

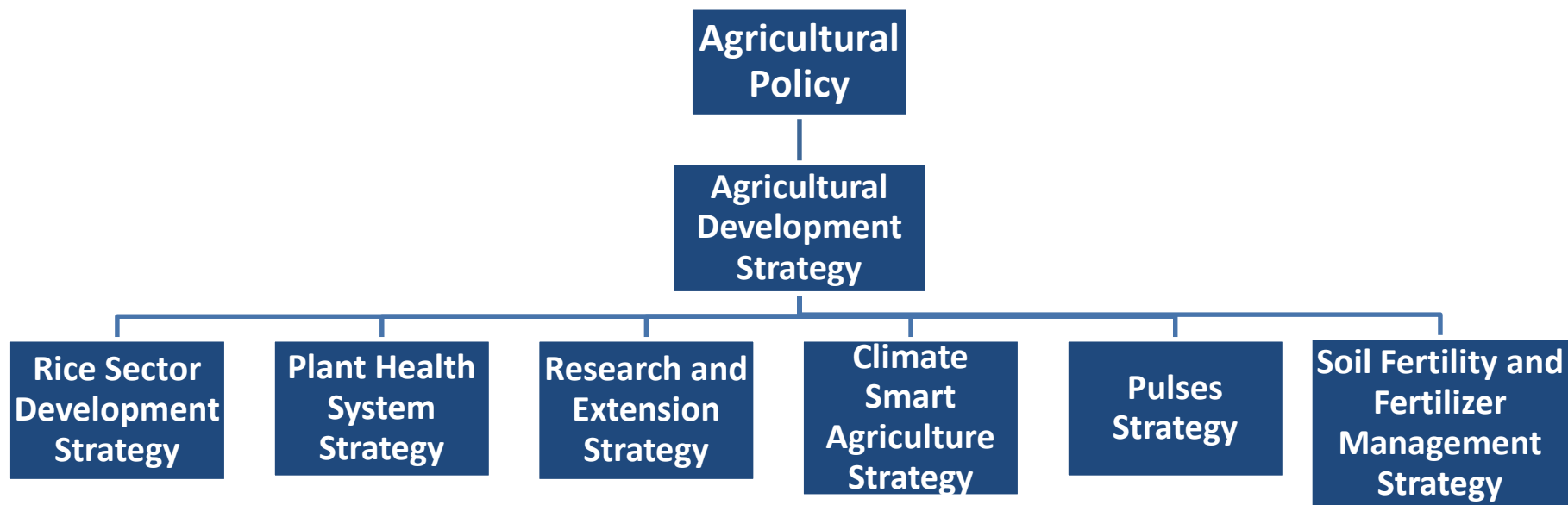
Soil Fertility and Fertilizer Management Strategy for Myanmar

**Myanmar Soil Fertility and
Fertilizer Management Conference**

**20 October 2017
DAR Auditorium
Yezin, Nay Pyi Taw**

Hierarchy of Policy and Plans

National Reforms and Plans



National Agriculture Policy of Myanmar

Vision Elements

| Vision Elements | Indicators |
|--------------------------------|---|
| Inclusion | <ol style="list-style-type: none"> 1. Marginal/landless male farmers' income 2. Marginal/landless female farmers' income 3. Rural poverty rate |
| Competitiveness | <ol style="list-style-type: none"> 1. Investment in agri-food sector 2. Value of agriculture exports 3. Value added in agriculture 4. Share of Myanmar agriculture exports in world agriculture exports |
| Food/Nutrition Security | <ol style="list-style-type: none"> 1. Stunting among children under 5 2. Underweight among children under 5 3. Wasting among children under 5 4. Women of reproductive age with chronic energy deficiency |
| Sustainable | <ol style="list-style-type: none"> 1. Land productivity 2. Labor productivity 3. Adoption of good agricultural practices (GAPs) 4. Water use efficiency 5. Soil fertility |
| Well-Being | <ol style="list-style-type: none"> 1. Smallholder male farmers' income 2. Smallholder female farmers' income |

Source: Agricultural Development Strategy and Investment Plan (draft) 2016.

The ADS Outcomes

Three main outcomes corresponding to the three strategic pillars of governance, productivity, and competitiveness:

- **Outcome 1 – Enhanced governance and capacity of institutions responsible for agricultural development**
- **Outcome 2 – Increased productivity and farmers' income.**
- **Outcome 3 – Enhanced market linkages and competitiveness.**

ADS Output on Crop Inputs

The ADS will adopt measures to improve productivity and fertilizer use efficiency and will promote a greater role of the private sectors in demonstrations and awareness campaigns, organic and bio-fertilizer.

The Government will establish a fertilizer use and distribution information system including imports and stock.

It will also enforce quality assurance and strengthen the fertilizer inspection system, through capacity building and strengthening of the soil fertility division.

Soil Fertility Management and the Demand for Fertilizer

- **Rice remains the dominant crop even though the returns for paddy cultivation are low and falling;**
- **For all crops the focus has been on varieties and seed;**
- **The Land Use Division (LUD) of MOALI is responsible for characterization and monitoring of soil status in Myanmar**
 - Existing maps are 40 mile : 1 inch
 - A new soil map is in preparation at 16 mile : 1 inch
- **Existing data would indicate enough variability in physical and chemical properties to compromise blanket soil fertility management recommendations.**
- **Comparisons of nutrients removed by harvest with nutrients supplied by fertilizers would indicate soil mining of nutrients;**
 - For example, in 2016, 800,000 t of N was removed in crop harvests. 480,000 t was applied as fertilizer.

Area Sown, Yield, Production, and Nutrient Removal by Harvested Component and All Parts for Key Crops in Myanmar for 2015/2016

| Crops | Sown Area | Yield | Production | Nutrient Removed by Harvest (t) | | | Total Nutrient Removed by Harvest plus Straw (t) | | |
|-----------|-----------|--------------------|------------|---------------------------------|---------|---------|--|---------|-----------|
| | ('000 ha) | t ha ⁻¹ | ('000 t) | N | P | K | N | P | K |
| Rice | 7,212 | 3.6 | 26,210 | 382,666 | 68,670 | 68,146 | 581,862 | 81,251 | 686,702 |
| Maize | 472 | 3.7 | 1,749 | 31,482 | 7,696 | 10,162 | 39,877 | 9,619 | 48,972 |
| Pulses | 4,382 | 1.0 | 4,225 | 257,656 | 22,001 | 160,973 | 325,325 | 26,026 | 176,183 |
| Groundnut | 955 | 1.6 | 1,518 | 58,636 | 5,291 | 8,943 | 87,080 | 8,082 | 38,088 |
| Sesame | 1,530 | 0.5 | 827 | 33,131 | 6,898 | 33,907 | 42,177 | 7,443 | 35,561 |
| Wheat | 96 | 1.9 | 179 | 3,759 | 752 | 823 | 5,119 | 877 | 4,117 |
| Cotton | 291 | 1.8 | 521 | 28,287 | 3,519 | 4,205 | 31,521 | 3,751 | 15,630 |
| Sugarcane | 162 | 63.7 | 10,305 | 5,925 | 1,395 | 15,385 | 23,341 | 6,338 | 79,812 |
| Total | | | | 801,543 | 116,222 | 302,544 | 1,136,302 | 143,387 | 1,085,065 |

Sources: DALMS, 2017; USDA, 2017; IFA, 1992.

Estimated Fertilizer Use in Myanmar, 2013/14 and 2016/17

| Fertilizer Product | Fertilizer Use 2013/14 (t) | Fertilizer Use 2016/17 (t) |
|--|-------------------------------|-------------------------------|
| Domestic urea | 200,000 | 150,000 |
| Imported urea | 500,000 | 770,000 |
| Ammonium sulfate | 1,750 | 2,300 |
| Calcium ammonium nitrate | 740 | 1,000 |
| NPK compounds | 300,000 | 390,000 |
| Diammonium phosphate | 7,000 | 9,000 |
| Triple superphosphate | 90,000 | 118,000 |
| Muriate of potash | 20,000 | 26,000 |
| Other | 21,500 | 33,700 |
| Total Product | 1,140,990 | 1,500,000 |
| <i>Estimated nutrient value</i> | | |
| Nitrogen (N) | 371,070 | 484,100 |
| Phosphate (P ₂ O ₅) | 91,345 | 117,000 |
| Potash (K ₂ O) | 57,150 | 74,100 |

Types of Organic Fertilizers

| | |
|--|---|
| Farm wastes | Crop residues |
| | Animal manures |
| | Compost |
| | Green manures |
| Residues from processing of plant products | Fibers, pressed cakes (from oilseeds), grinds |
| | Wood materials |
| | Bagasse (sugar industry) |
| | Seaweed extracts |
| Residues from processing of animal products | Blood-, horn-, and bone-meal |
| | Leather dust, feathers |
| Urban wastes | Composted household refuse |
| | Sewage sludge |

Mineral Fertilizers in Myanmar

| Type of Fertilizer | Name and Nutrient Content (N-P ₂ O ₅ -K) |
|-----------------------|---|
| Straight | Urea (46.4% N), TSP (46% P ₂ O ₅), SSP (20% P ₂ O ₅), MOP ^a (60% K ₂ O) |
| Complex | Ammonium sulfate (21% N, 24% S), calcium ammonium nitrate (21-27% N, 8% Ca) SOP (50% K ₂ O, 18% S), DAP (18% N, 46% P ₂ O ₅), gypsum (20% Ca, 18% S) |
| | NPK: 25-7-7, 21-11-21, 20-20-10, 20-10-20, 20-12-12, 19-11-22 (100% water soluble), 16-16-8, 15-15-15, 15-7-8, 15-5-5, 12-13-0, 10-10-5, 9-25-25, 9-9-19, 5-5-5 |
| | NPKplus: 20-10-5-7S+ME, ^b 19-9-19-1S+2.1% Ca, 18-4-5-15S, 16-16-8-13S+ME, 15-15-30+ME (soluble), 15-15-15-7S+ME, 15-15-15+ME, 15-5-20-5S+ME, 13-13-21+ME |
| With additives | Urea + gypsum (40% N, 2.2% S, 3.8% Ca) |
| | Urea (44% N) with rice herbicide |
| | Urea (44% N) with growth regulators for vegetative and grain growth (Nitroguaiacol sodium salt and p-nitrophenol sodium salt), benzoic acid for pest control |
| | Ammonium sulfate plus rice herbicide (pyrazosulfuron-ethyl) |
| Foliar | Multi N-P-K, Multi-Fert, Super-K, Quick-Mg |

a. MOP also supplies chlorine (Cl), an essential nutrient.

b. ME = micronutrients.

Soils Research in Myanmar

Public

- **DAR responsible for soil and crop research**
- **LUD responsible for soil mapping; soil plant and fertilizer analysis**
- **YAU for research and teaching**

Private

- **Soil testing to generate meaningful soil data for recommendations based on balanced crop nutrient requirements**
- **Field trials and on-farm demonstrations to determine the most crop- and zone-specific fertilizer recommendations, with emphasis on their own products**

IO and NGO

- **International organizations, research institutions, and universities have played a vital role in training scientists and promoting agricultural research in Myanmar**
- **NGO activities provide opportunities for improving agricultural productivity**

Technology Transfer and Farmer Education to Improve Farmer Knowledge in Soil Management

Public

- **The Agricultural Extension Division under the Department of Agriculture is responsible for technology transfer and farmer education**
- **YAU role in agriculture extension is providing education to students that may join the DOA and DAE.**

Private

- **Primarily targets promotion of company-specific fertilizer products**
- **Typically through fertilizer dealers.**
- **Use market oriented systems of farm-level demonstrations of fertilizer products, technical leaflets, dealer trainings, and application of information technology (IT)-supported systems (including mobile phone-based systems)**

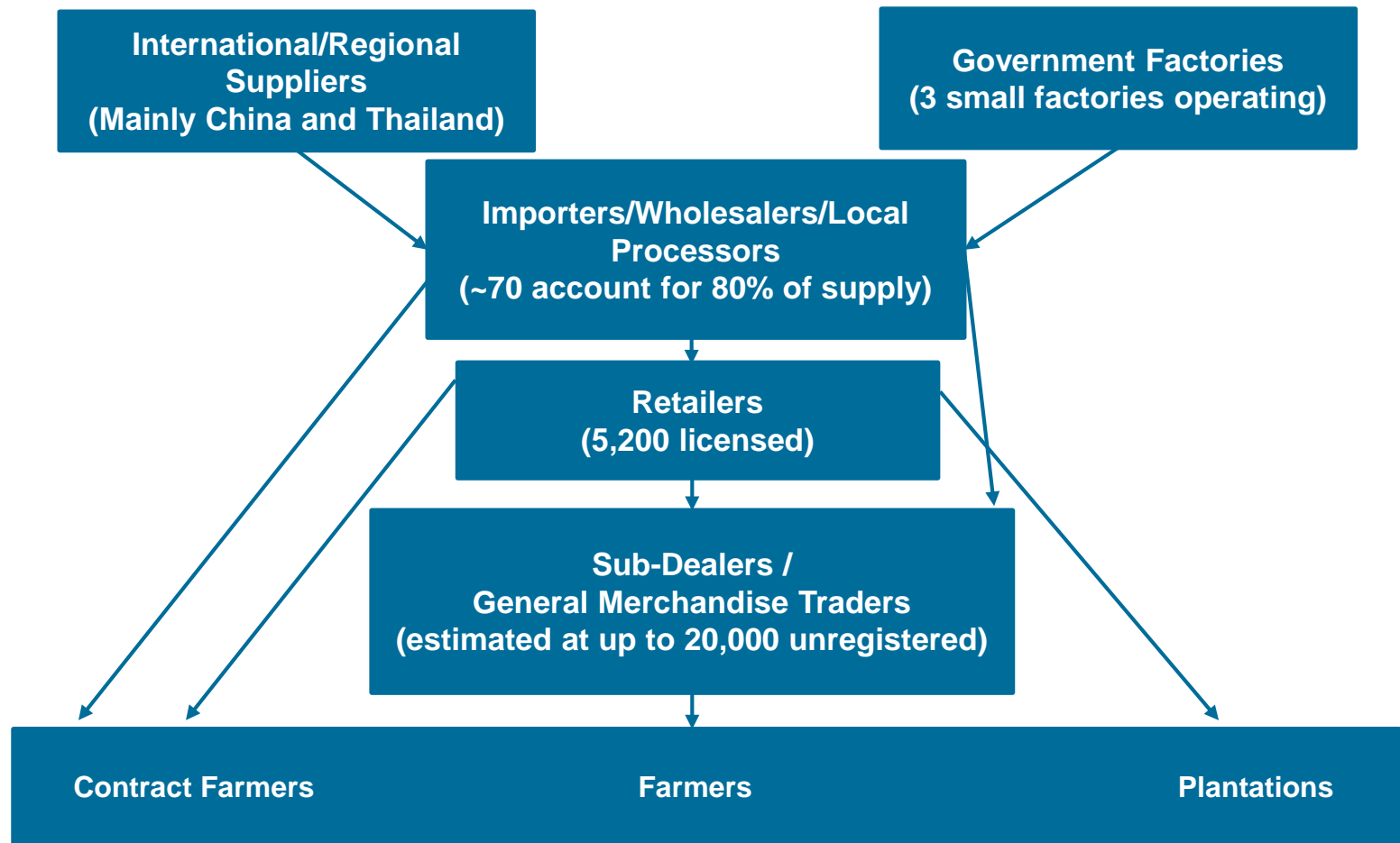
Basic Farmer Profile

- **80% of farm holders have less than 5 ha of land**
- **Small holders purchase inputs according to their financial capacity**
- **Most sell crops at harvest to repay loans**
- **Information and knowledge comes by word of mouth through friends, neighbors and family**
- **Lack of knowledge compromises adoption of new technology**
- **Farm labor is a constraint, and most management practices are determined by availability of labor. Hence most rice is broadcast seeded rather than transplanted.**

Role of Public and Private Sectors in Myanmar Fertilizer Market

| Function / Responsibility | Public Sector | Private Sector |
|---|---------------|----------------|
| Fertilizer policy/regulatory system | X | |
| Domestic fertilizer manufacture/processing | X | X |
| Fertilizer business/import license issuance | X | |
| Fertilizer import/wholesale activities | | X |
| Retail/dealer network development | | X |
| Fertilizer pricing | | X |
| Fertilizer product mix management | | X |
| Financial services: Marketing channel members | | X |
| Financial services: Farmers | X | X |
| Technology transfer/farmer education | X | X |
| Fertilizer recommendations/soil testing | X | X |
| Fertilizer product registration/quality control | X | X |

Schematic of Myanmar Fertilizer Value Chain (Physical Product Flow) – 2017



SWOT Analysis

Strengths

- GOM priority on improving agriculture sector performance, accelerating farmer adoption of modern technologies, establishing sustainable agriculture production systems.
- GOM policy based upon fertilizer market-economy.
- Active, dynamic private sector engaged in fertilizer supply, knowledge development/transfer, and improving farmer access to fertilizers.
- Private sector committed to long-term fertilizer market development.
- Farmers may adopt improved agricultural technologies if convinced of quality and potential returns.
- Crop diversification is expanding with improved returns to farmers, highlighting need for best management practices for fertilizers.
- Fertilizer market increasing rapidly with emphasis on balanced fertilizer use.
- Favorable fertilizer supply systems based upon low cost imports – excellent proximity to major international suppliers.
- Financial service system providers are interested in improving services to fertilizer value chain members/farmers.
- Priority attention to development of complementary seed sector and water management systems.
- Development of agribusiness/trade opportunities contributing to crop market improvements.

SWOT Analysis

Weaknesses

- Public sector soil and fertilizer research activities.
- Linkages between public sector research and extension underdeveloped, resulting in poor soil and fertilizer information dissemination.
- Farmer knowledge of fertilizer products and best use practices is low.
- Fertilizer dealer advisory capacity on fertilizer is low.
- Inconsistency in messaging systems from various stakeholders, including NGOs, on soil fertility management.
- Financial service systems underdeveloped in servicing needs of farmers and fertilizer dealers.
- Poor availability of fertilizer market information to support decision-making: time-series data on key fertilizer-market related issues (supply, demand, price) unavailable.
- Fertilizer law inadequate in clarity and completeness.
- Deficiencies in public and private sector systems to mitigate product quality risks contribute to uncertainty and low confidence in fertilizer quality at all levels – public sector, private sector, farmers.
- Domestic ammonia/urea factories are uneconomic due to technical issues and natural gas feedstock supply interruptions.

SWOT Analysis

Opportunities

- Strengthened public-private sector linkages in research and technology transfer to improve farmer knowledge on fertilizers and best management practices.
- Dealer role strengthened to support technology transfer to farmers.
- Financial service providers extend facilities to improve farmer loan provisions of MADB and dealer access to finance.
- Fertilizer Law reform to achieve an international standard of completeness and clarity.
- Linkages with international agriculture research centers to upgrade research programs on soil-fertilizer-crop research.
- Public and private sector linkages with NGOs.
- Strengthened public and private sector risk mitigation systems for fertilizer quality.

SWOT Analysis

Threats

- Continued weakness in farmer knowledge of fertilizers and best management practices.
- Continued violation of fertilizer “truth-in-labeling” concept and associated low confidence in quality.
- GOM fertilizer and soil research fails to establish needs-driven research in soils and fertilizers to better target fertilizer products to zone-specific soils and crops.
- Ineffective research and extension linkages and associated weakness in information dissemination on fertilizers.
- Weak crop markets with associated weakness in farmer access and price uncertainty.
- Financial service providers targeting farmers and fertilizer value chain members unsuccessful in meeting credit needs.
- Fertilizer market information limited and constrains decision-making.

Soil Fertility and Fertilizer Management Strategy

Scope

- ❖ Strengthening the legal framework that pertains to the fertilizer sector.
- ❖ Improving systems that impact fertilizer-related knowledge development, technology transfer, and fertilizer quality assurance.
- ❖ Improving farmers' access to and use of fertilizer products most appropriate to their specific crops based upon agronomic and economic considerations.

Vision for Myanmar Agriculture

“A highly productive agriculture sector that contributes to a food-secure nation, increased farmer incomes to lift the rural population out of poverty, and international trade competitiveness of Myanmar agriculture products.”

– National Agriculture Development
Strategy and Investment Plan

Expected Outcomes

- Soil fertility improved.
- Fertilizer-related knowledge development strengthened through research.
- Information sharing and dissemination expanded.
- Technology transfer to farmers through public and private sector systems strengthened.
- Farmer use of fertilizers increased.
- Incidence of fertilizer quality problems reduced/confidence in fertilizer quality improved.

Strategic Objectives

- | | |
|-------------|--|
| Objective 1 | Improve soil fertility management to support sustainable improvement in crop yield |
| Objective 2 | Improve farmers' access to and use of high-quality fertilizer products |
| Objective 3 | Increase farmers' economic returns from fertilizer use |
| Objective 4 | Strengthen the fertilizer legal and regulatory environment |
| Objective 5 | Facilitate monitoring and decision-making related to fertilizer markets, including investment planning |
| Objective 6 | Strengthen knowledge development and technology transfer systems |

Themes

1. **Ensure sustainable soil fertility improvement**
2. **Ensure farmers' access to information on soil fertility management**
3. **Farmers' access to information/fertilizer recommendations improved**
4. **Emphasize the role of soils and fertilizer use management in climate-resilient agriculture**
5. **Fortify Fertilizer Law and regulatory environment**
6. **Ensure sustainable supply of high-quality fertilizers with improved farmer access**
7. **Monitoring and strategic planning**
8. **Stimulate private sector investment**
9. **Market based fertilizer prices**
10. **Facilitate private sector investment**
11. **Capacity building**
12. **Infrastructure improvement**
13. **Nutrition and crop diversification**
14. **Fertilizer research and development**
15. **Strengthening post harvest markets and access to markets**

Compatibility of Soil and Fertilizer Management Strategy with Key Agriculture Development Strategies

Five key impact areas of the Agriculture Development Strategy and Investment Plan:

1. Food and Nutrition Security
2. Rural Poverty Reduction
3. Agriculture Trade Competitiveness
4. Higher Smallholder Farmers' Incomes
5. Farmers' Rights Ensured and Strengthened

The Way Forward

- ❖ Increase knowledge of soils and fertilizer requirements, thereby providing a science-based foundation for decision-making on fertilizer requirements.
- ❖ Transfer technology to farmers.
- ❖ Establish systems that underpin fertilizer quality assurance.
- ❖ Improve financial service systems targeting fertilizer dealers and farmers.
- ❖ Improve stakeholder access to fertilizer market information