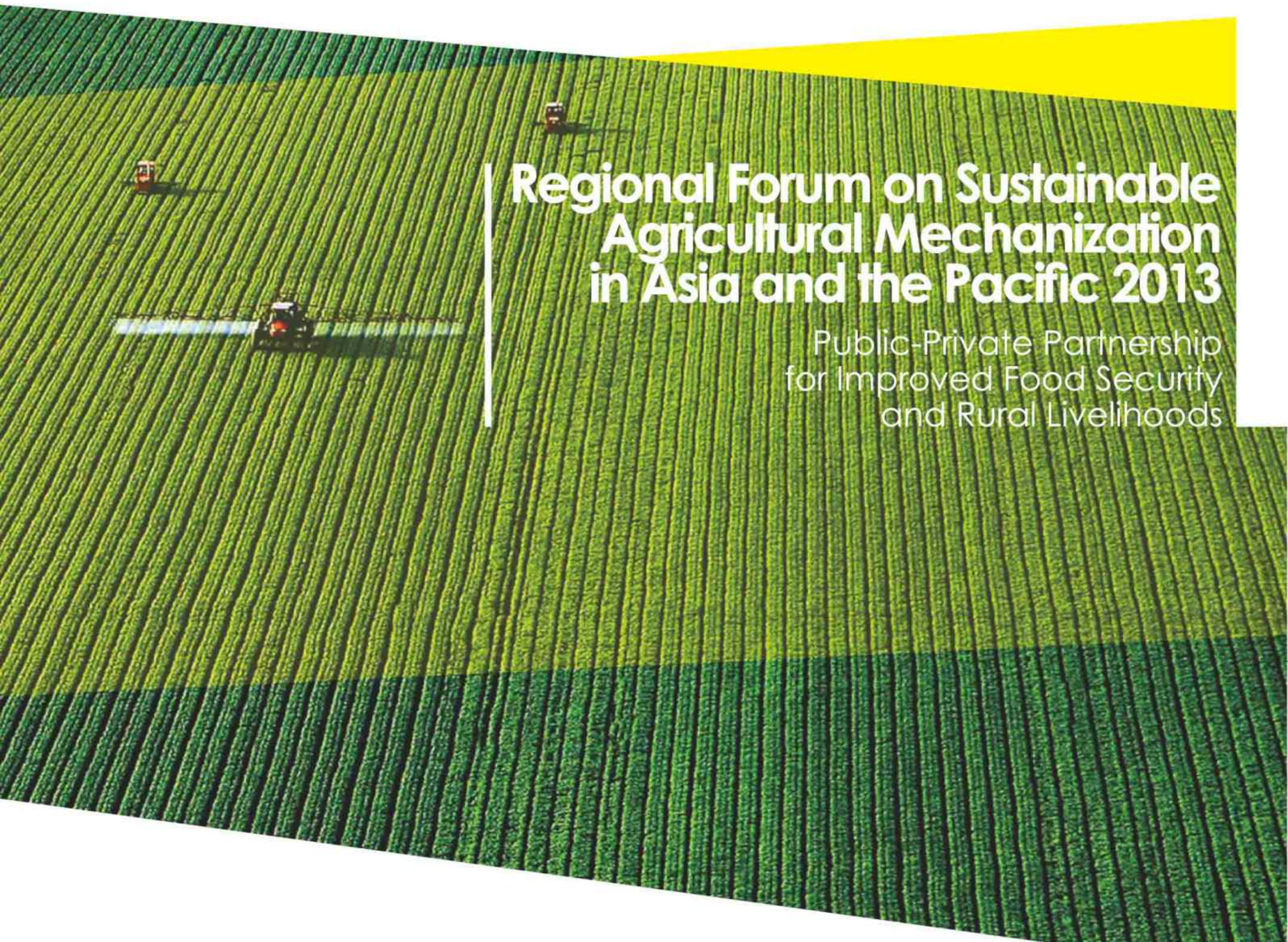


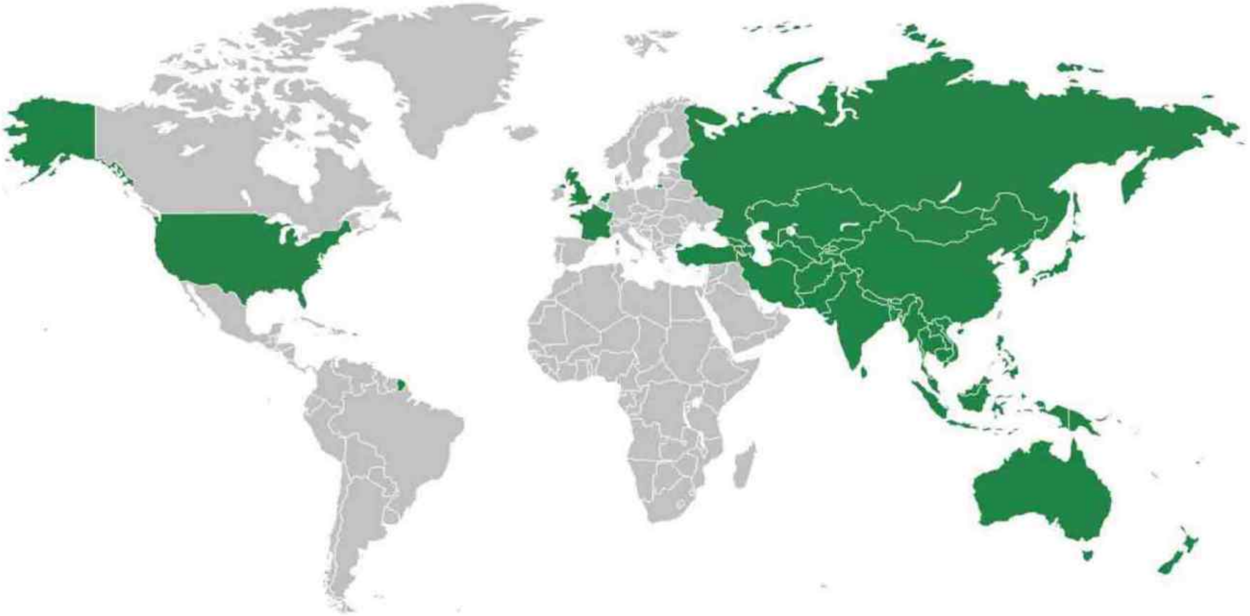
Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific 2013

Public-Private Partnership for Improved Food Security and Rural Livelihoods

UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

CSAM | CAMDA | CAMA 中国农业机械化协会 | 中国农业机械工业协会 CAAMM

The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) is the regional development arm of the United Nations for the Asia-Pacific region. Made up of 53 Member States and 9 Associate Members, with a geographical scope that stretches from Turkey in the west to the Pacific island nation of Kiribati in the east, and from the Russian Federation in the north to New Zealand in the south, the region is home to 4.1 billion people, or two thirds of the world's population.



The darker area of the map represents the members and associate members of ESCAP.

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Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific 2013

Public-Private Partnership
for Improved Food Security
and Rural Livelihoods

CSAM-ESCAP
Floor 7, No. 12 Yu Min Road,
Chao Yang District, Beijing, China

Opening Remarks

Dr. Ravi Ratnayake
Director of Trade and Investment Division
UN-ESCAP

Distinguished Delegates and Guests,
Ladies and Gentlemen,

It is a great pleasure to welcome you to the Regional Forum on Sustainable Agricultural Mechanization, jointly organized by the Centre for Sustainable Agricultural Mechanization (CSAM) of UNESCAP and China Agricultural Mechanization Association (CAMA), China Agricultural Machinery Distribution Association (CAMDA) and China Association of Agricultural Machinery Manufacturers (CAAMM).

I would like to thank the Chinese Ministry of Agriculture, Ministry of Foreign Affairs, the Food and Agriculture Organization of the United Nations and Changlin Group for your support to the Forum. I also wish thank the Qingdao Municipality for hosting the Forum.

As you all might be aware, although we succeeded in reducing drastically the proportion of undernourished people in Asia and the Pacific, there are still 540 million undernourished people in our region. Sustained agricultural production and productivity gains are the most important and likely ways to produce more and better food so as to meet the increasing and ever-changing food demand of this region. At the same time, agriculture is still the mainstay of most economies in the Asia-Pacific region and plays an important role in national economic development, poverty reduction and employment generation. Amid these challenges and that of climate change, sustainable agricultural mechanization can achieve the dual goals of increasing food productivity against the background of rapid population growth, reduction of rural labor as a result of urbanization and dwindling natural resources, and reducing the impact on the environment. Commercialization and use of safe, efficient and environmentally friendly agricultural machinery is an important component of agricultural mechanization.

CSAM, as a regional institution of UNESCAP, is mandated to promote sustainable agricultural mechanization in this region, thereby contributing to the achievement of production gains, improved rural livelihood and poverty alleviation. With its reviewed strategic directions for the future, CSAM is expected to play a more effective role as a regional forum, an information hub, a reference point of standards and a center of capacity building in the field of agricultural mechanization, in close partnership with other international agencies, governments, research institutes, private sector and the farmers.

The launch next month in Bangkok during UNESCAP's Trade and Investment Week of the Asian and Pacific Network for Testing Agricultural Machinery (ANTAM) will be a milestone event for CSAM and the agricultural mechanization community in the region. It is a regional network aimed to promote regional trade of, and investment in, safe and quality agricultural machinery for the benefits of farmers and manufacturers through harmonization of testing standards and codes across the region. Sustainable Agricultural Mechanization Strategy (SAMS) is another initiative developed and implemented jointly by FAORAP and CSAM. SAMS will also prove to be a useful policy advisory tool for countries in this region to tailor their sustainable agricultural mechanization strategies and policies.

The Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific is a further step to gather key stakeholders including representatives from international organizations and key participants from countries of Asia and the Pacific to discuss and share knowledge on good practices on sustainable agricultural mechanization and to formulate recommendations for strategies for improving food security and farmers' livelihoods in the region through fostering stronger public-private partnerships.

I am glad to see that more than 15 countries of the region are represented here today, both from the public and private sectors, a good mix for policy deliberation and for business development. It is therefore my expectation that the Forum will contribute to enhancing mutual understanding and trigger cooperation and business development opportunities for sustainable agricultural mechanization.

Last but certainly not the least, I wish to extend my appreciations to all the distinguished participants and resource persons for taking the time to participate in this Forum.

I wish all of you a pleasant and fruitful stay in Qingdao.

Thank you.

Acknowledgement

This synthesis report is the proceedings of the Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific, held on 26-27 October 2013, in Qingdao, China. It is prepared under the overall guidance of Zhao Bing, Head of CSAM, and the collaboration of the CSAM team. The original presentations and speeches were provided by their respective participants/speakers.

Special thanks go to Wu Sheng for compiling the report, summarizing the presentations, and providing administrative support to this publication. Feng Yuee also contributed by offering editorial assistance. We are also grateful to Liu Yuan for his lay-out and design.

This publication is prepared with generous support of Chinese Agricultural Machinery Distribution Association.

Content

Executive Summary

Agricultural mechanization has proved to play an irreplaceable role in increasing agricultural production, productivity and profitability and thereby helps eradicating poverty and hunger and improving farmers' livelihoods in general. However, the development of agricultural mechanization among the Asian-Pacific countries is comparatively low and features with vast disparity. Some countries are currently experiencing a rapid rate of agricultural mechanization; while others lag behind suffer from inappropriate and fragmented approaches to mechanization leading to adverse agricultural production and food security. Participation of governments, researchers, non-governmental organizations (NGOs), and the private sector have been recognized as one of the key factors in promoting sustainable agricultural mechanization.

Centre for Sustainable Agricultural Mechanization (CSAM) of United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) in collaboration with China's three leading associations in agricultural mechanization, namely, China Agricultural Machinery Distribution Association, China Agricultural Mechanization Association and China Association of Agricultural Machinery Manufacturers, organized Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific was held on 26-27 October 2013, in Qingdao, China. The forum was supported by the Chinese Ministry of Agriculture, Ministry of Foreign Affairs of China, Food and Agriculture Organization of the United Nations (FAO) and Shandong Changlin Deutz-Fahr Machinery Company LTD.

More than 100 participants from Bangladesh, Cambodia, China, India, Indonesia, Kazakhstan, Malaysia, Mongolia, Nepal, New Zealand, Pakistan, Sri Lanka, Thailand, The Philippines and Viet Nam, representatives from international organizations, including the FAO, and European Network for Testing of Agricultural Machines (ENTAM) came together, and constructed dialogues on "Public-Private Partnership for Improved Food Security and Rural Livelihoods".

The dialogue was organized into the three sessions with following objectives:

- Regional and Country Strategic Initiatives: dedicating to knowledge and information sharing on major ongoing strategic initiatives in the region and beyond;

• Country Perspectives Review: providing overviews of the status quo, challenges and prospects of agricultural mechanization in participating countries;

• Public-Private Partnership Dialogue: Opportunities for Regional Cooperation and Business Development: opening dialogues and discussions among the public-sector representatives on opportunities for regional cooperation and trade and investment.

The forum achieved the following outcomes:

• awareness raised among key stakeholders of potentially greater contribution of sustainable agricultural mechanization to food production gains and improvement of rural livelihoods, especially against the backdrop of dynamic social-economic development in the region, including population growth, rapid urbanization, and the need of climate change adaptation and mitigation;

• knowledge and experience sharing on sustainable agricultural mechanization policies, strategies and practices among countries in the region promoted; mutual understanding among countries enhanced, cooperation/business development opportunities among the countries discussed;

• a good foundation laid for CSAM's strategic direction to serve as a regional high-level platform for sustainable agricultural mechanization.

The forum concluded that sustained agricultural production and productivity gains are the most important and likely ways to produce more and better food so as to meet the increasing and ever-changing food demand of this region. In establishing enabling environment for rapid development of agricultural mechanization, stronger public-private partnership and greater scope of regional cooperation, governments, researchers, NGOs, international organizations and the private sector play different and crucial roles. The public sector plays important role in supporting effective functions of the supply chains of mechanization so to achieve its dual goals of agricultural production growth and environmental protection; international organizations' work on establishing multi-lateral cooperation platform for sharing of experience and lesson learnt on sustainable agricultural policy-making among countries, and creating regional network on standard setting for agricultural machinery industry is of great significance. Countries in the region expressed their urgent need to continue seeking opportunities to strengthen regional cooperation, public-private partnership and business development in such a forum in the future.

About the Event

Government officials from agricultural ministries, representatives from international organizations, universities, NGOs, more than 100 participants from Bangladesh, Cambodia, China, India, Indonesia, Kazakhstan, Malaysia, Mongolia, Nepal, New Zealand, Pakistan, Sri Lanka, Thailand, The Philippines and Viet Nam met in Qingdao, China on 26-27 October 2013. They constructed dialogues on "Public-Private Partnership for Improved Food Security and Rural Livelihoods". In parallel with the China International Agricultural Machinery Exhibition 2013, the Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific was jointly organized by CSAM of UNESCAP and China's three leading associations in agricultural mechanization. It was supported by the Chinese Ministry of Agriculture, Ministry of Foreign Affairs of China, FAO and Shandong Changlin Deutz-Fahr Machinery Company LTD.

The forum (see Annex 1 for agenda) has 3 major components: introduction of regional and country strategic initiatives; country perspectives review; and public-private partnership dialogue.

The meeting started with welcome remarks and followed by keynote speeches. Three sessions took place: Regional and Country Strategic Initiatives, dedicating to knowledge and information sharing on major ongoing strategic initiatives in the region and beyond; Country Perspectives Review, providing overviews of the status quo, challenges and prospects of agricultural mechanization in participating countries; Public-Private Partnership Dialogue: Opportunities for Regional Cooperation and Business Development, opening dialogues and discussions among the public-sector representatives on opportunities for regional cooperation and trade and investment.

The event raised awareness among key stakeholders of potentially greater contribution of sustainable agricultural mechanization to food production gains and improvement of rural livelihoods, initiated public-private partnership dialogues, seeking opportunities for regional cooperation and business development.

About the Participants

More than 100 participants participated in the event. This included representatives of public sector and private sector from 15 countries as follows: Bangladesh, Cambodia, China, India, Indonesia, Kazakhstan, Malaysia, Mongolia, Nepal, New Zealand, Pakistan, Sri Lanka, Thailand, the Philippines, and Vietnam. Three representatives from regional/international organizations and 15 China-based journalists also participated in the event.

FAO Message

Mr. Percy Misika
FAO Representative in China
On behalf of Dr. José Graziano da Silva
Director General of FAO

Ladies and Gentlemen:

It is my pleasure to convey welcome remarks on behalf of the Food and Agriculture Organization of the United Nations, to this regional forum on Sustainable Agricultural Mechanization Strategy, which brings in a focus on "Public-Private Partnership for Improved Food Security and Rural Livelihoods." I wish to thank my colleagues from our sister UN Orgnaization, CSAM, for inviting FAO's contribution to this forum.

At a global level there is no alternative but to increase agricultural productivity or crop yield per unit area to meet global food, feed and biofuel demand and to alleviate hunger and poverty. This scenario, indeed poses a great challenge for Asia and the Pacific region where population density is in many areas very high and population growth continues, while land and water resources are getting to their limits for providing food and other agricultural outputs.

Agricultural intensification has, until now, had a negative effect on the quality of many essential resources such as soil, water, land, biodiversity and ecosystem services resulting in declining yield and factor productivity growth rates. Another challenge for agriculture is its environmental foot print and the impact of climate change. Agriculture is responsible for about 30 % of the total greenhouse gas emissions of carbon dioxide, nitrous oxide and methane, while being directly affected by the consequences of a changing climate.

The functionality of environmentally friendly agricultural management practices is highly dependent on suitable mechanization technologies. Agricultural mechanization removes the drudgery associated with agricultural labour, reduces the work load of women engaged in production activities, overcomes time and labour bottlenecks to perform tasks within optimum time windows, and can influence the environmental footprint of agriculture, leading to sustainable impacts.

The impacts of mechanization in the crop sector are, however, varied in that it can have both positive and negative impacts. The positive impact of mechanization lies in its contribution to reducing the environmental footprint of agriculture, while its negative impact relates to the acceleration of environmental degradation.

While recognizing the importance of market mechanisms, the direction taken by agricultural mechanization should not only be left to market forces, particularly in view of the fact that environmental sustainability is not yet well reflected in market economies. Sustainable agricultural mechanization must, be guided by policies and strategies if it is to result in increased productivity from finite resources, with minimal negative environmental impact.

Within the current global economic paradigm the crucial role of the private sector must be recognized. Mechanization technology supply chains from manufacturer to end user must provide livelihood opportunities to all participating stakeholders and this is what will provide sustainability to the process. At the same time the public sector also has a crucial role to play in providing an enabling socio-economic environment within which mechanization technology supply chains can function effectively while reflecting the objectives of agricultural production growth and environmental protection. This includes provision and improvements to infrastructure and utility supply, as well as encouraging the supply of raw materials and markets for end products via supportive fiscal and import duty regimes.

Political support for local manufacture can have a dramatic impact on the success of local industries, resulting in a positive effect on national agricultural productivity, on world markets and last but not least on environmental sustainability. The success of the Indian and Chinese agricultural machinery industries provides a good example of what can be achieved through the application of judicious supportive policies. Currently, India is the world's market leader in tractor production, and China is rapidly catching up, with the inclusion of elements of environmentally sustainable mechanization such as the promotion of Conservation Agriculture.

Other good examples of mechanization policies addressing the above sectors exist in the region. The spectrum covered is very broad, ranging from reducing soil degradation by introducing no-till technologies, more sustainable water management with irrigation technologies, to reducing the pressure on production by reducing post harvest losses with better storage and processing facilities.

FAO has, over the past decades, assisted member countries with the development of agricultural mechanization strategies, encouraging private sector involvement and a demand driven, market oriented approach, while at the same time stressing the importance of environmental sustainability of farming. All of this is very well documented in the FAO publication Save and Grow.

We have a lot of discussions and deliberations ahead of us to think around and discuss all of these issues. I would, therefore, like to end by wishing you a productive outcome to your deliberations.

Thank You.

Welcoming Remarks

Mr. Mao Hong
Chairman of Chinese Agricultural Machinery Distribution Association

On behalf of Chinese Agricultural Machinery Distribution Association, Chinese Agricultural Mechanization Association, China Agricultural Machinery Industry Association, I welcome officials, experts, and private sector representatives from the Asian and Pacific region to attend the forum to discuss promoting sustainable agricultural mechanization, strengthening the collaboration between the public and private sectors, and ensuring food security.

At the 21 APEC Economic Leaders' meeting, Chinese President Xi Jinping delivered an important speech, proposing a framework of interconnection, which covers south coast of the Pacific. At the 16 China ASEAN 10+1 leaders meeting, Premier Li Keqiang also stressed the importance of strengthening economic and trade cooperation to achieve complementary advantages.

Chinese Agricultural Machinery Distribution Association, Chinese Agricultural Mechanization Association, and China Agricultural Machinery Industry Association represent the enterprises in Chinese agricultural machinery industry. The associations undertake responsibilities of assisting the government and serving the enterprises, in order to promote the development of the industry. We look forward to working with government, industry organizations to strengthen cooperation, and to contribute to sustainable agricultural mechanization in the Asian and Pacific region.

Abbreviation

AFMA	Agriculture and Fishery Modernization Act
AFMech Law	Agricultural and Fishery Mechanization Law
AICRP	All India Co-ordinated Research Project
ANTAM	Asian and Pacific Network for Testing Agricultural Machinery
CAAMM	China Association of Agricultural Machinery Manufacturers
CAMDA	China Agricultural Machinery Distribution Association
CAMA	China Agricultural Mechanization Association
CAMTC	Chinese Agricultural Machinery Testing Centre, Ministry of Agriculture
CIAE	Central Institute of Agricultural Engineering, Bhopal, India
CIAME	China International Agricultural Machinery Exhibition
CSAM	Centre for Sustainable Agricultural Mechanization
ECOSORN	Economic and Social Relaunch of Northwest Provinces
ENTAM	European Network for Testing of Agricultural Machines
EU	European Union
FAO	Food and Agriculture Organization
FAORAP	Regional Office for Asia and the Pacific, food and Agricultural Organization
FIM	Farm Implements and Machinery
GBPUAT	Govinda Ballav Pant University of Agriculture and Technology
GDP	Gross Domestic Product
IAMFE	International Association for the Mechanization of Field Experiments
IRRI	International Rice Research Institute
ICAERD	Indonesian Center for Agricultual Engineering Research and Development
LIFDCs	Low-income food-deficit countries
MARDI	Malaysia Agricultural Research and Development Institute
MoA	Ministry of Agriculture
NARC	Nepal Agricultural Research Council
NGO	non-governmental organizations
OECD	Organisation for Economic Co-operation and Development
PAIID	Programme for Accelerated Industrial Innovation development
PARC	Pakistan Agricultural Research Council
RCTs	Resource Conservation Technologies
PDB	Produk Domestik Bruto (Indonesian: gross domestic product)
PMWs	Prototype Manufacturing Workshops
PRC	People's Republic of China
R&D	Research and Development
SAMS	Sustainable Agricultural Mechanization Strategies
SEMEC	Seed and Mechanization Development Charitable Trust
UN	United Nations
UN-ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UPLB	University of the Philippines Los Baños
VIAEP	Vietnam Institute of Agricultural Engineering and Post-Harvest Technology

I.

Agricultural Mechanization in the Asian-Pacific Region and Sustainable Agricultural Mechanization Strategies

Sustainable Agricultural Mechanization Strategies (SAMS) in the Asia-Pacific Region

Dr. Rosa S. Rolle
Senior Agro-Industries and Post-harvest Officer
FAO Regional Office for Asia and the Pacific
Bangkok Thailand

Dr. Rosa Rolle is an Agricultural Industries Officer in the Rural Infrastructure and Agro-Industries Division of the Food and Agriculture Organization. Since joining FAO in 1995, she has worked internationally in the areas of food processing, coconut water preservation, post-harvest systems development and food packaging. Rosa is currently actively involved with the development, design and implementation of training programs on horticultural chain management in Asia and in Africa. Prior to joining FAO, Dr. Rosa Rolle conducted post-doctoral work at the University of Florida, Gainesville, Florida, USA and worked as a consultant to the Government of the Commonwealth of Dominica. Dr. Rosa Rolle holds MSc and Ph.D degrees in food science and a Higher National Diploma in applied chemistry. In 2003, she was recognized as an outstanding international alumnus of the Ohio State University's College of Food, Agriculture and Environmental Sciences.

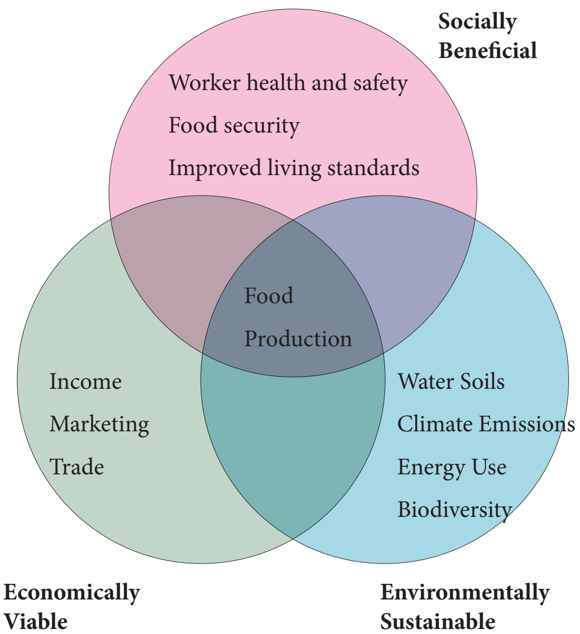
Asia and the Pacific Region is facing the challenges to the food supply and environment, including 1) population growth coupled with rising living standards; 2) increasing urbanization, a declining rural labor force and increasing feminization of agriculture; 3) ageing farming population; 4) growing scarcity of fresh water resources, 4) resource degradation and loss of biodiversity; 5) increasing energy costs and declining farm incomes; 6) climate change; 7) high levels of post-harvest losses, and so on.

The challenges listed above means there is a need to meet growing food demands, to respond to impacts of demographic change in rural areas, use natural resources in a more sustainable way, increase energy efficiency, innovate to enhance resilience, and implement post-harvest loss reduction strategies.
The challenges also highlight the need to focus on the development of sustainable agricultural production systems that maintain optimal production without jeopardizing production factors. Sustainable Agricultural Mechanization (SAM) can contribute to sustainable agricultural production.

SAM can contributes to environmental sustainability by increasing energy efficiency, reducing carbon and gas emissions, through application with practices that avoid accelerating erosion and soil degradation, and through including measures to conserve soil fertility.

SAM can enhance financial performance of farms/ producers by increasing trade and market opportunities, and contribute to social benefit by improving food security, reducing the drudgery associated with agricultural work, and better worker health and safety.

The desired benefits and impacts of SAM are showed in the following diagram:

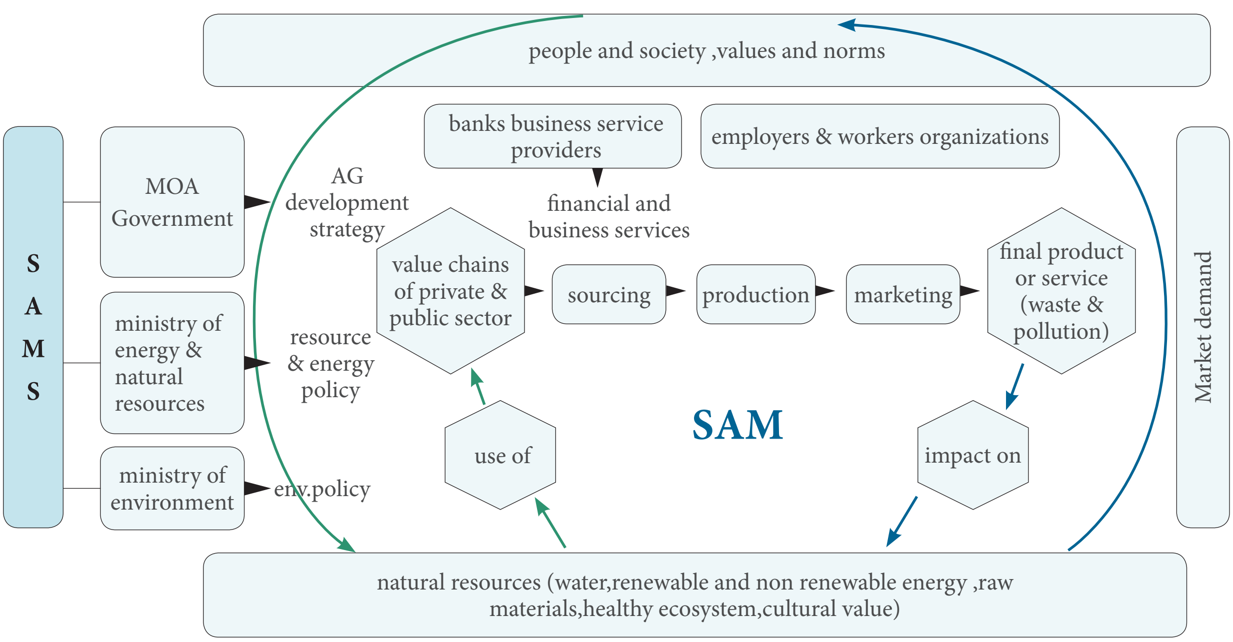


Desired Benefist and Impacts of SAM

Sustainable Agricultural Mechanization Strategy (SAMS) is a planning strategy that contributes to agricultural sustainability, while meeting food self sufficiency, generating economic development and inclusive growth as well as social benefit. SAMS is part of the enabling environment for the development of sustainable production systems and for the effective use of SAM. It can serve as a foundation to create a policy, institutional and market environment, that gives farmers the choice of farm power suited to their needs, while creating linkages among stakeholders.

SAMS is a joint initiative of CSAM and FAO launched in December 2011. The goal of SAMS for Asia and the Pacific is to address food security, poverty alleviation and environmental sustainability through sustainable intensification of agriculture, by creating an enabling environment.

SAMS constitutes an element of the enabling environment to promote sustainability



Source: adapted from donor committee on enterprise development, 2012

The factors that enable the formulation of SAMS include: relative importance of agriculture in the national economy, access to/availability of communication infrastructure, sufficient political commitment and will, adequate financial and human resources, recognition of the need for change by stakeholders – farmers, public and private sector, NGOs, financial institutions. Other enablers for SAMS formulation are competitive marketing and agricultural support services, systems and/or infrastructure for soil and water conservation, efficient agricultural, energy and environmental policies, information networks and training systems, public and/or private sector applied research systems adapted to local conditions.

Five Strategic Pillars were designated of SAMS for Asia and the Pacific, which are: Pillar 1 - Surveys, assessments and analyses of the current status of agricultural mechanization; Pillar 2 - Enabling policies and institutions for SAMS development; Pillar 3 - Human capacity development; Pillar 4 - Financial support to enhance investment in SAMS; and Pillar 5 – Advocacy (and awareness raising) on SAMS. CSAM and FAO will seek to utilize both South-South and North-South collaboration for CAMS implementation.

At the Sustainable Agricultural Mechanization Strategies Roundtable co-organized by CSAM and FAO on 8-9 December 2011, in Bangkok, Thailand, country representatives highlighted their priorities with regard to SAMS as the following Table:

Table 1 Priorities of Countries with Regard to SAMS

Countries	Priorities
Philippines	Comprehensive national program for sams
Srilanke	Standardization of agricultural machinery standards for sams
Malaysia	Providing access to approriate equipment to farmers
India	Optimize capitalization of agricultural machinery use,develop and promote agricultural machinery that is resource and energy efficient and conserve natural resources
Indonesia	Increasing the availability of agricultural mechanization technology to farmer stakeholders
Bangladesh	Strengthened capacity of agricultural mechanization technology on the supply side of amt
Nepal	SAMS
Vietnam	Applying appropriate machinery and equipment for agricultural production
Mongolia	Improve planning and implementation coordination of government agricultural mechanization (sams)
Thailand	Promote standardization of local agricultural mechanization
Myanmar	Training and education for farmers select suitable farm machinery for different types of soil

Pillar 1 of SAMS has been finalized in 2012, and the outcome document – Framework for Policy and Strategy Formulation is under preparation by FAO. Upon completion of the Pillar 1 outcome document, a Policy Level Workshop is scheduled in the first quarter of 2014 to outline the options and recommendations, discuss the actions forward, and solicit government input and support. The progress up to date of SAMS is illustrated as below:

Where are we now?

Country Level Surveys and Assessments Documented2012

↓

Under Preparation — Framework For Policy and Strategy Formulation

↓

Policy Level Workshop
Fao-Csam Quarter 12014 — Options and Recommendations for Government Input and Support Discussed

↓

Next Steps

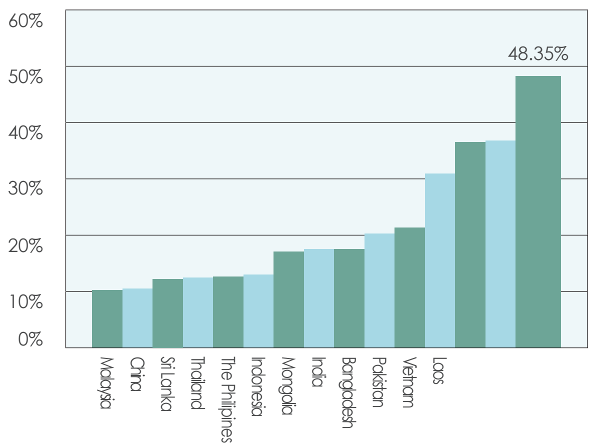
Regional Overview of Agricultural Mechanization

Mr. Zhao Bing
Head of Centre for Sustainable Agricultural Mechanization (CSAM)
United Nations Economic and Social Commission
for Asia and the Pacific (UNESCAP)

Mr. Zhao Bing has been the Head of the Centre for Sustainable Agricultural Mechanization (CSAM), a regional institution of ESCAP, since December 2012. Previous to that he worked for 5 years as Deputy Director of the Centre of International Cooperation and Service of the Chinese Ministry of Agriculture, coordinating and leading the design and implementation of bilateral and multilateral international cooperation projects, including the South-South Cooperation programme under China-FAO Trust Fund, the science and technology exchange programmes with the United States and Australia and NGO-related work. During the same period, he has also co-directed the preparation for the establishment of the Asian-Pacific Centre of the International Potato Centre (CIP). During 1999-2007, as an Alternate Representative, he worked in the Chinese Permanent Representation to the UN Agencies in Rome, a diplomatic mission to FAO, WFP and IFAD. Before that, he was a programme officer in the Department of International Cooperation in the Chinese Ministry of Agriculture, primarily dealing with Asian and African affairs. Mr. Zhao has a BA degree in international studies and a Master's degree in international business law from the University of Rome 'La Sapienza' in Italy. He's now a doctorate candidate of the Third University of Rome in the area of food safety.

The Asian and Pacific Region in UN speak usually include the 62 members/associate members of ESCAP. The focus of this overview, though, is on the more active member countries (15 circa) of the Centre for Sustainable Agricultural Mechanization, a group of countries of different nature but most of which are LIFDCs (low-income food-deficit countries).

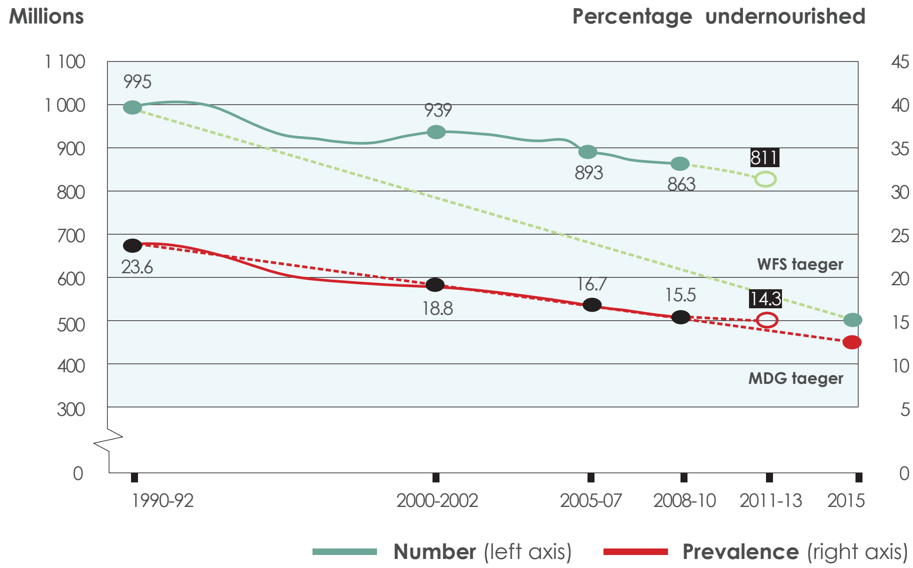
Traditionally agricultural countries, though agriculture's share in their GDPs showing a decreasing trend, it still represents important part of national economies. The diagram below shows the share of agriculture in GDP of some countries in Asia and the Pacific.



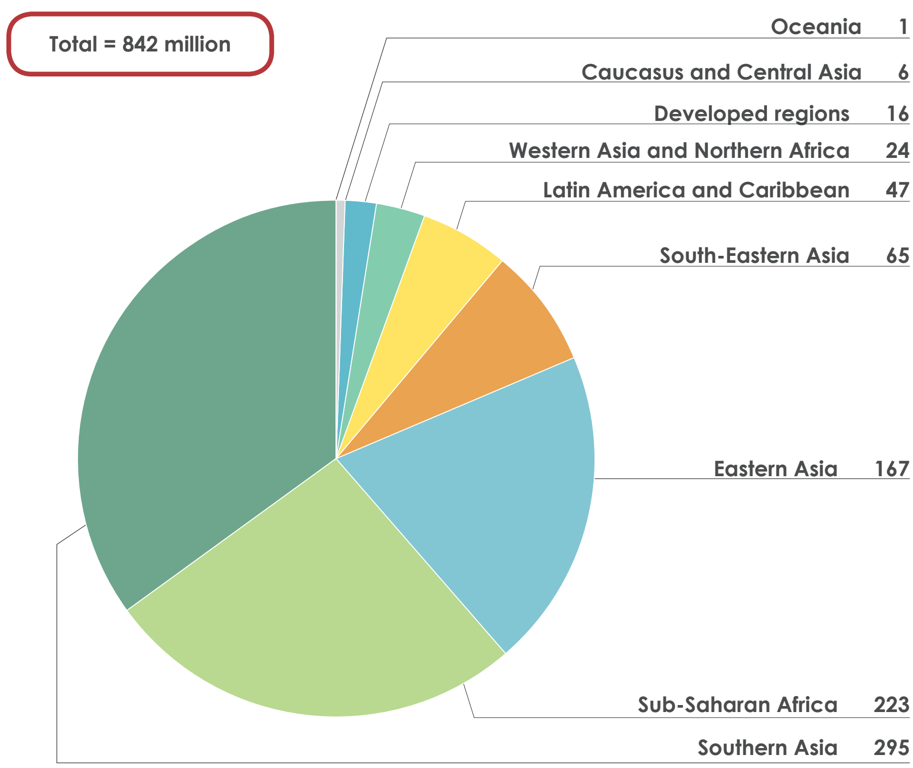
Agriculture Share in GDP

Food security remains a major concern of many countries in this region. And Asia and the Pacific still homes the majority of world undernourished people as showed below.

Undernourishment in the developing regions

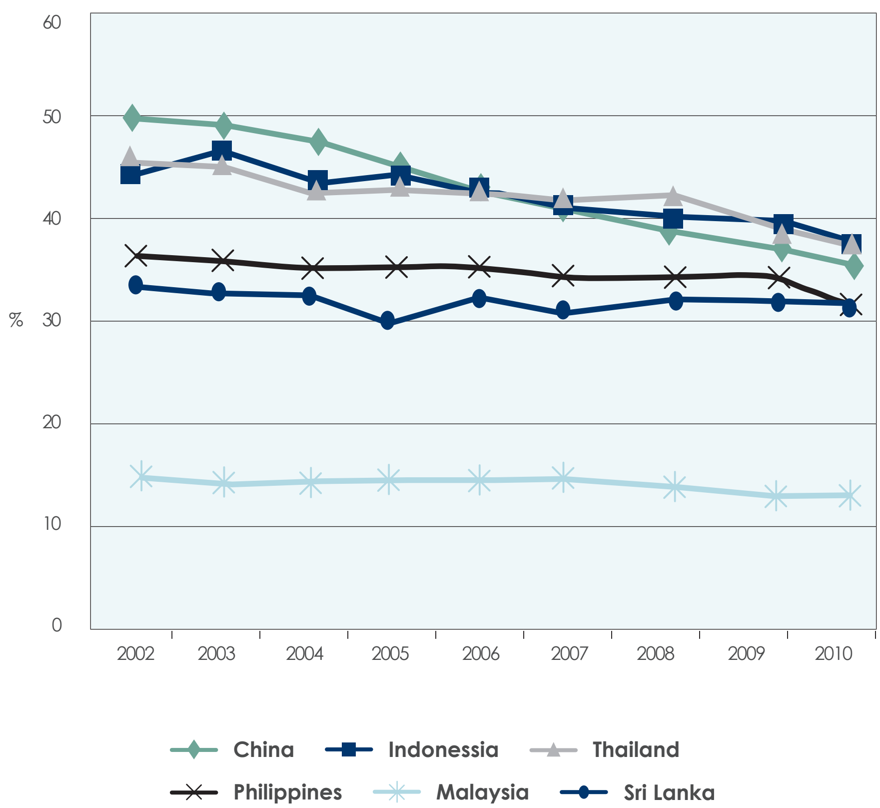


Undernourishment in 2011-13, by region (millions)



In addition, the region is also experiencing increasing urbanization and decreasing share of rural labour amid dynamic social-economic development. The chart below illustrates the declining share of employment in agriculture between 2002 and 2010 in some countries of the region.

Employment in agriculture (% of total employment)



The development of agricultural mechanization in the region is going through the following 4 trends:

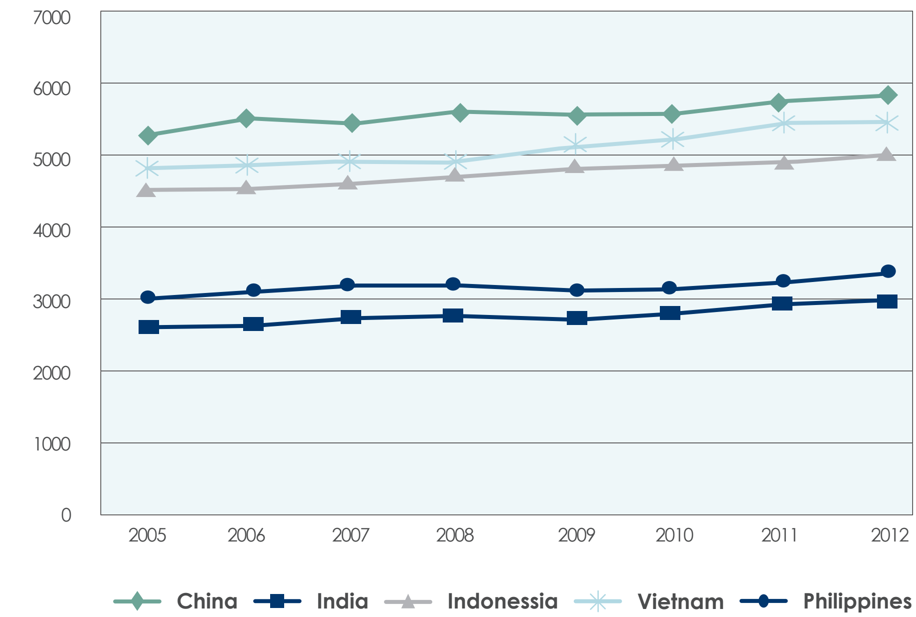
1 \ Generally, the region is seeing an increased mechanization levels.

Many countries witnessed remarkable growth in mechanization, for example, China's power availability per hectare reached 3.56 kw in 2011 and its 'overall mechanization rate' raised from 35% in 2004 to 57% in 2012; India's power availability has also achieved steady growth from 1.05 kw/ha in 1995/96 to 1.7 kw/ha in 2011/12; Bangladesh from 0.4 kw/ha in 1990 to 1.17 kw/ha in 2007. In Cambodia, the number of tractors increased more than 2 folds during 2006 to 2012, while its harvesters increased fifteen folds. And total tractors registered in Nepal increased from around

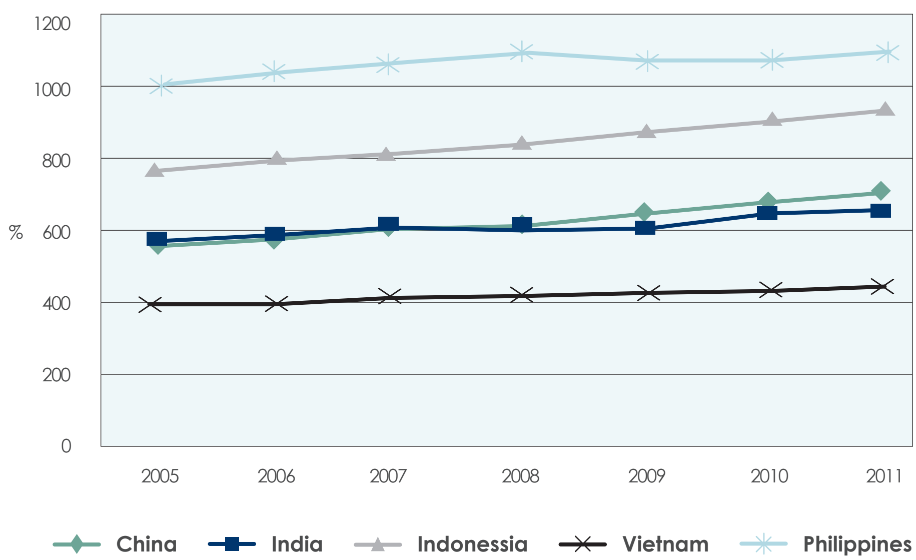
30,000 units in 2003 to nearly 70,000 in 2012. Vietnam's total agricultural horsepower more than doubled during the first decade of this century.

As a result, the agricultural productivity gains in line with increased mechanization as showed below.

Cereal yield (kg per hectare)



Agriculture value added per worker (constant 2005 US$)



2 \ However, the growth has been unevenly distributed.

For instance, mechanized rice harvesting is rather uncommon in Indonesia. Yet the unbalance is not only across border but also among different districts within the same country, like in India, the power availability in Orissa was only 0.60 kw/ha in 2001, compared with 3.5 kw/ha in Punjab.

Big gaps also exist among different crops, for example wheat harvesting in China was 91% mechanized while that of cotton only 5.7% in 2011; and among different stages of production too, for example close to 70% of rice is harvested by machines while the mechanization rate of rice planting is only 26%, also in China.

India has been a tractor exporting country since 1980s and now about 10% of its tractors are exported; China became the world leading agricultural machinery producer in 2012, producing over 2 million tractors and 1 million harvesting machinery per year. Local production of power tillers, seeders, hand and foot sprayers, threshers and millers, among other more sophisticated machines and implements, is becoming very common in most countries.

3 \ Increased volume of trade and investment in the agricultural machinery industry.

The contributing factors of the positive trends above of agricultural mechanization in the region cover: policies and strategies implemented; subsidies/credit/taxation (import duties, tax on industry); research and development efforts; targeted extension service; larger holdings in some countries (cooperatives and land lease); and specialized services (more accessibility and affordability to farmers through custom hiring/leasing).

In terms of the future trends and outlook of agricultural mechanization, the region is seeing: great potentials and opportunities to mechanize, likely boosted by government initiatives and policies given its comparatively low level of mechanization; greater need for adaptable machinery and implements for diversified agro-climate zones and topographies; the need to tackle environmental concerns, including through conservation agriculture; improved efficiency of utilization, for example through custom hiring or larger holdings; better trade-off of safety, quality and affordability; stronger public-private partnership; and greater scope for regional cooperation in policy assistance, information sharing, collaborative R&D, harmonization of standards, capacity building and trade and investment facilitation.

As a regional institute of UNESCAP, CSAM's vision is to achieve production gains, improved rural livelihood and poverty alleviation through sustainable agricultural mechanization for a more resilient, inclusive and sustainable Asia and the Pacific.The objectives of the Centre are to enhance technical cooperation among the members and associate members of ESCAP as well as other interested member States of the United Nations, through extensive exchange of information and sharing of knowledge and promotion of research and development and agro-enterprise development in the areas of sustainable agricultural mechanization and technology for the attainment of the internationally agreed development goals, including the Millennium Development Goals, in the region. Through analysis of the new circumstances faced the region, profound understanding of its strengths, synthesis of good practices and experiences in the past, and in line with its mandate and vision, CSAM recast itself of five strategic functions as follows:

- serving as a regional forum for regular policy dialogues;
- becoming a data and information hub;
- serving as a recognized reference point for standards and protocols;
- strengthening its role as the Center for capacity building; and
- facilitating regional agro-business development and trade.

II.

Country Perspectives

Cambodia

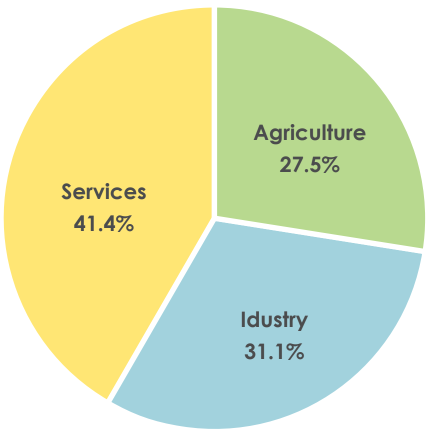
Agricultural Mechanization in Cambodia: Challenges and Opportunities

Dr. Chan Saruth
Director of Agricultural Engineering Department
Ministry of Agriculture, Forestry and Fisheries, Cambodia

Dr. Saruth obtained his PH.D in Business Administration at Build Bright University in Cambodia in 2008. He holds Maters Degrees in Business Administration and Agricultural Engineering & Management, and Bachelor degree in Agricultural Engineering. Dr. Saruth is the Director of Agricultural Engineering Department, Ministry of Agriculture, Forestry and Fisheries of Cambodia. From 2006 to 2010, he was the Project Director of Economic and Social Relaunch of Northwest Provinces (ECOSORN) of Cambodia/EU project; between 2000 and 2005, he was the Deputy Director of Personnel & Human Resource Development Department, Ministry of Agriculture, Forestry & Fisheries. The posts he held also include: National Coordinator of Human Resource Development and Training Management Component. Ministry of Agriculture, Forestry & Fisheries / World Bank project; Visiting lecturer, Faculty of Agricultural Technology and Management, Royal University of Agriculture; Vice Chief of Gender Working Group for Ministry of Agriculture, Forestry and Fisheries / Asian Development Bank project, etc.

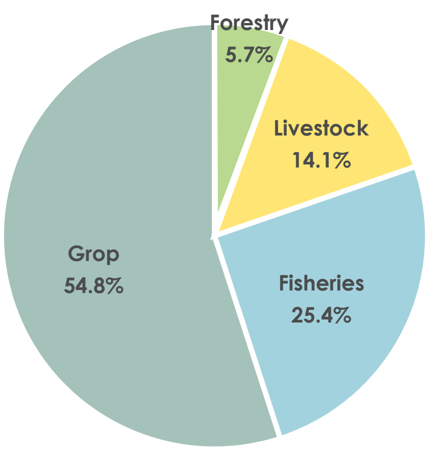
Cambodia is located in Southeast Asia, bordered with Vietnam, Laos and Thailand with a total area of 181,035km². Its total population is 14 millions (51.8 % are women) including 3 millions urban population and 11 millions rural population.

Below is some recent statistics given as an overview of the agricultural status in Cambodia:



Contribution of Cambodian Agriculture in GDP in 2012

Source: Ministry of Planning, March 2013



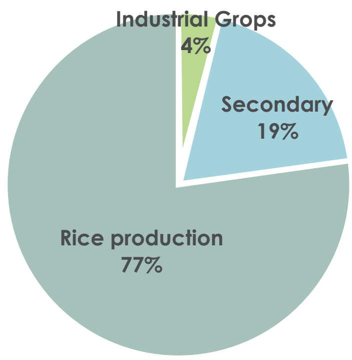
Contribution of Agriculture Sub Sector in 2012

Source: Ministry of Agriculture, Forestry and Fisheries, April 2013

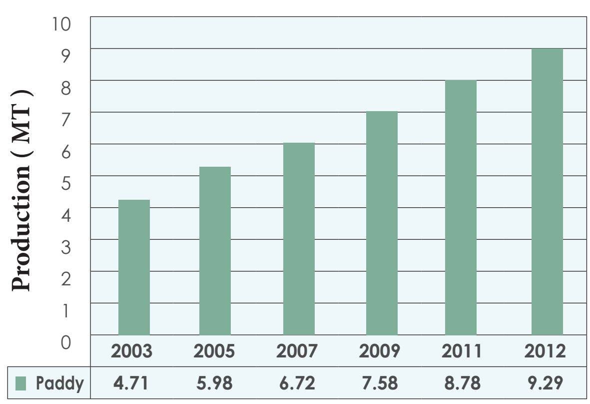
No	Items	Cultivated area(ha)	Production (tone)
I	Rice	3,007,545	9,290,940
II	Industrial crops	180,926	1,760,335
	2.1 Sugarcane	48,586	1,573,771
	2.2 Soybeen	71,337	120,165
	2.3 Sesame	36,722	26,764
	2.4 Peanut	18,048	30,376
	2.5 Tabaco	5,947	8,987
	2.6 Jute	286	271
III	Secondary crops	731,957	9,099,472
	3.1 Casseva	361,851	7,613,697
	3.2 Maize	216,330	950,909
	3.3 Vegetable	76,495	411,435
	3.4 Sweet potato	10,428	48,754
	3.5 Mung been	66,850	74,667

Crop production statistics in 2012

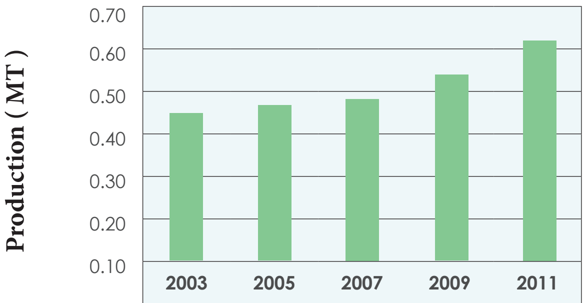
Source: Ministry of Agriculture, Forestry and Fisheries, April 2013



Cultivated area (%) in 2012

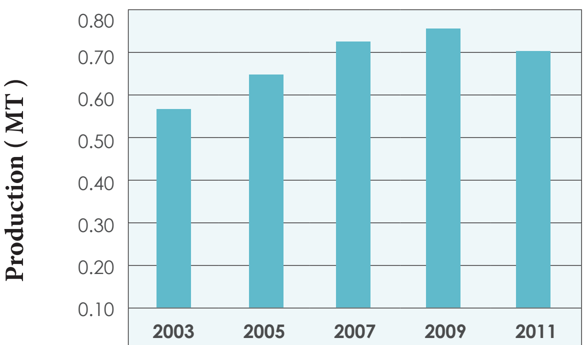


The paddy production in Cambodia from 2003 to 2012



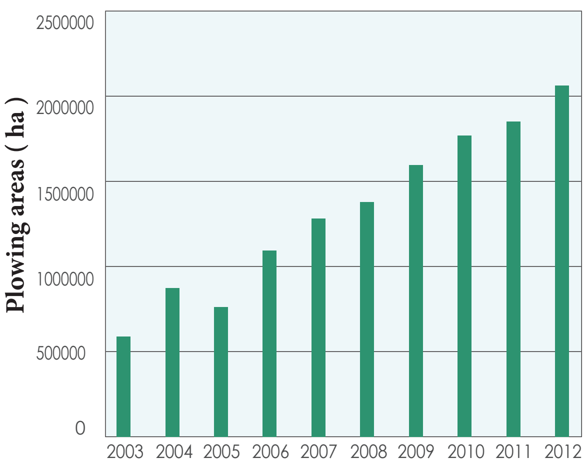
	2003	2005	2007	2009	2011
Vegatable fresh	0.47	0.48	0.49	0.54	0.62

The vegetable in Cambodia from 2003 to 2011



	2003	2005	2007	2009	2011
Fruit fresh	0.58	0.65	0.73	0.76	0.70

The fruit production in Cambodia from 2003 to 2011



Plowing areas(ha)

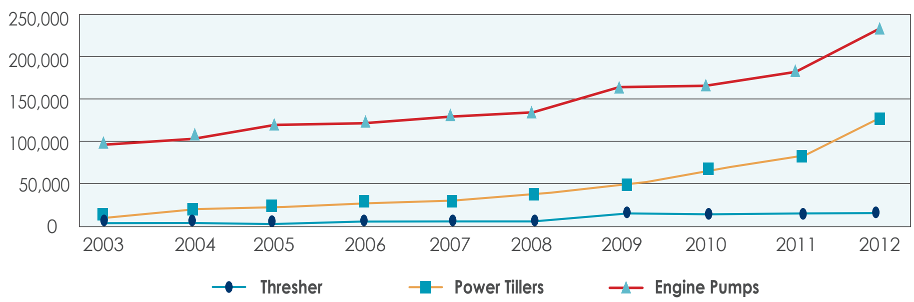
Note: The total of plowing area is approximately 3 million hectares/year

The challenges of agricultural mechanization in Cambodia include: 1) national policy on agricultural mechanization is not yet prepared; 2) structure of the Provincial Office of agricultural engineering is still weak; 3) inadequate skilled workforce at both national and provincial level; 4) credit scheme for buying farm machinery and equipment is not existent; 5) most of workshops for repairing and maintenance of farm machinery and equipment are not available at the rural areas; 6) annual budget allocated for the implementation of agricultural mechanization activities fails the nationwide coverage;7) less activities on Research and Development on agricultural machinery and equipment and it exists mainly at the national level; 8) external support and cooperation with development partners is still missing; and 9) gap in cooperation with private sector dealing with farm machinery.

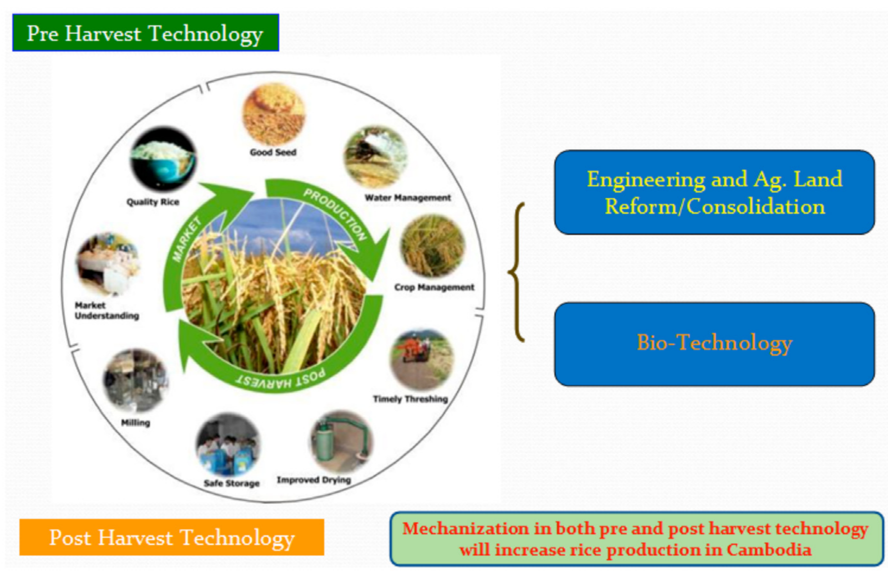
Meanwhile, there are positive points of Agricultural Mechanization in Cambodia including: 1) the number of farm machinery and equipment is increasing rapidly in the last few years; 2) strategy on agricultural mechanization is in place as a milestone; 3) clear structure and mandate are in place; 4) support from the Ministry of Agriculture, Forestry and Fisheries; 5) good cooperation with other line departments under the Ministry of Agriculture, Forestry and Fisheries; 6) academic institutions providing services in agricultural mechanization from short-term certificate courses to graduated degrees; and 7) annual budget allocation from the Government to implement its activities increasingly.

Below is the statistical data on farm machinery and equipment from 2003 to 2012.

No	Items	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	Tractor	3,310	3,857	4,166	4,247	4,475	4,611	5,495	6,200	6,786	8,961
2	Power tiller	13,693	20,279	26,504	29,706	34,639	38,912	53,220	66,548	77,421	128,806
3	Harvester	-	-	-	325	395	430	836	947	1,548	4,820
4	Thresher	4,967	6,220	7,338	7,795	8,036	8,237	13,798	14,390	15,210	16,146
5	Mill	32,945	36,531	38,606	38,618	38,680	39,429	47,620	48,217	48,753	54,328
6	Engine pump	99,875	106,569	120,968	127,610	131,702	136,061	164,974	166,633	183,502	231,942

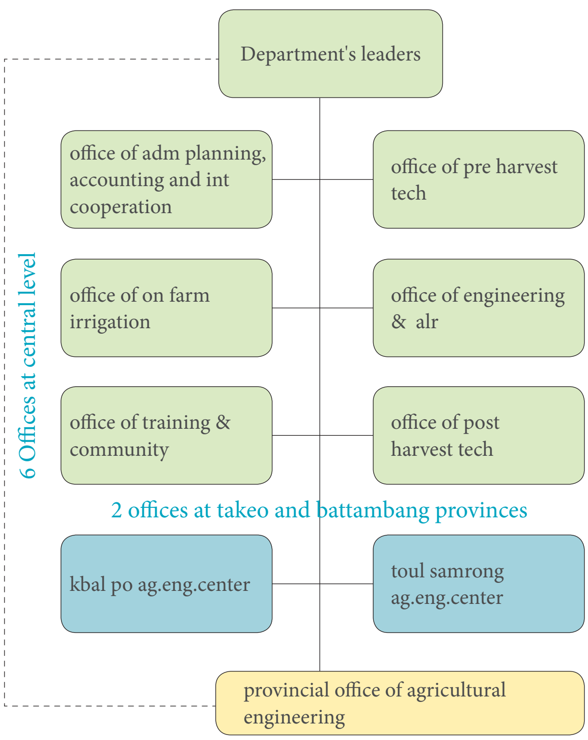


Orientations of agricultural mechanization development in Cambodia include: 1) shifting labor force from agriculture to other sectors; 2) shifting from the Subsistence Agriculture to Commercial Agriculture; and 3) rice exportation policy. And main objectives of agricultural mechanization in Cambodia include increase in labor productivity, increase in land productivity, and decrease in costs of production.



Agricultural Mechanization Development Strategic Planning in Cambodia has been outlined with the goal to commit toward contributing to poverty reduction, ensuring food security and adapting to climate change. Four main objectives are considered and addressed of the Strategy, namely enabling access to mechanization; develop broad-based skills and strengthen capacity in agricultural mechanization; commercialization of agriculture through mechanized farming; and improving policy, legal and regulatory environment for agricultural mechanization.

The development of an organizational chart of Department of Agricultural Engineering in Cambodia is illustrated as below:



The prospective activities of agricultural mechanization in Cambodia for 2014 include:

- Strengthen the organization of the Provincial Offices of Agricultural Engineering;
- Conduct in-depth data collection on the use of agricultural machinery and equipment;
- Prepare regulations and guidelines for the improvement of agricultural machinery;
- Conduct Research and Develop on most suitable implements equipped with hand tractors and tractors;
- Continue providing training on repair and maintenance of farm machinery and equipment to end-users/farmers;
- Make technical documents available in both Cambodian and English; Organize events, at national and provincial levels, where end-users/farmers, distributors and artisans/manufacturers can meet together to share experiences and updated information;
- Organize workshops to update and upgrade farmers and artisans/mechanics who are enthusiastic about the creation/innovation and modification of farm machinery and equipment;
- Coordinate and cooperate with development partners, NGOs, and private sector to make the agricultural mechanization sector kept pace with the Government's strategy on the promotion of rice export;
- Organize farm machinery expo in cooperation with private sector and development partners at national and provincial levels.

To conclude, agricultural machinery and equipment is increasing rapidly in the last few years in Cambodia. Agricultural mechanization in both pre and post harvest technology (plowing, harrowing and harvesting) plays a major roles in agricultural production. However, technical skilled workforce is limited and not competence enough to respond the needs at both national and provincial level. Most of workshops for repairing and maintenance of farm machinery and equipment are not available at the rural areas. Less activities on Research and Development of agricultural machinery and equipment and it exists mainly at the national level; and the involving of all support institutions from Governments, international organizations and private sectors are important in applying the agricultural mechanization in Cambodia effectively.

China

PRC Agricultural Mechanization Saw a Leap-Forward Development

Mr. Liu Hengxin
Deputy Director-General, Department of Agricultural Mechanization, Ministry of Agriculture, P.R.China

Mr. Liu Hengxin graduated from Northwest Agriculture & Forestry University in 1985, majoring in Agricultural Machinery Design. Since the same year, he started to work at Chinese Agricultural Machinery Testing Centre, Ministry of Agriculture (CAMTC, MoA). He had taken up positions including technician, engineer, senior engineer, office dean. In July 2003, he started to work as Deputy Director-General, Department of Agricultural Mechanization, MoA. Mr. Liu has extensive experience in agricultural mechanization management. In recent years, he has actively participating in policy making and policy implementation guidance in the areas of agricultural machinery purchase subsidy, agricultural machinery safety supervision, and conservation tillage.

China's agricultural mechanization has seen a leap-forward development. The presentation focuses on the status of China's agricultural mechanization and its development prospects.

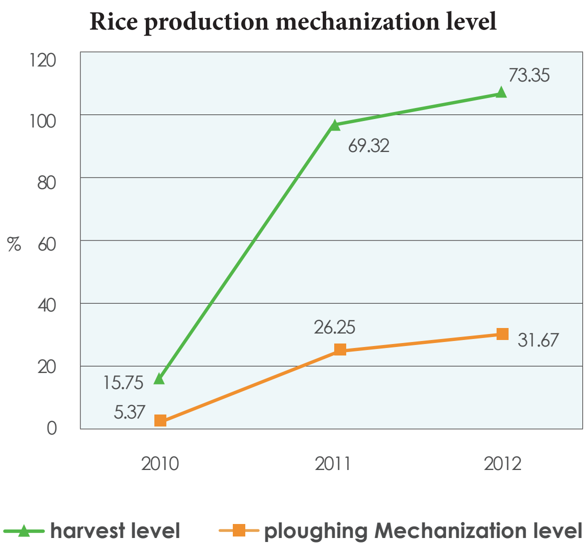
The development of agricultural mechanization has leaped forward to intermediate stage from primary stage. In 2012, the national integrated farming mechanization level reached 57.17%, keeping an annual increasing rate of more than 2% in the past 7 years. The following key achievements reflect the development status of China's agricultural mechanization:

1 \ The system of laws, regulations and policies of agricultural mechanization has gradually matured. Law of the People's Republic of China on Promotion of Agricultural Mechanization was issued in 2004; while Regulations on Agricultural Machinery Safety Supervision and Management was issued in 2009. And in 2010, the State Council released Opinions on Promoting Sound and Rapid Development of Agricultural Mechanization and Farm Machinery Industry. The system of agricultural mechanization policy, laws and regulations of Chinese characteristics has been formulated.

2 \ Input for agricultural machinery purchase subsidy has been increasing substantially in recent years. It has increased from RMB 70 million in 2004 to RMB 21.75 billion in 2013. From 2004 to 2013, the Central government has allocated a total of RMB 96.2 billion to agricultural machinery purchase subsidy.

3 \ The development of agricultural mechanization has accelerated. In 2012, the national wheat ploughing, sowing and harvest mechanization levels have reached 98.9%, 86.52% and 92.32%, respectively. Whole

process mechanization has almost been achieved of wheat production in China. Mechanization of rice production has become the highlight of the agricultural mechanization progress.



4 \ The quality of agricultural mechanization development has improved. Significant progress has been made in scientific and technological innovation. R&D of large horsepower tractor has made substantive progress. R&D and production of rice planting and harvesting machinery has entered mature stage. The intellectuality level and automation level of agricultural machinery has improved. The leading enterprises are playing more and more crucial roles in technology innovation. The R&D strength of major agricultural mechanization research institutes has increased substantially.

5 \ The structure of agricultural mechanization has been optimized constantly. In 2012, the national total power of agricultural machinery has reached 1,02 billion kilowatts, and the proportion of large- and medium-sized tractor and small tractor has increased from 1:15 to 1:3.7.

6 \ The range of agricultural mechanization services has broadened. Use of agricultural machinery is extending from the mid-stage of production to pre and post-production stages. The scale of trans-regional operations of farm machinery has been expended. By the end of 2012, the country has 167, 000 agricultural machinery service organizations. The organization level of organization has improved. The number of agricultural co-ops has increased from zero to 34,000 with up to 817,000 members.

7 \ Agricultural machinery industry thrives. In 2012, total industrial output value of agricultural machinery manufacturing enterprises has reached RMB 338,24 billion, which is 7 times of 2002's total. The average annual growth rate is 22%. This growth rate ranks first among the 13 engineering industries in China. The main agricultural products total index has taken up the leading position in the world. China has become the world leading manufacturing country. The production of main agricultural machinery has been able to meet 90% of the domestic needs, which has provided strong basis for the sustainable development of agricultural mechanization.

The prospects and outlook of PRC's agricultural mechanization is analyzed from six perspectives: 1) goal of development: by 2015, the comprehensive mechanization rate of ploughing, sowing and harvest is expected to reach over 60%, and over 70% by 2020; 2) key measures to achieve the goal: to carry out and improve the supporting policies; to support the development of stakeholders; to promote the scientific and technological progress; and to advance the integrated development of farm machinery and agronomy; to strengthen the building of talent team; and to upgrade the capability of public service of agricultural mechanization.

China's Agricultural Machinery Industry: A Global Perspective

Dr. Chen Zhi
Chairman, China Association of
Agricultural Machinery Manufacturers

Dr. Chen Zhi, PH.D in Engineering, is a renowned researcher and expert awarded with special government allowance from the State Council. Dr Chen is an adjunct professor of Shandong Agricultural University and Jilin University, committee member of the national science and technology association, Review Committee member of the National Science and Technology Award (expert), director of the China Society of Mechanical Engineering, chairman of the China Association of Agricultural Machinery Manufacturers, and vice chairman of the Asia Society of Agricultural Engineering. Dr. Chen started to work in 1973. He graduated from the Jilin Industrial University, majoring in agricultural engineering in 1982. The posts he took include the Deputy Director and Director of Chinese Academy of Agricultural Mechanization Sciences, the Chief Engineer of China National Machinery Industry Corporation since 2013.

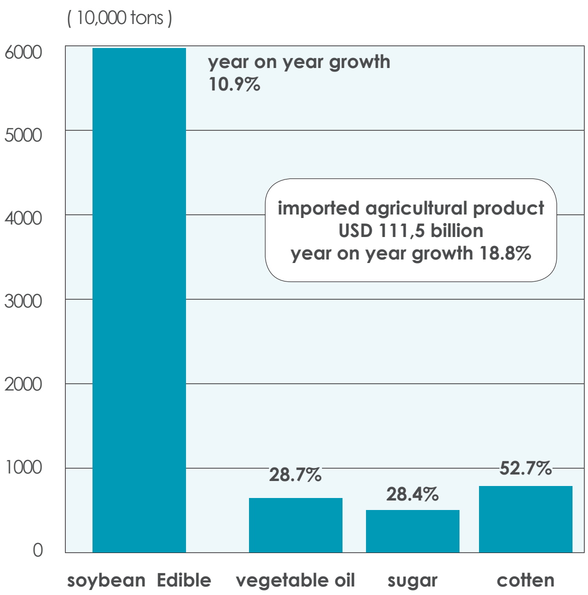
China's agricultural and rural development has entered a new stage. The industry has started to feedback support to agriculture. The agriculture development has received systematic policy support. International relations and cooperation of the industry has entered an opening-up stage. The product supply and demand has entered the new stage of "tight balance". Scaled, organized and socialized production is the new characteristic of the production mode. The production input has become more technology and capital intensive. And the contribution of non-agricultural sectors to farmers' income has increased drastically.

The new trend of agricultural and rural area development in china can be seen from the following perspectives: 1) use macro-management, such as urbanization to solve the "San Nong" problems (i.e. problems of rural areas, agriculture and farmers; 2) the policies that strengthen the agriculture and benefit the farmers will be promoted and extended; 3) the demand and quality of agricultural products will be improved continuously; 4) profitability of agricultural production is still limited; 5) the number of agricultural and rural labor force will continue to decline; 6) the scale of agricultural production will continue to increase; 7) the agricultural production management system will gradually improve; 8) the influence of natural disasters and environmental pollution on agriculture will continue; and 9) the proportion of farmers doing part-time work in other industries and non-agricultural income will continue to increase.

China's agriculture is facing three major challenges. First of all, the next eight years is crucial to the achievement of goal to build a "Xiao Kang" (a better) society. “San Nong” problems are crucial to the progress towards this goal. The second challenge is to ensure the effective supply of food and other major agricultural products against the backdrop of rapid economic growth, rapid urbanization, and faster progress towards the goal of building “Xiao Kang” society. The third challenge is who will do and how to do farming work after more than 260 million young people move to urban areas and work for non-agricultural sectors.

The primary issue of agricultural development is to provide food security. Despite of the increasing grain harvest every year, large gaps still exist in soybean and some agricultural products supply. The current food self-sufficiency rate is 90% with 10% supply gap, while the land productivity gap has reached 20%. It becomes more and more difficult to increase food production.

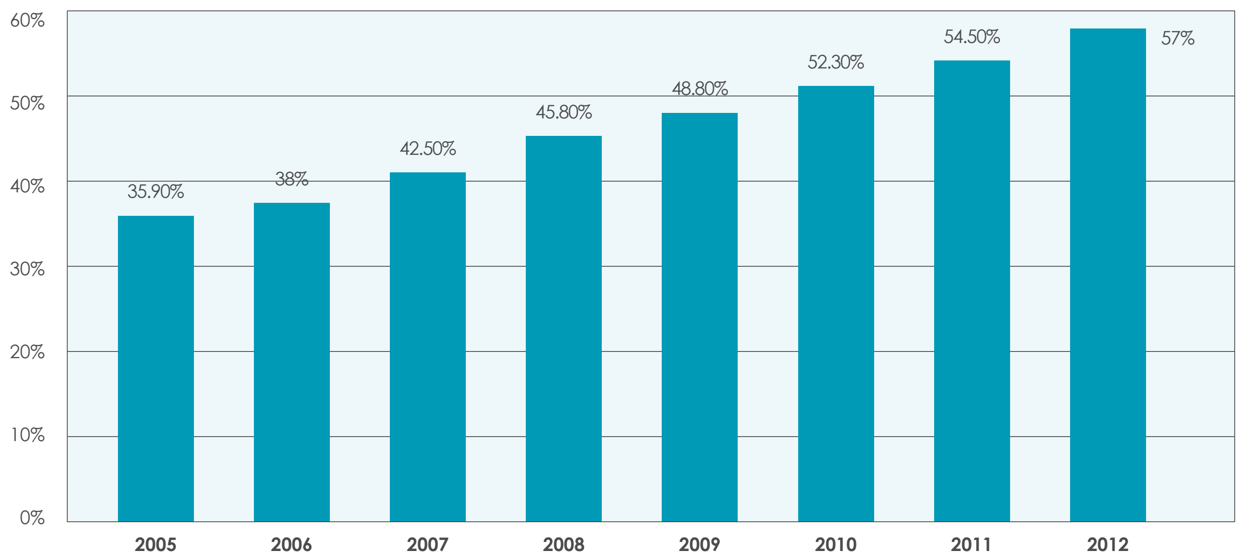
In 2011, China became the world biggest importer of agricultural products.



Agricultural product import in 2012

An emerging problem facing agricultural development is who will do and how to do the farming work. Firstly, the number of rural labor is shrinking. The current total of migrant worker is about 260 million. Every year, 9 million to 10 million people move away from rural areas. The number of farmers, especially young peasants, sharply decline. The countryside is losing labor force. Secondly, the structure of rural labor is losing balance. The average age of people living in countryside is about 50 with big proportion of women and children. Thirdly, the education level of the rural population is low. 70% of the population only has primary school education or junior middle school education. Fourthly, successors of agricultural labour are lacking. The number of high school graduates studying agriculture-related subjects is shrinking. Obviously, the new generation labor force is moving away from agricultural sector.

In the circumstances of the new trends of agricultural and rural development, agricultural mechanization has made significant progress in China. Firstly, agricultural mechanization has entered a new stage. The comprehensive agricultural mechanization rate has exceeded 57%. The mode of agricultural production has leaped from human and animal power to machinery power. Agricultural mechanization has moved from major production procedures to the whole process mechanization, and further to full mechanization in all agricultural sectors. The comprehensive agricultural mechanization rates from 2005 to 2012 are showed below:

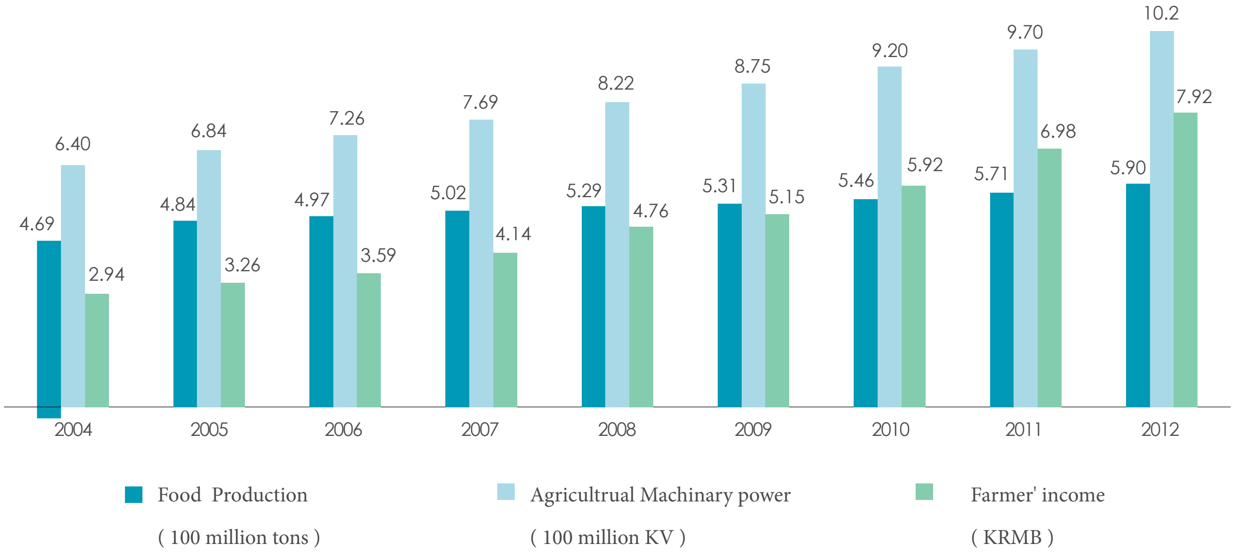


Secondly, the new system of agricultural operation has been established. In the new system, agricultural co-ops play a leading role, large agricultural machinery household is the main force, farmers using agricultural machinery are the basis, and the agricultural intermediary organizations are linkages. The rapid development of agricultural co-ops, has effectively improved the organization of agricultural production, promoted the transfer of rural labor force, and enhanced integrated application of agricultural technology. It has facilitated cost reduction, efficiency improvement, and scale operation of agriculture. It has become the highlight in the process of agricultural mechanization development.

Thirdly, integration of agricultural machinery and agronomy has been enhanced. Efforts are oriented not only on machinery's adaptability to local agronomic requirements, but also intensifying R&D of agronomy via developing new varieties, and new agronomic techniques so to create favorable conditions for the mechanized operation.

Fourthly, agricultural science and technology has achieved rapid progress. R&D on agricultural mechanization technology and equipment has been strengthened. Some "bottleneck" technology and integration issues are resolved. Large horsepower tractor development has seen significant progress. Rice planting and harvesting machinery equipment has matured basically. Significant progress has been made in equipment innovation, e.g. equipment of rape harvest, sugarcane harvest, forage harvest, and water saving irrigation equipment.

In addition, agricultural mechanization has played important role in ensuring food security. It is crucial of agricultural machinery to "maintain stable farming land, improve yield, catch season, and prevent disaster" in agricultural production. It has provided strong support to the nine-year continuous growth of food production and farmers' income, which could be illustrated clearly by the following diagram:



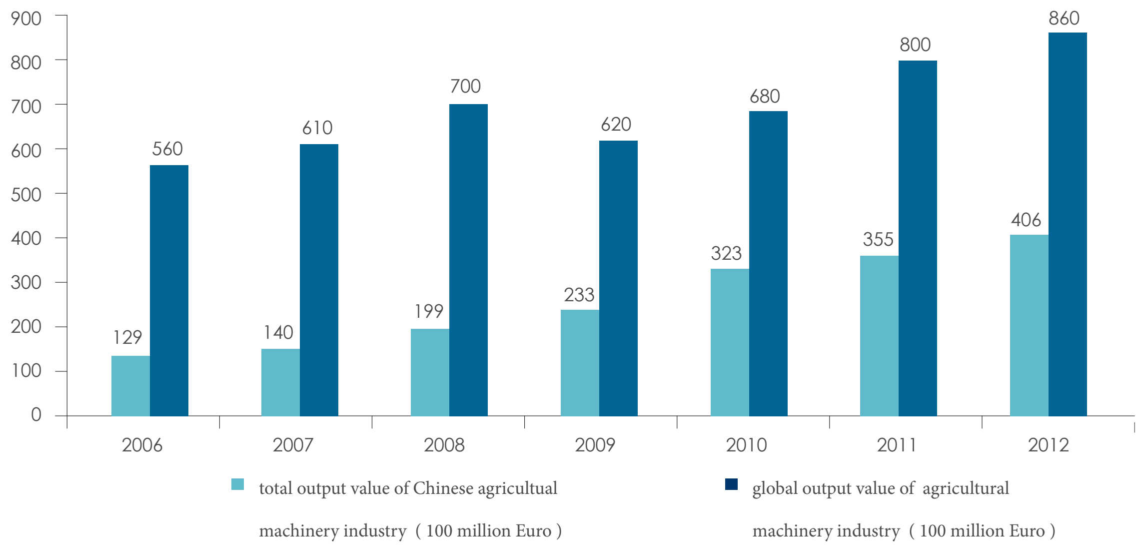
Meeting the development requirements of industrialization, informatization, urbanization, agricultural modernization, the overall goals of agricultural mechanization include, by 2020, the comprehensive mechanization rate reaches 70%; the main grain crops realize whole-process mechanization in basic; great progress made in mechanization of the production of main economic crop and mechanization of agricultural facilities; advance mechanization in fruit processing industry, animal husbandry, fishery and primary processing of agricultural products.

The strategic task of agricultural mechanization is to ensure food security and increase the productivity and efficiency of agriculture, against the backdrop of increasing population and food consumption. The development requires the agricultural mechanization to advance from the intermediate to advanced stage, promote the whole-process mechanization of main grain crop production and full mechanization in the production of agriculture, animal husbandry and fishery. To meet the new market demand and needs of the new agricultural operation and the service entity, agricultural machinery technology should be upgraded to mid-to-high-end stage. For meeting the innovation needs, integration of agricultural mechanization and agronomy, agricultural mechanization and informatization, engineering technology and biotechnology should be strengthened.

From a global perspective, Chinese agricultural machinery industry has the following characteristics:

1) both strengths and weakness exist; 2) began to integrate into global market, and to participate in global resource allocation; 3) the market is open, and international companies are occupying the high-end market; and 4) technology must be upgraded in order to transfer the industry from big to strong.

Global agricultural machinery industry has seen a trend of steady growth. In 2012, the global total output value reached 86 billion Euros. In the same year in China, it reached 338, 24 billion yuan with 20% annual increase for 10 consecutive years. China has become the world's first agricultural machinery manufacturing power, having advantage in scale. The following chart shows the comparison of total output value of Chinese and global agricultural machinery industries.



Although China has become the world's leading agricultural machinery manufacturing power, the industry is still facing the following challenges:

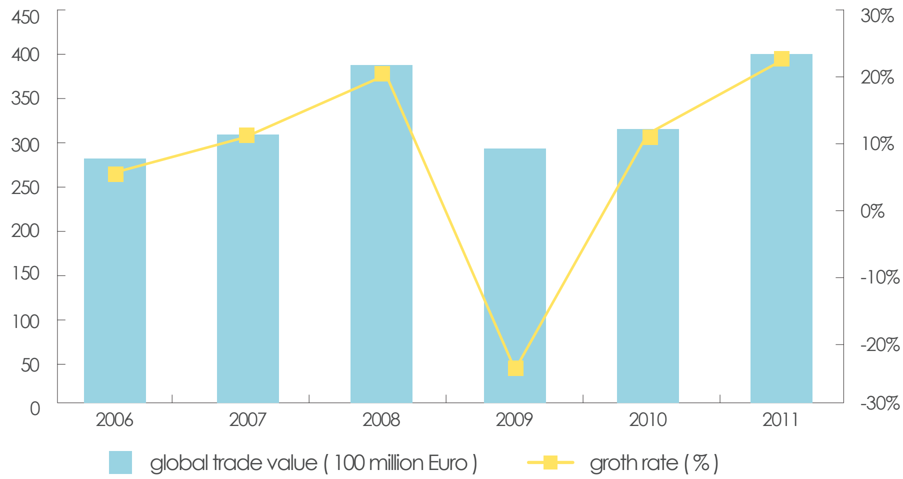
1 \ Foreign companies are dominating the high-end market. In the provinces, like Heilongjiang and Xinjiang, where requires big machines of high efficiency, foreign brands have monopolized the market.

2 \ The key technology is still controlled by other countries. Domestic enterprises still lack the scale production capacity in making large cotton picker, above 240 horsepower tractor, sugar cane and potato harvester, and main machinery for some economic crops production. Breakthroughs in key machinery parts have not been achieved.

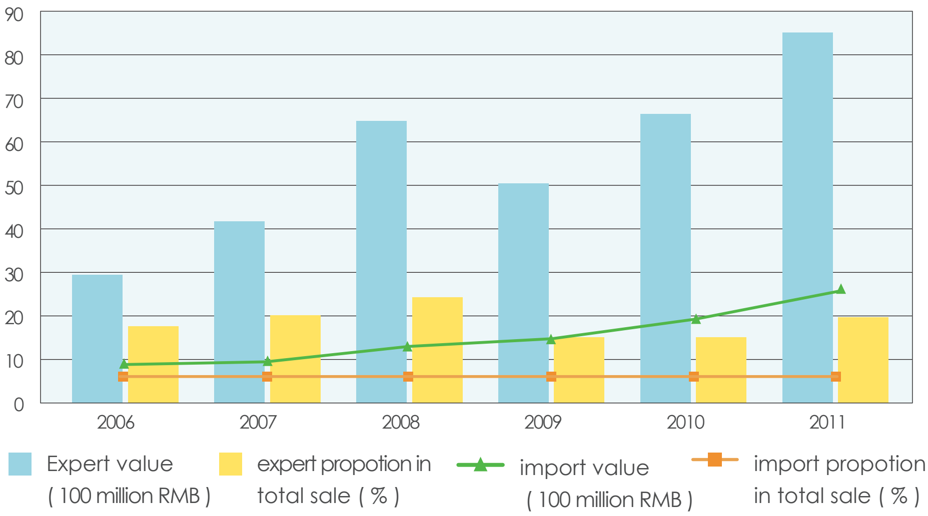
3 \ China does not have global renowned brands.

Production element resources including personnel, capital, technology and equipment have achieved global flow. In 2012, China's agricultural machinery exports increased nearly 12 times compared with that of 10 years ago. Some agricultural machinery enterprises are rising in globalization, and have established foundation for internationalization. At the same time, foreign enterprises further increase the weight in the industry. There are 147 foreign agricultural machinery enterprises above designated size in China, accounting for 7.97% of the total number of such enterprises. The output value of these foreign enterprises accounts for 12.06% of the total, while their export transaction value accounts for 54.86% of the total. In 2011, acquisition of French Mcc Company by China YTO Group Corporation initiated the cross border acquisition of Chinese agricultural machinery enterprises, and set a good example of utilizing global R&D resources.

The Chart below shows the global agricultural machinery trade value between 2006 and 2011:



While, the following chart illustrates the import and export value of agricultural machinery in China from 2006 to 2011:



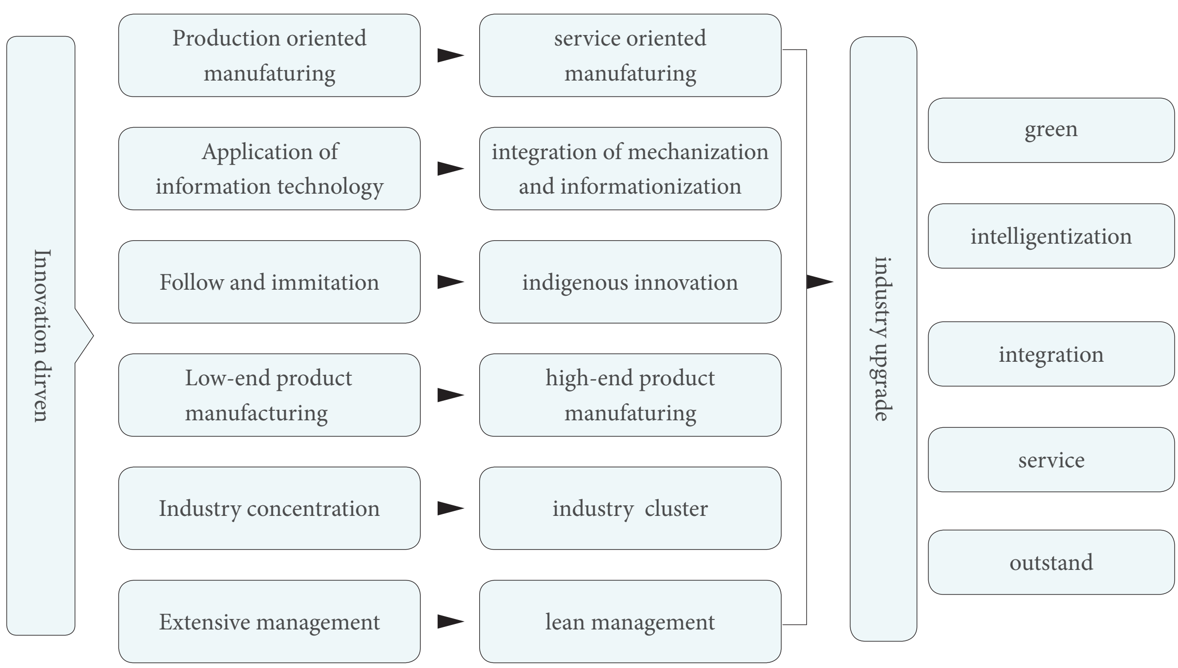
In the recent 10 years, the rapid development of agricultural market of China has attracted many international agricultural machinery enterprises to invest in China. The foreign capital has accelerated its activities in China. For example, the America AGCO acquired Shandong Dafeng; And Italian Same Deutz-Fahr established joint venture company with Shandong Changlin. Many foreign companies, including

Lemken and Kverneland, came to invest in China. Among the over 100 Japanese agricultural machinery companies, 20 have entered China. Four leading agricultural machinery companies in Korea, and top five agricultural machinery companies of the world have all entered China.

In the circumstance of globalization, the domestic competition became internationalized while international competition became globalized. Chinese agricultural machinery enterprises have to fully utilize both the domestic and international resources, extend the markets in China and the world, and actively engage into the international competition.

For achieving the transfer from big to strong, the Chinese agricultural machinery manufactures have to address the current constraints encountered including insufficient resources, increased environmental pressure, enhanced requirements from customers, augment of trade friction, fierce competition, gradually declined profit, and growth of operation costs. Chinese agricultural machinery enterprises have just started their journey of internationalization. Efforts need to be oriented to improve their global competitiveness focusing on entity, products and human resources.

In specific, the diagram below elaborates the path of industrial transformation and updating for Chinese agricultural machinery industry:



India

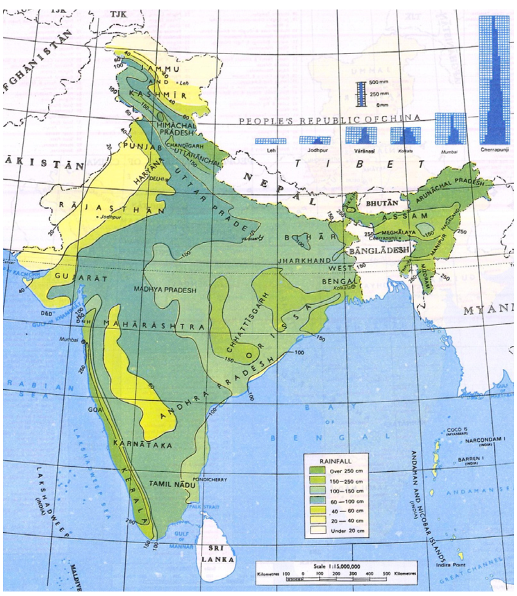
Agricultural Mechanization Strategies in India

Dr. Champat Raj Mehta
Project Coordinator, All India Co-ordinated Research Project (AICRP) on Farm Implements and Machinery (FIM), Central Institute of Agricultural Engineering
Indian Council of Agricultural Research

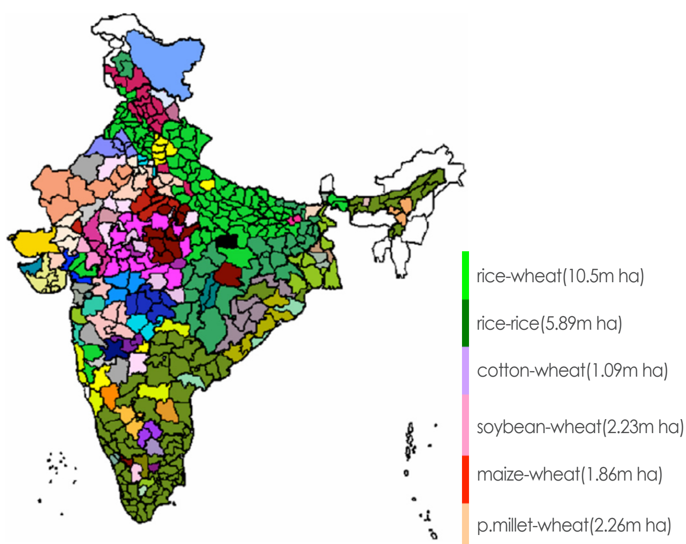
Dr. C R Mehta obtained his BE (Ag.) in Agricultural Engineering in 1987, and ME (Ag.) in Farm Machinery and Power in 1992 from College of Technology and Agricultural Engineering, Udaipur with Honours and Ph.D. degree from IIT, Kharagpur in 2000. He has worked as Scientist/Senior Scientist/Principal Scientist at Central Institute of Agricultural Engineering, Bhopal (CIAE) for the last 23 years. He has held the position of Head, Agricultural Mechanization Division at CIAE Bhopal from Aug 25, 2010 to 11 Dec, 2012. He has been working as Project Coordinator, AICRP on Farm Implements and Machinery at CIAE Bhopal since 30 Nov, 2012. He was Principal Investigator of CIAE, Bhopal Centre of National Initiative on Climate Resilient Agriculture (2010-12).

Background for Agricultural Mechanization Strategies in India can be looked from the following perspectives:

1) Average Annual Rainfall Map of India:



2) Major Cropping Systems in India:



3) Status of Indian agriculture: 1) Net sown area: 140 million ha (42.6%); 2) 263 million agricultural workers; 3) employs about 55% of the work force; 4) provides livelihood to about 60% of the population; 4) contributes 14% to the Gross Domestic Product (GDP); 5)

yearly production: 259 million tonnes food grains (2012-13), 76 million tonnes fruits (2011-12), 156 million tonnes vegetables (2011-12); 138 million land holdings; 6) characterized by small fragmented land holdings, hill agriculture and shifting cultivation: 15% farms are semi-medium (2-4 ha), medium (4-10 ha) and large (more than 10 ha) sizes; 85% are small and marginal (< 2 ha) .

Approaches to mechanization of Indian agriculture are improved equipment and enhanced farm power supply. Farm power in India maintains a socially desirable mix of human labour, draught animal power and mechanical power.

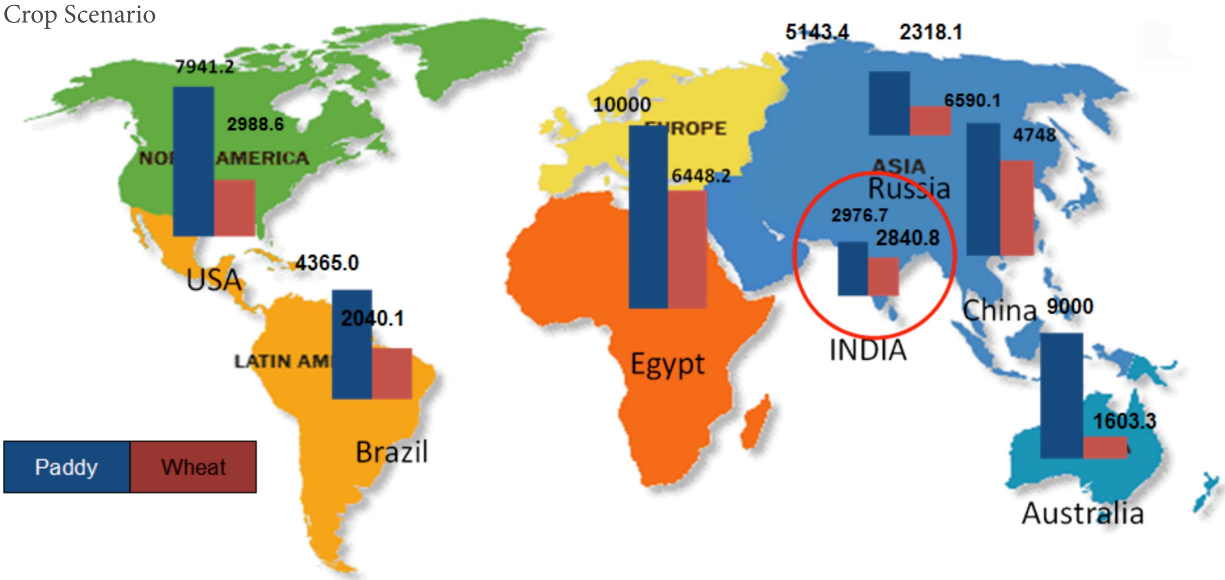
Population Dynamics of Indian Agricultural Workers (No. in million) are showed below:

Particulars	2001	2011	2020
Country's Population	1029	1211	1323
No. Of Workers As % Of Population	39	39.8	42.8
Total No. Of Workers	402	482	566
% Of Agricultural Workers To Total Workers	58.2	54.6	40.6
No. Of Agricultural Workers	234	263	230
% Of Females In Agril. Work Force	39	37.2	45.0
No. Of Male Agricultural Workers	143	165.7	126.5
No. Of Female Agricultural Workers	91	97.31	103.5

Global Ranking of India in Farm Production and Productivity is illustrated by the diagram below:

Crop	Production Rank	Production In 2011 (Million T)	Productivity Rank
Paddy	2nd	157.90	30th
Wheat	2nd	86.87	22nd
Maize	6th	21.76	35th
Groundnut	2nd	6.96	40th
Rapeseeds	3rd	8.18	28th
Pulses	1st	0.70	44th
Soybean	5th	12.21	44th
Potato	2nd	42.34	26th
Sugarcane	2nd	342.38	9th
Fruits	2nd	76.40	-
Vegetables	2nd	155.90	-

Crop Scenario



India very low on Productivity

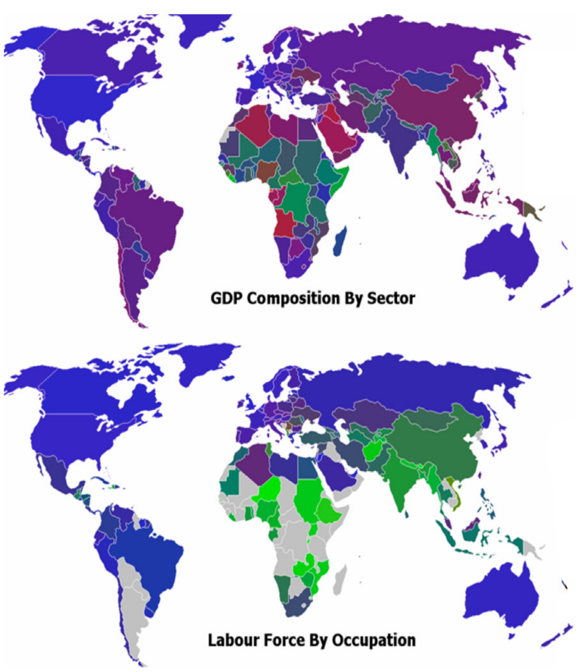
Figures represents yield of major crops during 2009

Yield is defined as kg/ha

Source :faostat

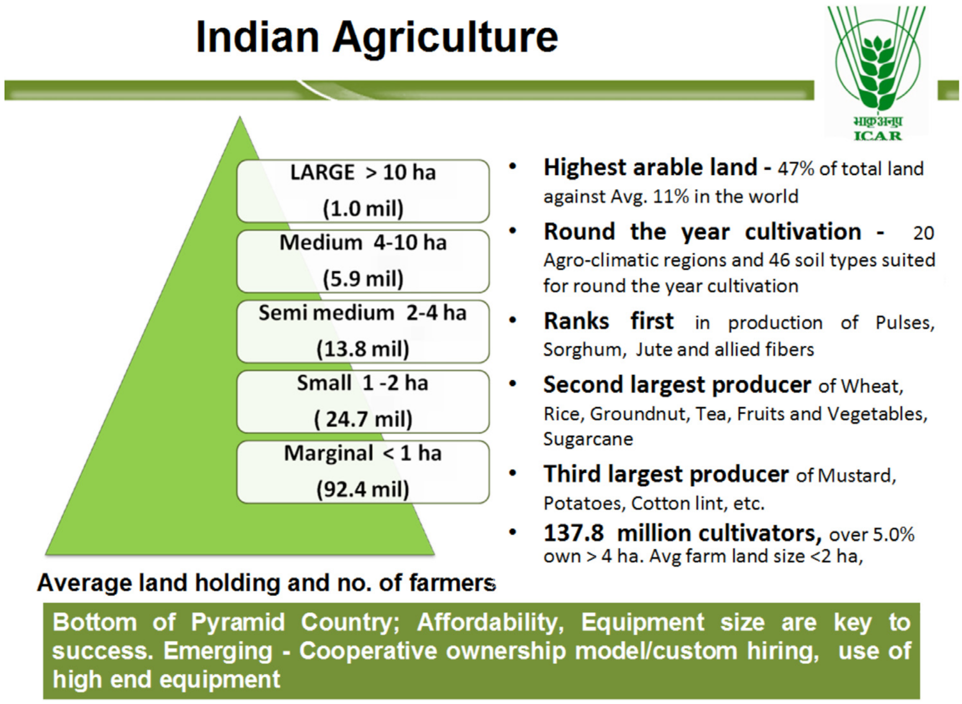
yield of principal crops in developed nations is much higher than other developing nations ,one of the reason being less adoption of automation

Mechanization - Precursor of Development



The green, red, and blue components of the colours of the countries represent the percentages for the agriculture, industry, and services sectors, respectively.

Indian Agriculture Overview:



Agriculture Scenario in India has the following characteristics: 1) poor utilization efficiency of critical inputs like water, seeds, fertilizers, chemicals and energy; 2)

benefits of engineering R&D not reaching the farmers expeditiously; 3) very high post harvest losses in grains and perishables; 4) only 10% of produce is processed in the country as against 40-60% in other South Asian countries; 5) very low value-addition in production catchments; and 6) nutritional insecurity of rural population.

The declining profitability in agriculture in India is due to various reasons including high cost of production and low levels of productivity, subsistence farming rather than professional enterprise, low returns to farmers, and low levels of by-product utilization.

To promote mechanization of Indian Agriculture, the country has made a SWOT analysis:

Strengths: large infrastructure of over 20,000 manufacturers in small scale industry; vast network of academic and R&D institutions including AICRPs under NARS for human resource development, R&D and extension; trained manpower for R&D in agricultural engineering; over 100 cooperating centers of AICRPs is the area of agricultural engineering; computer Aided Design adopted by the institutes for high pace of R&D.

Weaknesses: 1) unreliable after sales service of agricultural equipment; 2) poor TOT for agricultural engineering technologies through state departments; 3) poor liaison with industries for R&D and commercialization; 4) non effective feedback system; 5) absence of non-land economic activities; 6) non systematic marketing of agricultural equipment.

Opportunities: 1) entrepreneurship development for custom hiring of farm machinery and agro-processing equipment; 2) post harvest loss reduction and value addition at the production catchments through rural level agro-processing centers; 3) establishment of value chain for commercial supply, transport and marketing of agricultural produce; 4) opportunity to increase in irrigated area by introducing micro-irrigation; 5) reducing yield gaps and increasing productivity through precision farming technologies.

Threats: 1) low profitability in agricultural enterprises due to subsistence farming; 2) migration of farmers from agriculture; 3) fragmentation and continuous reduction of operational holdings; 4) slow pace of R&D and commercialization; 5) inadequate infrastructure back up for after sales support for farming equipment; 6) renewable energy technology still subsidy dependent.

The strategies for mechanization of Indian agriculture include: 1) design, development and commercialization of farm implements and machinery for mechanization of conservation agriculture, high capacity energy efficient machines for custom hiring, spraying of tall tree, cotton picking, sugarcane harvesting, horticultural crops, hill area agriculture and nursery raising under covered cultivation; 2) design, development and commercialization of farm implements and machinery for mechanization of root crops harvesting, feed and fodder production, seed spices crops, dryland agriculture, oilseeds and pulses; 3) development of machinery for adoption of precision farming for improved input use efficiency of seed, fertilizer and chemical; 4) development/adoption of manually guided power operated equipment for hilly terrains; 5) farm machinery management for efficient and optimum utilization of available agricultural machinery; 6) streamlining of testing procedure, training of engineers and conducting testing of farm equipment for standardization and quality control in farm equipment manufacturing; 7) development of package of farm equipment for major cropping systems for different states; 8) multiplication of R&D products at Prototype Manufacturing Workshops (PMWs) for multi-location trials; 9) establishment of Farm Machinery Bank for machines being manufactured elsewhere in the country and supply to users/farmers; 10) conducting prototype feasibility testing and front line demonstration of improved farm implements and machinery in different regions to bridge mechanization gap and to obtain feedback for design refinements; 11) promoting custom hiring services through entrepreneurship for use of high capacity farm equipment to ensure timeliness of operation and reduction in cost of operation; 12) increase in average supply of power to agriculture from about 1.7 kW/ha in 2010 to 2.5 kW/ha by 2025; 13) consolidation of widely fragmented and scattered land holdings in many parts of the country; 14) mechanization for all categories of farmers and to all regions of the country especially the rain-fed areas; and 15) increase interaction among farmers, R&D workers, departments of agriculture and industry to have access to the latest equipment and technology.

The National Mission on farm mechanization in India includes increasing the reach of farm mechanization to small and marginal farmers and to the regions where availability of farm power is low, offsetting adverse 'economies of scale' and 'higher cost of ownership' of high value farm equipment by promoting "Custom Hiring Centre" for agricultural machinery, passing the benefit of hi-tech, high value and hi-productive agricultural machinery to farmers through creating hubs for such farm equipment, promoting farm mechanization by creating awareness among stakeholders through demonstration and capacity building activities, and ensuring quality control of newly developed agricultural machinery and equipment through performance evaluation and certifying them at designated testing centers located all over the country.

While, the sub-mission on agricultural mechanization during 12th Five Year Plan covers 7 components, which are promotion & strengthening of agricultural mechanization through training, testing and demonstration; post harvest technology and management; financial assistance or procurement subsidy for selected agriculture machinery and equipment; establishment of farm machinery banks for custom hiring by small and marginal farmers; establishing hi-tech and high productive equipment hub for custom hiring; enhancing farm productivity at village level by introducing appropriate farm mechanization in selected villages; and creating ownership of appropriate farm equipment among small and marginal farmers in the eastern/north eastern regions.

On account of the SWOT analysis as well as the strategies and mission applied, the future of agriculture and agricultural mechanization in India might see the trends as the following: 1) future farm mechanization through mechanical sources of power; 2) R&D in farm mechanization through Public Private Partnership mode; 3) equipment/technology for increasing input use efficiency; 4) machines suitable for custom hiring, high capacity and high labor productivity; 5) quality manufacturing and after sales support for reliability of farm machinery; 6) mechanization of horticulture and hill agriculture; 7) mechanization of sugarcane harvesting and cotton picking; 8) centralized nursery raising for horticultural crops and rice; 9) covered cultivation; 10) adoption of conservation agriculture and precision farming; 11) consideration of ergonomics and safety in farm equipment/machinery design; 12) contract farming; and 13) farm machinery bank.

Indonesia

Indonesia Agricultural Mechanization Strategy

Dr. Astu Unadi
Director, Indonesian Center for Agricultural Engineering Research and Development, Agency for Agricultural Research and Development, Ministry of Agriculture, Indonesia

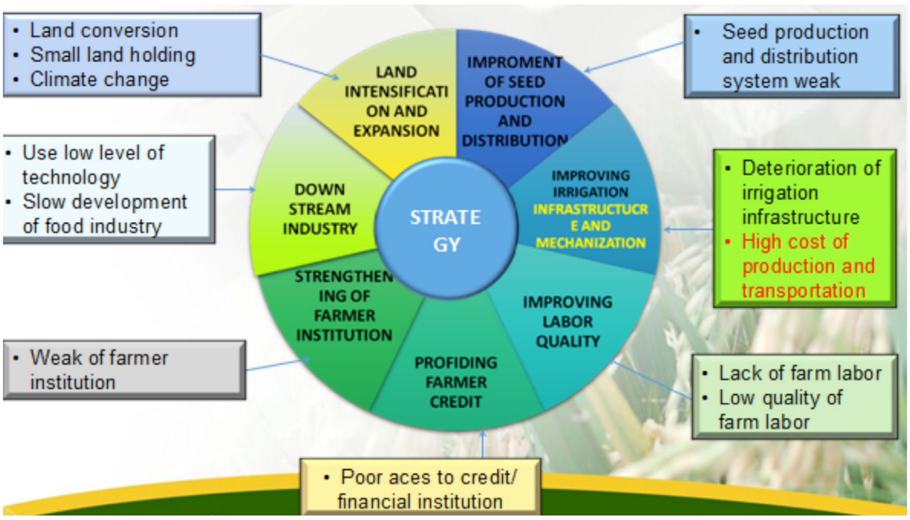
Dr. Astu Undadi obtained Ph. D. degree in Civil and Environmental Engineering at Melbourne University, in Australia in 2000; Master degree in Agricultural Mechanization and Management at Asian Institute of Technology in Bangkok, Thailand, in 1990; Master degree in Agricultural Engineering at Universitas Gadjah Mada in Yogyakarta in 1981, and Bachelor in Agricultural Engineering at Universitas Gadjah Mada in Yogyakarta in 1980. From 1991 to 2006, he was the Researcher/Head of Program Division at Center for Agricultural Engineering Research and Development, Agency for Agricultural Research and Development, Ministry of Agriculture, Indonesia. From 2006 to 2010, he was the Director of Indonesian Agroclimate and Hydrology Research Institute, Agency for Agricultural Research and Development, Ministry of Agriculture; and from 2010 to present, he is the Director of Indonesian Center for Agricultural Engineering Research and Development, Agency for Agricultural Research and Development, Ministry of Agriculture, Indonesia.

The strategic roles of agriculture in Indonesia are: 1) providing food for 245 million people; 2) providing 87% of raw material for small and medium scale industry; 3) contributing 14.7% of Gross Domestic Product; 4) making foreign exchange income (US$ 43,37 M); 5) providing 28.3% employment; and 6) constituting 70% source of income for rural people.

The 4 targets of Indonesia agricultural development cover achieving sustainable food self sufficiency, increasing food diversification, increasing added value, competitiveness and export, and increasing farmer welfare. Below are the targets of production by 2014 of 5 main food commodities in Indonesia:

COMMODITY	TARGET OF PRODUCTION 2014 (Million ton)
Rough rice	76,57
Maize	29,00
Soybean	2,70
Sugar cane	3,1
Beef meat	0,51

Problem and strategy of agriculture development between 2010 and 2014 in Indonesia is illustrated in the diagram below:



Agricultural mechanization in Indonesia plays important roles on agricultural production, which include contributing to production through increasing cropping intensity and reducing post harvest losses, improving quality of product, increasing added value and competitiveness of agricultural products, reducing cost of production by increasing labor efficiency, increasing farmers' income, and attracting young generation work in agricultural sector.

The diagram below illustrtes the mechanization utilization index for rice production in Indonesia in percentage:

Activity	Year			
	2004	2009	2010	2011
Land preparation	48	55	60	65
Seeding	0	1	2	4
Planting	04	5	6	7
Weeding	02	5	8	12
Pest control	100	100	100	100
Harvesting	5	10	18	26
Threshing	45	55	60	65
Drying	25	30	34	38
Milling	100	100	100	100

Source: ICAERD, 2009

While the number of agricultural machinery used in Indonesia is showed below:
Sources: BPS-Statistics Indonesia, 2007; dan Direktorat Alsintan, 2010)

NO.	Type of Agric. Machinery	2006(Unit)	2010(Unit)
1	**Pump irrigation**	185.322	187.801
2	**Tractor 2-wheels**	116.016	126.453
3	**Tractor 4-wheels**	2.853	2.969
4	**Thresher (manual)**	150.224	151.284
5	**Power thresher**	41.192	49.957
	Box Dryer	1.416	1.436
6	**Continuous Dryer**	1.388	1.421
7	**Mini RMU**	58.512	68.386
8	**Stationer RMU**	39.267	40.495

Indonesia is also facing various problems and constraints on agricultural mechanization development,for example poor skill of operator for operation, maintenance and management of agricultural machinery, poor capability of farmer institution, lack number of extension worker, high cost of farm machineriy & equipments and difficult to access credit; lack of machinery suitable for specific agro ecosystem; need R&D, short life time of agricultural machinery, poor farm road facility, poor irrigation and drainage facility, and lack of rural workshop facilities and spare parts.

For achieving the big potential and addressing the constraints faced, Indonesia applied a series of strategy promoting the development of agricultural mechanization including agricultural machinery grand and loan from government to farmer groups, improving access to credit/ bank (credit for rural business), strengthening Agricultural Machinery Business Service Unit, training for agricultural machinery operator, establishing demonstration plot of farming using agricultural machinery, capacity building for extension worker, establishment of mechanization center at provincial and district level, strengthening R&D on agricultural engineering, and strengthening partnership between R&D, agricultural machinery industry/trader and user/farmer.

In summary, although utilization index of agricultural machinery in Indonesia is low, agricultural machinery have been used widely and significantly increased yield and quality of agricultural product. Indonesian strategy to develop mechanization has been set up to increase crop production, quality and added value of agricultural product. And synergy between government, research institution, university, business, industry is essentially needed to support the development of mechanization in Indonesia.

Kazakhstan

Upgrading of Agricultural Complex of Kazakhstan Conditions and Its Successful Development

Dr. Tlektes Isabaevich Yespolov
Rector of Kazakh National Agrarian University

Dr. Tlektes Isabaevich Yespolov is the Rector of Kazakh National Agrarian University and the Academician of National Academy of Sciences of the Republic of Kazakhstan. Dr Yespolov obtained his post graduate degree in Technical Sciences at Scientific Research Institute of Hydraulic Engineering in Moscow in 1982. After graduation, he worked in Kazakh Institute of Agriculture as a lecturer, associate professor and the Head of Industrial Research Laboratory of Kazakh Institute of Agriculture. In 1993 he was appointed as the Director of the Almaty Industrial College, and then as the Rector of the Almaty Industrial-Pedagogical Academy. In 1997, he defended a doctorate dissertation in Economic Sciences. In 2001 was awarded the rank of Professor. Under his leadership the transition to a three-level structure of university education: bachelor - master – doctorate Ph.D was adopted and a credit education technology was introduced. Planned work to achieve a world level education institution is carrying out nowadays at the university. Kazakh National Agrarian University has entered the European educational space, has joined the Bologna Declaration, and signed agreements on cooperation with 54 foreign universities. Strategic plan for the development of the University for 2010-2015, Development Program for National Research University for 2011-2015 have been developed under the leadership of the Rector.

Agro-industrial complex in Kazakhstan is focused on exports and provides a dynamic level of production. In the global index of competitiveness, Kazakhstan takes the 51th place.

From his speech at the Scientific Forum, the President of the Republic of Kazakhstan Nazarbayev N.A. pointed out that: “The time comes for the scientists, researchers and the scientific workers to make the most significant contribution for the development of Kazakhstan.”

Kazakhstan is the 9th largest country in the world with a territory of 2,725 million km2. The sown areas in the country takes more than 25 million hectares, while 77% for the permanent crops. Kazakhstan is the world leader of the production of wheat and wheat flour. The volume of gross agricultural and industrial production shows steady upward trend. Over the last 5 years, the growth rate of agriculture was about 20%. Further development of the agro-industrial complex of Kazakhstan is aimed to increase the competitiveness of agricultural products by increasing the efficiency of governmental support and the creation of the equal conditions favorable for the development of agribusiness.

Kazakhstan has launched State Programme for Accelerated Industrial Innovation Development (PAIID), which contains 5 new priorities, namely power engineering, comprehensive recycling of raw materials and products, information and telecommunication technologies, life sciences, and intellectual potential of the country. A new branch program "Agribusiness – 2020" is developed under the umbrella of this state program.

The agriculture production of Kazakhstan requires more than 1200 models and modifications of agricultural machinery and equipment for the production, processing and storage of the crop and livestock production. Currently, the supply of agricultural machinery and processing equipment in Kazakhstan is through import, joint ventures. and domestic producers.

The program framework of "Agribusiness – 2020" is illustrated as below:

Program aim	Program directions	10 questins to be considered in the framework of the AIC development program and other program documents
The creation of conditions for the increase of competitiveness of agro innovational complex (aic) subjects of the republic of kazakhstan	1.financial recovery 2.Increase of the goods availability works and the services for the subjects of AIC 3.The development of state support systems for the subjects of AIC 4. The increase of effectiveness of state control systems after AIC	• financial recovery • industry funding • the effectiveness of government support measures • land and tax relations • infrastructure security technical regulation • development of cooperation • marketing consultancy • science innovations education personnel training • related industries: agricultural chemistry agricultural engineering • social infrastructure

The macroeconomic and social effects that are expected to achieve after program implementation cover 1.5 times increase of physical capacity of agricultural products, 3 times increase of labor productivity per person in agriculture, 20% increase in export revenue from agricultural and industrial production, providing 80% of the domestic food requirement, and attracting more than 10 trillion tenge (Kazakhstan currency) of private funds into the sector.

According to the Strategic Development Plan of Kazakhstan until 2020, export from agricultural sector is expected to account for 8% of the total export value; labour productivity in agriculture will increase by at least 2 times; the proportion of meat processing will be increased up to 27%, milk up to 40%, and fruits and vegetables up to 12%.

The condition of agricultural mechanization in Kazakhstan is showed below:

Malaysia

Agricultural Machinery and Mechanization Development in Malaysia

Dr. Chan Chee Sheng
Principal Research Officer
Malaysia Agricultural Research and Development Institute

Dr. Chan Chee Sheng is a Principal Research Officer at Malaysian Agricultural Research and Development Institute (MARDI) at its branch in Seberang Perai, Pulau Pinang Malaysia. He graduated with a Bachelor in Agricultural Engineering from University Pertanian Malaysia in the year 1985. He obtained his Master degree on Irrigation and Drainage from Colorado State University, USA in 1991 and received his doctorate from Universiti Putra Malaysia in 2006. Presently, he leads several research projects in the field of agricultural engineering in MARDI. Basically the work encompasses on mechanization and water management for wetland and aerobic paddy production. His work also revolves around planning, design and development of internal paddy farm infrastructure for farm mechanization as well as on irrigation and drainage facilities. Since the year 1985, Dr. Chan Chee Sheng has had several accomplishments nationally. In line of his work, he has represented MARDI as an executive committee member in Malaysian Commission of Irrigation and Drainage (MANCID) since 2006. He was also appointed as an independent checker to the rice production project in Kota Belud, Sabah in the year 2010 and also as consultant of several others paddy production project all over the country. He was also made a member in the technical IRPA panel committee that evaluates and approves horticulture projects nationally. In the year 2008, MARDI awarded him the excellent public servant.

Malaysia is located in East Asia with a total population is 28 million. Rural population constitutes 30%, while urban population accounting for 70% of the total. Population involved in agriculture in Malaysia is 16% of the total, while 28% in industrial sector. Main exported goods of Malaysia are electronic equipment, petroleum and liquefied natural gas, wood and wood-based products, palm oil, rubber, textiles and chemicals. And the major agriculture commodities are palm oil, natural rubber, timber and rice. In terms of the contribution of different sectors to GDP, manufacturing sector accounts for 28% of GDP, service sector contributes to 57%, and agricultural sector for 7%. GDP-per capital (purchasing power parity) in Malaysia is US$16,900.

The diagram below shows the breakdown of agricultural land usage in Malaysia:

Breakdown of Agricultural Land Usage, ('000ha)

Crops	1995	2000	2005	2010	Average Annual Growth Rate (%)			
					1995-2000	2000-2005	2005-2010	1995-2010
Rubber	1,679.0	1,560.0	1,395.0	1,185.0	-1.5	-2.2	-3.2	-2.3
Oil Palm	2,539.9	3,131.0	3,461.0	3,637.0	4.3	2.0	1.0	2.4
Paddy	672.8	521.2	475.0	450.0	-5.0	-1.8	-1.1	-2.6
Cocoa	190.7	163.8	160.0	160.0	-3.0	-0.5	0.0	-1.2
Coconut	248.9	213.8	193.2	175.5	-3.0	-2.0	-1.9	-2.3
Pepper	10.2	9.2	8.5	8.1	-2.0	-1.6	-1.0	-1.5
Vegetables	42.2	48.3	63.7	86.2	2.7	5.7	6.2	4.9
Fruits	257.7	291.5	329.8	373.2	2.5	2.5	2.5	2.5
Tobacco	10.5	9.3	7.8	6.2	-2.4	-3.5	-4.5	-3.5
Other	99.1	106.4	111.4	30.0	1.4	0.9	3.1	1.8

There are four categories of paddy farmers in Malaysia, which are tenant farmers who rent the land for farming, farmers as well as land owners who farm on their own land, combination of tenant farmers and farmers owning lands whereby these farmers not only farm on their own land but also rent other people's land, and land owners who lease their land to others for farming.

The age composition of farmers in Paddy sector is showed below:

Farmers' age pattern in Paddy Sector

Age categories (years old)	%
< 35	1.9
35.1 – 45	7.3
45.1 – 55	24.8
55.1 – 65	38.2
> 65	27.8
Total	100

Soft soil problem is the major issue faced in Malaysia on agricultural mechanization. The causes of soft soil conditions include indiscriminate use of heavy machinery, insufficient field drainage, planting not as scheduled as water in the field has not yet completely drained, and effect of climate change where rainfall pattern changes. Improvement in irrigation and drainage system will be the solution to address soft soil problem.

In terms of strategies and policies applied in Malaysia, the National Agro-food Policy was approved in Sept 2011 with the purposes of addressing issues of food supply and food safety for consumption, modernizing and commercializing the food production sector, and ensuring continuous adoption and utilization of mechanization and automation technologies in agricultural production.

Malaysia also adopted several measures by the government to encourage personal ownership of small and medium machinery. Such measures include matching grant that is supposed to support farmers to acquire small and medium farm machinery like power tiller and pump set, tax exemptions to imported agricultural machinery, and government grants to farmer organizations for acquiring heavy machinery such as tractors and combine harvesters.

Several issues and challenges faced in Malaysia on the transition of agricultural mechanization sector to modernization including no comprehensive database available on the number of farm machineries owned by the private sector, government agencies and individual farmers, no standard regulations imposed on importers in importing farm machineries, no standard procedures regulated on farm machinery movement results in spreading of paddy plant diseases and rice weeds, and not sufficient training programs available and insufficient funding by the authorities results in failure to produce sufficient modern farmers.

To address these issues and improve mechanization development in Malaysia, several strategies need to be outlined and implemented, for example, 1) implement the mechanization programes efficiently at all levels; 2) good field infrastructure for easy machine access; 3) develop and sustain hardpan to support machine mobility; 4) further encourage small and medium machine ownership through favorable financial assistance; 5) introduce subsidies and incentives at operational level; and 6) apply compulsory standard tests to imported machineries for assuring quality compliance.

Mongolia

Mongolian Agricultural Mechanization Development

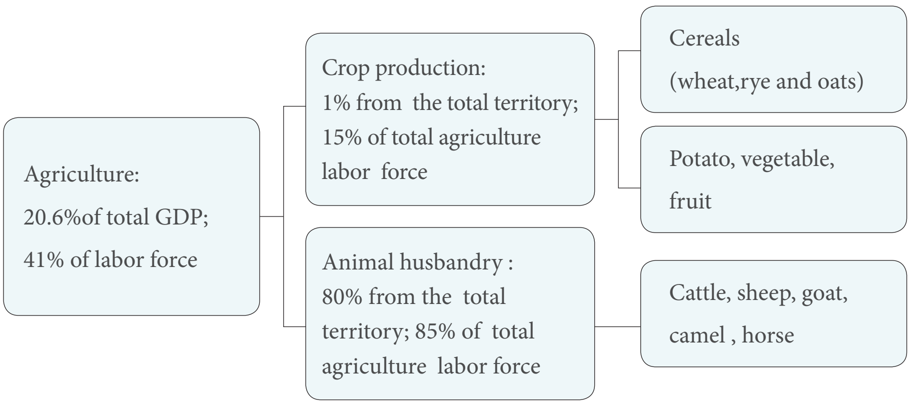
Mr. Davaasuren Yesun Erdene
Crop Production Policy Implementation and
Coordination Department
Ministry of Industry and Agriculture of Mongolia

Dr. Davaasuren Yesun Erdene obtained his Bachelor's Degree in Agricultural Engineering at the Mongolian State University of Agriculture in 2000; Master and Ph. D Degree in Horticulture at Kangwon National University of Korea between 2002 and 2008. From 2012 to present, he is the Senior Officer of Crop Production Policy Implementation and Coordination Department, Ministry of Industry and Agriculture of Mongolia. From 2010 to 2012, he held the position of Head of Technique and Technology Division, Ministry of Food Agriculture and Light Industry.

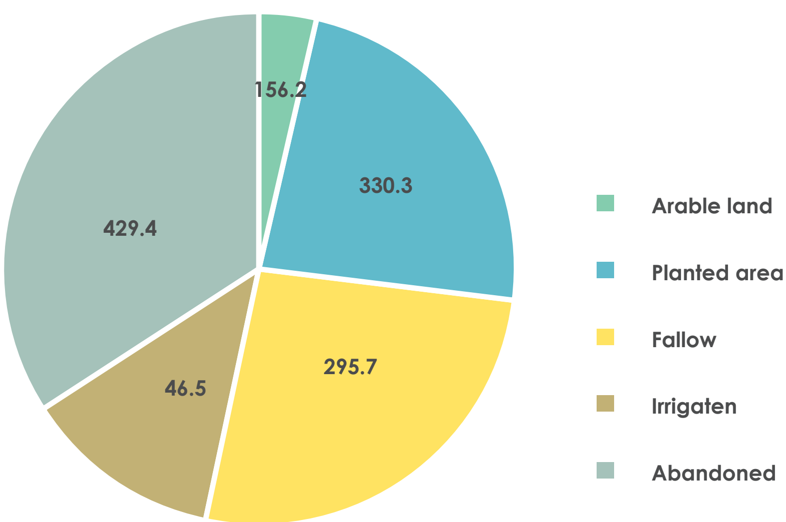
Mongolia is located in Northern Asia, between China and Russia. It is a landlocked country with a total territory of 1,566,500 Km2 and 2,754,685 population (as of 2010). Its GDP has reached USD 8,506 billion, while per capita GDP was USD 3,042 in 2011. The terrain in Mongolia includes vast semi desert and desert plains, grassy steppe, mountains in west and southwest and Gobi Desert in south-central. It has continental climate with large daily and seasonal temperature ranges from lowest -40oC to highest 38oC. The precipitation is 200-350 mm in a year. Arable land in Mongolia accounts for only 1%, while 80% are permanent pastures, 9% are forests and woodland and 10% are for other purposes.

The main manufacturing sectors in Mongolia are agriculture and mining. Agriculture sector is the main traditional economic sector with intensive growth. Agricultural sector produces 21.7% of total GDP, among which livestock constitutes 80%, and crop production accounts for 20% of the total. 40% of total working force is in agricultural sector. The main crops in Mongolia are wheat, potato, and vegetables. The amount of livestock has reached approximately 44 million herds by 2012. And, the main agricultural export products include leather, organic cashmere, meat, sheep and camel wool.

The agriculture profile of Mongolia is showed below:



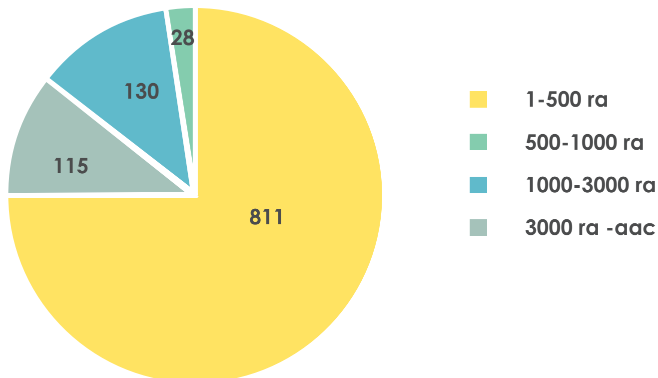
The diagram below illustrates the condition of land use for crop production in Mongolia:



Land use for Crop production,(Total 1322,8 thous. ha)

The crop production entities in Mongolia are showed below:

Field	Nunber of entities	Land / ha /
1-500 ha	811	127.856
500-1000 ha	115	78.560
100-3000 ha	130	203.656
3000 and more ha	28	122.457
TOTAL (as of 2009)	**1084**	**532.529**



Crop Production Entities

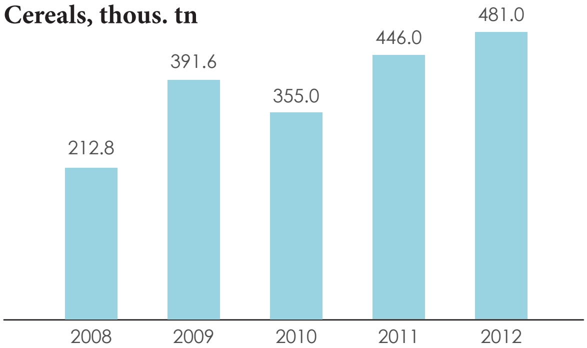
The main purposes of the agriculture policies applied in Mongolia are to ensure self sufficiency of the stable crops such as wheat, potato and main vegetables, to supply safe food to the consumers and maintain ecological crop production, and to reduce poverty in rural area through income diversification. Policies adopted in Mongolia for crop production sector include "Green Revolution" national programme (1998~2012), State policy toward food and agriculture (2003~), "Third crop rehabilitation campaign" national programme for development of crop production (2008~2010), and "Seabuckthorn" programme (2010~2016). Mongolian government provides the following subsides in crop production sector:

- 50% off from the price of new and advanced technique (tractors, combines);
- import and VAT tax free for new and advanced technique;
- loan for seed and fuel, and fertilizer;
- financial incentives for wheat (appr. USD 50-70 per ton) per year;
- final product purchase;
- construction and rehabilitation of Irrigation system (30% free);
- free construction of water reservoir and dams;
- soil analysis of cropping area (579 300 ha);
- 50% off for greenhouse;

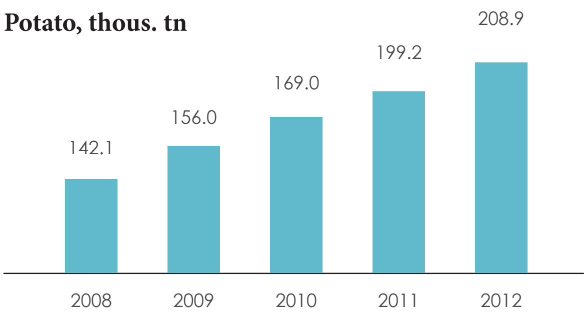
- free of charge of tools and seeds for vegetable and potato;
- free of charge of all type of short time trainings; and
- no charge to participate and visit agricultural exhibitions and field demonstrations.

The estimated total harvest of major crops in Mongolia between 2008 and 2012 are showed below:

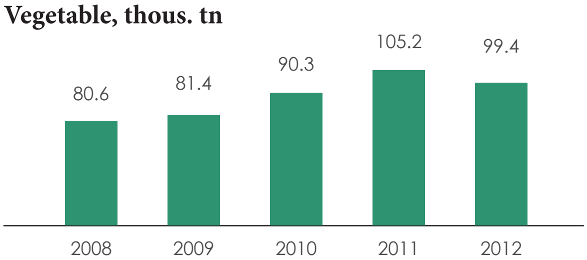
Cereals, thous. tn



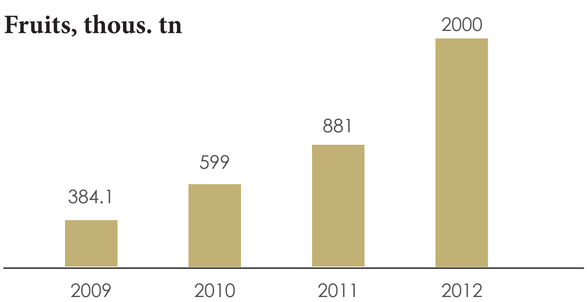
Potato, thous. tn



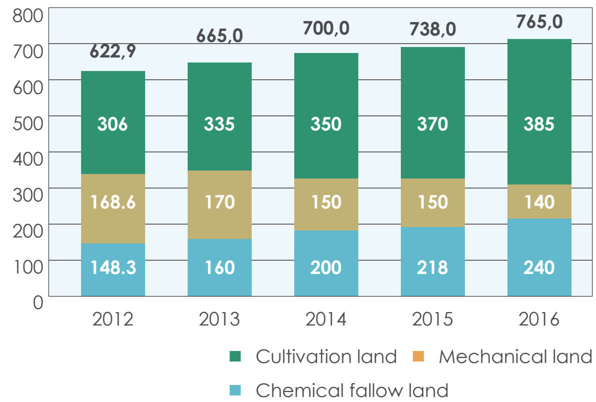
Vegetable, thous. tn



Fruits, thous. tn



And the current condition and designated development goals in terms of cultivation land, mechanical fallow land, and chemical fallow land are showed below:



Due to the various policies adopted including the subsidies provided, agricultural mechanization in Mongolia has developed rapidly, which helped to improved the performance and efficiency of agriculture significantly. For example, using tractors and combines helped to reduce the working time for planting to 12-14 days, and harvesting and cultivating fallow to 35-38 days. The quality of fallow is improved and the productivity from each hectare increased by 0.6 ton in 2011 and 2012. Technology has been transferred into no tillage technology from plowing technology. As a result, the soil erosion has decreased. The operation cost of crop production has been reduced. Soil moisture has been improved through making straw cover by using wheat combine and straw spreader at the same time. In addition, opportunity is created to assist the small farmers to run their businesses by installing public equipment. For example, public service units which provide technical services were established in 54 soums (equivalent to township) of 14 provinces. Return on investment in crop production sector is increased (food and flour processing etc). And advanced technologies are being transferred from World leading brands such as John

Deere, Challenger, Sun Flower, Class, and Morris, and some of them opened their dealer companies in Mongolia.

In terms of the future development of agriculture in Mongolia, the following objectives and areas are designated:

- technical renovation and advanced technology;
- developing irrigated agriculture;
- improving quality of seeds and its supply;
- increasing the capacity of storing facilities and elevators;
- developing vegetable and fruit production;
- capacity building of the sector;
- attaining self sufficiency with wheat, potatoes, vegetable and developing crop production for export purpose;
- developing export oriented crop production;
- improving the legal environment on crop land usage, ownership;
- improving the legal condition to protect cropping area and harvest from livestock, to set up border area for integrated crop and livestock production;
- creating appropriate crop insurance system; and
- increasing crop production through investment from the profit of mining sector.

Currently, the country can supply 52% of the vegetable consumption. The 2012-2016, Government Action Plan/ Article 6 aims to supply 100% of the vegetable needs by 2016.

Performance		2012		Results to Reach 2016	
		Potato	Vegetable	Potato	Vegetable
Population needs,thousand ton		134,7	165,7	140,4	173,2
Domestic Production	**thousand ton**	191,9	98,9	191,9	198,4
	percentage	142,7%	52%	136,6%	115%
Import, thousand ton	**thousand ton**	3,2	48,5	0	0
	percentage	2,3%	29,2%	0	0
Potato excess processing requirement, thousand ton		57,2	0	65,5	25,2
Current capacity of potato, vegetable processing industry, thousand ton		0	15,4	5,5	47,5

Mission to Increase Potato and Vegetable Production

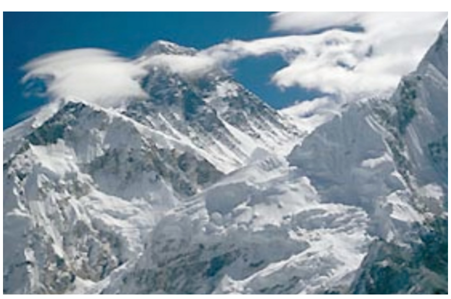
Nepal

Challenges in Sustainable Agricultural Mechanization in Nepal

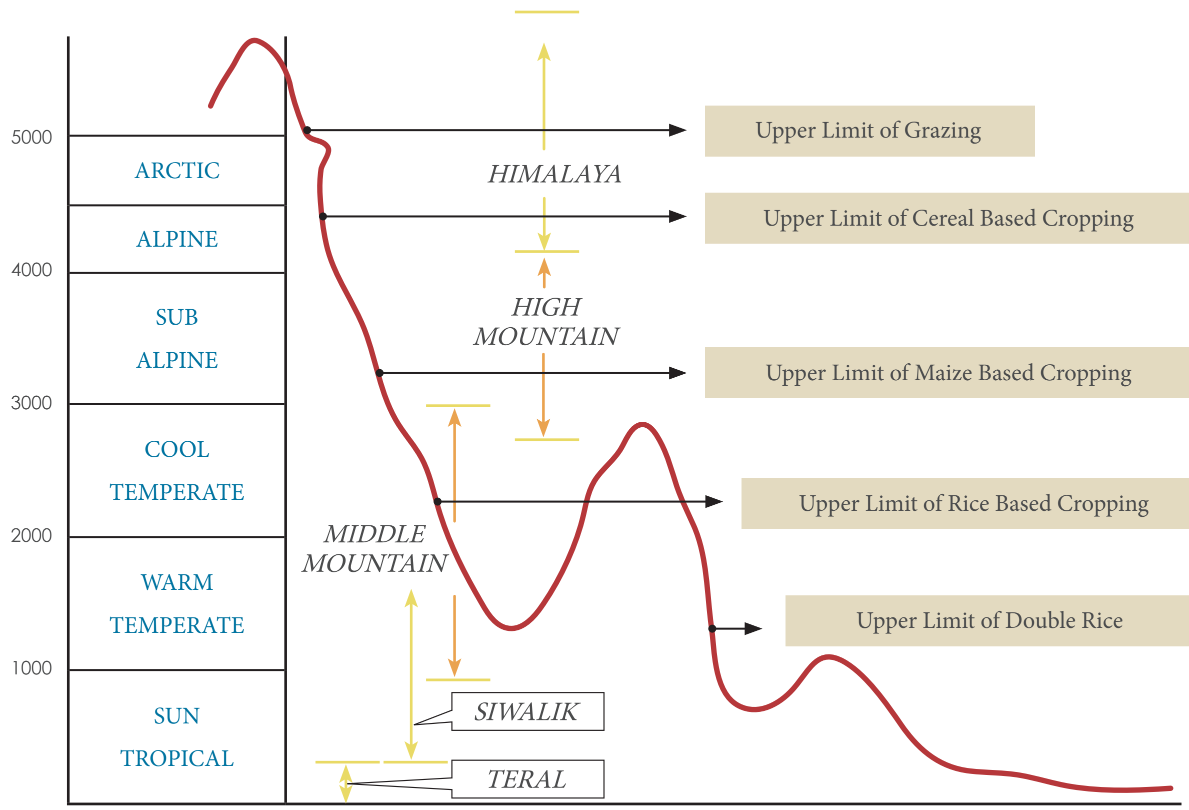
Shreemat Shrestha
Division Chief
Agricultural Engineering Division
Nepal Agricultural Research Council

Mr. Shreemat Shrestha obtained Bachelor Degree in Agricultural Engineering from Kerala Agriculture University in India in 1991, and Master Degree in Agricultural Engineering from Govinda Ballav Pant University of Agriculture and Technology (GBPUAT) in India with distinction. Mr. Shrestha is the Division Chief of Agricultural Engineering Division of Nepal Agricultural Research Council. He's been working as an agricultural engineer research scientist in different capacities in Nepal Agricultural Research Council (NARC) since 1994. Mr. Shreemat Shrestha involved in the design and development of appropriate agricultural implements, viz. jab seeder, pedal operated millet thresher, cornpeeler, low cost solar dryer, cardamom dryer, coffee pulper, tunnel solar dryer, ginger washing machine, etc and modification of strip till drill, bed planter and animal drawn zero till drill. He also directly involved in field validation and promotion of resource conservation technologies (RCTs) in rice wheat system through participatory demonstration, field trials and farmers' training in the hills of Nepal under different projects. As a member of agricultural mechanization policy drafting committee, he contributed to the preparation of the upcoming agricultural mechanization policy of Nepal.

Nepal is a land-locked country sandwiched between India and China. Its land area is 147,181 Km2. Population in Nepal is 2.7 Million. There are three geographical regions in Nepal, namely Terai, hill and mountain. Elevation in the country ranges from 70 m to 8,848 m. Its climate type varies from temperate to sub tropical. The typical feature of Nepal is rugged terrain and diversity in all scenes.



The Pphysiographic regions in Nepal are showed below:



Agriculture in the country is dominated by subsistence and small holder agriculture with average land size below 0.8 hectares. Agriculture contributed 36% to the GDP in Nepal, employing 60 percent of its population. Rice-based and maize-based cropping systems are dominant in Terai and hills respectively. Cattle, buffalo, goat and poultry are the major livestock. Besides cereal production, Nepal also produces vegetables, and cash crops, viz tea, coffee, cardamom and ginger, etc.

The areas and production of cereal crops in Nepal for the year 2011-2012 are showed below:

Crops	Area (ha.)	Production (mt.)	Yield (kg/ha)
Paddy	1531493	5072248	3312
Maize	871387	2179414	2501
Millet	278030	315067	1133
Wheat	765317	1846142	2412
Barley	27966	34830	1246
Buckwheat	10339	10021	969
Total	3484532	9457722	2710

In Nepal, tillage is generally conducted by animal power. Only 26% of farmers use iron plough; while just 8% use tractors and the proportion could reach 18% in Terai areas. Most of the tractors use cultivators. Custom hiring of tractors in Nepal is common. And power tiller is getting popular. In terms of planting and seeding, rice is manually transplanted; wheat is broadcasted; and maize & vegetable seeds are dibbled. More than 64% of the farm work in Nepal are performed by women. Zero-till drill-and minimum till drill are promoted by NARC & DOA. For inter culture operation, rice, potato, maize and vegetables all need major interculture operations. Hand tools are used, and bullock drawn local plough is also used for maize inter culture. More than 60% of inter-culture operations are carried out by women. 42% of arable areas in Nepal are irrigated, while 18% could have year round irrigation. Only 242,000 hectares of arable land is irrigated by groundwater (GW) in which 208,746 hectares is through shallow-tube wells (STW) and 33,732 hectares by deep-tube wells. 14% in the terai areas in Nepal use cystic fibrosis (CF) pump mainly for shallow tube well; and there are more than 100,000 treadle pumps in Terai areas. And simple low cost drip system and sprinkler irrigation are being used for vegetable cultivation. Harvesting in Nepal is usually performed manually by using locally made sickles; and serrated sickles locally made are also popular. There are more than 30 Combine harvesters in operation in Terai; and 4 wheel tractors operated reapers, power tiller & mini tiller operated reaper are also getting popular. In terms of processing, both manual and mechanical power are used. Majority of cereal crop processing operation is mechanized. Sheller, huller, grinding mill, oil expeller and beaten rice mill are commonly used in Nepal. There is need for appropriate technology in processing of perishables / cash crops.

The inappropriate equipment use of agricultural mechanization in Nepal causes severe consequences. In Terai, the 9/11 tyne cultivator used for land preparation requires 6-7 pass for land preparation, which increases the cost of tillage. Frequent accidents occur, specially in the agro processing mills with exposed flat beltand operating tractors mainly due to lack of safety feature and lack of training for operation. In Nepal, the machinery supply chains cover multi-players, including black smiths, small agricultural machinery fabricators, agricultural machienry importers, dealers/ Sub dealers, service providers (custom hiring, repair and maintenance) and farmers.

To promote sustainable agricultural mechanization in Nepal, challenges include not only socio-economic and technological issues, but also policy and institutional issues. The socio-economic reality in Nepal is that small and fragmented land holding is dominating; and young people are not interested in agriculture. In addition, traditional blacksmiths are in poor condition; and there are gender concerns and capital constraints as well. In terms of technological issues, realization of small holder agricultural mechanization and availability of spare parts remain challenging; local agricultural machinery fabricators are in poor condition; and there is a lack of technical and safety standards. Specific to policy issues, Nepal lacks sound agricultural mechanization policy; and there is no recognition of farm machinery custom hiring enterprise. For institutional issues, the research and extension system is weak and institution for testing and quality control is absent in Nepal; and there is need for capacity development for private sector and farmers.

Due to the above mentioned issues and challenges, interventions are needed in the following aspects:

- Development, adaptation, and promotion of efficient hand tools through capacity development of local blacksmiths and commercialization of their skill;
- Development, adaptation, and promotion of efficient animal drawn implements;
- Development, adaptation, and promotion of efficient processing machinery of high value commodities;
- Agricultural mechanization with conservation agriculture;
- Cooperative farming/ command area development;
- Assured and efficient irrigation for commercialization; and
- Promotion of renewable energy in agriculture.

In promoting Public & Private Partnership for promoting sustainable agricultural mechanization, the key stakeholders shall play different roles. The government should formulate and implement favorable policies and act as facilitator and coordinater among key stakeholders; it should also ensure that testing and quality control measures are in place and demonstration, training and research capacities are strengthend. The private sectors, on the other hand, should strengthen their roles in manufacturing, importing, distribution, marketing, and service provision. While for financial intermediaries, they need to establish appropriate mechanisms and enhance their capacity to facilitate easier access to credit by the private sectors and farmers. In conclusion, Public & Private Partnership is crucial for achieving sustainable agricultural mechanization that requests cohesive collaboration efforts.

Pakistan

Agricultural Mechanization in Pakistan

Dr. Syed Ghazanfar Abbas
Technical Staff Officer to Chairman
Director (Mechanization)
Plant Sciences Division
Pakistan Agricultural Research Council

Dr. Syed Ghazanfar Abbas is an Agricultural Engineer from University of Agriculture, Faisalabad, Pakistan. He has completed his M.Phil and Ph.D from Massey University, Palmerston North, New Zealand. Dr. Abbas has lots of international exposure when he has worked with FAO-HQ, Italy, Rome, and in Iraq. He has also taken up various assignments for UNIDO in Afghanistan and in Sudan. Dr. Abbas is working with Pakistan Agricultural Research Council (PARC) since July, 1985 and currently he is the Director (Farm Mechanization) of Plant Sciences Division of PARC. Before joining PARC he has worked for private tractor manufacturing company in Pakistan from 1980 to 1985. Dr. Abbas is an associate Member of Club of Bologna, Italy that is actually like an Agricultural Machinery Manufacturers Association established in 1987. Dr. Abbas carries lots of technical as well as managerial experiences spread around 33 years.

Pakistan is the 6th most populated country in the world. It is the 9th largest producer of wheat in the world, a sector accounting for 4.4% of value added and 3.0% of GDP in Pakistan. Rice production constitutes 5.9% of value added and 1.3% GDP. In terms of cotton production, Pakistan is the 4th largest producer in the world amounting 7.3% of value added and 1.6% GDP. Cotton is the major export and agro-industrial crop, and major source of employment in value chains. Nearly 80% total cotton production took place in Punjab. Sugarcane is also an important crop in the country, which accounts for 3.4% of value added and 0.7% in GDP. Pakistan falls in the top 15 most livestock populous countries of the world. Pakistan ranks 2nd in buffalo population, 13th in cattle population, 10th in sheep population, 3rd in goat population. In addition, Pakistan has comparative advantages in the production of many dry fruits and Kinnow production .

By June 2010, the population of Pakistan has reached 180 million, among which 110.5 million are rural. The geographical area of Pakistan is 79.6 million hectares. The contribution to GDP of the services sector, industrial sector, and agriculture respectively are 53.3%, 25.2% and 1.5%. The total size of the agriculture economy is Rs. 3,016.6 billion (Pakistani Rupee), and 45% of total labor force are employed in agriculture. Cultivated area in Pakistan is 21.21 million hectares, in which 70% are canal irrigated. The country has highly diversified climate that is suitable for cultivating a number of crops. The important crops include wheat, rice, cotton, sugarcane, maize, gram, mung, potato, onion, tomato, mango, citrus, dates, apple, etc.

In Pakistan, 85% farm households cultivate nearly 45% of agricultural lands. Please refer to the table below for the farm households and farm area composition in Pakistan:

Farm Households & Farm Area Composition (%)

Farm size	Units	Punjab	Sindh	KPK	Baloch	PAK.
Marginal (upto 5 ac.)	% Farms	56.0	45.9	78.5	28.4	57.6
	% Area	16.3	12.6	31.0	3.5	15.5
Small (5 - 12.5 ac.)	% Farms	29.4	36.6	16.1	34.3	28.1
	% Area	31.0	27.7	28.3	14.6	27.9
Medium (12.5-25 ac.)	% Farms	9.5	9.6	3.2	20.0	8.8
	% Area	21.6	16.5	12.9	17.9	19.1
Large (25-50 ac.)	% Farms	3.9	5.4	1.4	10.3	3.9
	% Area	16.5	17.7	11.1	17.4	16.3
Landlords (> 50 ac.)	% Farms	1.2	2.5	0.7	6.9	1.6
	% Area	14.6	25.6	16.7	46.5	21.2

Source: Agriculture Census, 2000

Table below shows the cropping patterns by farm size groups in Pakistan:

Cropping Patterns by Farm Size Groups (% Crop Area)

Crop types	Marginal (upto 5 ac)	Small (5-12.5 ac)	Medium (12.5-25 ac)	Large (25-50 ac.)	Landlord (> 50 ac.)	All Pakistan
Wheat	43.3	41.2	40.5	39.0	35.6	40.4
Rice	11.0	14.1	12.3	12.3	11.1	12.5
Cotton	12.3	13.4	15.1	14.1	14.0	13.7
Maize	8.7	3.5	1.9	1.6	1.7	3.7
Sugarcane	3.0	3.9	3.7	3.7	4.9	3.8
Potato	0.3	0.3	0.4	0.4	0.9	0.4
Oil Seeds	0.9	1.8	2.3	2.4	2.7	1.9
Pulses	1.7	3.3	6.1	9.4	11.3	5.4
Fodder	12.0	11.8	10.6	9.2	6.9	10.6
Vegetables	1.7	1.7	1.9	2.1	3.4	2.0
Orchard	1.1	1.1	1.5	1.6	4.0	1.6

Source: Agriculture Census, 2000

Pakistan is facing various issues and challenges in terms of agricultural mechanization development. Agricultural mechanization policy and strategy has just been in place. The National Network of Agricultural Mechanization needs revival. Machinery testing lab. and accreditation of machinery need further improvement. In terms of livestock mechanization, only poultry sector has adopted few innovative technologies, and lots of work needed to be done in Livestock sector. Currently, mechanized sugarcane planting and harvesting is very expensive considering the cash-return that sugarcane farmers get. The European second hand wheat combine harvesters are being used for rice harvesting in Pakistan, which causes a lot of grain damage of rice. Fruit and vegetable planting and picking need to be mechanized. And up-scaling seed processing machinery is needed as well. Introduction of Solar power for Agricultural purposes need to be encouraged in Pakistan. Irrigation needs to be strengthened in Pakistan. Loss of land due to water and wind erosion has to be curtailed. Pakistan has undulated topography, and laser land leveling can play important role in terms of increasing water efficiency and reclaiming land for agricultural purposes. In addition, for encouraging youth in agriculture sector, value addition mechanization systems should be introduced.

Thailand

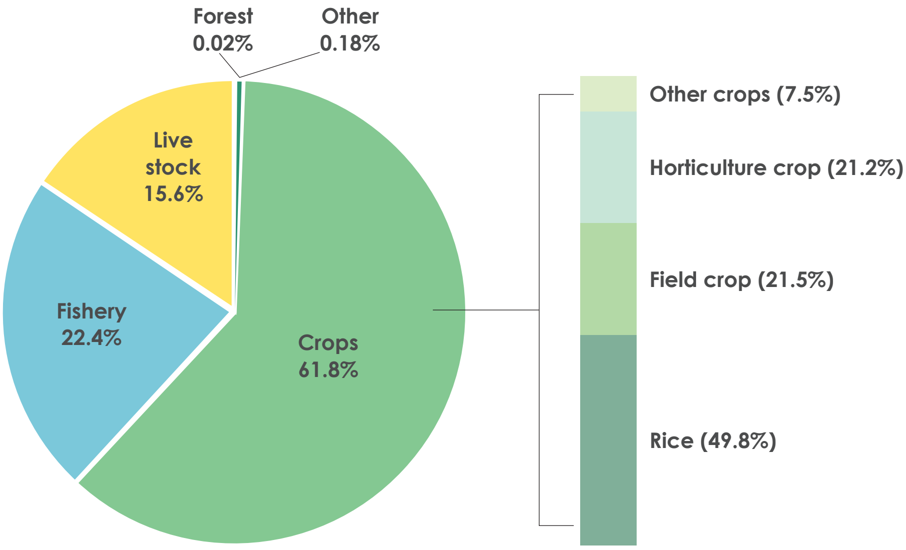
Agricultural Mechanization Development in Thailand

Mr. Viboon Thepent
Senior Agricultural Engineering Specialist
Agricultural Engineering Research Institute
Department of Agriculture

Mr. Viboon Thepent, obtained his Mater degree in Food Processing Engineering in 1985 from Asian Institute of Technology, and Bachelor degree in Agricultural Engineering in 1980 from Kasetsart University. He has worked as researcher in Agricultural Engineering Research Institute, Department of Agriculture since August 1980 up to present. He is responsible in conducting research on development of agricultural machinery, agricultural process and providing technologies as well as services to government and private agencies. He has held the position of Director of Postharvest Engineering Research Group since 2003.

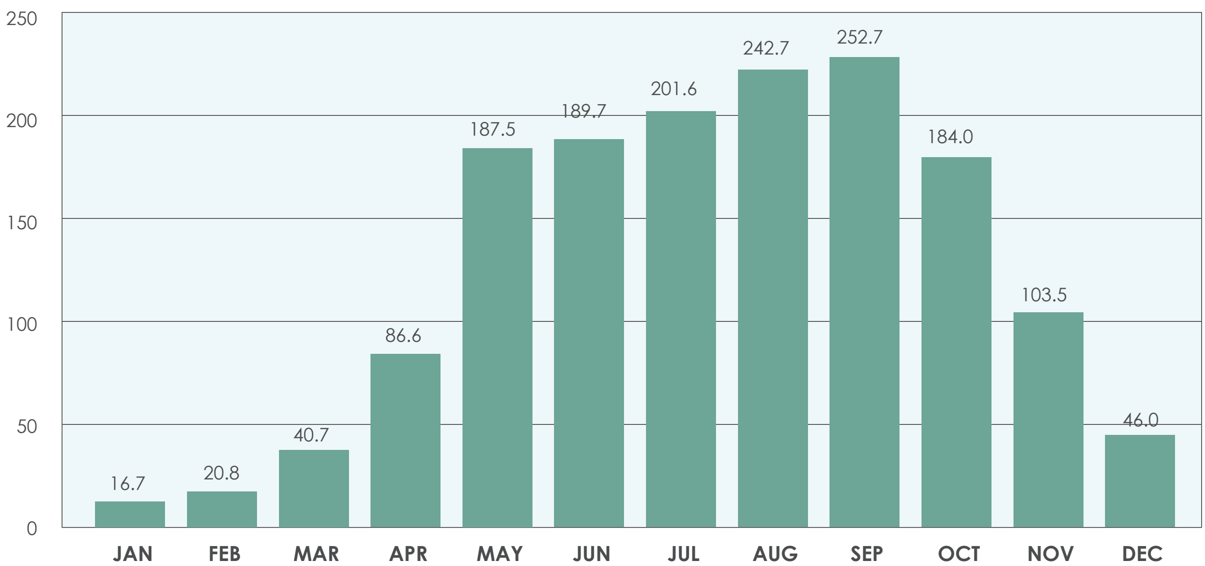
Thailand is an agricultural country with approximately 21 million hectares, or 40.9% of the total area, is used for agricultural production. Thailand is located in the center of peninsular Southeast Asia adjacent to Myanmar is to the west, Laos to the north and east, Cambodia to the southeast, and Malaysia to the south. The south coast of Thailand faces the Gulf of Thailand. The total size of Thailand is 514,000 Km2 (51.4 million hectares).

In Thailand, 46.6% of population is engaged in agricultural sector. Thailand is the world's largest rice exporter. Agriculture constitutes 10.1% of its GNP. Within the 21 million hectares used for agricultural production, 31.4% is for forest, 40. 9% for farm holding, 27.8% for other agricultural purposes. The diagram below shows their shares in the agricultural sector in Thailand:

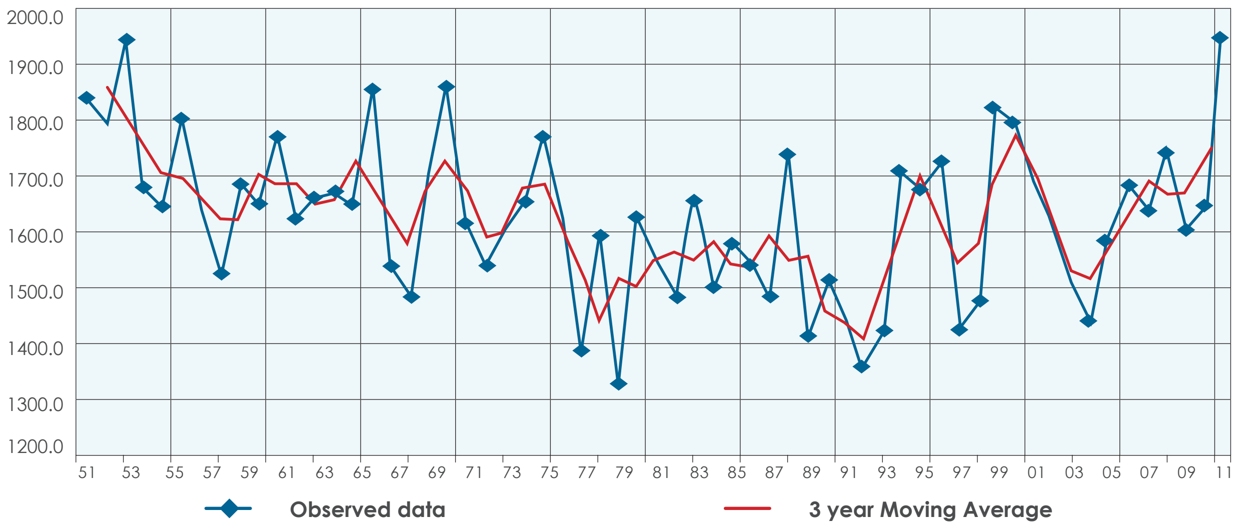


Contribution for agricultural sector

The mean monthly rainfall in Thailand respectively for the period of 1971-2000 and 1951-2011are illustrated by the two diagrams below:

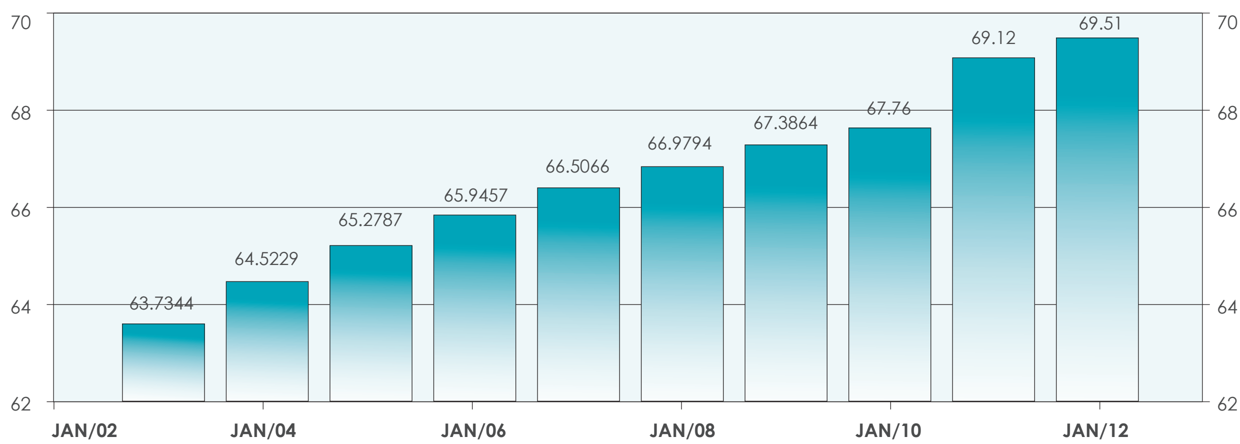


Mean Monthly Rainfall in thailand(mm)
30-year period:1997-2000



Mean Annual Rainfall in thailand(mm)

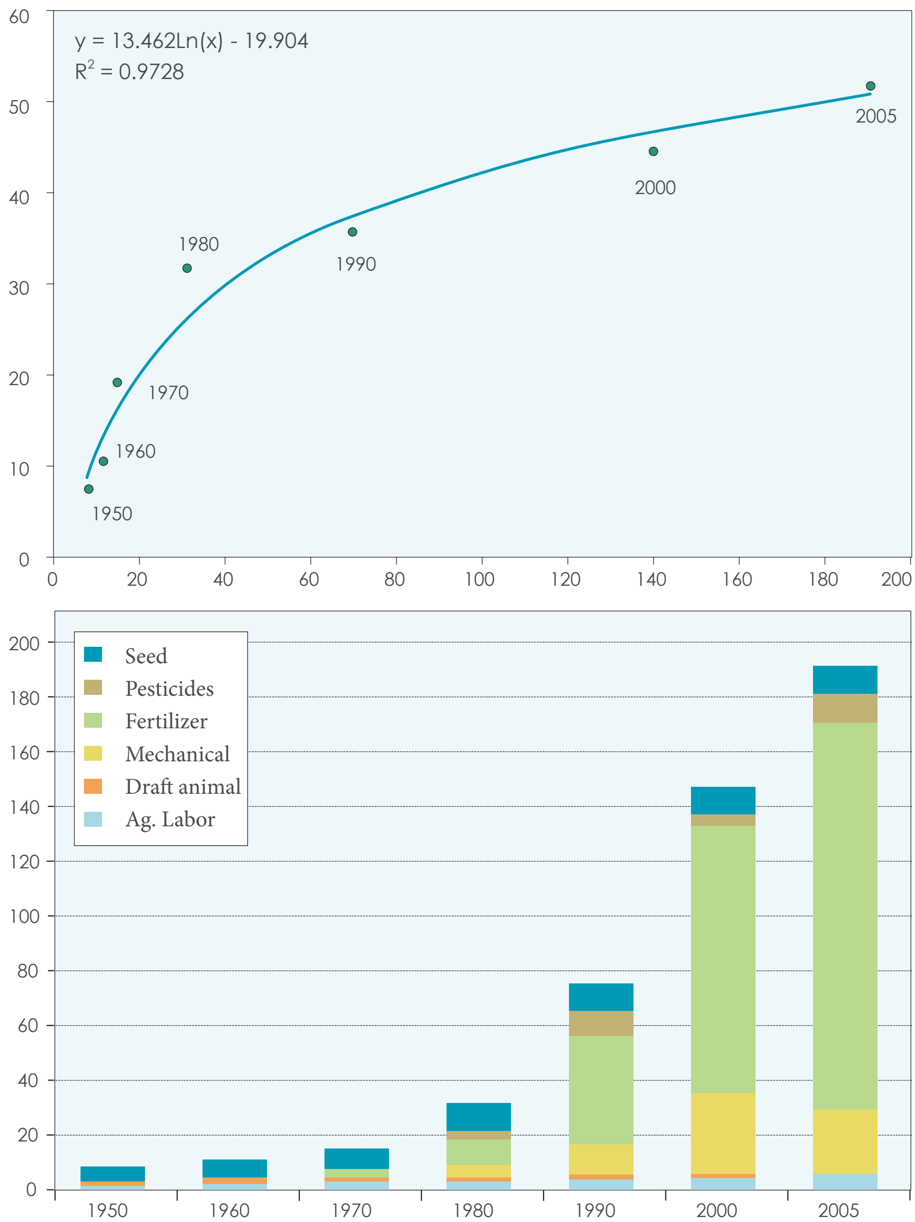
The total population in Thailand since 2002 is showed below:



Thailand Population
millions of people

Thailand is a newly industrialized country. Its economy is heavily export-dependent, with exports accounting for more than two thirds of its GDP. In 2012, Thailand had a GDP of THB 11.375 trillion (US$366 billion), while per-capita GDP was $5,390. Thailand's agricultural sector produces 8.4 percent of the GDP. The Thai economy grew by 6.5 percent in 2012 with inflation rate of 3.02 percent. In 2013, the Thai economy is expected to grow in the range of 3.8-4.3 percent. The major crops in Thailand include rice, maize, sugarcane, soybean, cassava, rubber, horticulture crops, and oil palm.

The diagrams below show the relationship between energy input and crop production in Thailand during 1950-2005, and the contribution of different energy inputs in crop production in the same period of time.



Thailand has developed its own range of agricultural machinery and equipment tailored for its special needs of its mainly agrarian population including planting machinery, rice threshers, tractors and walking ploughs, and recent machines that help with the cultivation, caring and harvesting of other crops such as fruit, rubber and cassava. Rice production is the foremost user of these machinery and equipments.

Sri Lanka

Updates on Sustainable Agricultural Mechanization Technology

Eng. M. H. M. A. Bandara
Chief Engineer
Department of Agriculture, Sri Lanka

Eng. Bandara is the Chief Engineer of the Department of Agriculture of Sri Lanka. Eng. Bandara has 31 years experience in the field of farm mechanization, especially in the testing & evaluation of farm machinery. He obtained Bachelor's Degree in Engineering at University of Moratuwa, Sri Lanka, and Post Graduate Diploma in Farm Mechanization at National Agricultural College in Netherlands. Eng. Bandara is the Chartered Engineer and Member of the Institute of Engineers in Sri Lanka. He has obtained professional trainings from various renowned organizations including International Rice Research Institute (IRRI) in the Philippines, BRAIN in Japan, DEULA in Germany, and TBIC in Japan. He is responsible for all engineering-related activities such as development of infrastructure facilities, maintenance of seed storage facilities and for development of farm mechanization activities.

Sri Lanka's population is 20.8 million. Main agricultural crops include paddy, maize, onion, potato, grain legumes, fruits and vegetable, and cash crops cover tea, rubber, coconut and spices.

The performance of main commodities is showed below:

Paddy	excess production, looking for export avenue, need quality improvement
Maize	self sufficient, use imported seeds, development of competitive local hybrid seeds is very urgent
Onion	majority of the requirement imported, focused on self reliance in near future
Grain legumes	becoming self sufficient
Vegetable	export
Fruits	sector needs improvement
Chili	majority imported

The contribution of agricultural sector in Sri Lanka is declining dramatically from accounting for 28% of GDP in the early 1980s to about 12% in 2012, which is the lowest in South Asia of the proportional contribution of agriculture to GDP. Even in rural households, the average income derived from non-farm activities (56%) is much higher than the earnings from farming activities (23%).

The average land holding size in Sri Lanka is about 1 hectare. The majority of paddy farming lands is small fragmented fields. However paddy cultivation system is almost fully mechanized except for bund reconditioning and plant establishment. Mechanization of maize cultivation as the second major crop needs to be strengthened. In addition, the production of grain legume, vegetable and fruit has not been mechanized yet in Sri Lanka.

Most agricultural machinery in Sri Lanka are imported, while very few are locally produced including water pumps, sprayers, seeders and hand tools. However, the supply of machinery is not regulated, which allows inferior quality machinery to inflows into the country. And local production is not supported due to unfavorable trade policy and small local market.

In spite that the Government identified mechanization as a very essential component in food production, the purchasing power of individual farmer is very poor in Sri Lanka. There are private machinery hiring facilities in operation in Sri Lanka, while charges are not reasonable, and the production cost are not reduced. Therefore, regulation on hiring system of agricultural machinery is essential.

Farm Mechanization Research Centre and Institute of Post harvest Technology are responsible for research and development of agricultural machinery in Sri Lanka. Testing and evaluation activities are also carried out by those institutes. However testing is not mandatory requirement in Sri Lanka.

Farmers in Sri Lanka are facing various problems in terms of getting appropriate machinery and equipment. Firstly, the quality of the machinery is a genuine issue for farmers due to free imports and lower efficiency of machines. Secondly, the high cost of the machinery itself as well the spares due to long supply chain and indirect taxes are a big burden for the farmers. Thirdly, farmers are lack of relevant operational knowledge. Fourthly, farmers' purchasing power of agricultural machinery is low due to the low farm gate price of their agricultural products. In addition, the farmers urgently need machinery for drying and storage of grains during harvesting season.

There are some positive efforts of the government promoting the sound development of agricultural mechanization in Sri Lanka recently. A Cabinet memorandum is presented to the parliament to issue 'import permits' only for the quality assured machinery by any recognized institute. If the performance of the machinery will be affected by local conditions, it has to be tested and certified by Farm Mechanization Research Centre of Sri Lanka. In order to protect the benefits of the farm machinery suppliers, farm machinery producers, farm machinery service providers, farmers and other stakeholders, a farm machinery act is being drafted and will be implemented in the future with necessary regulations.

The following table shows the annual sales of major farm machinery in Sri Lanka:

Year	2 wheel Tractors	4 Wheel Tractors	Combine Harvesters	Sprayers	Trans planters
11/12	14445	7184	2160	26093	n/a
12/13	9664	5141	1099	6240	23
13/14 Aug	2783	1479	N/a	N/A	87

In paddy cultivation, most of the operations are mechanized, while the least mechanized areas covers bund cleaning and plastering, plant establishment and week management, small scale seed paddy processing, and drying and storage. For bund cleaning and plastering, technology is available and has to be introduced in collaboration with the private sector. In terms of plant establishment, manually operated machines are not productive, and power operated direct seeding and transplanting machines are to be introduced, the preliminary trials of which have been conducted and looked promising. In weed management, design and testing of two models has been completed and can be released after fine tuning. Available machines of weed management in other countries are very expensive. Machines for small scale seed paddy processing are being designed and introduced by FMRC. However, scaling up of the machines is still an issue due to low capacity of the manufacturers.

Laser leveling techniques have been introduced in Sri Lanka. If land leveling is done with the use of laser guided land leveler both in lowland and highland, about 20% - 30% water can be saved and the crops could grow more evenly. The laser guider has to be imported and preliminary trials will be conducted. Specific of commercial scale maize cultivation with high capacity, reliable maize planter is an urgent need. Imported maize planters are not reliable, especially of high missing hills. Two types of maize planters cum fertilizer applicator are being tested and will be ready for dissemination. For irrigation, very high capacity (more than 20,000 l/min.) four wheel tractor powered axial flow type water pump has been developed, which have very low fuel consumption per liter water and have good demand in the Eastern Province. And a number of manufacturers in that province were already trained.

In terms of promoting sustainable agriculture mechanization in the Asia-Pacific region, various actions could be taken including publishing tested and certified machinery brands products and manufacturers in CSAM web page, giving publicity on precision agriculture mechanization and productive indigenous methods adopted in the region, benchmarking agriculture process costs based on value of produce for the region, and promoting low cost IT systems for farm machinery extension and educating on precision agriculture.

The Philippines

Status of Agricultural Mechanization in the Philippines

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Agricultural Machinery Testing and Evaluation Center
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Dr. Delfin C. Suministrado obtained his Ph. D. in Agricultural Engineering at Tsukuba University in Japan in 1991; Master degree of Engineering in Asian Institute of Technology in Bangkok, Thailand in 1979; and Bachelor degree of Science in Agricultural Engineering at University of the Philippines Los Baños in 1976. Dr. Suministrado is specialized in agricultural engineering, farm machinery design, soil mechanics, and non-conventional energy resources. Dr. Suministrado is also the Professor of the Division of Agricultural Machinery in the Institute of Agricultural Engineering, College of Engineering and Agro-Industrial Technology of University of the Philippines Los Baños. He is also the Director of Agricultural Machinery Testing and Evaluation Center, CEAT, UPLB.

The Philippines has a land area of 30 million hectares, while agricultural area covers 9.5 million hectares, among which 4.8 million hectares are used for rice production, 2.6 million hectares for corn production, and other areas are for major plants including coconut, sugar cane, banana, pineapple, cassava, rubber, mango, and vegetables. The Philippines is a net rice importer, and total rice production in 2013 was 18 million tons. Corn production reached 7.4 million tons in the same year.

In 1890s, agricultural machines from Spain and United States were introduced in the Philippines, particularly in large estates. In 1940s, preferential tax incentives were given to imported agricultural machines, and still mechanization was heavily biased to large scale farming. At that time, mechanization was synonymous to tartarisation.

From 1966 to 1980, the CB-IBRD loan encouraged the acquisition of four-wheel tractors, and later, small power tillers. In 1970s, the Green Revolution saw the growth of local agricultural machinery manufacturing industry. Power tillers and threshers were locally designed and fabricated at the time. And the 1970s saw a shift of model of mechanization from large scale to small scale.

Laws adopted in the Philippines affecting agricultural mechanization include the Agriculture and Fishery Modernization Act (AFMA) of 1998, the Agricultural Engineering Law issued in 1998, and the Agricultural and Fishery Mechanization Law (AFMech Law) issued in 2013.

Below is an overview of mechanization status of various crops in the Philippines:

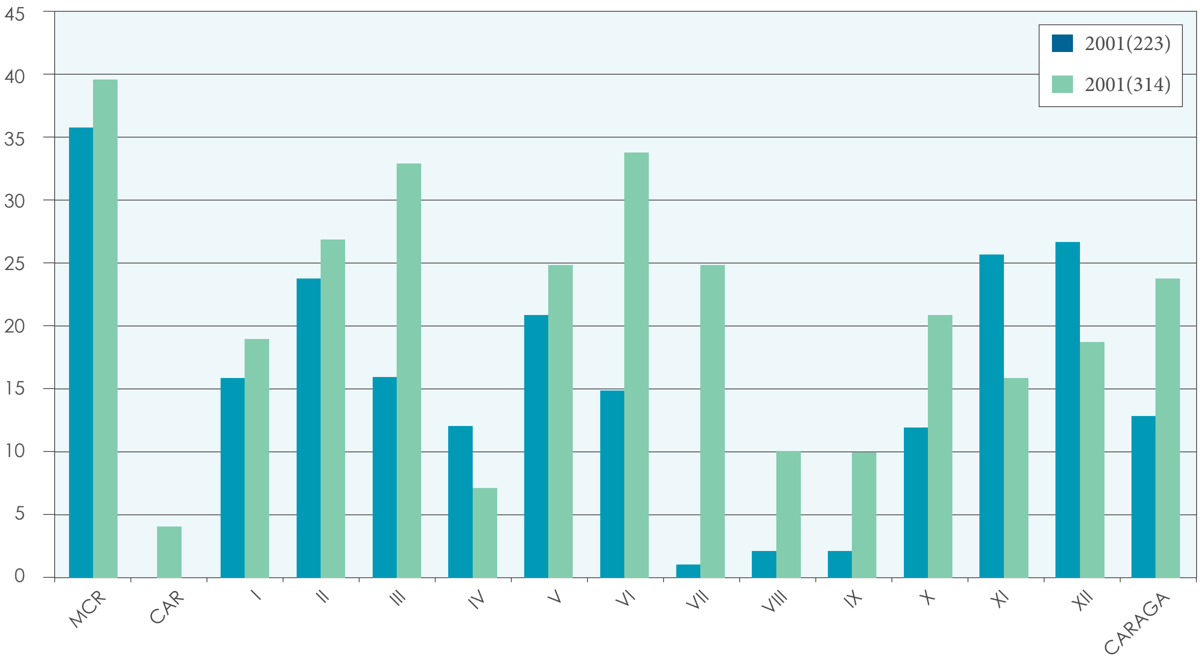
Operation	Rice/Corn	Vegetable, legumes & rootcrops	Coconut/Fruits / Fiber crops	Sugarcane, pineapple
Land preparation	Intermediate to high	Low		Intermediate to high
Planting/ transplanting	Low	Low	Low	Low to intermediate
Crop care/ cultivation	Low	Low	Low	Low to high
Harvesting	Low	Low	Low	Low
Threshing/ shelling	Intermediate to high	Low (legumes)		
Cleaning		Low		
Drying	Low	Low (legumes)	Low	
Milling/ village level processing	High	Low	Low	

The agricultural machinery industry in the Philippines has the following characteristics:

1) import of heavy machines and prime movers, and local assembly and fabrication of small equipment; and

2) locally manufactured machines have high import content sometimes constituting more than half of the total machinery cost.

The status of the agricultural machinery industry in the Philippines is showed in the following diagram:



While, the geographical distribution of the agricultural machinery industry in the Philippines is illustrated in the map below:

Research and development efforts in the Philippines is focusing on power tillers and hydrotillers, irrigation pumps, rice transplanters, drum seeders, weeders, rice reapers, rice threshers, rice strippers, corn threshers and shellers, village rice mills, grain moisture meters, coconut husk decorticators, abaca extractor, and grain and copra dryers.

There are strong demands for appropriate agricultural machinery in the Philippines including transplanter, harvester and drier for rice production, machinery for production of corn, vegetables and upland crops, coconut and other fruit crops, and the ones used for livestock, poultry and aquaculture. Attention shall also be paid to structures and controlled-environment agriculture, precision agriculture/smart farming, and high energy utilization for the future development of agricultural mechanization in Philippines.

The challenges facing the Philippines in terms of research, development and extension of agricultural mechanization in the country cover low farm gate prices, lack of alternative market outlets, dictated prices by middlemen, high costs of farm inputs, incidence of pests and diseases, environmental problems, lack or inadequate support infrastructures (roads, irrigation), and lack of access to current farming technologies.

While, the policy recommendations for addressing these challenges and improving the situation include non-interference by government on price levels of commodities, increased availability of loans/less stringent requirements, more cooperative buying stations, more machinery centers (custom hiring, repairs), support to manufacturers, more support infrastructures, and discourage land division.

The newly enacted law on Agriculture and Fishery Mechanization (AFMech Law of 2013) is expected to promulgate plans for a sustainable mechanization development contributing to the agriculture modernization in the Philippines.

Vietnam

Vietnam's Agricultural Mechanization Strategies

Mr. Nguyen Duc Long
Head
Department of Personnel and Administration
Vietnam Institute of Agricultural Engineering and
Post-Harvest Technology (VIAEP)

Mr. Nguyen Duc Long obtained his Engineering Degree in Mechanic at Hanoi University of Agriculture, and Bachelor's Degree in Economical Business at National Economic University in Vietnam in 1999. Mr. Nguyen obtained a M. Sc Degree in Agricultural Mechanism at Hanoi University of Agriculture in 2003. He also participated in a 6-month training in Japan pertaining to utilization and preservation techniques for agricultural and animal products. From 1993 to 2010, Mr. Nguyen worked as researcher in Vietnam Institute of Agricultural Engineering and Post Harvest Technology. Between 2006 and 2011, He was as the Scientific Secretary of the National Program on Science and Technology for Industrialization and Modernization in Agriculture and Rural Areas run by the Vietnam Ministry of Science and Technology. In 2013, Mr. Nguyen was appointed as the Head of the Department of Personnel and Administration of VIAEP.

According to statistical data, 70% of the population is engaged in agriculture in Vietnam. Major food staples in Vietnam are rice, corn, legumes. Due to weak awareness and lack of skills and technologies, farming operation in Vietnam usually causes negative impacts to the environment and health of the farmers, which include, for example, spraying overmuch pesticide and burning crop residues in the field, etc.

At present, the traditional production method based on human and animal labor still played a dominant role in Vietnam with limited application of mechanization. Mechanization ratio for soil-related operations is approximately 70% while is lower than 30% for other stages and the share of agricultural labor against the total labor force is more than 50%. That is to say, the development of agricultural mechanization in Vietnam is still at a preliminary stage. The highest level of applying agricultural machinery in Vietnam is at the Mekong River Delta areas.

The invested engineering equipments for agriculture and rural construction are showed below:

Year		Cultivation in agricultural field and cultivated soil for forestry plants	Immobile equipments	Fishing	Cargo ships for rivers and canals	Total	Comparison 2011/2001
2001	Horsepower	4,590,000	9,282,000	4,720,000	3,100,000	21,472,000	
	Ratio (%)	21.37	43.78	21.76	14.29	100	
2006	Horsepower	5,739,690	11,973,000	6,200,000	7,856,620	31,841,394	1.48
	Ratio (%)	18.03	37.60	19.70	24.67	100	
2011	Horsepower	9,740,240	15,804,360	7,449,358	9,485,310	42,479,268	1.33
	Ratio (%)	22.92	37.20	15.20	24.68	100	

Source: Vietnam General Statistics Office, 2012

In Vietnam, agricultural mechanization technologies are needed for two main purposes, namely, to improve yield and quality of main crops, and to reduce post-harvest losses ensuring quality and food safety. For achieving the first purpose, the most needed technologies include comprehensive mechanization for rice production, mechanization in drainage and irrigation, development of greenhouse system and devices to create micro-climate area, comprehensive mechanization for sugar-cane production, and mechanization for corn and legumes. While, technology and equipment for rice seed processing, and drying technology and equipment for agro-products are requisite for reducing post-harvest losses.

Recent years, the Vietnamese government has issued various regulations and programmes to support sustainable agricultural mechanization. Resolution No. 26-NQ/TW issued on Aug. 5th 2008 on agriculture, farmers and rural areas set the following two targets pertaining to agricultural mechanization by 2020:

- building the agriculture sector toward modernization, and industrialization and development of services in rural areas; and

- enhancing research, transfer and application of science, technology, human resources training, making breakthrough to agricultural modernization and rural industrialization.

Framework of Adapting to Climate Change Programme in the period of 2008-2020 issued on Sep 5th 2008 by the Sector of Agriculture and Rural Development together with the Minister of Agriculture and Rural Development's Decision No. 2730/QD-BNN-KHCN states that the key activities in climate change minimization and adaptation of the sector include "the implementation of research program; the planning of infrastructure of agriculture and rural, farming systems of agriculture, forestry, fishery and salt production so to prevent and mitigate natural disasters towards enhancing adaptation to climate change ". Action Plan of the Ministry of Agriculture and Rural Development has set the task of implementing 16 strategic projects by 2020 related to agricultural and post-harvest technology covering agriculture and rural development, horticulture, irrigation, and mechanization and post-harvest loss reduction in agriculture, etc. Resolution 48/NQ-CP dated on Sep 23rd 2009 was about mechanisms and policies to reduce post-harvest losses of agricultural products and aquatic products. On Jun. 4th 2010, the Vietnamese Prime Minister signed Decision No. 800/QD-TTg approving the national target program on new rural construction for the period of 2010-2020. And the Programme on Developing High-tech Agriculture has been issued to the national government for approval, which was drafted by the Ministry of Agriculture and Rural Development with extensive consultation with relevant experts.

To improve the quality and lower the cost of mechanized products for agriculture and rural development, a comprehensive solution is needed ranging from developing orientation, research & development, planning and supporting policies from Government on investment in equipment, training and fostering of knowledge management as well as technical skills to operate the equipment, combining machinery complexes, technology assemblies to managers and skilled workers.

The priorities of agricultural mechanization development in the process of agricultural modernization in coming years in Vietnam cover mechanization of production stage, mechanization of the processing of agricultural (forestry and fishery) products, and research on energy sources of agricultural machinery.

Efforts to promote sustainable agricultural mechanization in Vietnam contributing to agricultural and rural development could be focused on speeding up the implementation of the various Resolutions. Efforts need to be made to developing policies to encourage investment in dynamic engine and agricultural machinery production, and to strengthen human resource development including conducting short-term training programmes for management officers and farmers.

In conclusion, mechanization in Vietnam has experienced significant improvement, while farmers are the major investors of agricultural machinery and equipment. Yet, the scale of investment and business of agricultural machinery is still small, especially for complex high-tech combining equipment like agricultural-forestry-fishery processing assemblies. In addition, the level of comprehensive mechanization is still low, and the application is generally focused on soil preparation, threshing, water pumping and rural transportation, while more efforts should pay as well on transplanting, sowing, cutting and harvesting. The machinery manufacturing industry has a significant progress in terms of providing dynamic engines, agricultural equipment for crop production and processing stages. However, for some high-tech agricultural and processing equipments, the industry in Vietnam still lacks the technical competence. In addition, the policies adopted by the Vietnamese government supporting the development of agricultural mechanization began to have positive effects. The financial sectors have invested in the production and manufacturing of agricultural machinery for agriculture, forestry and fisheries processing. And farmers can get loans with preferential interest rates for purchasing agricultural machinery and equipments better serving the whole process of production.

III.

Regional and Global Strategic Initiatives

Asian and Pacific Network for Testing of Agricultural Machinery (ANTAM)

Dr. Sandro Liberatori

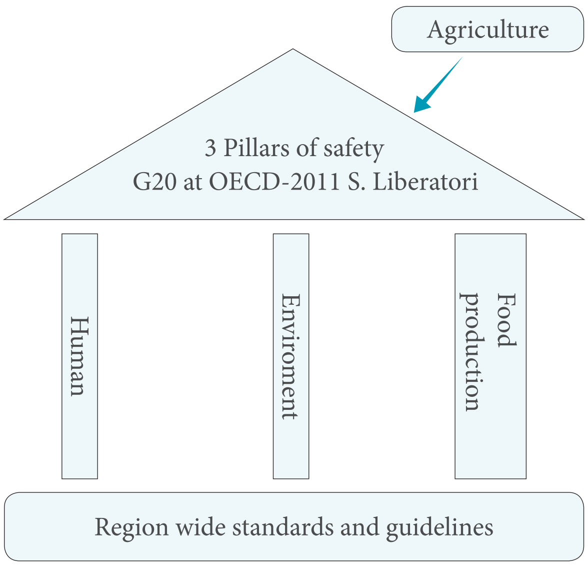
General Director of ENAMA (Italian Body for Agricultural Mechanization and Engineering)

Dr. Sandro Liberatori is the General Director of ENAMA (Italian Body for Agricultural Mechanization and Engineering). ENAMA is acting for the Ministry of Agriculture and its Members as a certification body in the field of agricultural engineering. Sandro is actively involved in international co-operation in OECD (Organization for Economic Co-operation and Development) as past Chair of the Tractor Codes and National Designated Authority of Italy; in ENTAM (European Network for testing Agricultural Machines) and in UN-ESCAP/CSAM offering his experience in the development of the ANTAM Network. He has more than 140 publications at national and international level and more than 90 presentations at national and international conferences. In 2004 he received the Banhazi commemorative medal, the highest Hungarian tribute of respect awarded for foreign scientists acting in agricultural engineering by the Scientific Council of MGI (Hungarian Institute of Agricultural Engineering). He is Member of many Governing Bodies and Committees at national and international level. Sandro is also involved in voluntary work for non profit associations.

Governments adopted development agenda for inclusive and resilient growth. The agriculture development will reflect the key priorities of the development agenda, including sustaining inclusive growth, sustainable development & resilience, and regional cooperation & connectivity.

Nowadays, the world agriculture is the primary sector of the economy. The agricultural output in 2011 all over the world is USD 4.249.237 billions, accounting for 6.2% of the world GDP. Chemicals are widely used in agriculture and agriculture has close relation to the environment. In addition, agriculture work is one of the most hazardous occupations.

Agriculture, itself implies three pillars of safety respectively on human, environment, and food production. And region wide standards and guidelines could help to ensure these safeties.



The creation of an Asia-Pacific Network for Testing of Agricultural machinery has the Organization for Economic and Development (OECD) and the European Network for Testing of Agricultural Machines (ENTAM) as examples currently in operation. Both institutions have offered strong support for the establishment of such a network in the region. Taking up this challenge, the Centre for Sustainable Agriculture Mechanization (UN-CSAM), one of five regional institutes under the umbrella of the United Nation Economic and Social Commission for Asia and the Pacific (ESCAP), has promoted the establishment of an Asia-Pacific network for testing agricultural machinery and farm implements, more commonly referred. ANTAM will facilitate the trade and use of agricultural machines and implements fulfilling common requirements of safety (operator, environment, and food production) and performance.

A system based on standardization, testing/verification and certification is the frame for development and trade offering benefits to all stakeholders. For governments, it implies less social cost, less environmental cost, and more food quality and security. Higher quality and more exports, less responsibilities, and fair competition could be expected for manufactures. And farmers could be benefited from the higher quality of production, less injuries, and reduced cost.

To make ANTAM more affective, the following issues need to be discussed and addressed:

- Common basis for standards and guidelines; ENAMA has provided two crop protection testing methodologies as a first step.
- Common policies for agricultural mechanization; and
- Step by step policy/deadlines until ANTAM could be operated as ENTAM.

The existing networks on agricultural machinery include OECD Tractor Codes Certification and ENTAM European Network for Testing Agricultural Machines could be good reference for ANTAM. The OECD tractor Codes involve 34 Member Countries and 32 Testing Stations. OECD codes exemplify the standardization, testing, and certification system under the umbrella of an intergovernmental organization.

ENTAM is an agreement between different countries. On the platform, countries develop common activities in the field of agricultural and forestry engineering; develop common activities and documents with the aim to develop testing activities for the mutual recognition of test and test reports in the field of agricultural and forestry engineering; develop common research projects; promote the exchange of information among the institutions; and keep contacts with other National, International, public and private Institutions.

Promoting Sustainable Development of Agricultural Mechanization in the Asian-Pacific Region: "Taking A Global Perspective"

Dr. John Stevens,
Director, Flexiseeder Ltd

Dr John Stevens is an agronomist, international agriculture consultant, inventor, engineer and a farmer. John holds a Masters in Range Management from Lincoln University, New Zealand and a Ph.D in Agronomy from the University of Nebraska, USA. He has spent over 30 years working as a consultant on agricultural development programmes in South America and throughout Asia, specialising in seed technology, plant breeding, agricultural mechanization and agricultural rehabilitation covering all stages of project cycles. During that time he has also been deeply involved in research, development and field evaluation of plot / small scale and farm seeding equipment for reduced tillage and difficult arable soils, suited to emerging, transitional and developed economies, particularly since 2000 through his company Flexiseeder Ltd. He has a very close working relationship with colleagues at the Swedish University of Agricultural Sciences, Qingdao Agricultural University and Lincoln University where he is deeply involved with the work of the Lincoln University Seed Research Centre and a Trustee of the Seed and Mechanization Development Charitable Trust (SEMEC). Through this association he has supported IAMFE (International Association for the Mechanization of Field Experiments) globally since 2000 / ongoing including senior executive positions.

In regard of the importance of networking for sustainable Agricultural Mechanization, we introduce the International Association for the Mechanization of Field Experiments (IAMFE). Its global head office is in Qingdao Agricultural University. It is a non-profit organization founded in Norway in 1964. It has more than 120 Countries as members or contacts, and Branches in 10 countries. It was founded by Prof Egil Oyjord, Norway.

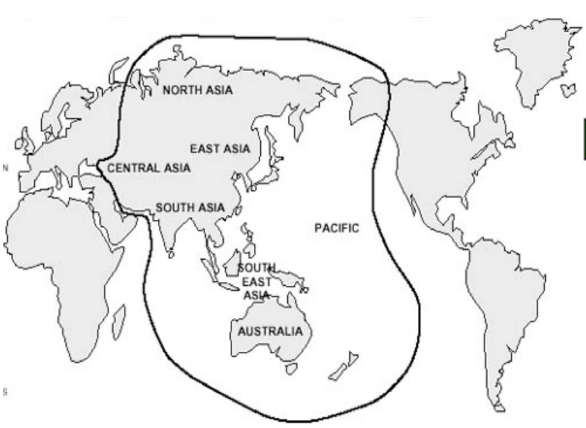
Lincoln University Seed Research Centre - SEMEC (Seed and Mechanization Development Charitable Trust) is the contact and focal point for Australia & New Zealand including 13 years of collaborative activities in agricultural seeding equipment with Qingdao Agricultural University; and through SLU (Swedish Agricultural University, Uppsala), other Nordic and European Agricultural Universities, research stations and commercial companies.

Out of this association, a new generation of global modular plot and small farmer drills has been developed, and brought into the market, suitable for local manufacture and use in emerging, transitional and developed agricultural economies, covering traditional as well as reduced and zero tillage. A key feature of these technologies is that the coulters require substantially less down pressure than normal to penetrate the soil. Meaning lighter than average frames and other related components including necessary tractor power can be used.

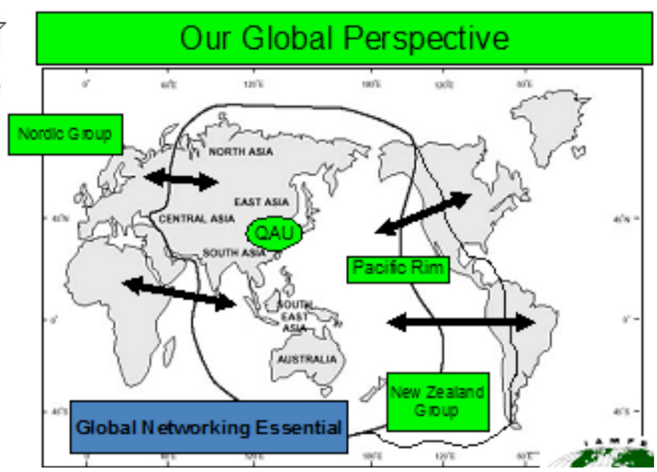
Flexiseeder Ltd is the core risk taking / financial element of this very successful ad hoc global collaborative group which includes a strong core philanthropic / educational / technical voluntary seed and machinery help-group including placing core designs into trust with SEMEC for member use including IAMFE members, free of royalties. Membership is open to individuals, public and private organizations, agencies and other entities.

Resulting from this experience including sourcing high-quality components from emerging and transitional as well as developed economies within Asia and the Pacific region, we propose that an expanded perspective is needed to assist with the sustained economic and social development, manufacture and extension of agricultural mechanization across emerging, transitional and developed economies. This is in stark contrast to traditional more localized regional perspectives, including helping the poorest of the poor.

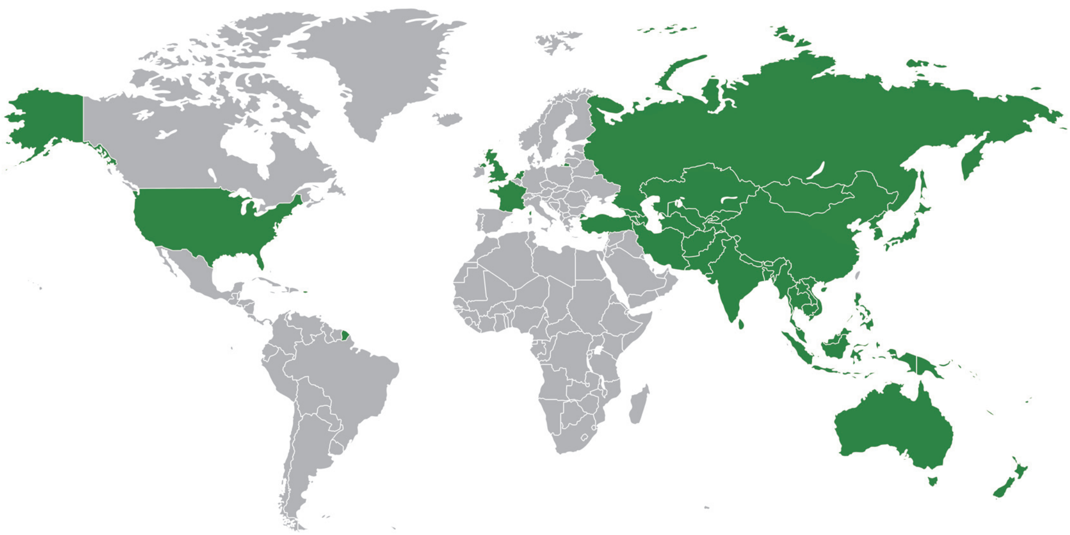
Traditional Regional Geographic Perspective – where Australia and New Zealand tend to fall outside of equipment networks for the rest of Asia, in spite of sourcing a substantial proportion of their machinery components from these areas. It is a dual economy which needs to change, for the benefit of all.



Traditional Regional Geographic Perspective



Our Global Perspective matches well with the geographic spread of the 52 country membership of ESCAP including 9 associate members (global coverage shown below); and the mandate of ESCAP, of which CSAM is an integral part. To this needs to be added improved networking to facilitate "cross over" of technologies between member countries spanning emerging, transitional and developed economies in properly planned and financed ways likely to be economically viable and sustainable.



Map showing United Nations Economic and Social Commission for Asia and the Pacific members

Regional and global networking in seed and machinery year-round on basis of agro-ecological overlap / analogues is a powerful and now well proven tool for:

• Promoting and facilitating end user contact networks that involve using integrated Seed, Machinery and Livestock chain - value added (pyramid) approaches across the full range of levels of economic development;
• Rationalization and modularization of components / parts / components across brands, end uses and economies (including but not limited to lights, wheels, bearings, chain, sprockets, castings);
• Highlighting advanced component manufacture – for example casting and machining seed drill parts; and
• Mandating focal points to bring science, parts and production closer together – "hands on". Flexiseeder is a good working example of this.

From 2000 -2013, the Flexiseeder group has been working in the following major areas:

• Commercial product – Modular plot drills & farm drill components – mixed and matched across brands / economies / seed, machinery and livestock chains;
• New and existing technologies up-graded and offered back to suppliers;
• Nordic – NZ (year round activities) with outreach, including China where many parts are sourced and voluntary student training given;
• Basic frame design placed in trust – including selected coulters equally suited to reduced tillage in emerging, transitional and developed economies; and
• Selected elements / modules retained for commercial production including technical back-up to help sustain operations.

Our applications cover a wide range of seed, machinery and livestock value added chains (pyramids). For instance:

- Tropical, Sub-tropical, Temperate, Mediterranean, Continental, Sub-arctic, Antarctic ecologies;
- Crop improvement / seed industry at all levels covering breeding, cultivar identification, development and maintenance - including accelerated seed increase & commercial seed production;
- Applied global and local agro ecology – mixing / matching cultivars, crops, equipment, projects and programmes using sequential approaches bridging emerging, transitional and developed economies;
- Agricultural mechanization particularly seeding into difficult environments - traditional, reduced and zero tillage (plot, small scale and farmer machines); Because our coulters need less than normal down pressure to penetrate, our basic test bed suited to all global conditions / situations is, by using a "Lego like" approach, also the basic design of our farmer drill for emerging and transitional economies. Easily scaled up for broad acre machines.
- Project identification, documentation, fund raising, start-up monitoring and evaluation, training at all levels, emergency relief, rehabilitation and development support.

The Flexiseeder ad hoc group is now ready for new members and investors so that financial management and co-ordination can be strengthened and handed over to subsequent generations so as to continue development and sustain the technology. At the China EXPO we saw many new modules, components and complete items which would fit in well to the Flexiseeder range targeting emerging, developing and developed economies. Including mentoring / training / philanthropy / commercial / and educational aspects; and, an on-line shop prepared for investors.

The present structure of Flexiseeder is illustrated as below:

1) Flexiseeder Ltd, a small family company and IAMFE member which is the major funding and risk taking entity for the group; open to suggestions and guidance including being re-structured / mentored / expanded as appropriate to provide necessary sustained support for the Flexiseeder group going forward;
2) Swedish Ag University (Swedish contact point for IAMFE) and Lincoln University Seed Research Centre / SEMEC (NZ & Australia contact point for IAMFE);
3) Qingdao Agricultural University as a core educational / extension – outreach base example of IAMFE Global Headquarters at work in support of its members; and
4) Regional / global portfolio of end users and contracted suppliers.

IV.

Public-Private Partnership Dialogue: Opportunities for Regional Cooperation and Business Development

Speech of Shandong Changlin Deutz-Fahr Machinery Company LTD

Mr. Marcello Albertini
CEO
Shandong Changlin Deutz-Fahr Machinery Company LTD.

I am very honored to make this speech as a delegate of enterprises. I come from SAME DEUTZ-FAHR Group in Italy, now holding the post of CEO in the Sino-Italian joint venture company - Shandong Changlin Deutz-Fahr Machinery Company LTD.

SAME DEUTZ-FAHR Group in Italy was established in 1927, now has become a world leading Agricultural Machinery manufacturer. Under the background of globalized competition, For overall market development in China and the Asia-pacific area, in April 2011, we came to China, planned to seek and cooperate with an powerful agricultural machinery manufacturer who with opening sense. After comprehensive study, we selected Shandong Changlin Group as our partner, and we signed our joint venture contract and held the foundation laying ceremony on Oct. 14th, 2011.

The reason why we selected Shandong Changlin Group is easy: it is an outstanding enterprise among Chinese agricultural machinery industry, its distribution network covers the entire China market; it has long history and great experience of production, development and marketing in agricultural machinery range. We have also realized that Chinese enterprises is marching towards international stage, and becoming a key player of world economy.

With the rapid growth of Asia-pacific economy, the demand of food is also growing rapidly in both quantity and quality. With the continuous development of modern agriculture, small pieces of land are gathering together into large ones, formed up more and more cooperatives like mushrooms after rain; the existing large scale farms in some area also in urgent need of modern agricultural machinery, implements etc to promote their overall agricultural mechanization level; more and more rural area are speeding up and deepening their urbanization, the structure of the labour force, as well as the labor attitude are with profound changes, so the modern agriculture need to build up high-yield, high quality, high efficiency, ecological and safe development mode, to promote the productivity and meet the increasing food demand; as modern agricultural machinery manufacturers, we should take our historical mission, take the power of innovation, and constantly enhance the level of the comprehensive, harmonious and sustainable agricultural mechanization development, provide the modern farmers high-end agricultural machinery, implements, to cover their entire production process, help them to realize the promotion of both quantity and quality of food.

CIAME is the largest and the most influential agricultural machinery exhibition in Asia-pacific area. With "Asia-pacific regional sustainable agricultural mechanization forum", it provides an excellent communication platform for relevant international agencies, governments in Asia-pacific area, as well as excellent enterprises in agricultural machinery industry.

Shandong Changlin Deutz-Fahr Machinery Company has prepared its excellent products, and we will also take the opportunity of this Forum, to study the advanced experience and solutions in agricultural mechanization from other outstanding enterprises, provide better products for different markets.

We expected to have further communication with all the leaders, experts and partners participate this forum, to share mutual benefit by complement each other's advantages, make our unremitting endeavor to promote the sustainable development of agricultural mechanization in Asia-pacific area.

Thanks to all of you.

Summary of Discussion

Topic1: How to cope with the bottlenecks in the implementation of sustainable agriculture and sustainable agricultural mechanization in the Asian and Pacific Region countries?

Experience from India: In the beginning, farmers may have some objections, then they find it is a good system, which requires less time. There are many local conservation agriculture machines are in use especially in the northern part of India, the farmers do have some concerns, but it does increase their yields by 10 % -20 %. It also helps with the reduction of greenhouse gas.

In terms of food production, fuel certification is needed. Especially oil, vegetable oil, they need to be verified, not just to ensure product quality, but also to demonstrate sustainable processes.

Topic2: How to ensure the improved quality of agricultural machinery?

Experience from India: There are a lot of manufacturers in India, some are relatively large scale , there are some relatively small size. The product is of relatively poor quality , the cost is relatively low. We bought a relatively high quality products, such as China 's rice transplanter. An Indian manufacturer may provide the transplanter by half of the price, and with lower quality. In India, the machinery are provided through the government system, so we need to have a detection agencies to detect the quality , which is a mandatory.

Experience from Indonesia: We have established a committee to test agricultural machinery. Agricultural machinery that enter Indonesia all need to go through this body detection. The problem is that we only test its performance, not its quality. Quality is more difficult to test. We will educate farmers, for example: if you buy a cheap tractor, then 1-2 years later, it can not be used; If you buy a good quality tractor, although the cost is high, it can last more than 5 years.

Experience from ENTAM: In general, the better the quality is, the better the performance is. However, not to spend more money, is a cultural concept. Safety culture and performance of the machine culture should enter into the concept among farmers in Italy in this situation: the farmers just buy the cheapest farm machinery, although the first time they spend very little money, but it costs more money over a long time, and some agricultural chemicals will be wasted. Therefore, this is not a technical concept, but rather a cultural concept.

CSAM: ANTAM will coordinate the relevant standards bodies at the regional level according to the standard for export, import agricultural trade.

Annexes

Annex 1:
Program of the Regional Forum

Saturday, 26 October 2013	
10:00 – 10:30	**Opening of the China International Agricultural Machinery Exhibition (CIAME 2013)**
10:30 – 12:00	**Visit the Exhibition and attend demonstration activities** • International Rice Machinery • Demonstration of digitalized manufacturing • Agricultural aviation demonstration
12:00 – 13:30	Lunch Break
13:30 – 17:00	**Visit of the Exhibition**
18:00 – 20:00	**Welcoming Reception**
Sunday, 27 October 2013	
09:00 – 10:20	**Session I: Opening and Regional Overview** **Moderator: Mr. Ma Shiqing, Executive Vice-Chair of China Agricultural Mechanization Association (CAMA)** • Welcoming remarks Mr. Mao Hong, Chairman of China Agricultural Machinery Distribution Association Mr. Xu Zhenxi, Vice Mayor of Qingdao Municipal Government • Opening remarks by Dr. Ravi Ratnayake, Director of Trade and Investment Division, ESCAP • Opening remarks by Mr. Percy Misika, FAO Representative in China, DPR Korea and Mongolia, FAO Representation in China • Presentation on 'Sustainable Agricultural Mechanization Strategies (SAMS)' in the Asian-Pacific Region - *Ms. Rosa Rolle, Senior Agro-Industries and Post-harvest Officer, Regional Office for Asia and the Pacific of the Food and Agriculture Organization (FAORAP)*

	• Presentation on 'An Overview of Agricultural Mechanization in the Asian-Pacific Region' - *Mr. Zhao Bing, Head of CSAM*
10:20 – 10:40	Coffee break
10:40 – 12:10	**Session II: Regional and Country Strategic Initiatives** (This session is dedicated to knowledge and information sharing on major ongoing strategic initiatives in the region and beyond.) **Moderator: Dr. Ravi Ratnayake** • Presentation on 'China's Agricultural Mechanization Policies' - *Mr. Liu Hengxin, Deputy Director-General of the Department of Agricultural Mechanization, Ministry of Agricultural of China (MoA)* • Presentation on 'ANTAM & ENTAM—A Partnership for Safer and Higher Quality Agricultural Machinery' - *Dr. Sandro Liberatori, European Network of Testing of Agricultural Machines (ENTAM)* • Presentation on 'China's Mechanization Industry Development from International Perspective' - *Mr. Chen Zhi, President of China Association of Agricultural Machinery Manufacturers (CAAMM)* • Presentation on Indonesia Agricultural Mechanization Strategies - *Dr. Astu Unadi, Director of the Indonesian Centre for Agricultural Engineering Research and Development (ICAERD), Ministry of Agriculture of Indonesia* • Presentation on India Agricultural Mechanization Strategies - *Dr. Champat Raj Mehta, Project Coordinator, AICRP on Farm Implements and Machinery, Central Institute of Agricultural Engineering, India* • Presentation on Sri Lanka Agricultural Mechanization Strategies – *Dr. M.H.M.A. Bandara, Chief Engineer, Department of Agriculture, Sri Lanka* • Private Sector's perspective - *Mr. Marcello Albertini, CEO of Shandong Changlin Deutz-Fahr Machinery Company LTD.*
12:10 – 13:40	**Lunch Break**
13:40 – 14:40	**Session III: Country Perspectives** (This session is to provide overviews of the status quo, challenges and prospects of agricultural mechanization in participating countries.) **Moderator: Dr. Champat Raj Mehta** • Presentation on Cambodia Agricultural Mechanization Development – *Mr. Chan Saruth, Director, Department of Agricultural engineering, Ministry of Agriculture, Forestry and Fisheries* • Presentation on Kazakhstan Agricultural Mechanization Development – *Mr. Yespolov Isabaevic Tlektes, Rector, Kazakh National Agrarian University*

	• Presentation on Malaysia Agricultural Mechanization Development – *Dr. Chee Sheng Chan, Principal Research Officer, Malaysia Agricultural Research and Development Institute* • Presentation on Mongolia Agricultural Mechanization Development – *Mr. Davaasuren Yesunerdene, Officer, Agriculture Crop Policy Implementing Department, Ministry of Food and Agriculture and Light Industry* • Presentation on Nepal Agricultural Mechanization Development – *Mr. Shreemat Shrestha, Division Chief, Agricultural Engineering Division, Nepal Agricultural Research Council*
14:40 – 15:00	Coffee break
15:00 – 15:50	**Session III: Country Perspectives (cont.d)** **Moderator: Dr. M.H.M.A. Bandara** • Presentation on Pakistan Agricultural Mechanization Development – *Dr. Abbas Syed Ghazanfar, Technical Staff Officer to Chairman, Director (Farm Mechanization), Pakistan Agricultural Research Council (PARC)* • Presentation on Thailand Agricultural Mechanization Development – *Mr. Viboon Thepent, Senior Agricultural Engineering Specialist, Agricultural Engineering Research Institute, Department of Agriculture* • Presentation on the Philippines Agricultural Mechanization Development – *Prof. Delfin Coronado Suministrado, Professor, Agricultural Machinery Testing and Evaluation Center, College of Engineering and Agro-Industrial Technology (CEAT)* • Presentation on 'Vietnam's Agricultural Mechanization Strategies' – *Mr. Nguyen Duc Long, Head, Department of Personnel and Administration Vietnam Institute of Agricultural Engineering and Post-harvest Technology (VIAEP)*
15:50 – 17:30	**Session IV: Public-Private Partnership Dialogue: Opportunities for Regional Cooperation and Business Development** (This session is to open dialogues and discussions among the public-sector representatives on opportunities for regional cooperation and trade and investment. A question-and-answer approach will be used.) **Moderator: Mr. Zhao Bing / Mr. Shang Shuqi, Dean and Professor, Colleague of Mechanical and Electrical Engineering, Qingdao Agricultural University**
18:30 – 20:00	Official Dinner

Annex 2:
Feedback

Summary of the Participant Evaluation Form

Regional Forum on Sustainable Agricultural
Mechanization in Asia and the Pacific
26-27 October 2013
Qingdao, China

Profile of the questionnaire responders

22 participants completed the evaluation questionnaire, which provides a good baseline for improving similar events in the future. The profile of the 22 participants is showed in Table 1:

Table 1: Profile of the questionnaire responders

Gender	Male		Female		
	21		1		
Agency / organization	Government	Private	NGO	Academia	Other
	11	4	1	3	2

Note: 1 participant did not indicate the type of his agency.

Level of satisfaction

Participants were invited to rank their level of satisfaction of the Forum in terms of logistics, topics, and speakers from very satisfied, satisfied to dissatisfied. The results are showed in Table 2:

Table 2: Level of satisfaction of the responders

	very satisfied	satisfied	dissatisfied
Registration process	16 (73%)	6 (27%)	0
Organization/venue	15(68%)	7 (32%)	0
Topics	13(59%)	9 (41%)	0
Speakers*	9 (41%)	11 (50%)	0
Overall satisfaction	12 (55%)	10 (45%)	0

*2 participants did not respond to this question.

Willingness to recommend the Forum: All the 22 participants would like to recommend the future forums of CSAM to others.

Usefulness of the meeting

Participants were invited to comment the usefulness of the meeting in terms of its information and documents, which is showed in Table 3:

Table 3: Feedback on usefulness of the meeting

	Useful	Not useful
Usefulness of information	22 (100%)	0
Usefulness of handouts and documents	22 (100%)	0

Detailed comments for the Forum:

Participants were invited to comment, in specific, on the topics that would be useful to the participants and/or their countries for future forums, personal benefits gained from the Forum, and suggestions for improvement.

- **Specific topics and/or contents that would be useful to the participants or their countries:**

➢ agricultural mechanization policies, patterns of agricultural mechanization, taxes for agricultural machinery, demands for agricultural machinery, agricultural mechanization laws or acts in countries;
➢ share the success and failure of the countries in the region in agriculture mechanization, including constraints and challenge faced, strategy and technology applied, as well as the big social and economic context in developing countries;
➢ cooperation of science and industry in the field of agriculture and in particular in mechanization;
➢ regional standard of agricultural machinery;
➢ standardization on farm machinery data collection;
➢ control and supervise to quality of agriculture machinery and equipment;
➢ measurement of the efficient use of agricultural machinery;
➢ contract farming, conservation agriculture, precision farming and renewable energy, and zero-waste agriculture approaches;
➢ application of fertilizer/chemical & storage; and specific machinery like mini tillers and rice trans-planters; and
➢ define and promote the concept of "sustainable agricultural mechanization".

- **Benefits the participants personally have drawn from this forum:**

➢ overviews of agricultural mechanization development in different countries;
➢ networking with the key stakeholders in the field including governmental officials, professionals, and manufacturers from other countries; and
➢ acquaintance of the new progress of agricultural mechanization in China and the world, especially via participating the 2013 China International Agricultural Machinery Exhibition

- **Comments/Suggestions for improvement:**

➢ Arrange more time for discussion and dialogue
➢ give more publicity to the organization and the work the organization does
➢ supply a common power point template and a CD containing all of the presentations at the end of the Forum
➢ circulate the presentation materials before the event
➢ try to supply all documents in English
➢ one more day may be kept for field visit and visit to any R&D organization in the host country of the Forum
➢ organize such events always in parallel with the main farm machinery activities

ANNEX 3:
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