liquid milk for ordinary consumer.

Cost of production and milk prices

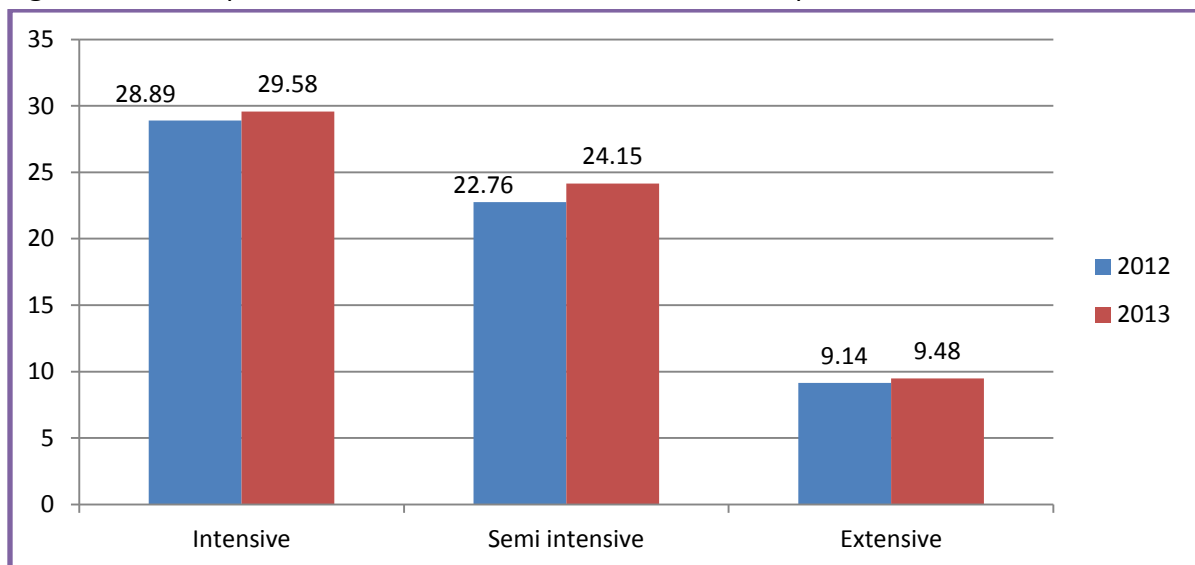
The production cost in dry zone is low under all three management systems compared to all other zones. The estimated cost of production per litre of milk under three management systems in 2012 and 2013 is shown in figure 6.

In order to reduce the cost of production the utilization of crop residues, natural grasses and legumes should be maximized. In addition, research should be promoted to develop low cost feed rations for different regions using locally available feed resources.

If the farmers' cost of production of milk is high, encouraging farmers to produce value added products will be of benefit to increase the profit margin. Facilitating evening milking is also a point to be considered by farmers who have higher production costs.

Since the production of milk is having continuous increasing costs of raw materials of feeds and for services, there should be an annual market price fixing system based on the cost of production. Also the milk price should be determined giving a weighted average to the hygiene (cell count) of milk. This will help to promote clean milk production in the country.

Figure 6. Cost of production of 1 litre of milk in Sri Lankan Rupees in 2012 and 2013



(Source –Department of Animal Production and Health)

Trends

1. Low cost production is experienced in Dry zone under extensive management system.
2. Farmer awareness improving by both state and private milk collectors.
3. Comparatively milk prices are little higher than the cost.
4. Farmers are moving from small-scale farms to medium and large scale farms to reduce the Costs of Production (COP).
5. Women labour available in the home is being used for dairy farming.
6. Increasing trend for the use of good breeding stock.

Issues

1. High drug costs.
2. Non-availability of different varieties of fodder and pasture suitable for different agro ecological zones.
3. High cost of local raw materials for concentrate feed due to export demand.
4. Increasing concerns about environmental issues.

Key Opportunities and Challenges

Sri Lanka is currently configuring the dairy farming into a dairy industry after 35 years experience of an open economy. The ordinary farming system (smallholder) is not strong enough to fulfill the growing needs of the consumer.

Local milk production has been covering only 20% of the national requirement for about two decades until 2009 but, currently, this coverage has increased up to 40%.

Opportunities

Optimistic government policies to enhance dairy sector in the country: The government has accepted that the dairy industry is to be strengthened by producing the manifesto “Mahinda Chintana” and it has taken action to increase milk prices several times. The current average milk price is Rs 50/L and it will be increased up to Rs 60 for the year 2015. The government has given a tax free facility to import dairy machinery and low interest loans for purchasing animals and machinery required for dairy development. The main programmes coming under the government’s dairy sector development programme include forming state-private sector partnerships, importation of quality genetic material and importation of 2 000 pregnant heifers (while planning to import another 20 000 pregnant heifers), strengthening milk collecting and processing facilities and proposing to recruit about 1 500 new field veterinary staff.

Up graded crossbred cattle population: The cattle population in the country is about 1.2 million and approximately 60 – 65% is upgraded crossbred cattle. The PPRS has found that the average production potential of these animals is about 5.5 to 6 l/day while the average daily production of a cow has increased from 2.9 to 3.6/l/day in the last two years.

Artificial Insemination and the natural service programme contribute to produce about 35 000 crossbred heifer calves to add to the national herd annually. The progeny testing programme and PPRS are a continuous process to select and breed the genetically superior animals in order to increase the genetic potential of the local cattle.

This activity will be further facilitated by implementing crossbreeding programmes based on the imported herds. The current herd strength of the imported animals is about 2 000. These animals are in a nucleus herd for providing breeding material for both national AI and natural breeding programmes.

Use of national buffalo herd for increasing milk production in the dry zone: The total buffalo population is 0.47 million and buffaloes are mainly scattered over the dry zone and the intermediate zone. They are well adapted animals for the harsh environment in the dry zone and they have better milk and meat production potential than the average cow due to better disease resistance and the ability to utilise poor quality feeds.. Buffaloes have the largest unexploited production potential. One of the major constraints of this species is the lower reproductive efficiency. However under good management conditions their performance is good. Adaptation for AI is poor and less than 5 000 inseminations are performed annually. The majority of buffaloes are bred by the natural service and there is no effective selection programme designed for buffaloes in Sri Lanka.

The DAPH has started a buffalo breeding programme to obtain 500 upgraded buffalo calves annually through an artificial insemination programme and to add upgraded buffalo males as breeding bulls instead of scrub buffalo bulls presently being used.

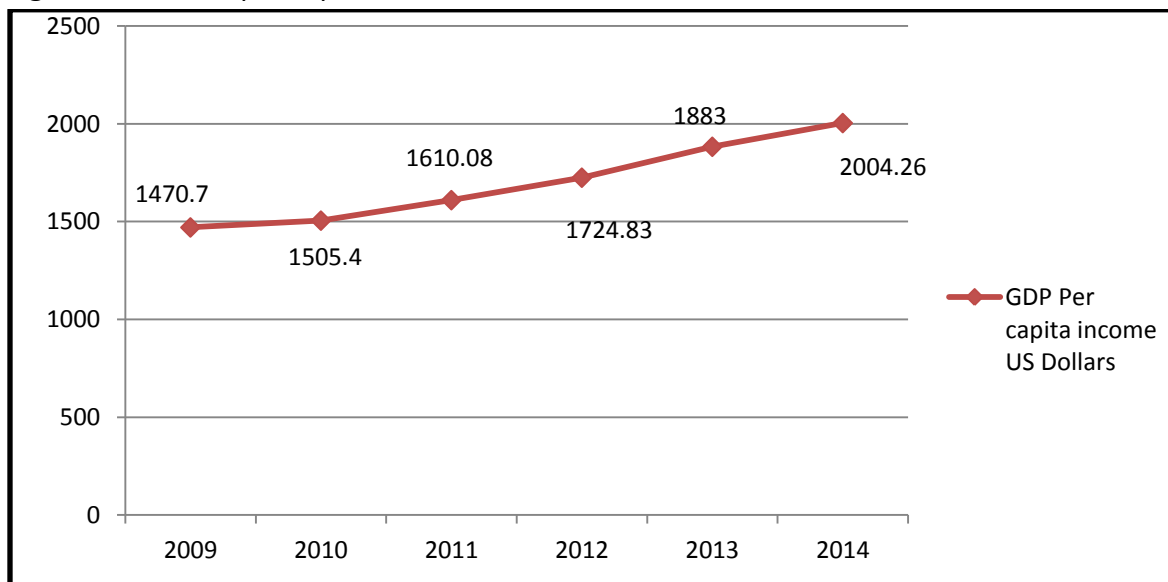
Currently, buffaloes are contributing only 20% of national milk production and, if this present value is doubled, it will be an effective contribution for national milk production.

Growing consumer demand for milk and milk products: Owing to the recent past economical growth of the country, the per capita income of the country has increased and the purchasing power of the people has developed (Figure 7).

The ordinary dairy farming system of the country is not capable of catering for the growing consumer demand for milk and milk products under the current economic expansion.

Although there is a local milk production enhancement in the country, a continuous increase of imports of milk and milk products has been experienced over the past decades. This is due to the amount of milk enhanced in local production over the years is not sufficient enough to fulfil the consumer demand (Figure 2).

Figure 7. Trend in *per capita* GDP income in US dollars since 2009 to 2014



(Source – Central Bank Sri Lanka)

Importation of milk and milk products have decreased by 17.14% within the year 2013 due to reports appearing in the media regarding the occurrence of detrimental chemicals in imported milk. As a result, the local consumer is prefers consuming locally produced milk and milk products

Under this situation, there is a golden opportunity for the Sri Lankan dairy sector to develop itself by producing at least two thirds of the national requirement. However the sector is currently facing the following issues:

1. Slow improvement of the production potential of local animals.
2. The authorities have not developed a system to exploit the genetic merit of recently imported cattle.
3. Lack of quality feed resources.

4. The country has not effectively used the national buffalo population in the productivity improvement chain.
5. Strengthening milk collection network with the assistance of the private sector.
6. Increase the milk processing capacity of leading milk collectors.

Importation of 20 000 cattle from overseas: The government of Sri Lanka has decided to import a herd of 20 000 cattle with good production potential in order to increase national milk production and to increase the genetic potential of local animals. However, while this is a good opportunity for the sector to implement an effective breeding programme for increasing production, it does bring with it the risk of new emerging diseases. This is a programme for introducing approximately 2% of new animals into a population with new genes that can change the whole potential for milk production of the existing population if these animals are effectively used to upgrade the local population and can adapt to local conditions. There are some challenges also link with this project such as providing accommodation facilities for animals, feeding compounded feeds, availability of quality roughages, facilities for operating micro environment changes, providing calf management facilities and arranging future breeding programmes, experienced human resources etc.

Challenges

Quality assurance of foods of animal origin: With increasing purchasing power, people become more aware of the need to consume safe food with assured food production and the control of diseases of zoonotic importance. DAPH needs to establish sound veterinary public health teams with strong laboratory facilities in relation to quality assurance of dairy products.

It is found that, globally, 70% of contagious diseases are of animal origin. There is an important need for veterinarians to be involved in this emerging issue.

On the other hand, this also is an important opportunity to the dairy sector to produce quality guaranteed food items and this programme could be developed to target the export market in future. Already legislation in this regard is approved by the parliament.

In addition, there is the possibility of opening a direct sea route to India between closest parts of the two countries. This opening may lead to bringing in low quality dairy products and people may be exposed to new diseases. Hence, the need to make people aware that they should consume quality assured dairy products.

In order to face this challenge, the country should develop the following strategies:

1. Develop human resources in relation to quality assurance.
2. Develop other infrastructure.
3. Increase farmer awareness about the diseases and their control.
4. Develop technology in relation to the making different quality assured varieties of dairy products.

Possibility of occurrence of new animal diseases: Recently Sri Lanka had a large outbreak of FMD and the available vaccine did not produce enough immunity. It was found that the virus was a mutant of type O virus which developed during an outbreak in neighbouring countries. The possibility of opening a sea route to India, while improving trade between the two countries, could also increase the threat of reporting new animal disease if a sound and secure custom system is not operated.

Hence, the Country should have disease prevention programmes immunizing animals at the vulnerable sites of the country. In addition, the country should have efficient and effective diagnostic facilities against the highly contagious diseases present in neighbouring countries

Milk collection and processing: Health authorities of Sri Lanka recommend the consumption of 180 ml/day/person of milk and milk products. Although the country is producing 320 million litres of milk annually, the formal annual collection of milk is 193 million litres meaning that 60% milk is being collected through the formal network. State and private companies are involved in the collection of milk with a higher amount of milk currently collected by a government owned company and the main constraint faced by milk collectors is the high collection cost. This is due to small farm locations in faraway places but Sri Lanka presently has electricity in more than 90% households so chilling facilities could easily be provided. In order to reduce the cost of collection, farmers have adopted the use of domestic refrigerators or deepfreezes where twice a day milking is practiced. Some collectors have introduced small chillers to farmer cooperatives.

Environmental issues: Due to the expansion of cities, the lands in sub urban regions are becoming residential areas. The dairy farms located in the sub urban areas to supply the informal markets such as hotels and residences are currently facing problems due to complaints by the residents. Economic expansion of the country promotes health and health related education and people become concerned about environmental pollution.

This is an escalating challenge for the dairy industry in the urban and sub urban areas. The Department of Animal Production and Health, The Ministry of Environment and Environmental Authority have prepared a policy document, which provides minimum requirements for the farmer to get the approval from the environmental authority. This document is a legal document approved by the authorities and the dairy farmer is protected from unnecessary annoyance.

Potential Areas for International Cooperation

Dairy buffalo development in Sri Lanka

The national buffalo herd comprises of local, Surthi, Murrah and Nili Ravi breeds and their distribution is confined to dry, dry intermediate and low country wet zones. Buffaloes are more productive than the cows under hot and humid climates and several South Asian countries have genetically improved buffalos making an effective

contribution to their national milk production. In this context, Sri Lanka can develop its buffalo production potential since a high percentage of buffaloes is not upgraded.

In an effort to double milk production in a sustainable manner within a short period of time, the DAPH has initiated a pilot programme for ovi-synchronization. The programme is successful and buffalo breeding should be carried out within a three months period since the buffalos are seasonal breeders in Sri Lanka. During this short period, at least 10 000 buffaloes are to be bred with imported quality semen and 25 000 buffalos should be upgraded within 2 to 3 years. These upgraded buffaloes should undergo intensive management in order to better exploit the genetic potential for milk production and reproduction improvement.

This is a potential area for the international cooperation and DAPH is hoping for both technical and financial assistance from APHCA to establish the programme and the continuation will be with the assistance of local funds as is usual.

Facilitation of exchange of breeding materials of cattle and buffalo among APHCA countries

Tropical breeds are usually low milk producers compared to temperate breeds. Though they are low producers under genetic selection the production potential of those animals has been improved and presently they are producing substantial amount of milk under good management systems. Being a small country, Sri Lanka is not in position to develop its own breed due to the limited population size and the little genetic variation within the available breeds.

Hence, Sri Lanka is implementing cross breeding programmes to improve the milk production of local animals. In this context, Sri Lanka recently imported Jersey and Friesian young bulls from Australia born to proven sires and selected bull mothers of each breed. These animals are presently being used for semen collection and processing DF semen under strict bio-security measures. The surplus DF semen doses could be sold to other countries where crossbreeding programmes are undertaken. Sri Lanka would like to exchange this semen for Sahiwal semen or buffalo semen as our breeding programmes require.

Facilitation of exchange of pasture breeding materials among APHCA countries

Dairy production is mainly dependent on the feeding of quality roughages and compounded feeds. Most of the member countries require good pasture and fodder varieties to develop their dairy industry. However most pasture and fodder varieties are common in member countries.

Some countries may have developed specific varieties suitable for special climatic conditions. If the member countries can exchange these pasture resources, they can feed their cows well and achieve better positions in the world dairy development indexes.

Facilitation of establishing quality control system for foods of animal origin

It is well understood that there should be an effective food quality control system in the country to cater for the increased demand for food safety assurance as incomes

increase. Sri Lanka, being a developing country, is short of technology and related knowledge in operating such a system effectively. Hence, the country is expecting financial and technical cooperation to establish a quality control system for foods of animal origin.

Thailand

Background and Current Situation

Historically, dairy farming was introduced to Thailand in the early years of the 20th century. Dairy cows were mainly raised on a small scale by Indian or Pakistani immigrants who mostly lived in the suburban areas of Bangkok. After a royal visit of H.M. King and the Queen of Thailand to Denmark in 1960, the Government of Denmark provided technical and financial support for a dairy development project in Saraburi province, Thailand. Since then, the introduction of extensive dairy development took place in the early 1960s. It started with the establishment of the Thai Danish Farm and Training Centre at Muak Lek district, Saraburi province in support of the Danish and Thai Governments. The Thai-Danish Dairy Farm was inaugurated and began operating on 17 January 1962 (later designated as National Dairy Day). Subsequently, in 1971, the Thai Government took over the project responsibilities under the management of the newly established state enterprise, called 'the Dairy Farming Promotion Organisation of Thailand (DPO)'.

Throughout the 60s till 90s, dairy development efforts were facilitated by dairy breed and feed development, promotion of dairy farming as an alternative to crop farming for income and employment creation, promotion of dairy cooperatives for organizing milk collection, processing and marketing alongside private dairy processors, and tax and tariff and investment policy to protect the domestic dairy sector from international competition. Consequently milk production increased rapidly and the share of domestic production in total consumption also increased.

Over the past decades, the Thai dairy sector has been supported and promoted by the Thai Government through the Department of Livestock Development, the Dairy Farming Promotion Organisation of Thailand and the Cooperative Promotion Department, Ministry of Agriculture and Cooperatives. As a result, dairy farms have been dispersed into rural areas around the country. However, during the past five years, the number of smallholder dairy farmers has decreased, but a size of dairy farm has scaled up.

Drinking milk products in Thailand had current value growth of 9 percent in 2013, resulting in the endeavours of brand players in terms of new product development and integrated marketing campaigns to boost demand. In fact, drinking milk is regarded as an inexpensive source of protein and calcium, with a link to holistic health and wellness benefits. Nowadays, Thai consumers are familiar with packaged drinking milk products.

Milk Production Structure

Most farmers sell their raw milk to dairy cooperatives or private milk collecting centers. Then raw milk from cooperatives or milk collecting centers is transported and sold to the big milk processing plants, such as CP-Meiji, Foremost, Thai Dairy Industry, Dutch Milk, Nestlé and Dairy Farming Promotion Organization (DPO). Due to a higher cost of

feed, labour and transportation, the cost of milk production has been increasing dramatically during last decade. Figure 1 shows a milk supply chain in Thailand from smallholder farmers through dairy cooperatives/milk collecting centers and milk processing plants. Currently, there are 104 dairy cooperatives and 186 milk collecting centers (including 104 MCCs of cooperatives and 82 private milk collecting centers) located throughout the country.

In Thailand, a national body or 'Milk Board' has been established which consists of representatives from all stakeholders in dairy sector. The role of Milk Board is to formulate and oversee national dairy policies in order to promote the national dairy industry.

Currently, several big dairy cooperatives have their own milk processing plants to produce a variety of dairy products such as pasteurized milk, UHT milk, drinking yogurt, yogurt and ice cream. It is necessary to support the dairy industry by increasing production efficiency at the farm and cooperative levels and by encouraging research and development for new milk products – supporting processing technology as well as research in the marketing of dairy products.

During 2007-2013, the daily production of raw milk (metric tons per day) in Thailand increased by an average of 5-10% each year (Figure 2). In 2014, there was a total dairy cow population of 495 691. A number of dairy cows decreased from 500 418 cows in 2013, but total milk production increased from 1 022 190 (in 2012) to 1 095 314 (in 2013). The decrease in cow numbers may also be linked to export of heifers and dairy cows to other neighboring countries.

For the Southeast Asia region, milk production grew by 1.4 per cent per year between 1980 and 1990; more than two percent between 1990 and 2000; and almost four percent between 2000 and 2010. Currently several Southeast Asian countries, e.g. Viet Nam, Myanmar, and Malaysia, are interested in expanding their dairy sectors. In Thailand, about 95–97 percent of milk production was processed for drinking milk. The remaining 3–5 percent was processed for other products i.e., yogurt and cheese. Of the daily production of raw milk, 61 percent is from dairy cooperatives, 27 percent from private milk collecting centers and 12 percent from other individual farms (Figure 3).

In 1992, the government launched a national school milk programme with full government funding alongside an ongoing school lunch programme. The objective of school milk program was to provide dairy producers an outlet for a share of their milk output and to reduce malnutrition among school children. Nowadays, the Thai Government provides a total budget of US\$500 million Baht per year to support the school milk programme. Approximately 40 percent of raw milk in the country is processed for school milk programme and 60% for commercial milk market.

Thailand also imported dairy products of 186 680 tonnes in 2013 which was valued at 19 699 million Baht (US\$606 million). Meanwhile, in 2013 Thailand also exported dairy products of 10 640 million Baht (US\$327 million) including sweetened condensed milk,

sterilized drinking milk, ice cream, cheese, and evaporated milk to other neighbouring countries such as Cambodia, Indonesia, Philippines, Malaysia, Myanmar and Singapore.

Figure 1: Milk supply chain in Thailand from smallholder farmers through dairy cooperatives/milk collecting centers and milk processing plants.

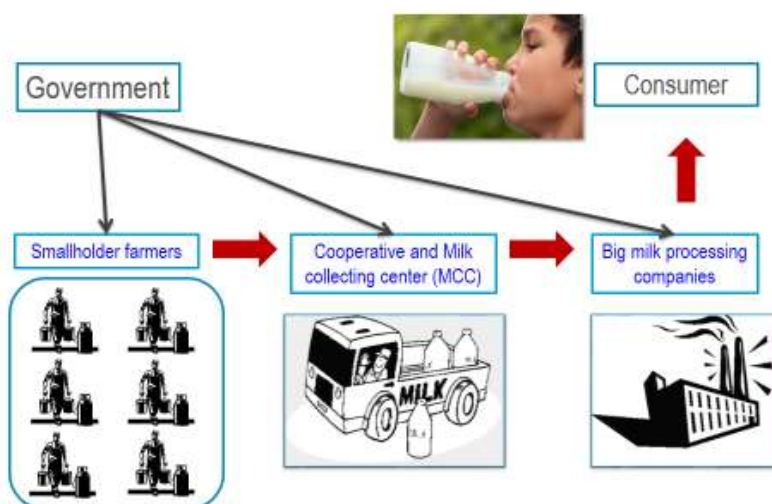


Figure 2: Raw milk production in Thailand (metric tonnes per day) during 2007-2013

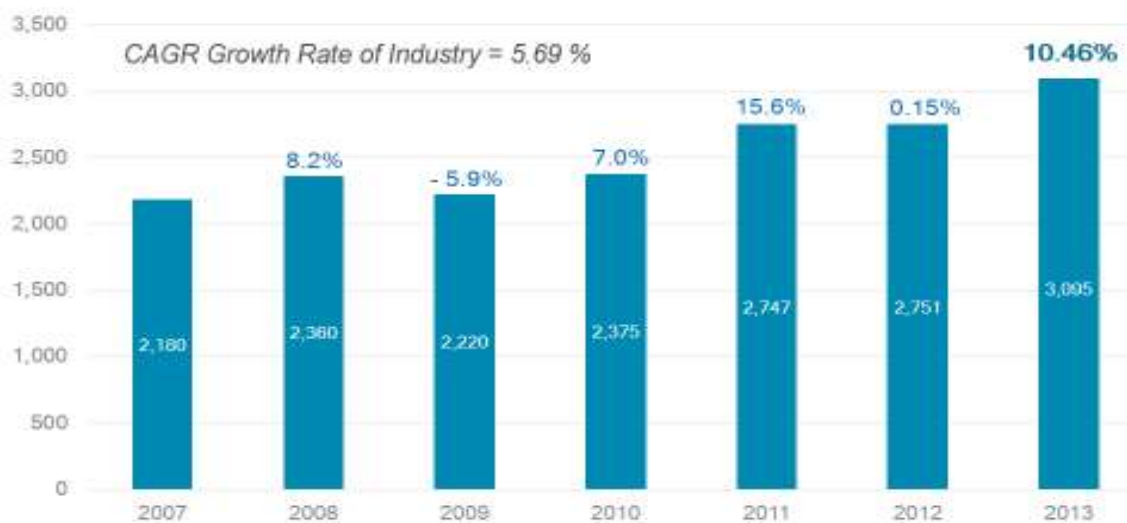
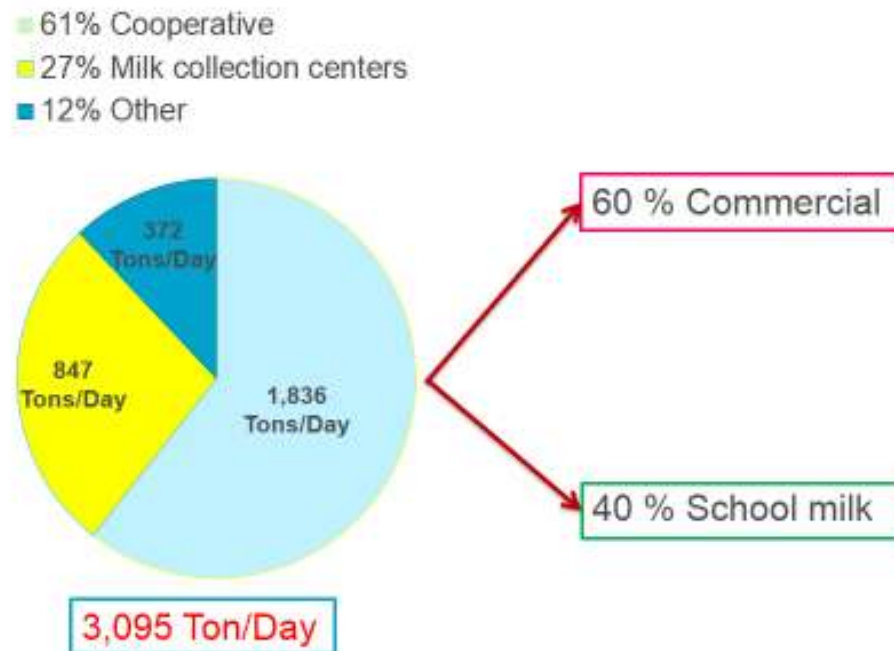


Figure 3: Source of raw milk and proportion of milk used for milk processing in Thailand, 2013



The growth of raw milk production from 2004 to 2013

Over the past decades, the Government has provided support to dairy farmers through the Department of Livestock Development (DLD), the Dairy Farming Promotion Organization (DPO), other key government agencies, and private sectors. Table 1 presents the number of dairy cows, dairy farmers and raw milk production in Thailand during 2004-2014. In addition, Table 2 also shows an average cost of production and milk price in Thailand during 2004-2013.

Traditionally, Thai people are not milk drinkers. In 1956, it was reported that *per capita* milk consumption (drinking milk) was as low as 0.15–20.00 cm³. (Supamala 1969). However, by 1987 per capita consumption of drinking milk in Thailand had increased to 2.32 kg/year. In 2013, it was estimated that Thai people consumed almost 20 kg of drinking milk/year per person. Milk consumption, especially consumption of drinking milk, is confined almost totally to urban or peri-urban populations where marketing facilities and purchasing power exist. We have to thank to school milk programme that has promoted Thai children to be familiar with milk drinking.

Table 1: Number of dairy cows, dairy farmers and raw milk production in Thailand during 2004-2014

Year	Number of dairy cows	Number of farmers	Average number of cows per farm	Raw milk production (MT / year)
2004	383,975	23,439	16	842,611
2006	384,933	20,568	19	826,464
2008	445,182	19,214	23	786,186
2009	462,238	17,837	26	840,691
2010	508,642	20,116	25	911,391
2011	539,670	20,645	26	982,453
2012	562,504	20,624	27	1,022,190
2013	500,418	17,094	29	1,095,314
2014*	495,691	16,634	30	1,067,452

Source: Department of Livestock Development and Office of Agricultural Economics
2014* - forecast of raw milk production

Table 2: Cost of production and milk price in Thailand during 2004-2013

Year	Average cost of production (Baht / kg)	Milk price at MCC (Baht / kg)	Price at processing plant (Baht / kg)	Milk per cow per day (Kg / cow / day)	Average net profit of farmer (Baht / kg)
2004	8.51	11.38	12.5	11.38	2.87
2005	9.16	11.48	12.5	11.60	2.32
2006	10.60	11.50	12.5	10.65	0.90
2007	12.31	12.91	12.50 - 14.50	10.05	0.60
2008	13.40	15.44	14.50 - 18.00	11.28	2.04
2009	12.81	15.54	16.50	12.32	2.73
2010	13.59	15.43	16.50 - 17.00	12.14	1.84
2011	14.35	16.48	17.00 - 18.00	12.22	2.13
2012	14.46	16.92	18	12.54	2.46
2013	15.17	16.91	18	12.30	1.74

Quality and safety of milk and dairy products

Dairy farmers, as a producer in milk supply chain, have to ensure that the safety and quality of their raw milk will satisfy the highest expectations of the food industry and consumers. On-farm practices should also ensure that milk is produced by healthy animals under acceptable conditions for the animals and in balance with the local environment. According to the Thai Government's policy, from raw material production to the point of consumption, all dairy products should be subject to a combination of control measures. Together, these measures (good agricultural practice - GAP and good manufacturing practice - GMP) should meet the appropriate level of public health protection. Figure 4 and Table 3 describe the safety and quality scheme of milk supply chain in Thailand which have regulated by the Department of Livestock Development

and the Ministry of Public Health in collaboration with dairy cooperatives and milk processing plants.

Many dairy companies and cooperatives are introducing on-farm and milk processing quality assurance programmes aimed at assuring their consumers about the safety of their dairy products. This is a new trend of premium products of milk market in Thailand so-called “premium or gold milk”.

Figure 4: Safety and quality scheme of milk supply chain in Thailand

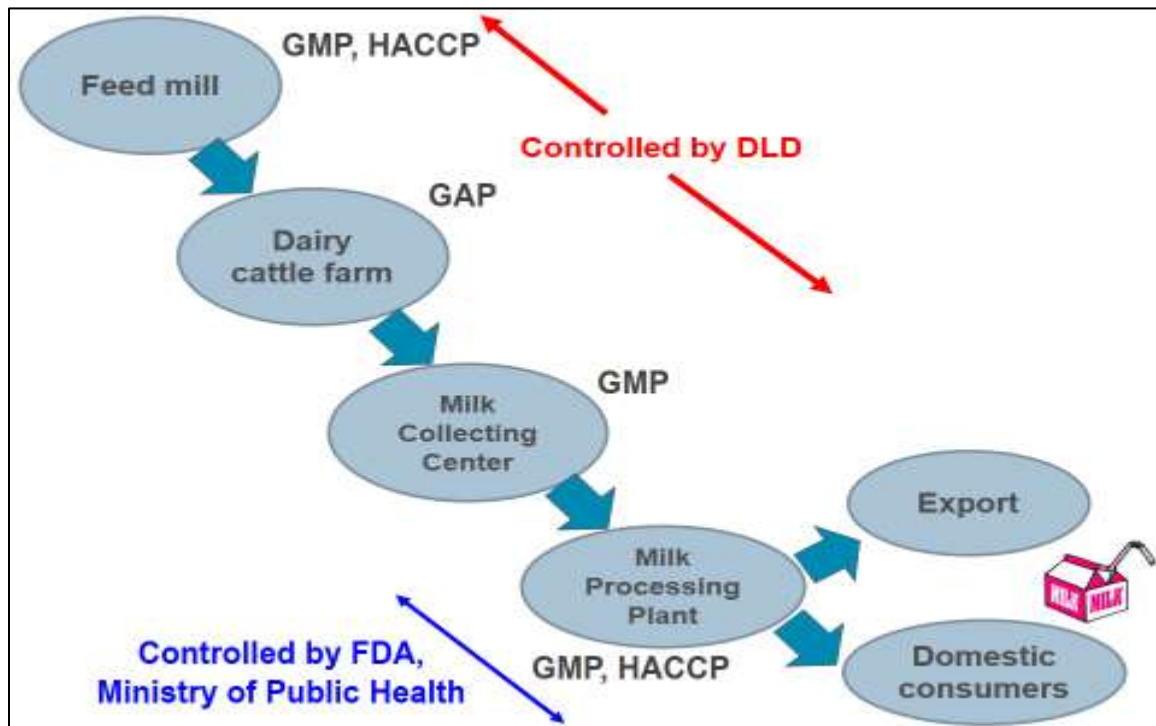


Table 3: Safety measures and management along milk supply chain in Thailand

	Quality assurance scheme	Responsible control agency
Dairy farmers	GAP	Department of Livestock Development, the Ministry of Agriculture and Cooperatives
Milk collecting centers	GMP (based on Codex)	Agricultural Commodity and Food Standards (ACFS)
Milk processing plants and distributors	GMP regulation by Thai FDA	Food and Drug Administration
	GMP (based on Codex)	Department of Livestock Development
	HACCP (voluntary)	

Key Opportunities and Challenges

The average annual consumption of liquid milk in Thailand is relatively low (20 kg per person per year) as compared with that of other developed and developing countries. Therefore, it is a potential opportunity and challenge to increase milk consumption in Thailand. Due to many difficulties and limitations, dairy development has been quite successful compared with other agricultural sectors. The opportunity for expansion of dairy production in Thailand is potentially high due to the following factors.

1. Opportunities of dairy production in Thailand

Economic viability

- The Thai government's milk drinking campaign aimed to increase *per capita* consumption of drinking milk through the school milk programme. In addition, there are many other indications that an increasing percentage of Thai people will become regular milk consumers, e.g. improving levels of education, higher incomes, more efficient milk marketing and an increased awareness of health issues.
- Some milk manufacturers in Thailand have been exporting dairy products (such as UHT drinking milk, condensed sweetened milk, and other dairy products) to neighbouring countries. Hopefully, in the near future, more dairy products may be exported to those countries as a result of improving political and economic conditions.
- Yoghurt put in another positive performance of milk market in Thailand, largely thanks to the booming health and wellness trend in Thailand. Thai consumers have become more aware of the benefits of yoghurt, particularly pro/pre biotic yoghurt, in terms of aiding digestion etc. Manufacturers are tending to target their products at adults in response to greater demand for healthy products among working-class consumers.
- Cheese in Thailand grew by six percent in current value terms in 2013 to reach sales worth Bt1.4 billion, this being a slightly better performance than that of 2012. Thai consumers are likely to be exposed to a wider variety of cheese products. The rapid expansion of modern retail outlets such as supermarkets/hypermarkets and convenience stores in conjunction with strong economic growth will support the performance of cheese in Thailand over the next decade.

Government policies

- The Thai government has implemented various policies and measures in order to develop, promote, and sustain dairy production in Thailand. According to a new government policy on area-based approach or zoning, appropriate areas for dairy production have been identified.
- The Thai government has a long-term policy to decrease the areas of paddy rice production by diverting rice farming to other production or commodities. Dairy farming is identified as one of those options. As a result, paddy fields will be used as forage plots for dairy farming. Such policy will also enhance a rapid expansion

of forage business. Forage crop producers can sell roughage to dairy farmers. In Thailand, many areas are unsuitable for crop production, but can be utilized for dairy farming. In addition, use of cow manure could enhance the quality of the environment and ecosystems and improve soil fertility.

2. Challenges of dairy production in Thailand

- Farmers who do not grow forage crops but harvest grass from public areas or collect agricultural by-products, such as corn stover, sugarcane tops and rice straw for dairy feeding, have been experiencing higher costs of crop by-products and transportation. Likewise, the transportation costs for delivering raw milk from farms to cooperatives, milk collecting center and/or to milk processing plants have increased over past decades resulting in higher milk production cost of both the smallholder farmers and the small dairy cooperatives.
- Given the low *per capita* consumption of cow milk in Thailand, there remains considerable room for growth over the forecast period. With regard to the ongoing health and wellness trend in the country, it is possible that consumers will switch from functional bottled water, ready-to-drink (RTD) tea and other soft drinks to drinking milk products. There also remain challenges and opportunities for growth in dairy products.
- It is a challenge for smallholder dairy farmers to reduce their milk production costs. Most milk production costs are related to feeds and feeding (approximately 65 to 75 per cent of milk production costs). In addition to feeding management during the dry season, it is most important how farmers can manage to have enough high quality feed and forages during the *dry season*.
- Establishment of a Regional Dairy Training Center in Chiangmai offers challenges and opportunities for dairy development partners to link with Thai and international partners to develop international dairy training courses for extension workers (dairy farm management etc.), milk producers and processors in the SE Asia region. The feasibility of a training center on a commercial base including the possibilities for funding need to be investigated. This needs to be done in 2015-18 but extra funding will be needed.
- It needs to develop a national strategy and action agenda to innovate the dairy value chain in Thailand based on results of project and an analysis of the challenges and opportunities shared by the stakeholders (the public and private sectors).

Potential Areas for International Cooperation and Role of APHCA/Dairy Asia

Due to Thailand's small domestic capacity of dairy sector, Research and Development of smallholder dairy farms have been relatively low. Knowledge and technology available in developed countries cannot be readily adopted by small farmers in developing countries due to their difference in socio-economic and agro-ecological conditions. However, some dairy technology developed in advanced countries may be appropriate for adoption by smallholder dairy farmers but most of these dairy technologies or dairy

practices have never been transferred to smallholder farms due to a lack of effective extension services and support from the Government.

Since 2011, Thailand with support of FAO, APHCA and CFC has implemented the Regional TCP programme on “Smallholder Dairy Development in Bangladesh, Myanmar and Thailand: Improving the Bargaining Power and Sustainable Livelihood of Smallholder Dairy Farmers, through the Enhancement of Productivity and Market Access in Dairy” (SDDP). The project aims at empowering smallholder milk producers by improving bargaining power and sustainable livelihoods in Bangladesh, Myanmar and Thailand by enhancing productivity and market access through adapting and demonstrating successful complete cow-to-consumer dairy chain models. One of key activities under SDDP is to upgrade demonstration and training facilities at the Chiang Mai to be Regional Dairy Training Center (RDTC). It is a challenge for RDTC in Chiangmai to maintain their activities and the international cooperation and roles of APHCA, Dairy Asia, FAO and other international development organizations are essential to strengthen the roles and activities of RDTC.

Conclusions

The efforts of the Government in the development of dairy farming in Thailand have been successful. There has been a satisfactory increase in milk production and in the number of dairy cattle and dairy farmers. However, today Thai farmers produce only 30% of the raw milk needs for all milk products. Such a rapid growth requires great investments in facilities for the farmers. For instance, it will be necessary to import dairy cattle to get enough animals and to get the right stock. Furthermore, training of farmers and good extension services are important factors, especially in making dairy farming into a good business. Serious efforts must be made to reduce the costs of milk production and, as concentrates are expensive, it would pay to look for better utilisation of pastures and fodder crops.

In addition, it is very important to establish a national body or ‘Milk Board’, which consists of representatives from the different sectors with an interest in dairy enterprise, to formulate and oversee national dairy policies in order to promote the national dairy industry. It is essential to strengthen dairy training for farmers and the provision of an effective dairy extension system. Provision of mobile extension or dairy herd health units (DHHUs) that give on-farm advice to farmers is one of the most effective ways to improve dairy efficiency. The national programme for dairy herd improvement in Thailand for the selection and multiplication of superior quality dairy sires and cows shall be continued. Quality and safety of raw milk and milk products are important through a government- and private-supported milk quality and safety scheme through GAP and GMP, which provides some incentive payment scheme for dairy farmers. Finally, there is real need for strong and continuing support for dairy research. With these strategies, a substantial expansion and improvement in dairy production is expected within the next decade.

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Speeches

Welcome by APHCA Chairperson

Dr Tashi SAMDUP

Assistant Director General, FAO, Representatives of FAO, OIE & INGOs/NGO's, the Secretariat of APHCA, Dr. Joachim Otte, Delegates, Participants, Ladies and Gentlemen

On behalf of the APHCA and its executive committee members, I take this opportunity to welcome all the dignitaries and participants to the 38th APHCA session.

Almost 14 months ago, we successfully organized the 37th APHCA Session and the Regional workshop on *Zoonoses, Food-borne Diseases and Antimicrobial Resistance in the Asia and Pacific Region* in Thimphu, Bhutan.

On that Occasion, Bhutan was handed in the Chairmanship of APHCA. I, on behalf of my country was honored to serve as the Chairman of this reputed organization. Though my personal contribution to this organization may not be substantial I am aware that under the dynamic Secretariat led by Dr. Joachim Otte; quite a number of significant events have been achieved: for e.g.

- The *“Regional Workshop on Brucellosis Diagnosis and Control in Asia-Pacific Region”*
- An international consultation on *“Dairy Asia Towards Sustainability”*
- A Regional Training Workshop on *“Antimicrobial Susceptibility Testing (AST) of Bacteria Isolated from Farm Animals”*

This 38th APHCA Session and the *“Regional Workshop on Breeding for Milk Production in Tropical / Non-Temperate Environments”* is timely and relevant owing to the strongest growing consumption of milk in Asia and the Pacific Region.

While production has responded to growing demand, our region remains to be the net importer of milk and milk products. In the last three decades, our region's import increased by three folds. At this rate, OECD-FAO estimates the demand for milk and milk products to grow up to 320 million tonnes by the year 2021; requiring to produce another 50 million tonnes within this decade.

To meet this demand, dairy production systems are undergoing a gradual transformation from small scale production to commercial scale but the question we need to ask is: Is the transformation desirable and sustainable under increasing land scarcity, climate change, growing pressure on feed resources and rising animal feed prices?

Under these challenges and constraints, we are compelled to look for solutions to produce more without compromising on economic benefit, environmental soundness and societal acceptance.

Today's gathering provides a platform and an opportunity to collectively formulate holistic and strategic interventions to enhance milk and milk products. The meeting of such kind and magnitude has culminated out of our collective Vision for the Region.

To remind the house of our Vision, set in 2007-2008, and adopted as Chiang Mai Declaration: ***Asian milk for health and prosperity***. Today as we are here in same place, we must jointly assess our achievements and find out how far we have moved towards realizing our Vision and decide we should move from here on to attain our common Vision.

I once again thank all the delegates, participants from international organizations, dignitaries for making it to this conference. Your presence here, especially the presence of ADG of FAO is an indication of your unstinted commitment to APHCA and to bring changes to the lives of people who struggle day in and day out to make their ends meet, and I call for all the participants to give the best effort to make our region OUR world a better place to live with dignity and humane value.

At this juncture I would like to take an opportunity to thank Dr. Vishnu Songkitti, former APHCA Liaison Officer for his immense contribution to APHCA. Your contribution will be cherished and I wish full success in your future endeavors.

And last but not the least, I would like to thank all the organizers of this session and the upcoming workshop: APHCA, FAO, DLD, DPO and all the people behind the scene for the successful organization of event and wish you all a successful deliberation and happy stay in Chang Mai.

Thank You & kop khun krap

Welcome Address by FAO

Hiroyuki KONUMA, FAO ADG and RR Asia-Pacific

Dr Tashi Samdup, APHCA Chair,
Dr Otte, APHCA Secretary,
Director Generals, Directors, Senior Officials,
Dear Colleagues,
Ladies and Gentlemen,

It is my honour and profound pleasure to welcome you all on behalf of FAO and its Regional Office to the 38th Session of the Animal Production and Health Commission for Asia and the Pacific, held in the beautiful city of Chiang Mai.

I would like to specifically welcome Dr Kugita from the OIE Regional Representation, which has a tradition of regularly attending the Session as ‘observer’ and is a longstanding partner of FAO in animal health related activities in the region.

As you are aware, APHCA is one of five regional technical commissions hosted by FAO’s Regional Office. These commissions, Forestry, Fisheries, Plant Protection, Statistics and APHCA, were established in the 1960s and 70s upon the request of Member Countries to have dedicated fora, at which to discuss and find solutions to technical matters of common concern. As such, they are important elements of FAO’s governance architecture.

Although times have changed dramatically since the establishment of the technical commissions, they are as relevant today as they were 40 or 50 years ago. It might even be argued that, with increasing concerns over rapid increase in demands for livestock products, emergence of new transboundary animal diseases, and regional integration and the growing complexity of international relationships, dedicated technical bodies providing a neutral forum to identify and deliberate on pressing contemporary issues are more important than ever before.

Globally, but particularly in Asia, dramatic changes have taken place over the past decades: technological advances and investments have been tremendous, take the internet and mobile phones, human and animal populations have grown considerably, movements of people, animals and animal products have increased exponentially, public institutions have in many instances challenged for transformation, and climate changes are advancing.

Diseases, many of which originate in animals, are emerging at an unprecedented rate, food safety scares, often involving livestock products, are making headlines, animal waste has become a liability rather than a valued input into crop agriculture, and import dependency on animal feed and animal source food is draining foreign reserves.

The fact that since its establishment in 1976, this Commission has convened almost every year and the attendance and level of representation at this year's Session are testimony to its relevance and value to the countries in this Region. The Commission has worked steadily over more than 40 years, under at times adverse conditions, and established a track record of continuity, reliability and partnership.

You can proudly look back on a year of hard work and important accomplishments since last year's Session in Thimphu, Bhutan. Most member countries, as well as non-member countries in the region, have participated in brucellosis proficiency testing, prepared national feed assessments, contributed to the Asia Dairy Network, the formulation of a regional dairy development strategy and preparations for a Dairy Asia Platform, undertaken steps to rationalize the use of antimicrobials in food animal production and made efforts to enhance the national capacities for antimicrobial resistance monitoring and management. These are all extremely important initiatives and your involvement ultimately contributed to the advancement of FAO's renewed strategic objectives.

It is furthermore gratifying to note that, in addition to fostering common activities, Commission meetings give rise to technical assistance and resource sharing through bi-lateral discussions and arrangements.

Ladies and Gentlemen,

To end, I would like to express my personal appreciation to the Royal Government of Thailand, Department of Livestock Development for hosting this event.

I am confident you will have a fruitful Business Session and outcomes, and will look forward to tomorrow's regional workshop on *breeding for milk production in non-temperate environments*.

Thank you for your kind attention.

