

TECHNICAL WORKING PAPER

CAMBODIA

QUALITY ASSESSMENT REPORT

RAPID APPRAISAL OF FERTILIZER QUALITY IN CAMBODIA



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July 15, 2010

Agriculture Global Practice

East Asia and Pacific Region

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សច្ចករណ៍សង្គម

ទីផ្សារដីមានទំហំតូចរបស់ប្រទេសកម្ពុជា

ពឹងអាស្រ័យទាំងស្រុងលើការនាំចូលពីប្រទេស ជិតខាង

ផលិតកម្មកសិកម្មភាគច្រើននៃកន្លែងប្រទេសកម្ពុជា

គឺជាការបង្កប់បង្កុំកើនផលស្បូវ។ គិតត្រឹម ឆ្នាំ ២០១០ ជិត ៧៨ ភាគរយ នៃដីដែលមានដីជាតិរបស់ប្រទេសកម្ពុជា ត្រូវបានប្រើប្រាស់ សម្រាប់បង្កប់បង្កុំកើនផលស្បូវ។ ស្បូវស្រូវប្រមាណជា ៨៥ ភាគរយ នៃការបង្កប់បង្កុំកើនផលស្បូវ នៅរដូវស្ងួត ប៉ុន្តែត្រឹមតែ ៣ ភាគរយនៃការបង្កប់បង្កុំកើនផលស្បូវដូចស្ងួត ដែលមានទឹកពីប្រព័ន្ធស្រោចស្រព ប៉ុណ្ណោះ។ កសិករបង្កប់បង្កុំកើនផលស្បូវ នៅកន្លែងប្រទេសកម្ពុជា ភាគច្រើនតាំងពីដើមរៀងមក គឺជាកសិករដែលបង្កប់បង្កុំកើនផលស្បូវសម្រាប់ចិញ្ចឹមជីវិត។ មានកសិករបង្កប់បង្កុំកើនផលស្បូវត្រឹមតែ ៤០ ភាគរយប៉ុណ្ណោះ ដែលផលិតបាននូវអតិរេកស្បូវ ដែលអាចលក់បានទៅលើទីផ្សារ។ ផលស្បូវ ជាមធ្យមនៃកន្លែងប្រទេសកម្ពុជា ស្ថិតនៅកន្លែងកម្រិតដែលទាបជាងគេនៅអាស៊ី។

ការប្រើប្រាស់ដីគឺមិនមានកម្រិតទាប ហើយជារឿយៗ

ដីធម្មជាតិមិនមានដីជាតិឡើយ។ មានផ្ទៃដីដាំដុះប្រហែលជា ៣០ ភាគរយ នៃផ្ទៃដីដាំដុះសរុបប៉ុណ្ណោះ ដែលទទួលបានការប្រើប្រាស់ដី ដែលនេះគឺជាកម្រិតនៃការប្រើប្រាស់ដីទាបបំផុតមួយ នៅអាស៊ីអាគ្នេយ៍។ ដូចនេះហើយ មានជាដីធម្មជាតិមានសារជាតិចិញ្ចឹមសំខាន់ៗ ដូចជា អាសូត (N) ផូស្វ័រ (P) និងប៉ូតាស្យូម (K) ទាបជាងកម្រិតដែលផ្តល់ជាអនុសាសន៍។ ការកែប្រែដី តាមរយៈការបន្ថែមដីគីមី ត្រូវបាន ចាត់ទុកថាមានសារៈសំខាន់ ដើម្បីឱ្យដំណាំលូតលាស់បានលឿន និងផ្តល់ផលបានច្រើន។

ប្រទេសកម្ពុជា គឺជាអ្នកនាំចូលដីគីមីសុទ្ធជា (នាំចេញ

ទាបជាងនាំចូល)។ គិតត្រឹមឆ្នាំ ២០១០ នៅកន្លែងប្រទេសនេះ ពុំមានរោងចក្រផលិតដីឡើយ។ ទីផ្សារដីដែលមានទំហំតូច ត្រឹមតិចជាង ២០០០០០ តោន ទទួលបានការផ្គត់ផ្គង់ទាំងស្រុងដោយការនាំចូលពីប្រទេសថៃ និងប្រទេស វៀតណាម។ ដីសរីរាង្គ ត្រូវបាននាំចូលទាំងស្រុងពីអឺរ៉ុប។ ការនាំចូលពីប្រទេសវៀតណាម មានទំហំសម្រេច រហូត ៦៥% នៃទីផ្សារសរុប ហើយត្រូវបានផ្តល់ឱ្យដី តាមរយៈអ្នកផលិតដី

ដល់មានតំណាងលក់

នៃក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ

ការនាំចូលពីប្រទេសថៃដែលផ្គត់ផ្គង់មានប្រមាណជា ៣០% នៃទីផ្សារ និងធុរវើ ឡើង តាមរយៈឈ្មួញជាជនជាតិថៃ។ ទំនាក់ទំនងដូច្នោះជាមួយនឹងរោងចក្រផលិតដីនៃប្រទេសថៃ កម្រមានណាស់។

ទីផ្សារដីរបស់ប្រទេសកម្ពុជា

គឺជាទីផ្សារសេរី

ដឹកនាំដោយវិស័យឯកជន។

នៃក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ

១៩៩០

ប្រទេសកម្ពុជាមានចាប់ផ្តើមប្រើប្រាស់ប្រព័ន្ធផ្តល់ដីប្រកបដោយប្រសិទ្ធភាព

និងអនុញ្ញាតឱ្យកម្មវិធី ឯកជន និងសាធារណៈ ផ្គត់ផ្គង់ និងចែកចាយដី

នៃក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ។ នៃក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ មានកម្មវិធីបញ្ជូនដី ២០

នាំចូលដីមកក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ។ ប្រព័ន្ធផ្តល់ដី មានអ្នកចូលរួម ជាង ១០០០ នាក់

ចាប់ពីអ្នកនាំចូល ដល់អ្នកលក់រាយនៃតាមផ្សារកម្មវិធីភូមិ។ ការប្រកួតប្រជែង

នៃគ្រប់កម្មវិធីទាំងអស់នៃសង្គមរាស្ត្រផ្គត់ផ្គង់ នាំឱ្យអត្រាចំណេញមានកម្រិតទាប

និងកាត់បន្ថយតម្លៃ លក់រាយ។ វិស័យដីរបស់ប្រទេសកម្ពុជា គឺជាវិស័យ

“ដលៃគិតពីតម្លៃ” ជាមួយនឹងកម្រិតចំណាយ កម្រិតទាប

និងទទួលបានផលចំណូលខ្ពស់ពីការឡើងចុះតម្លៃ នៃក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ។

តម្លៃខ្ពស់ និងដីក្នុងក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ

គឺជាក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិធានាកសិកម្មនៃកម្ពុជា

ការឡើងតម្លៃនៃផលិតផលកសិកម្ម

បានរុញច្រានតម្លៃដីក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិខ្ពស់ដល់កម្រិតមិនអាចទទួល

យកបាន និងបង្កកើតឱ្យមានសក្តានុពល សម្រាប់ដីក្នុងក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ។

ការឡើងតម្លៃសេដ្ឋកិច្ចជាតិ នៃក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ ២០០៧-២០០៨

នាំឱ្យទីផ្សារដីនៃកម្ពុជាឡើងចំណែកខ្ពស់

ដលៃធុរវើឱ្យគម្រិតមិនអាចយកដីមកប្រើប្រាស់ សម្រាប់ដំណាំជាច្រើនមាន

ប្រើគិតពីតម្លៃសេដ្ឋកិច្ចជាតិ។ តម្លៃការរស់កសិករ ដលៃចង់បានដី “មាន តម្លៃថៃវាក”

ប្រើកម្រិតទីផ្សារនាំឱ្យមានដីក្នុងក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ។ នៃក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ ២០០៨ អ្នកនាំចូល

និងមនុស្ស រដ្ឋាភិបាល មាននិយាយថា ដីដលៃលក់ក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ ៣០%

គឺជាដីក្នុងក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ។ ការអនុវត្ត ក្នុងប្រទេស រួមមាន ការលាយដីចូលគ្នា

និងការដាក់ទឹកលាយចូល ការចេញចុះដីដលៃមានតម្លៃ ថៃវាក ក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិ

ដលៃដាក់សុលាកសម្រាប់ធុរវើឱ្យគម្រិតមិនអាចមានតម្លៃខ្ពស់, ការចេញចុះដីខ្ពស់

និងការក្នុងដីដលៃមានកម្រិត NPK ទាប ថាជាដីដលៃមានជាតិផូស្វ័រដ៏ថ្លៃថ្លៃ (DAP)

ខ្ពស់ ដោយហាញប្រទេសរោបពីលើ ដើម្បីការផ្តល់ប្រយោជន៍ដល់សេដ្ឋកិច្ចជាតិ។

នៃក្រុមប្រឹក្សាភិបាលសេដ្ឋកិច្ចជាតិចុងក្រោយនេះ

ការប្រើប្រាស់ដីក្នុងតំបន់កសិកម្មមានការថយចុះ ដោយសារតែតម្លៃដីមានការថយចុះ ហើយកសិករកាន់តែដឹងពីគុណភាពដី។

តម្លៃដីខ្ពស់ ផ្ទុះឡើងយកសិករចៀសវាងមិនប្រើប្រាស់ដី ក្នុងកម្មវិធីដីកសិកម្មប្រើប្រាស់ដី កសិករភាគច្រើន កសិករភាគច្រើនបញ្ជូនដីកសិកម្ម ពួកគេប្រើដីមិនដល់កម្រិត ដោយសារតែពួកគេ មិនមានលទ្ធភាពទិញដីទាំងនោះបាន។ តម្លៃដី ស្រុមនឹងប្រហែលជា ៣០% នៃតម្លៃផលិតកម្មសរុប របស់កសិករ នៅរដូវប្រាំង និងជាង ២០% នៃចំណាយផលិតកម្មសរុបរដូវវស្សា។ មានភាពខុសគ្នា ក្នុងការកាន់តែច្រើនឡើងវិញតម្លៃដីកសិកម្ម ក្នុងតម្លៃអនុវត្ត។ នៅក្នុងកំឡុងពេលដី តម្លៃដីឡើងខ្ពស់ ទៅក្នុងឆ្នាំ ២០០៧-២០០៨ ឧទាហរណ៍ តម្លៃដីអ៊ុយរ៉េ កើនឡើងដល់ ៤០ ដុល្លារ ក្នុងមួយហិកតា ៥០ គីឡូ ដលៃខ្ពស់ជាង (ដី ៥០%) ជាងតម្លៃដីអ៊ុយរ៉េ នៅក្នុងទីផ្សារពិភពលោក។

សេវាផ្តល់ជូនដល់ស្រាវជ្រាវមានកម្មវិធីទាប ផ្ទុះឡើងយកការប្រើប្រាស់ដីមានការថយចុះ។ កសិករពុំមាន ព័ត៌មានគ្រប់គ្រាន់អំពីការប្រើប្រាស់ដីគឺមិនប្រកបដោយប្រសិទ្ធភាពឡើយ។ កសិករភាគច្រើនដឹងពីដី តាមរយៈកម្មវិធីផ្តល់ជូនដល់ស្រាវជ្រាវសាធារណៈ សកម្មភាពរបស់អង្គការមិនមែនរដ្ឋបាល អន្តរកាល លើទីផ្សារ ឬតាមរយៈការសាកប្រើដោយខ្លួនឯង។ ចំនួនមនុស្សផ្តល់ជូនដល់ស្រាវជ្រាវសាធារណៈ ដលៃមានច្រើន កាត់ការបណ្តុះបណ្តាល និងមានបទពិសោធន៍ ដលៃអាចចែករំលែកពីការអនុវត្តដលៃអង្គការ និងដលៃជា អនុសាសន៍ នៅមានចំនួនមិនគ្រប់គ្រាន់ទៅឡើយ។ លើសពីនេះ ការស្រាវជ្រាវកសិកម្មតាមបែប វិទ្យាសាស្ត្រ កំពុងទៅក្នុងដំណាក់កាលចាប់ផ្តើមដំបូងទៅឡើយ នៅក្នុងប្រទេសកម្ពុជា។ វិទ្យាសាស្ត្រ ស្រាវជ្រាវ និងអភិវឌ្ឍន៍កសិកម្មកម្ពុជា (CARDI) បានសាកល្បងប្រើប្រាស់ដីតម្លៃដីកសិកម្មប្រើប្រាស់ដី ២០០៩ ហើយសូម្បីតែកាលពីពេលនោះ ការស្រាវជ្រាវផ្តល់ជូនដលៃការប្រើប្រាស់ អាកាសធាតុ និងការកែលម្អការប្រើប្រាស់ដី ក្នុងវិស័យកសិកម្ម តម្លៃដីកសិកម្ម ជាលទ្ធផល ក្រុមហ៊ុននាំចូលដី កំពុងបំពេញតួនាទីកាន់តែសកម្ម នៅក្នុងការផ្តល់ជូនដលៃប្រទេសដលៃយុទ្ធសាស្ត្រ និងកសិករ អំពីការប្រើប្រាស់ដី។

គុណភាពដីនាំចូលដលៃមានការប្រើប្រាស់ខ្ពស់ក្នុងតំបន់ តម្លៃដីមានការបញ្ជូនដី ទៅក្នុងតំបន់ ពិនិត្យគុណភាពដីមានការកាន់តែប្រសើរជាងមុន

ការសិក្សាស្រាវជ្រាវនេះត្រូវបានផ្តល់ឡើង ដើម្បីផ្តល់ជូនការវាយតម្លៃតាមបែបសីលវិស័យស្រាវជ្រាវបច្ចុប្បន្ន

របស់គុណភាពដី នៅក្នុងប្រទេសនេះ។ កាលពីខែ ឧសភា ឆ្នាំ ២០១០ មានសំណាកគំរូមាណាជា ១០៣ ត្រូវបានប្រមូលតាមបែបចៃដន្យពីក្រុមហ៊ុននាំចូលដី អនុកលក់ដុំ និងអនុកលកាយ នៅក្នុងខេត្តចំនួន ១០។ ការសិក្សាស្រាវជ្រាវសន្ទនីដូប្រទេស ពុំមានការលាយដីចូលគ្នាថាឱ្យច្បាស់ថាពិតជាមាន នៅក្នុងសំណាកគំរូណា ដលៃត្រូវបានសង្កេតឃើញចេញពីការពិនិត្យរូបរាងខាងក្រៅឡើយ យ៉ាង ហោចណាស់ក៏មិនច្រើនដូចករណីដលៃត្រូវបានរាយការណ៍ ជារឿយៗ នៅក្នុងប្រទេសនេះផ្សេងទៀត និងរបាយការណ៍ផ្សេងៗទៀត។ ប៉ុន្តែ មានសំណាកគំរូជាច្រើន ដលៃបង្ហាញពីការលាយដី ជាមួយនឹង ធាតុផុសមិនត្រូវទំហំក្នុង និងងាយញែកចេញពីក្រុមហ៊ុនយ៉ាងងាយស្រួល។

រាល់សំណាកគំរូដីអ៊ីយ៉ូរ៉េនទាំងអស់ មានកម្រិតអាសូត (N) ដលៃចាំបាច់ត្រូវមាន។ បើ ទោះបីជាសំណាកគំរូភ្ជាប់ដីអ៊ីយ៉ូរ៉េនមួយចំនួន មានទំហំតូចខ្លះៗ (ដលៃបង្ហាញថាភ្ជាប់ដីអ៊ីយ៉ូរ៉េនមានកម្រិតខ្ពស់ខ្លះៗ) ក៏ដោយ ក៏សំណាកដីអ៊ីយ៉ូរ៉េនទាំងអស់ ត្រូវបានវិភាគរកឃើញថាមានកម្រិតជាតិ N ៤៦% ឬខ្ពស់ជាងបន្តិចបន្តួច។

មានសំណាកដីផូស្វ័រត្រីផូស្វ័រ (DAP) មួយចំនួនតូចប៉ុណ្ណោះ ដលៃមានកម្រិតទាបតិច ក្នុងកម្រិតបញ្ជាក់ក្នុងស្ថិតិ ១៨% សម្រាប់ជាតិ N និងក្រុមហ៊ុនកម្រិតកំណត់ ៤៦% នៃជាតិ P₂O₅។ សំណាកគំរូដី DAP នាំចូលពីប្រទេសថៃ ដលៃត្រូវបានគេអះអាងថាទិញពីសហរដ្ឋអាមេរិក មក មានជាតិ P₂O₅ តិចជាងឆ្នោយ (៣៣%) ប៉ុន្តែជាតិ N របស់វា សុទ្ធតែបំពេញទៅតាមកម្រិត ដលៃត្រូវបាន (១៧,៦%)។ ការពិនិត្យមើលរូបរាងភ្ជាប់របស់ដី បង្ហាញថា ភ្ជាប់ដីមួយចំនួនគឺខុសគ្នា ដូចខ្លះៗ ដូចរូបរាងរបស់ដី DAP ដលៃ ប៉ុន្តែដីភ្ជាប់មួយចំនួនមានពណ៌សខាងក្នុង។ នេះបង្ហាញថា ការ ប្រើប្រាស់ជាតិស៊ុលហ្វួរត្រីផូស្វ័រត្រីផូស្វ័រ (APS) ក្នុងកម្រិតមធ្យមគឺ N ១៦% P₂O₅ ២០% K₂O ០% និង S ១៣%។ ការលាយផលិតផលជាមួយនឹង DAP អាចកើតឡើង នៅកម្រិតណាមួយនៃស្ថិតិផុតពីគ្រប់គ្រង។ សំណាកដីមួយ គឺថា ភ្ជាប់របស់ដីត្រូវបានផលិត និងលាយ នៅកន្លែងផលិតផល មុន។

ដីប្រភេទអ៊ីយ៉ូរ៉េន DAP, APS និង MOP ដលៃត្រូវបាននាំចូលទៅក្នុងប្រទេសវៀតណាម និងថៃ ក្នុងបរិមាណច្រើន ហើយបន្តទាញមក រចម្រុះសម្រាប់នាំចេញទៅប្រទេសកម្ពុជា មាន គុណភាព ពណ៌ និងធាតុផុសមិនត្រូវទំហំខ្ពស់ខ្លះៗ។ សំណាកគំរូដីផូស្វ័រត្រីផូស្វ័រ (DAP)

ដលៃនាំចូលពី បុរេសេថៃ គឺសុទ្ធលើតដៃចនឹងដី DAP លាយជាមួយនឹង ១៦-២០-០១ ដី DAP និងស៊ុលហ្វាតផូស្វ័រអាម៉ូញ៉ូម (APS) ដលៃនាំពីបុរេសេថៃរៀតណាម បង្កហាញពីកម្មវិធីនៃការលាយបញ្ចូលគុណភាពទាបជាងម។

សំណាកគំរូដីលាយបញ្ចូលគុណភាព ដលៃត្រូវបានយកមកវិភាគ
មិនមានបំពេញទៅតាមកម្មវិធី នៃសារជាតិចីញុចីមមួយ ឬចុះចំនួន
ដលៃត្រូវបានឱ្យមាននោះទេ។ សំណាកគំរូសុទ្ធលើតទាំងអស់ (លើកលែងតែមួយចេញ)

នដីដលៃត្រូវបានលាយចូលគុណភាពមានកម្មវិធីទាបជាងកម្មវិធីធានានៃដោតិប៉ូតាស ដោយសំណាកគំរូចំនួន ៨ មានជាតិផូស្វ័រអាម៉ូញ៉ូម និងសំណាកគំរូចំនួន ១០ មានជាតិអាសូតទាប (ពេលគឺទាបជាងកម្មវិធីដលៃអនុញ្ញាតឱ្យមានសម្រាប់ការសុវារដុវារ)។

គុណភាពដីដលៃមានលាយបញ្ចូលគុណភាព និងដី NPK ក្នុងទម្រង់ជាក្រាប
ដលៃផុតពី ផុតដោយ រោងចក្រនៃរៀតណាម មានកម្មវិធីទាបជាងសុដង ដា។
ដី NP និង NPK លាយ សុទ្ធលើតទាំងអស់ ដលៃមានបុរេសេថៃរៀតណាម
ត្រូវបានរកឃើញថាមានសារជាតិចីញុចីមមិនគ្រប់គ្រាន់។ នេះ អាច
កើតឡើងដោយសារតែការលាយ និងការបញ្ចូលជាក្រាបសម្រាប់មិនមានលុះ
ការលាយទឹកបន្ថែម ការចុះលើមិនមានត្រឹមត្រូវ ឬត្រូវបានគុណភាពអស់។
ជារឿយៗ រោងចក្រនៃរៀតណាមទិញត្រូវបានផ្តល់ដោយបុរេសេថៃ
ដោយត្រូវបានផ្តល់ដោយទាំងនេះពុំបានឆ្ងល់កាត់ការផ្តល់សេដ្ឋកិច្ចសារជាតិចីញុចីម
មានសមស្របឡើយ។ បន្ថែមពីលើដី NP និង NPK លាយ ដលៃមានគុណភាពអស់ ដីដលៃមាន
បុរេសេថៃរៀតណាម ពុំមានជាតិប៉ូតាស និងផូស្វ័រអាម៉ូញ៉ូមគ្រប់គ្រាន់។ ផុតយូរទៅវិញ
ដី NP និង NPK មកពីបុរេសេថៃ បំពេញទៅតាមសន្ទសុសន្តិគុណភាព
ក្នុងកម្មវិធីដលៃអាចទទួលយកបាន។

សំណាកគំរូ NPK គ្រប់ចំនួន ២ មួយមានបុរេសេថៃមិន
និងមួយទៀតពីបុរេសេ រៀតណាម
មានកម្មវិធីទាបជាងសន្ទសុសន្តិសារជាតិចីញុចីមសរុបតិចតួចប៉ុណ្ណោះ
ពេលគឺមានកម្មវិធី ៩៨%¹។ ផលិតផលទាំងនេះមានបញ្ហាដោយឡែកពីគុណភាពចំនួន ៣ ៖
ក) សារជាតិ N ទាប កម្មវិធី P₂O₅ ទាប និងកម្មវិធី K₂O ទាប។
ផលិតផលទាំងនេះត្រូវបាន ផលិតដោយបុរេសេថៃហាយទឹក
ដើម្បីសន្ទសុសន្តិសារជាតិស៊ុលហ្វាតអាម៉ូញ៉ូម DAP និងប៉ូតាស (MOP) ជាក្រាបតូចៗ។
នៃក្រុមដំណើរការនេះ ជាការសំខាន់ណាស់ ដលៃភាពលាយរបស់ប៉ូតាស

¹ Total Nutrient Index = Total guaranteed nutrient content / Actual total nutrient content. A product with an index level below 98 percent is defined as not meeting guarantee.

ត្រូវសម្រេចខ្លួនឯង ដើម្បីអាចបញ្ជូនចូលវាចូលទៅក្នុងគ្រាប់ដី។
 ដើម្បីធុរវិបលែងនេះមាន សីតុណ្ហភាពរបស់គ្រាប់ដី ត្រូវលើសពី ១៦០⁰ F។
 ប្រសិនបើសីតុណ្ហភាពរបស់គ្រាប់ដី មិនឡើងដល់កម្រិតនេះទេ នោះ
 MOP មិនអាចជួយចូលទៅក្នុងគ្រាប់ដីបាន ឡើយ
 ហើយនេះទៅក្នុងពេលសំងួត MOP ដលៃជាជាតិមុនស្រាប់តែត្រូវបានដកចេញ
 តាមប្រព័ន្ធខ្នែង ឬប្រមូលផ្តុំទៅក្នុងអគារ
 ដលៃប្រើសម្រាប់ស្លូតគ្រាប់ដី។

ខ) កម្មវិធីស្រុកវាតទាប នៅក្នុងសំណាកគំរូ NPK ប្រហែលជាកើតឡើង
 ដោយសារតែការ ប្រើប្រាស់អាស៊ីដូស្ត្រីកែដលៃមានគុណភាពទាប
 នៅក្នុងការផលិត DAP និងការប្រើប្រាស់ អាស៊ីដូស្ត្រីកែ
 ក្នុងការបង្កើនសីតុណ្ហភាពប្រតិកម្ម
 ដើម្បីឱ្យជាតិអាស៊ីដូស្ត្រីកែចូលពេញ លញ្ជា។

គ) ផ្លូវវាតអាម៉ូញ៉ាម ដូចជា DAP ជាដើម អាចមានការប្រែប្រួលក្នុងកម្រិតភាគរយរបស់វា
 ពីកម្រិតសុទ្ធដង្កា ១៨% សម្រាប់ N/៤៦% សម្រាប់ P₂O₅ ទៅចន្លោះ ១៧-២០%
 សម្រាប់ N និង ៤៥-៤៦% សម្រាប់ P₂O₅ ហើយការបន្ថែមអាស៊ីដូស្ត្រីកែ
 អាចផ្តល់ឱ្យកម្រិតនេះ កាន់តែចុះទាប។ រោងចក្ររៀតណាម ដលៃផលិត NPKs
 ទាំងនេះ ពឹងផ្អែកលើ DAP ដលៃនាំចូល ហើយត្រូវឱ្យដុំ DAP
 ហាក់បីដូចជាទាបជាងកម្រិតសុទ្ធដង្កាដលៃមានកំណត់
 ដលៃនាំឱ្យផលិតផលចុងក្រោយមានកម្រិតភាគរយ។
 ប្រសិនបើមានករណីបែបនេះកើត ឡើង
 នោះប្រព័ន្ធត្រួតពិនិត្យគុណភាពរបស់រោងចក្រទាំងនេះសុំឱ្យមានការសង
 រឹតយ៉ាង។

ការត្រួតពិនិត្យឱ្យបានកាន់តែប្រសើរជាងមុនលើការចេញអាជ្ញាប័ណ្ណ
 និងការផ្តល់ប្រញូញត្រួតពិនិត្យ និងបង្កើនតម្លៃលាភាព
 និងប្រសិទ្ធភាពនៃការចែកចាយដី

ខណៈពេលដលៃសកម្មភាពរបស់អ្នកលក់រាយ	និងអ្នកលក់ដុំ
ត្រូវបានគ្រប់គ្រងត្រឹមត្រូវ	មានឈ្មួញណាមួយ
ដលៃគេមិនសុំគាល់អត្តសញ្ញាណមួយក្រុម ដូចជា	ឈ្មួញចល័តជាដើម
ដលៃដីកដីពីអ្នកលក់រាយតាមសុំរក	ទៅឱ្យកសិករ។
បើទោះបីជាឈ្មួញចល័តទាំងនេះលក់បាន ៣០%	នៃចំណូលលក់ដីសរុបក៏ដោយ
ឈ្មួញទាំងនេះមិនចាំបាច់បញ្ជូនដីអាជីវកម្មរបស់ខ្លួន	ជាមួយនឹងក្រសួងកសិកម្ម

រក្សាខាប្រមាញ់ និងសោទឡើយ។ ឈុំម្ហូបកណ្តុដាលមួយចំនួនលក់ដើម្បី ដលៃជាការដុដល់
សវាសមស្រប ប៉ុន្តែដំណើរការតម្រូវឱ្យដលៃកសិករ។ ឈុំម្ហូបចល័តទាំងនេះ
និងអ្នកលក់វាយតម្លៃតាមភូមិ ជារឿយៗ ត្រូវបានគេបន្តទៅសាលាកំដៅក្នុងក្រុមលាយ
ដលៃនាំឱ្យមានការខាតបង់ផ្ទះកែហិរញ្ញប្បទានដលៃកសិករ
និងធុរ្មើឱ្យទីផ្សារដីចុះទន់ខុសទៅ។ ការត្រួតពិនិត្យឱ្យបានកាន់តែប្រសើរ
លើសកម្មភាពទាំងនេះ នឹងបង្កើនតម្លៃភាពរស់រវើកដី នៅក្នុងប្រទេសកម្ពុជា។

នីតិវិធីដលៃអាជ្ញាប័ណ្ណបំណុលដលៃការនាំចូលដី

មានលក្ខណៈសុមុតសុមាញ់ មិនឆ្ងល់ឆ្ងោលតបចំពោះ តម្រូវការទីផ្សារ
និងដាក់កំហិតលើការប្រកួតប្រជែងក្នុងទីផ្សារ។ ដំណើរការ ដើម្បីទទួលបាន
អាជ្ញាប័ណ្ណបំណុល សម្រាប់នាំចូល មានលក្ខណៈសុមុតសុមាញ់ និងពុំមានតម្លៃលាភ។
ចំនួនត្រូវបានកំណត់ ត្រូវបានកំហិតត្រឹម ៣០០០០ ត្រូវបាន ក្នុងមួយអាជ្ញាប័ណ្ណ
ដលៃការអនុញ្ញាតនាំចូលដីមិនឱ្យទៅរក ទីផ្សារអន្តរជាតិ
ដើម្បីទិញផលិតផលក្នុងបរិមាណច្រើន ប្រកបដោយគុណភាពខ្ពស់ ក្នុងតម្លៃកាន់
តែទាប។ ការដឹកជញ្ជូនក្នុងបរិមាណតិច អាចធុរ្មើទៅឱ្យមានដោយសន្តិសុខសំចៃ
តពីទិសដៅដឹកជញ្ជូនបំណុលនោះ

ដលៃបង្កើនឱ្យអ្នកចែកចាយត្រូវបាននាំចូលពីប្រទេសវៀតណាម
និងប្រទេសថៃបន្តទៀត។ ក្នុងនោះត្រូវចំណាយប្រតិបត្តិការខ្ពស់
ប្រព័ន្ធធកូតាដលៃកំណត់ចំនួនត្រូវបានបែបនេះ លើកទឹកចិត្តឱ្យមានការនាំចូលខុសច្បាប់
និងការរារាំងកម្រិតតូចមិនឱ្យចូលមកប្រកួតប្រជែងក្នុងទីផ្សារដី ដលៃនឹង
នាំឱ្យតម្លៃដលៃកំណត់ រាយការណ៍ចុះ និងដលៃប្រយោជន៍ដលៃកសិករខ្មែរ។

ការិយាល័យសុដង ដាសមុតសុមាញ់ (BAMS)

ធុរ្មើការវាយតម្លៃលើការត្រួតពិនិត្យគុណភាព វិស័យដី
នៅក្នុងប្រទេសកម្ពុជា

និងដាសុមាប័ណ្ណដលៃទទួលខុសត្រូវលើការចេញអាជ្ញាប័ណ្ណនាំចូលដី។

ការិយាល័យនេះ គឺជាផ្នែកមួយនៃយកដ្ឋាននីតិកម្មកសិកម្ម របស់ក្រសួងកសិកម្ម
រុក្ខាប្រមាញ់ និងសោទ។

បើទោះបីជាមនុស្សចុះត្រួតពិនិត្យដលៃមូលដ្ឋានមានទទួលបានជោគជ័យ

ក្នុងការបង្កើនការយល់ដឹងរបស់កសិករអំពីដីក្នុងក្រុមលាយ

និងដលៃការបណ្តុះបណ្តាលដលៃឈុំម្ហូបអំពីការកំណត់ការក្នុងប្រទេសក៏ដោយ

នាយកដ្ឋាននីតិកម្មកសិកម្មនៅខ្មែរសមតុច្ចភាពផង និងអំណាចផង ក្នុងការត្រួតពិនិត្យ

លើពាណិជ្ជកម្មដី នៅក្នុងប្រទេសកម្ពុជា។ ជារឿយៗ ការត្រួតពិនិត្យគុណភាព

ត្រូវបានធុរ្មើឡើង តាមរយៈការពិនិត្យលើរូបរាងខាងក្រៅ ដលៃមិនត្រូវបាន

សម្រាប់កំណត់រកដីដែលលាយជាមួយ ដីក្នុងដីក្នុងលាយ
 ឬដីដែលមានកម្មវិធីសារជាតិចិញ្ចឹមក្នុងរោមកម្មវិធីដីត្រូវបានធានាឡើយ។ ក៏ដោយ ទាន់
 មានផងដែរនូវវិធានការចុះបាត់
 ដើម្បីចោទប្រកាន់ជនដែលប្រព្រឹត្តិបំពានលិខិតបទដ្ឋានគតិយុត្តិ ដដែលមានសម្រាប់។
 ក្រុមរោមកម្មវិធីសារជាតិចិញ្ចឹមត្រូវបានសម្របសម្រួលសម្រាប់ការសិក្សា (QCAM) ដដែលមាន រយៈពេល
 ៣ ឆ្នាំ មនុស្សពិសោធន៍ភាគជាច្រើន នឹងត្រូវបានបង្កើតឡើងសម្រាប់ភាពទៅតាមឆ្នាំ
 ២០១១ ដើម្បីផ្តល់សេវាភាគដីឱ្យមានពេញលេញ
 សម្រាប់គាំទ្រដល់មនុស្សដែលចុះពីនិក្ខយដល់មូលដ្ឋាន រ
 បស់នាយកដ្ឋាននីតិកម្មកសិកម្ម។

ចាំបាច់ ត្រូវតែមានការកែលម្អចុះបាត់ សុដីពីដី

និងចុះបាត់កសិកម្មបច្ចុប្បន្ន។ សេចក្តីព្រាងចុះបាត់ចុះ ត្រូវបានរៀបចំឡើង
 ដើម្បីបង្កើនសុវត្ថិភាពសម្រាប់ជនដែលលិខិតបទដ្ឋានគតិយុត្តិជាក់លាក់ ដូចជា អនុក្រឹត្យ
 ជាដើម ដដែលអាចផ្តល់សេវាធានាកម្ម ដោយក្រុមស្នងកសិកម្ម រុក្ខាប្រមាញ់ និងនសោទ
 មិន ចាំបាច់សុវត្ថិភាពអនុម័តពីសភា។ ប៉ុន្តែ ក្រុមស្នងកសិកម្ម រុក្ខាប្រមាញ់ និងនសោទ
 គួរពិចារណា បំបែកចុះបាត់សុដីពីដី ពីសេចក្តីព្រាងចុះបាត់ចុះប្រចុះ
 ឬផ្តល់សេវាធានាកម្មសេចក្តីព្រាងចុះបាត់នេះ ដើម្បីត្រូវ
 ដណ្តប់តំបន់ដែលការទទួលខុសត្រូវរបស់សមត្ថកិច្ច
 លើការអនុវត្តលិខិតបទដ្ឋានដោយឡែក ដដែលពាក់ ព័ន្ធជាមួយនឹងចុះបាត់កសិកម្ម ដី
 ចំណីសត្វ និងបសុឱសថ។

អនុសាសន៍សុដីវិធានការគោលនយោបាយ

១. ជាការសំខាន់ ដល់នាយកដ្ឋាននីតិកម្មកសិកម្ម
 នៅក្នុងបទសេកម្ពុជា និងអនុក្រឹត្យនីតិយុត្តិ មូលដ្ឋាន
 អាចទទួលបានសេវាភាគដី ដដែលអាចជឿទុកចិត្តបាន និងមានលុបចោលច្រើន
 ដោយសារតែការពិនិត្យពីខាងក្រៅអាចដឹងពីលាយផលិតផលបញ្ចូលគុណ
 ឬមានការដាក់កម្មវិធីសារជាតិ ទាប ជាងកម្មវិធីដីត្រូវបានធានានោះទេ។

- ពេលចុះដល់មូលដ្ឋាន អនុក្រឹត្យនីតិយុត្តិអាច
 និងគួរបង្កើនសុវត្ថិភាពសម្រាប់ដីសាមញ្ញ មួយ ដើម្បីកាត់បន្ថយដី DAP និង
 APS ជាពាក់កណ្តាល ដើម្បីពិនិត្យមើលថាតើចុះបាត់ដី ទាំង
 នេះមានលក្ខណៈដូចគ្នាទាំងអស់ដែរឬទេ។
- ក្រុមស្នងកសិកម្ម រុក្ខាប្រមាញ់ និងនសោទ នៅក្នុងបទសេកម្ពុជា
 គួរទទួលខុសត្រូវមានការផ្តល់ វិញ្ញាបនបត្រធានាគុណភាពដោយឯករាជ្យ

ចេញពីអង្គការដលៃត្រូវមានទទួលសុំគាល់ គុណភាព សម្រាប់ជីវិតចូលទាំងអស់ និងជាពិសេស ដីដលៃមានសារជាតិចិញ្ចុំមីមចុំរើនយ៉ាង ដូចជា NP ឬ NPK ជាដើម។

២. ធុរវើសាមញ្ញកម្មនីតិវិធីដាក់ពាក្យសុំអាជុញាបំណុណនាំចូល និងលិខិតបទដុំឋានគតិយុត្តុដិនានា។ ជា អនុសាសន៍ អាជុញាបំណុណនាំចូលនេះគួរអនុម័ត ផុតកែទៅតាមភាពសមសុំរបស់ផែលិតផលតម្លៃ ណុណោះ ហើយអនុកនាំចូលទាំងអស់គួរត្រូវមានអនុញ្ញាតឱ្យនាំចូលដីដលៃមានចុះបញ្ជូ ផ្ទៃកន្លងបរិមាណថ្មីនុំមានក៏ មាន។

- ដកចេញនូវការកំហិតចំនួនតោន និងអនុញ្ញាតឱ្យកម្មហ៊ុននាំចូលនាំចូលផលិតផល ដលៃមានចុះបញ្ជូផ្ទៃសមសុំរកនុំឯបរិមាណមិនកំណត់ ផុតកែតាមការវាយតម្លៃហិរញ្ញវិទ្យាផ្ទៃសុំសារ។ លើសពីនេះ អនុញ្ញាតឱ្យអនុកនាំចូលតូចចូលមកកន្លងផ្ទៃសុំសារ និងពង្រីកការបុរក្តតបុរដងៃ ខាងតម្លៃ និងគុណភាព។
- ធុរវើសោធនកម្មលិខិតបទដុំឋានគតិយុត្តុដីសម្រាប់ផុំដលៃអាជុញាបំណុណដលៃ ការនាំចូលដី និងលុប ចោលអំណាចរបស់កុំរស្តងកសិកម្ម រុក្ខាបុរមាញ់ និងនសោទ កន្លងការដាក់លក្ខខណ្ឌ អាជុញាបំណុណនីមួយៗ ទៅតាមបរិមាណដីដាក់លាក់។ វិធានការនេះនឹងសម្រួល ក៏ដូចជា ពនុលឡើងដំណើរការនៃការផុំដលៃអាជុញាបំណុណ និងលុបចោលភាពចាំបាច់ ដើម្បីឱ្យមាន “ការ សម្រួល” សម្រាប់ពនុលឡើងការចេញអាជុញាបំណុណនាំចូល។
- ការពិនិត្យឡើងវិញលើពាក្យសុំអាជុញាបំណុណនាំចូល ត្រូវកំហិតត្រឹមតម្លៃ DAL/BAMS និង នាយកដុំឋានបច្ចុចកេទសេរបស់កុំរស្តងកសិកម្ម រុក្ខាបុរមាញ់ និងនសោទបំណុណោះ ដលៃត្រូវ ផុំដលៃការឯកភាពលើការចុះបញ្ជូផ្ទៃផលិតផល។
- គួរមានការតម្លៃឱ្យកម្មហ៊ុននាំចូលផុំដលៃព័ត៌មានលំអិតអំពីដីដលៃនាំចូលទាំងអស់ ជា បុរចាំត្រឹមស ដលៃនាយកដុំឋាននីតិកម្មកសិកម្ម ហើយកុំរស្តងកសិកម្ម រុក្ខាបុរមាញ់ និងនសោទ គួរបោះពុម្ពផុំសាយព័ត៌មានសង្ខុខបេបុរចាំត្រឹមសអំពីការនាំចូលដី ដោយបងៃចកែទៅតាមកម្មផលិតផល ដើម្បីផុំដលៃព័ត៌មានអំពីទីផុំសារទាំងមូល។
- មនុំដុំអធិការរបស់នាយកដុំឋាននីតិកម្មកសិកម្ម គួរផុំដលៃនូវមធ្យោបាយ ដើម្បីចុះត្រួតពិនិត្យ សំណាកគុំដី នៅតាមចុំកពុំដនៃ។
- សង្កេតពិនិត្យដីរបស់នាយកដុំឋាននីតិកម្មកសិកម្ម គួរបុរមូលផុំដុំលើការពិនិត្យតាមដានលើបុរភេដីលាយ និងដី NP និង NPK គុំរាប់ ដលៃនាំចូលពីបុរទសេរៀតណាម។

- រាល់ជំនាញទាំងអស់ គួរបញ្ចូលព័ត៌មានអំពីរោងចក្រដើម និងបុរេសេដ្ឋកិច្ច នៅក្នុងករណីនាំចេញបន្ត។ នេះផ្តល់លទ្ធភាពខ្លះៗមានការកំណត់ពីបុរេសេដ្ឋកិច្ច ដែលមានគុណភាពក្នុងរោងចក្រដើម។
- វិញ្ញាបនបត្របញ្ចប់ការសិក្សា គួរផ្តល់សម្រាប់ជំនាញទាំងអស់ ដោយវិញ្ញាបនបត្របញ្ចប់ការសិក្សា បញ្ចប់ជាក់នេះ ត្រូវមានបុរេសេដ្ឋកិច្ចពិភពលោក ដែលមានការទទួលស្គាល់ជា អន្តរជាតិ។ នេះអាចមិនអនុវត្តបានចំពោះការនាំចូលក្នុងវិមាណតិចតួច ដូចជា ការនាំ ចូលដឹកតាមឡាន ឬតាមទូកតូច ប៉ុន្តែមានការពិភាក្សាអំពីដំណោះស្រាយ ដែល អាចអនុវត្តបាន ជាមួយនឹងកម្មវិធីនាំចូលធំៗ។
- ដាក់សុលាកសម្ភារៈផលិតផលនាំចូលជាមួយនឹងព័ត៌មានអំពីបុរេសេដ្ឋកិច្ច ដើម្បីសម្រាប់ជំនាញទាំងអស់ ដែលមានគុណភាពមិនដល់ស្តង់ដារ។
- ពង្រីកការស្រាវជ្រាវវិទ្យាសាស្ត្រ និងសេវាផ្តល់សេវាសាធារណៈ ដើម្បីបង្កើនបុរេសេដ្ឋកិច្ច និងការប្រើប្រាស់ដី តាមរយៈការបង្កើនតម្លៃការសាធារណៈខាងការស្រាវជ្រាវ និងការ អភិវឌ្ឍន៍សិក្សា។
- អប់រំអ្នកលក់ដី និងកសិករ អំពីការប្រើប្រាស់ដីគឺមី។

៣. គួរមានការចុះបញ្ជី និងការចេញវិញ្ញាបនបត្របញ្ចប់ការសិក្សា ដល់ទិញដី ពីអ្នកលក់ ដល់មាន លិខិតបញ្ជាក់ ត្រឹមត្រូវ និងដឹកជញ្ជូនទៅលក់បន្តដល់កសិករតាមភូមិដោយផ្ទាល់ (ដោយសារតែបែបបទបុរេសេដ្ឋកិច្ច)

នេះពុំមានការផ្តល់សេវាបញ្ជីបញ្ចប់ការសិក្សាដឹកជញ្ជូនដោយបុរេសេដ្ឋកិច្ច ដែលអាចលក់ដីបានក្នុងវិមាណច្រើនណាមួយឡើយ)

- បន្ថែមពីលើការផ្តល់វិញ្ញាបនបត្របញ្ចប់ការសិក្សាដល់អ្នកលក់ដី និងអ្នកលក់រាយ ការិយាល័យ នីតិកម្មកសិកម្មនៃក្រសួងកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទ គួរអនុវត្តវិធានការជាដំបូង ដើម្បីផ្តល់វិញ្ញាបនបត្របញ្ចប់ការសិក្សា ផងដែរដល់ភាគីទី ៣ ដល់ទិញដី និងដឹកជញ្ជូនទៅតាមភូមិ ដើម្បីលក់បន្តទៅខ្លះៗកសិករ។ នា ពេលបច្ចុប្បន្ននេះ បុគ្គល និងកម្មវិធីទាំងនេះ ពុំរួមចំណែកកាត់ការគ្រប់គ្រងទាល់តែសោះ ពាក់ ព័ន្ធជាមួយនឹងគុណភាពដី ហើយពួកគេអាចលាយដី ជាមួយនឹងដីដែលមានគុណភាព។ ការផ្តល់វិញ្ញាបនបត្របញ្ចប់ការសិក្សាដល់អ្នកលក់រាយ មានន័យតិចតួច បុរេសេដ្ឋកិច្ចប្រើប្រាស់ដីកសិករទាំងនេះ នៅតែមិនត្រូវបានគេស្គាល់អត្តសញ្ញាណ

និងពុំត្រូវបានគ្រប់គ្រងឱ្យមានតម្លៃស្រដៀងគ្នា។
គួរមានការពង្រឹងការចុះបញ្ជីប្រតិបត្តិការទាំងនេះ។

តិចបំផុត

៤. រៀបចំសេចក្តីព្រាងច្បាប់ដោយឡែកពីការគ្រប់គ្រងថ្នាំកសិកម្ម
និង ចេញលិខិតបទដ្ឋាន គតិយុត្តិសុទ្ធិអំពីទំនិញជាក់លាក់។ ច្បាប់
និងលិខិតបទដ្ឋានគតិយុត្តិសុទ្ធិពីដី គួររៀបចំឡើង ដើម្បីការពារ កសិករ
និងអ្នកចូលរួមក្នុងទីផ្សារ ក្នុងនោះរួមមាន អ្នកនាំចូល អ្នកចែកចាយ
អ្នកលក់ដុំ អ្នកលក់រាយ និងសាធារណជនទូទៅ ៖

- ការអនុវត្តមិនត្រឹមត្រូវ ដូចជា ការលាយបន្ទុះ ការដាក់ស្រោចសម្រាល់បន្ទុះ
និងការចុះលិខិតគ្រប់គ្រង គឺឡើយ។
- ការអះអាងអំពីអត្ថប្រយោជន៍របស់ផលិតផល ដោយមិនមានការបញ្ជាក់។
- មុខសញ្ញាគ្រប់គ្រងថ្នាំកសិកម្ម។
- មុខសញ្ញាគ្រប់គ្រងថ្នាំកសិកម្មខាងសុខភាពសាធារណៈ។

ការការពារទាំងនេះអាចដាក់បញ្ចូលទៅក្នុងលិខិតបទដ្ឋានគតិយុត្តិ
តាមរយៈគោលការណ៍ “សេចក្តីព្រាងច្បាប់ក្នុងការដាក់ស្រោចសម្រាល់”។

៥. ក្រសួងកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទ
គួរសិក្សាពីឯកសារបោះពុម្ពផ្សាយផ្សេងៗ ដូចជា ការអនុវត្តច្បាប់
សមាគមមនុស្សធម៌ និងសុខភាពសាធារណៈ និងសុខភាពសាធារណៈ (AAPFCO)
ដលៃមានចំណងជើងថា “សេចក្តីព្រាងច្បាប់ឯកសណ្ឋានរបស់ស្តីពីដី”
មុនពេលបញ្ចប់លិខិតបទដ្ឋានគតិយុត្តិសុទ្ធិអំពីដី សម្រាប់ ប្រទេសកម្ពុជា
និងដាក់បញ្ចូលបញ្ជីពាក់ព័ន្ធ។

លិខិតបទដ្ឋានគតិយុត្តិសុទ្ធិរបស់ប្រទេសកម្ពុជា គួរមានដាក់បញ្ចូល ៖

- និយមន័យដី ដូចជា ជីវសាស្ត្រ និងជីវសាស្ត្រ ដីដែលបញ្ចូលចេញយឺត
និងបញ្ចូលដោយមាន មានការគ្រប់គ្រង និងការកែដី
- និយមន័យសារជាតិចិញ្ចឹមដល់ប្រព័ន្ធកសិកម្ម និងការកែដី
និងកម្មវិធីភាគដលៃមានការធានា រាប់បញ្ចូលទាំងមីក្រូសារជាតិចិញ្ចឹមផង
- នីតិវិធីចុះបញ្ជីផលិតផល និងមនុស្សដែលទទួលបានបទដ្ឋាននេះ
- និយមន័យ និងសេចក្តីព្រាងច្បាប់ព្រឹត្តិការណ៍នៃការគ្រប់គ្រងសម្រាប់ស្រោចសម្រាល់
រួមទាំងភាសាផង
- និយមន័យពីកងរ៉ាស្ត្រសារជាតិចិញ្ចឹមរបស់រុក្ខជាតិ
- និយមន័យផលិតផលដី ដលៃលាយជាមួយដីខ្ពស់គុណភាព

- ការកំណត់ពីកម្មវិធីដដែលអាចអនុញ្ញាតឱ្យមានអំពីបរិមាណលំហូរធាតុធាតុដុំនៃនីតូក្នុងដី
- អាជ្ញាធរកសិកម្មកសិកម្ម
- នីតិវិធីបង្កើតសំណាកគំរូ
- នីតិវិធីវិភាគ
- ទណ្ឌខកម្មសម្រាប់ការបំពានលិខិតបទដ្ឋានគតិយុត្តុដីទាំងនេះ

និន្នាការនាពេលអនាគត

និន្នាការសំខាន់ៗនាពេលអនាគតមួយចំនួន

ដលៃវិធីថាវាមាននៃក្រុមប្រឹក្សាសេដ្ឋកិច្ចជា ពាក់ព័ន្ធជាមួយនឹងគុណភាពដី ៖

- ចាប់ផ្តើមស្រែដីធានាកសិកម្ម
 - ដោយមានលិខិតបទដ្ឋានគតិយុត្តុដីដោយឡែកអំពីដី និងចុះកសិកម្ម
- រោងចក្រដីថ្មី នៃក្រុមប្រឹក្សាសេដ្ឋកិច្ចជា ក្រុមហ៊ុនផ្តល់សេវាសម្រាប់ដី NPKs ទាំងលាយ ទាំងគ្រាប់
- បង្កើនការអប់រំកសិករអំពីការប្រើប្រាស់ដីប្រកបដោយគុណភាព
- បន្តអង្វរអនុវត្តកំណត់អំពីការប្រើប្រាស់ដីប្រកបដោយគុណភាព
- ការប្រកួតប្រជែងត្រីមាត្រ
 - និងប្រតិបត្តិការប្រកបដោយក្រុមសីលធម៌របស់ក្រុមហ៊ុនដី
- អនុសាសន៍អំពីការកែលម្អការប្រើប្រាស់ដីនៃកន្លែង
- អភិវឌ្ឍន៍ផ្នែកកុំព្យូទ័រ និងលុបចោលកូតា
 - ដលៃផ្តល់លទ្ធភាពឱ្យក្រុមហ៊ុននាំចូលដោយ ផ្តល់ព័ត៌មានអនុវត្តជានិច្ច
 - ដលៃអាចសន្ទស័យ ១០ ដុល្លារ ក្នុងមួយតោន

Executive Summary

Cambodia's small fertilizer market relies entirely on imports from neighboring countries

Paddy rice production dominates agricultural production in Cambodia. As of 2010, nearly 78 percent of Cambodia's arable land is under rice cultivation. Rice accounts approximately 85 percent of wet season production and only 3 percent of irrigated dry season production. Rice farmers in Cambodia are predominantly subsistence producers. Only 40 percent of rice growers are capable of generating a marketable surplus. Country's average rice crop yields are among the lowest in Asia.

Chemical fertilizer use is low and native soils are often infertile. Only about 30 percent of total cultivated area receives fertilizer applications, which is one of the lowest fertilizer use rates in Southeast Asia. As a result, the native soils contain below recommended levels of major nutrients like nitrogen (N), phosphorous (P) and potassium (K). Modifying the soil through the addition of fertilizers is considered essential to promote strong crop growth and increase yield.

Cambodia is a net importer of fertilizers. As of 2010, there is no fertilizer production plant in the country. The small fertilizer market of less than 200,000 metric tons (mt) of product is entirely supplied by imports from Thailand and Vietnam. Organic fertilizers are imported directly from Europe. Imports from Vietnam account for some 65% of the total market and are conducted through input producers who have sales representatives in Cambodia. Imports from Thailand make up *ca* 35% of the market and are carried out through Thai traders. Direct contacts with Thai fertilizer producers are rare.

Cambodia's fertilizer market is a free market lead by the private sector. In the 1990s Cambodia adopted an open economy system and allowed both private and public companies to supply and distribute fertilizers in a free market. In 2009, there were 20 officially registered companies importing fertilizer into Cambodia. The fertilizer marketing system involves over 1,000 participants, ranging from importers to village-level market retailers. Competition at all levels of the supply chain keeps profit margins low and retail prices down. Cambodia's fertilizer sector is a "price taker" with low bargaining power, and strongly influenced by a price volatility of the international fertilizer market.

High prices and fake fertilizers concern Cambodia's input market

International price spikes raised domestic fertilizers prices to unacceptably high levels and created a potential space for fake fertilizers. The global price spike in 2007-2008 caused escalations in the Cambodian fertilizer market making the fertilizer use economically not feasible for many crops. Farmers demand for “cheaper” fertilizers opened market for fake inputs. In 2008, importers and government officials were saying that nearly 30% of fertilizers sold in Cambodia were fake. The major practices included adulteration and dilution, re-bagging less expensive fertilizer in bags that were labeled as higher analysis, short-weighting bags and disguising lower analysis NPK fertilizer as higher analysis diammonium phosphate (DAP) fertilizer by coating with oil to change the product appearance. Over the recent years, the use of fake fertilizer has decreased as prices have fallen and farmers have become more aware of the quality of fertilizer.

High prices avert farmers from using fertilizers at recommended levels. A majority of farmers confirm that they underuse fertilizers because they simply can't afford them. Fertilizers count for about 30% of farmers' total production cost during a dry season and over 20% of their wet season rice production costs. There is an increasing difference between Cambodia's domestic prices and international prices. During the 2007-2008 price spikes, the price of urea, for example, grew to USD 40 per 50 kg bag, which was significantly (nearly 50%) higher than the urea price at the world market.

Poor extension services weigh down the use of fertilizers. There is a lack of information available for farmers on effective use of chemical fertilizers. Most farmers learn about fertilizer through public extension programs, NGO activities, from market retailers or through their own trial-and-error production. There is a shortage of trained and experienced public extension officers who can share best practices and recommendations. In addition, scientific agricultural research is in its fledgling stage in Cambodia. The Cambodian Agricultural Research and Development Institute (CARDI) has conducted only one fertilizer trial in 2009, and even then the main research focus was on climate change and improved water use in agriculture. As a result, larger import firms are taking on a more active role in advising dealers and farmers on fertilizer use.

Variable quality of imported fertilizers requires better certification and quality control

This study was conducted to provide a rapid appraisal of the current fertilizer quality situation in the country. In May 2010, some 103 samples were taken at random from fertilizer importers, wholesalers and retailers in 10 provinces. The study concluded that there were no obvious adulterations of any samples observed from visual inspection, at least not as much as has been often reported in the media and various reports. However, there were several samples of blended fertilizers with poorly size-matched components and highly prone to segregation.

All urea samples contained required levels of nitrogen (N). Although there were some samples of urea prills that were very small and dusty (indicating weak prill strength), all samples of urea were analyzed with 46% or slightly higher N content.

Few Diammonium phosphate (DAP) samples were marginally below the standard specification of 18% of N, and well under required 46% of P₂O₅. One imported DAP sample from Thailand, claimed to be purchased from the US, contained much less (33%) of a P₂O₅ content but its N content almost met the required level (17.6%). A visual examination of cut granules revealed that some granules were homogeneously black as DAP should look like but some granules were whitish inside. This suggested the use of ammonium phosphate sulfate (APS) with a normal analysis of 16% N, 20% P₂O₅, 0% K₂O and 13% S. The mixing of the product with the DAP may have occurred at any stage in the supply chain. One scenario is that it was granulated and blended at a manufacturing site.

Urea, DAP, APS and MOP imported into Vietnam and Thailand in bulk and then bagged for export to Cambodia were variable in physical quality, color and chemical composition. Samples of diammonium phosphate (DAP) imported from Thailand were almost certainly a blend of DAP and 16-20-0. The DAP and ammonium phosphate sulphate (APS) from Vietnam showed overall deficiencies in blend analyses.

Blended fertilizer samples analyzed failed to meet the guaranteed analysis in one or more nutrients. Almost all samples (except one) of blended fertilizer were below guaranteed analysis in potash, eight samples were low in phosphate content and 10 samples were low in nitrogen (i.e. below the investigational allowances).

The quality of blended fertilizers and granulated NPK fertilizers from Vietnamese producers is below standard. Almost all NP and NPK blends originated from Vietnam were found to be deficient in nutrient content. This could be the result of poor blending and component segregation, dilution with filler, inaccurate weighing or poor quality of raw materials. Vietnamese producers often buy raw materials from China, where these materials are not subject of appropriate chemical testing. In addition to poor quality NP and NPK blends, fertilizers from Vietnamese producers were deficient in potash and phosphate. Conversely, NP and NPK compounds from Thailand met acceptable quality indices.

Two granulated NPK samples, one from China and another one from Vietnam, were only marginally below the total nutrient content index of 98%.² Three separate problems were apparent in these products:

² Total Nutrient Index = Total guaranteed nutrient content / Actual total nutrient content. A product with an index level below 98 percent is defined as not meeting guarantee.

- a) **Low N content, low P₂O₅ analysis and low K₂O levels.** These products were manufactured using steam granulation of ammonium sulfate, DAP and Muriate of Potash (MOP). In this process it is critical that potash solubility is achieved to effect its inclusion in the granules. In order to do this the granulation temperature has to exceed 160⁰ F. If granulator temperatures do not reach this level the MOP fails to bind to the granules and during the drying process the powdered MOP is extracted through the ventilation system or accumulates in the granulator building.
- b) **The low phosphate levels** in the NPK samples were probably due to the use of low-quality phosphoric acid in the manufacture of DAP and the use of sulfuric acid to raise reaction temperatures to ammoniate the acid fully.
- c) **Ammonium phosphates such as DAP** can vary in analysis from the standard 18% N/46% P₂O₅ to between 17-20% N and 45-46%P₂O₅ and the addition of sulfuric acid can lower the analysis further. The Vietnamese manufacturers of these NPKs are relying on imported DAP and it would appear that the DAP ingredient was below standard specification causing the low analysis of the final products. If this is the case then the manufacturers' quality control systems are to suspect.

Better control over licensing and regulatory environment would improve transparency and efficiency of fertilizer distribution

While retailers and wholesalers' activities are regulated, there is a group of unidentified middlemen e.g. mobile traders, who deliver fertilizers from district retailers to farmers. Although these mobile traders execute at least 30% of all input sales, they are not required to register their business with a Ministry of Agriculture, Forestry and Fisheries (MAFF). Some of these middlemen provide sales on credit, which is a legitimate but costly service to farmers. These mobile traders and small village retailers are often blamed for selling fake fertilizers, causing financial losses to farmers, and corrupting the fertilizer market. Better control over their activities would improve the transparency of the fertilizer sector in Cambodia.

The fertilizer import licensing procedures are complex, out of touch with market demand and restrictive to competitive market operation. The process of obtaining an import licence is complicated and not transparent. Import tonnage is restricted to 30,000 mt per one licence, which prevents larger importers from accessing international markets for bigger bulks of higher quality product at lower prices. Small shipments are economically feasible from closer destinations forcing distributors to continue importing from Vietnam and Thailand. Aside from higher operation costs, the tonnage quota system encourages illegal imports and prevents small firms from entering and competing in the input market, which, in turn, would bring retail prices down and benefit Cambodian farmers.

The Bureau of Agricultural Material Standards (BAMS) conducts quality control over the fertilizer sector in Cambodia and is responsible for administrating fertilizer import licensing. BAMS is a branch of the Department of Agricultural Legislation (DAL) by MAFF. Although field inspectors have been successful in increasing farmers' awareness on fake fertilizer and training dealers on detecting fraud, DAL lacks both the capacity and authority to control the fertilizer trade in Cambodia. Quality control is often performed through visual inspection that is not sufficient for identifying adulterated fertilizer or fertilizer below guaranteed nutrient analyzes. There is also a lack of legal recourse to prosecute any violators of the existing regulations. Under the three-year Quality Control Agricultural Materials (QCAM) project, there will be several analytical laboratories upgraded by 2011 to provide a complete fertilizer analysis service to back up the DAL's field inspectors.

The current fertilizer and pesticide legislation needs to be reviewed. The new draft law is designed to be used in conjunction with specific regulations in sub-decrees that can be amended without parliamentary approval by MAFF. However, it is strongly recommended that the MAFF consider either separation of the fertilizer law from the current draft or that it amends the draft law to cover only the responsibilities of the authorities to administer the separate regulations pertaining to pesticides, fertilizers, feedstuffs and veterinary medicines.

Recommendations for policy actions

1. It is essential that the Department of Agricultural Legislation in Cambodia and the field inspectors have access to reliable and fast fertilizer analytical services as visual inspections cannot detect product adulteration or below-guarantee analysis.

- In the field, inspectors can and should use a simple pill cutter to cut DAP and APS granules in half to check the consistency of granules.
- The Ministry of Agriculture, Food, and Fisheries in Cambodia should insist on independent quality assurance certificates of analysis from accredited organizations for all imported fertilizers and particularly those with multi-nutrient content, either NP or NPK content.

2. Simplify the import license application procedure and regulations. It is strongly recommended that import licenses are approved on the basis of product suitability only and that all importers are allowed to import any quantity of registered fertilizer products.

- Remove tonnage restrictions and allow importers to import unlimited amounts of suitable registered products based on market risk assessment. Also allow small importers to entry the market and thus widen competition in price and quality.

- Amend the fertilizer import licensing regulations and abandon the MAFF's power to control individual licenses to specific quantities of fertilizer. This measure will simplify and speed up the licensing process and remove the need for "liaison" to expedite the issuing of import licenses
- The review of import license applications has to be restricted to the DAL/BAMS and the MAFF Technical Department for approval of the product registration only
- Importers should be required to provide details of all fertilizer imports on a quarterly basis to the DAL and the MAFF should publish quarterly summaries of fertilizer imports by product grouping to provide total market information
- The DAL inspectors should be provided with the means to take spot check fertilizer samples at border crossings
- The DAL fertilizer inspection services should concentrate monitoring efforts on blended fertilizers and granular NP and NPK fertilizers imported from Vietnam
- All imported fertilizer should include the manufacturer's factory source of origin or in the case of re-exports the original country of origin. This will enable identification of sources of sub-standard fertilizer
- A certificate of analysis should accompany all imported fertilizer from an internationally accredited quality control organization. This may not be practical with the small import lots such as truckloads or small barge loads but a practical solution should be discussed with the major importers.
- Label imported products with source of origin to identify sub-standard fertilizer
- Expand scientific research and public extension services to improve fertilizer use efficiency through increased public demand for agricultural research and development
- Educate input dealers and farmers on the use of chemical fertilizers.

3. There should be registration and certification of traders who buy fertilizer from certified dealers and transport the fertilizer to villages for direct re-sale to farmers (as at present there is no regulation of these operators who can account for a substantial portion of fertilizer sales).

- In addition to certification of wholesalers and retailers, the provincial DAL should take steps to also certify the third parties who purchase fertilizer and deliver it to villages for re-sale to farmers. At present, these individuals and firms have no regulation at all with regard to fertilizer quality, and there exists the opportunity to adulterate the fertilizer. The certification of retailers means little when these operators are unidentified and unregulated. At a minimum, registration of these operators should be enforced.

4. Separate the draft Law on Managing Agricultural Pesticide and Fertilizer from specific commodity regulations. Fertilizer law and regulations should be designed to protect farmers and market participants including importers, distributors, wholesalers, retailers and the public from:

- Malpractices such as adulteration, mislabeling and short weights.
- Unsubstantiated claims of product benefits.
- Environmental hazards.
- Public health hazards.

These safeguards can be incorporated into the regulations through the principle of “truth in labeling.”

5. MAFF should study the Association of American Plant Food Control Officials’ (AAPFCO) official publication “Uniform State Fertilizers Bill” before finalizing the fertilizer regulations for Cambodia and incorporating relevant provisions.

The Cambodia’s regulations should include:

- Definitions of fertilizer materials including inorganic and organic fertilizers, slow and controlled release fertilizers and fertilizer amendments
- Definitions of plant nutrients and guaranteed analysis including micronutrients
- Product registration procedures and officials
- Definitions and specifications of label requirements including language.
- Definitions of plant nutrient deficiencies
- Definitions of adulterated fertilizer product
- Defined permissible limits on heavy metal content of fertilizer
- Inspection authority
- Sampling procedures
- Analytical procedures
- Penalties for breaching the regulations

Future trends

Some of the important future trends expected in Cambodia in relation to fertilizer quality:

- New Agricultural Inputs Legislation with separate regulations for fertilizer and pesticide
- New fertilizer factory in Cambodia – Five Star Company for NPKs, both for blends and granulation
- Increased farmer education on the use of quality fertilizer
- Continuing dealer education on the use of quality fertilizer
- Healthy competition and ethical operations of fertilizer companies
- Improved site-specific fertilizer recommendations
- Development of Sihanoukville port and removal of quotas, which allows firms to import directly from international market, possibly saving \$10/mt

1. Introduction

1. In response to numerous reports and claims of poor quality or “fake” fertilizer that were extensively reported by farmers, fertilizer dealers and government officials of the Ministry of Agriculture, Forestry and Fisheries (MAFF) over the past three years, the World Bank, in support of the Royal Government of Cambodia and in response to the food crisis through the Smallholder Agricultural and Social Protection Support Development Policy Operation (DPO) engaged the International Fertilizer Development Center (IFDC) to perform a rapid appraisal of fertilizer quality in Cambodia. The Terms of Reference for the assessment are presented in Annex 1. The assessment performed by IFDC included a field visit to Cambodia from April 27 to May 20, 2010. In addition to on-site observations of performance factors relevant to the fertilizer and other agricultural input markets, discussions were held with key public and private sector officials regarding policy and market-related issues. A total of 103 samples of fertilizer were collected for analysis of quality from 26 fertilizer dealers and three importers. Six Cambodian farmers were interviewed and three fertilizer manufacturers were visited and interviewed in Ho Chi Minh City, Vietnam.

2. The field investigations involved extensive interviews and discussions with public and private stakeholders and site visits to fertilizer dealer shops and warehouse locations. The following official contacts were made during the visit:

- 50 major contacts in government or agricultural development projects.
- 26 fertilizer dealers.
- Three importers.
- Three Vietnamese fertilizer companies: Binh Dien Fertilizer Company, Petrovietnam Fertilizer and Chemicals Corporation, and Five Star International Group)
- Six Cambodian farmers.

3. During the first week time was devoted to team formation, schedule planning and discussions with government officials and project principals in Phnom Penh. This included visits to the World Bank office, the Cambodian Agricultural Research and Development Institute (CARDI) and the mid-term review workshop of the Quality Control Agricultural Materials (QCAM) project organized by the Japanese International Corporation Agency (JICA) and the Ministry of Agriculture, Food and Fisheries (MAFF).

4. During the second week, visits were made to three provinces (Kampong Chan, Kandal and Svay Rieng) and discussions were held with importers in Phnom Penh and government officials, the analytical laboratories of the General Directorate of Agriculture (GDA) and the Bureau of Agricultural Materials and Standards (BAMS).

5. During third week visits were made to six provinces in the main rice production areas of Cambodia (Pursat, Battambang, Banteay Meanchy, Siem Reap and Kampong Thom). Discussions were held with senior staff of the Provincial Departments of Agriculture (PDA) and with provincial-, district- and village-level fertilizer distributors and retailers. A planned visit with 30 farmers attending a training workshop was not completed due to a time constraint. Six individual farmers were interviewed either at their farms or at fertilizer retail stores.

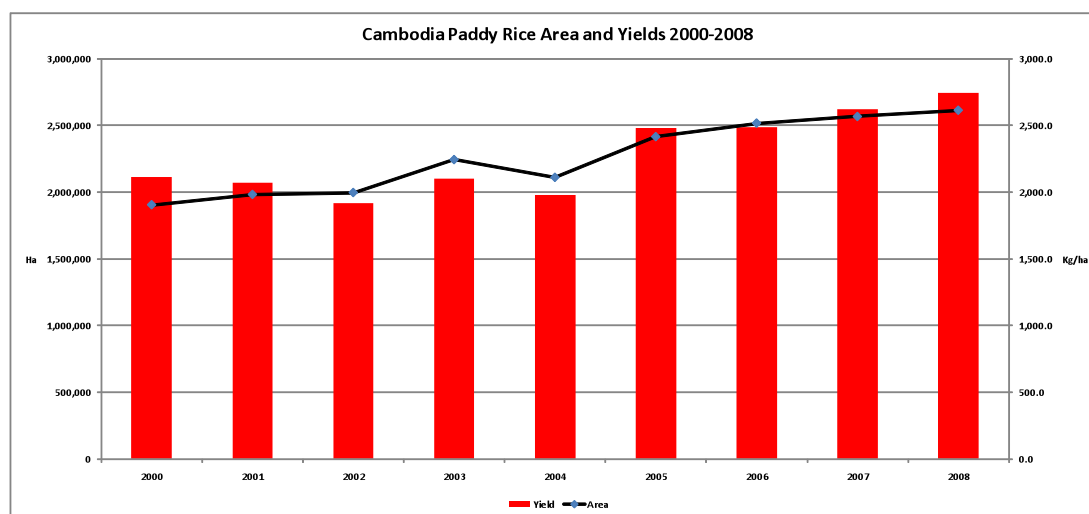
6. During fourth week, a two-day visit was made to Ho Chi Minh City for discussions with three Vietnamese fertilizer producers that export to Cambodia. A visit was made to inspect fertilizer import operations in Takeo Province. Finally, a debriefing report was made to Mr. Cyprian Selebalo, Land Specialist at the World Bank office in Phnom Penh.

2. The Cambodian Fertilizer Market

7. **Agriculture contributes around 40 percent to the country's gross domestic product (GDP) and provides direct livelihood to 1.8 million rural households involving about 9 million dependents.** Rice production dominates agriculture. Rice area accounts for 78 percent of the total cultivation and approximately 85 percent is wet season production and only 3 percent irrigated dry season production with a further 12 percent of irrigated early wet season crop. Since 2002, many farmers have changed their cultural practices from self-home consumption to market-cash oriented. With improvement of public infrastructures and political stability, many rice traders, especially those from neighboring countries, offered higher price than local traders could normally offer. With these opportunities, many farmers have changed their low-yield traditional variety to a high-yield, short-duration, or high-quality market demand variety (aromatic variety), which are all improved varieties.

8. **Currently, almost 100 percent of dry season and early wet season farmers are growing improved varieties.** For wet season, many farmers are starting to grow improved high-quality varieties for cash and keep part of their lands to grow traditional varieties for home consumption. However, the ratio of traditional versus improved variety is dramatically changing after huge price differences in 2008-2009. For example, farmers can sell one kilogram (kg) of paddy traditional variety 1 for about 600-700 riels, while they can get 1100-1200 riels for an aromatic improved variety. Beside the price differences, the yield of improved varieties is almost double that of the traditional varieties. As a result, in the wet season 2009-2010, there was a large shortage of improved aromatic variety (e.g. Phka Rumdoul variety) to meet farmers' demand.

Figure 1: Cambodia Paddy Rice Area and Yields 2000-2008



Source: FAOSTAT

9. Maize and cassava each account for a further 5 percent of crop areas, fruit and vegetables for around 4 percent and rubber plantations at approximately 30,000 hectares (ha) for a further 1 percent. Obviously rice accounts for the vast majority of fertilizer usage followed by vegetable crops.

10. Fertilizer use on rice is estimated by the extension service to be restricted to about 40 percent of the wet season production area and 80 percent of the dry season area. Recommendations are as follows:

- Wet season: 1.5 bags urea and 1 bag of DAP
- Dry Season: 2 bags urea and 2 bags of DAP

11. No official recommendations are given for potash and certainly the evidence supports claims that there is little or no response by rice on sandy- and clay-loam soils which are subject to inundation in the wet season although there are responses on the lighter sandy soils. There is strong official support for the use of organic fertilizer and the SRI program for poor light textured soils with poor cation exchange capacity. The use of traditional sources of organic matter is strongly supported but the use of imported organic fertilizers with low nutrient content as a sole source of fertilizer is not supported.

12. There is a dearth of information for farmers on fertilizer application recommendations and research is minimal. At the Cambodian Agricultural Research and Development Institute (CARDI), only one fertilizer trial was conducted in 2009 even though the main research priorities of rice intensification and food security stress related aspects of climate change and improved water use in agriculture.

13. The larger import firms are taking on a more active role in advising fertilizer dealers and farmers on fertilizer recommendations, as a result of the lack of any major effort from the research and extension services on fertilizer use, .

2.1 Fertilizer deep placement technology

14. The innovative urea deep placement/fertilizer deep placement (UDP/FDP) technology has been promoted by IFDC and partner organizations as an effective and efficient approach to managing fertilizer inputs for flooded rice in of Asia. IFDC and partners disseminated the deep placement technology to thousands of rice farmers in Bangladesh, Cambodia and Vietnam. The approach has proven to be successful in increasing crop productivity and reducing rural poverty. Moreover, given the increasing cost of fertilizer inputs and the need to use them more efficiently, the UDP/FDP technology stands ready to be replicated and scaled up to benefit many more resource-poor farmers in Asia.

15. In 2004 and 2005 IFDC conducted farmer training in Cambodia for 1020 small, resource poor farmers in Prey Veng and Svay Rieng Provinces using NPK briquettes used for deep placement. As shown in Table 1, the use of this technology increased production by 69 to 70 percent, although with higher N applications than farmer practice. There were considerable profit gains.

Table 1: Rice Paddy Yield (14% Moisture) and Profitability Obtained From On-Farm Trials Comparing UDP/FDP With Farmers' Practice (FP) of Broadcast Applications

Country	Season	Observations ^b	FP (Broadcast)		UDP/FDP ^a		% Yield Increase Due to UDP/FDP
			Urea (kg/ha)	Yield (kg/ha)	Urea (kg/ha)	Yield (kg/ha)	
Cambodia	Dry season	181	100	2,767	122	4,690	69
	Wet season	173	70	2,398	122	4,083	70
Profitability			Per Hectare		Per Household		
		Rice Land	Yield Gain	Profit Gain	Yield Gain	Profit Gain	
	Dry season	0.56	1,923	211	1,077	118	
	Wet season	1.66	1,685	174	2,797	289	

a. Urea applied as NPK briquettes

b. Number of on-farm comparisons made in side-by-side plots.

16. The project in Cambodia benefited from a month-long visit in July 2005 by a team of four recent MBA graduates from the Kellogg School of Management at Northwestern University, U.S.A. These graduates were volunteers who studied the business potential for deep placement in Cambodia. They drafted a business plan and guide for developing a sustainable, for-profit urea and multi-nutrient briquette supply chain for resource-poor rice farmers. The purpose of the plan was to outline how IDE-Cambodia could nurture the supply chain to self-reliance within three years. IDE continues to work with FDP in both paddy rice and vegetable production and in 2009 farmers used 50 mt of NPK briquettes. These were analyzed as part of this study to check the nutrient composition.

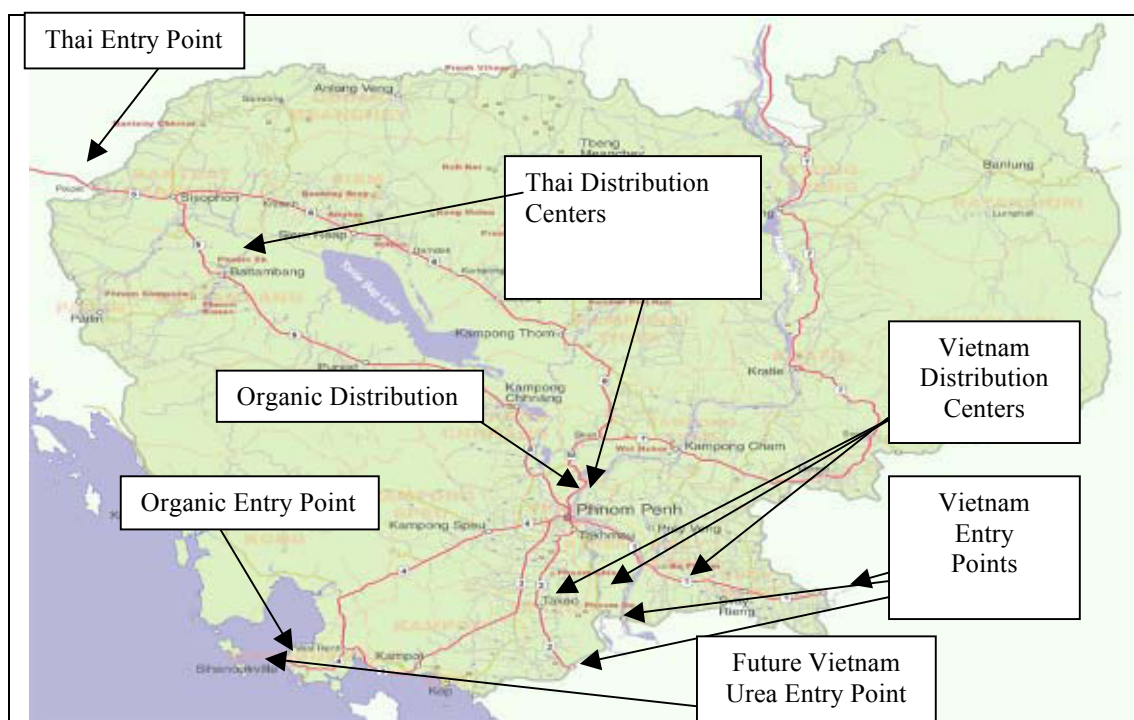
17. Urea deep placement technology has a small but important niche market potential in Cambodia for small, resource-poor farmers because it improves nitrogen use efficiency. However, with farmers in the main rice production regions increasing mechanization of rice production and opting more for direct seeding, this precludes any widespread adoption because of the absence of any proven mechanized application machinery for deep placing briquettes, shortage of labor for hand

placement and the lack of demonstration of the technology with direct seeded rice. Results obtained by IDE with use of FDP for vegetable production are encouraging but again the market potential for the technology will be small in Cambodia.

2.2 Fertilizer supply

18. There is no fertilizer manufactured in Cambodia³ and all supplies are imported from either Thailand, Vietnam or, in the case of organic fertilizer, directly from Europe. Imports from both Thailand and Vietnam consist of fertilizer manufactured in each country and re-exports of bagged fertilizer imported in bulk from the international market. Imports from Thailand are all by road transport essentially through Poipet to either importer/distributor warehouses located at the border or to distributor warehouses in Phnom Penh. Imports from Vietnam enter Cambodia by river barges or by road transport to three major distribution points in the southeast or to Phnom Penh. Organic fertilizers from France and Belgium enter the country through the port of Sihanoukville.

Figure 2: Fertilizer import and distribution center locations



³ A new granulation and blending plant is expected to start operation in 2011.

19. Import licenses from MAFF are required and annual quotas are applied. While investigating the license procedures and quantities imported in 2009, consultants from Japan⁴ found that official data on fertilizer imports were generally unavailable. This situation prevails with the only official data made available being the import licenses granted in 2008 and 2009 and the tonnage licensed for import in those two years.

20. The Supply Chain Analysis (2009) reported a wide (30%) discrepancy between official import data and the international trade statistics on fertilizer exports to Cambodia from Vietnam and Thailand for the period 2003 to 2008. Fertilizer imports to Cambodia based on the international trade statistics for 2003 to 2007 are shown in Table 2.

Table 2: Estimated fertilizer imports and demand 2003-2009

	2003	2004	2005	2006	2007	2008 (Est.)	2009 (Est.)
Vietnam							
Nitrogen	65,466	56,087	39,363	57,242	58,203	41,049	50,334
Phosphate	35	66	46		41	29	36
Potash		85	107	207	108	76	94
NPK	45,635	43,420	47,577	54,207	51,647	36,425	44,664
Total	111,136	99,658	87,093	111,656	110,000	77,580	95,128
	71.39%	69.03%	56.44%	63.22%	58.46%	60.00%	65.00%
Thailand							
Nitrogen	11,737	7,160	16,379	18,766	24,080	15,061	14,917
Potash	35	68	27	11	10	9	9
NPK	31,617	36,512	48,740	45,664	53,033	36,650	36,297
Total	43,389	43,740	65,146	64,441	77,123	51,720	51,223
	27.87%	30.30%	42.22%	36.49%	40.99%	40.00%	35.00%
China and Other							
Nitrogen	254	448	860	510	1,050		
NPK		206					
Other	905	308	1,205	9			
Total	1,159	962	2,065	519	1,050		
	0.74%	0.67%	1.34%	0.29%	0.56%	0.00%	0.00%
Total							
Nitrogen	77,457	63,695	56,602	76,518	83,333	56,111	65,251
Phosphate	35	66	46	0	41	29	36
Potash	35	153	134	218	118	85	102
NPK	77,252	80,138	96,317	99,871	104,680	73,075	80,961
Other	905	308	1,205	9	0	0	0
Total	155,684	144,360	154,304	176,616	188,173	129,300	146,350
Percent Change		-7.27%	6.89%	14.46%	6.54%	-31.29%	13.19%

⁴ Agricultural Inputs Supply Chain Analysis, Cambodia for World Bank. Japan Development Institute and Global Developments, Japan, April 2009.

21. The split between imports from Vietnam and Thailand is approximately 65 percent and 35 percent respectively with trade activity with Vietnam growing. Estimates were made for imports in 2008 and 2009 based on variations in the official Cambodian import quotas for 2008 and 2009 compared to 2007. The total market peaked in 2007 at around 188,000 mt products after growing on average by 4.8 percent per annum from 2003. In 2008 it is estimated that the demand fell by over 30 percent due to the high prices prevailing from October 2007 to October 2008. It is estimated that demand recovered somewhat in 2009 by 13 percent to 146,000 mt products. The 2009 market is estimated at 45,000mt N, 16,000mt P₂O₅ and 12,000 mt K₂O. No account has been taken in these estimates of the organic fertilizer imports, reportedly around 30,000mt per annum

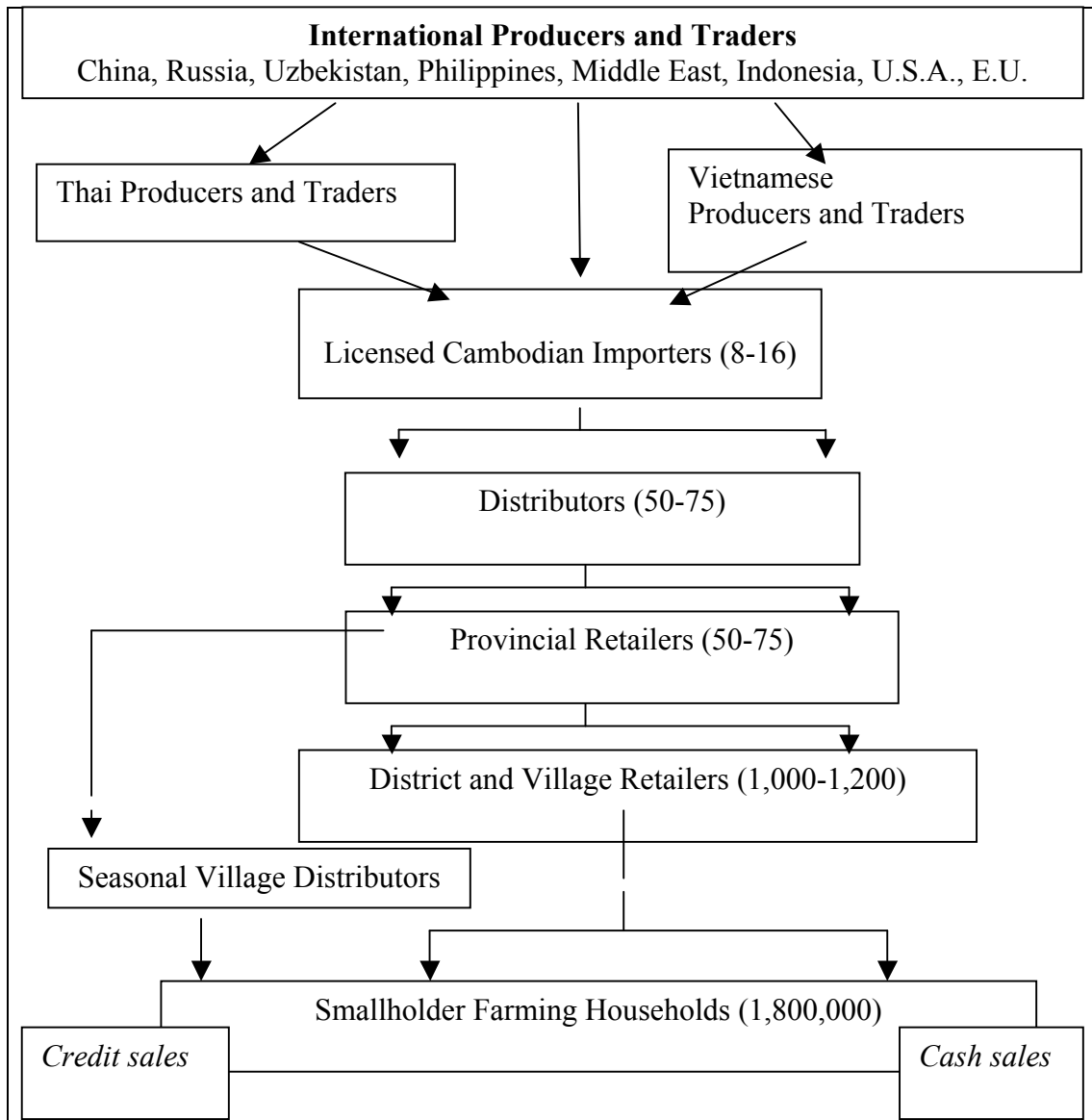
2.3 Organization of the Cambodian fertilizer market

22. The structure of the fertilizer sector in Cambodia is evolving but is already quite structured and formalized to serve the 1.8 million farm households in Cambodia (as illustrated in Figure 3). It is an entirely private sector structure operating in a competitive manner with prices set by market forces.

23. The major fertilizers imported into Cambodia are urea and NP and NPK granular compound and blended products. All products are imported in 50kg bags. Thailand produces compound fertilizers by the steam granulation process from three plants with a total annual capacity of 1.8 million mt. Thai Central Chemical Public Company Ltd. operates two of these plants with 1.2 million mt capacity. A wide range of compound NPK formulations is produced. Although there are blending plants, these are all geared to the domestic market. There is no urea or diammonium phosphate (DAP) production in Thailand. Imports from Thailand to Cambodia are made through Thai traders rather than directly from the production companies. Urea, DAP and potash imports from Thailand are re-bagged imports from international suppliers. In Vietnam there are eight NPK steam granulation plants with a total annual capacity of 2.62 million mt. Traditionally, Binh Dien Fertilizer Co., a public sector company, has been the main supplier of compound NPK fertilizers to Cambodia, exclusively through YETAK Group in Cambodia. In 2007 a new company, Five Star Group, opened a 200,000 mt steam granulation plant and a 100,000 mt blending plant in Ho Chi Minh City and began marketing into Cambodia in 2008. In 2012, Five Star will open a duplicate production complex with steam granulation and blending plants in Cambodia .

24. Urea is produced in Vietnam in two plants with a total annual capacity of 920,000mt. Petro Vietnam Fertilizers and Chemicals has the largest capacity at 740,000 mt of prilled urea. A new Petro Vietnam granular urea plant with an annual capacity of 790,000 mt will start operation in 2012. Imports to Cambodia from this plant will be made through Sihanoukville port. This may reduce the freight cost by up to \$20/mt

Figure 3: Fertilizer procurement and distribution channels



25. In addition to Binh Dien Fertilizers, Petro Vietnam and Five Star, all of which have representation in Cambodia, there were 29 fertilizer companies registered between 2005 and 2007. In 2008 the number of registered fertilizer companies was reduced to 18, of which 10 were only importing and handling organic fertilizers. In 2009 the number registered increased to 21 with eight only handling organic fertilizer. Six companies were the most active, namely: YETAK Group, Heng Pich Chhay Import Export Company, Sayimex Co. Ltd., Heng Ny Heng Co. Ltd., E Skor Co. Ltd., and Chung Heng Company. All have distribution warehouses in Phnom Penh and some have warehouses close to border entry points. There is little vertical integration in the market channels. However, as Five Star, Binh Dien and Petro strive to establish brand image in Cambodia with logos of 5 Stars, Buffalo Head and Petro respectively, closer working relations in the distribution chain are being

developed with exclusive arrangements with distributors and large Provincial dealers. The YETAK Group has already appointed representative lead dealers in each of the provincial capitals to serve as distribution points for each province.

26. Two of the importers, YETAK and Import Export Company, employ technically qualified agronomists and the Vietnamese production companies also employ technical field staff. YETAK Group has an exclusive contract for importation with Binh Dien Fertilizer Company in Vietnam. Most of these large importers distribute to all provinces in Cambodia and many of the smaller ones have restricted operations in only one to three provinces. The Cambodian importers usually use wire transfer rather than Letters of Credit (LCs) for import payment either to traders in Vietnam and Thailand or directly to the production companies. All imports require import licenses issued by MAFF which are specific to the products and volumes to be imported. The complex licensing process is an unnecessary and significant barrier to entry for potential small or new importers and appears to be circumvented by various means with regard to volumes.

27. The importers store imported fertilizer in both near-border warehouses and in Phnom Penh and their distributors transport product to provincial retailers located in the main provincial cities or on major roads close to the cities. Depending on the province, there can be between four and 10 per province. Delivery costs to the provincial dealers consist of freight at \$0.15/mt km plus handling and distributor markup of around \$5/mt. These larger retailers have warehouse facilities that can store up to 2,000-3,000 mt. Markups ex-store of only around 3.5 percent to 5 percent are typical. Most have trucks for delivery to village-based retailers and sales are made to city retailers frequently located in main city markets. These city retailers typically have small shop premises with limited storage and sell a range of farm and garden requirements.

28. The main provincial retailers and some of the larger district retailers re-sell to small mobile traders who deliver fertilizer to villages and sell direct to smallholder farmers. Up to 30 percent of sales from some provincial and district retailers are made through these mobile traders. These are frequently funded by businessmen who sell fertilizer and other inputs to farmers on credit terms. They are not required to be registered with the MAFF, whereas all other businesses handling fertilizer for sale are required to be registered. Frequently it was reported that the mobile traders were not known to the retailers and they just appeared and purchased product for re-sale and when sales are made on credit to farmers, this may add as much as \$5/50-kg bag.

29. Village retailers typically buy from one provincial retailer but may use more sources depending on price and services offered or to meet specific customer needs. These village stores are typical one-stop shops with feed, pesticides, fuel and seed stocked in addition to fertilizer. Premises are small and fertilizer storage is usually less than 100 mt (but can be larger). Purchases are generally made on a cash basis and with low mark-ups of 3 percent to 5 percent (under \$1/50-kg bag). Most sales are made on a cash basis as significant risks exist with late payments by farmers.

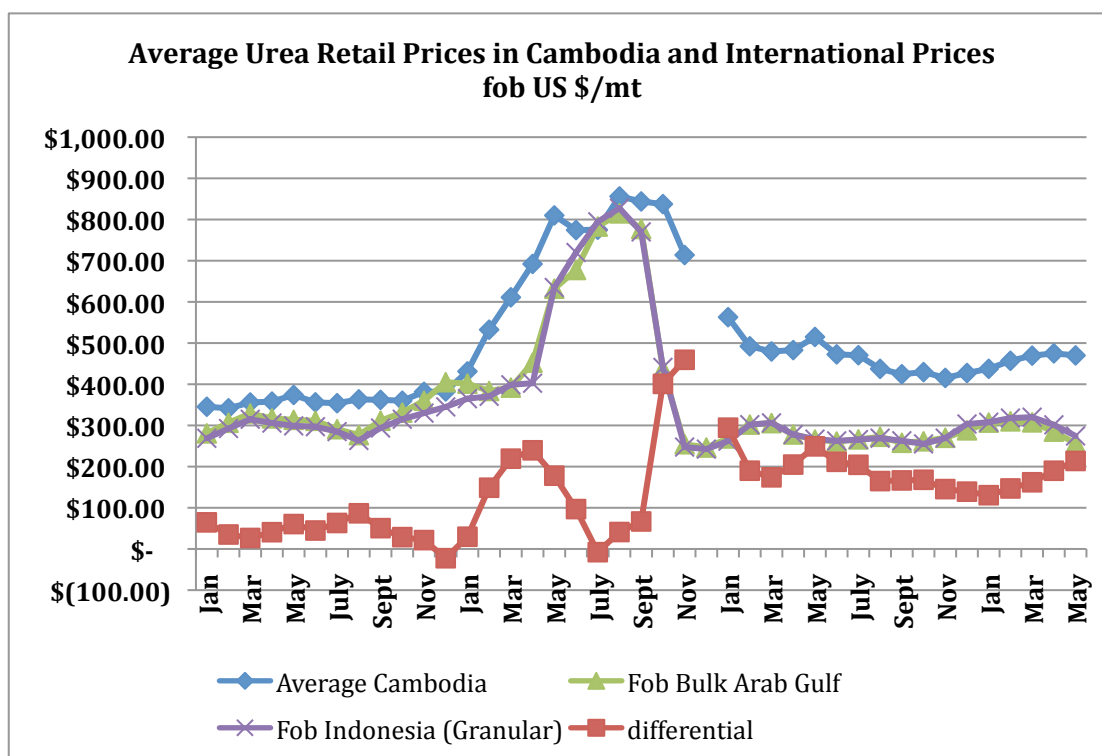
2.4 The fertilizer value chain

30. During the field visit, buying prices and selling prices were recorded for each importer, provincial and village retailer visited. The prices for purchases together with the markups for importers and retailers are illustrated in Table 3. These low markups are indicative of a very competitive market, particularly for urea. When operating costs are taken into account the margins from fertilizer at the provincial and village level are very low. Prices recorded match with those recorded by the Cambodian Market Project, which has recorded market prices for at least the past two years. Selected data is shown in Figures 3 to 5 with domestic prices compared to international bulk fob prices

Table 3: Summary of buying and selling prices per 50-kg bag by province, May 2010

Location	Product							
	Granular Urea				Prilled Urea			
	Buy	Sell	Markup	%	Buy	Sell	Markup	%
	US\$/50-kg bag				US\$/50-kg bag			
Vietnam Importers	19.00	19.90	0.90	4.74	19.00	19.50	0.50	2.63
Kampong Cham	22.75	23.50	0.75	3.30	18.95	19.70	0.75	3.96
Kandal	17.50	18.00	0.50	2.86	20.00	20.50	0.50	2.50
Svey Rieng	19.37	20.73	1.37	7.06	18.50	19.50	1.00	5.41
Kampong Chang	19.00	20.00	1.00	5.26				
Pursat	22.56	22.86	0.30	1.32	19.50	20.24	0.74	3.79
Battambang	21.00	21.58	0.58	2.77	21.03	21.68	0.65	3.11
Poipet (importer)	23.50	25.00	1.50	6.38				
Siem Reap	20.06	20.89	0.83	4.14	18.50	18.77	0.27	1.46
Song	18.00	19.00	1.00	5.56				
Average Urea	20.27	21.15	0.87	4.30	19.35	19.98	0.63	3.26
Average DAP	27.16	28.11	0.96	3.53				
Average 15-15-15	26.91	27.86	0.94	3.51				
Average 16-20-0	23.65	24.56	0.91	3.85				

Figure 4: Comparison of urea prices, January 2007 to May 2010



31. Domestic retail prices for urea and DAP have reflected the price movements of fob international prices with some lag of about two months. However, there does appear to have been an increase in the differential between domestic urea prices (retail, bagged) and international prices (fob, bulk) since 2009. This differential has increased from around \$100/mt to around \$200/mt. This may have been partly caused by a change from Chinese-sourced prilled urea to other sources of granular urea or a shortage of urea in the Cambodian market as international prices fell during 2009. Even so it appears that overall price-gouging in Cambodia is not a problem because of the intense competition in procurement, distribution and retailing.

32. Monthly retail prices for 16-20-0, recorded in Figure 4, follow a similar pattern as international DAP prices during the price spike. The spike in international fertilizer prices between October 2007 and October 2008 led to peak prices for Cambodian farmers of \$800-850/mt for urea and \$1300-\$1400/mt for DAP (at which levels the products were unaffordable for most small farmers and the economics of use were negative).

Figure 5: Comparison of DAP prices, January 2007 to May 2010

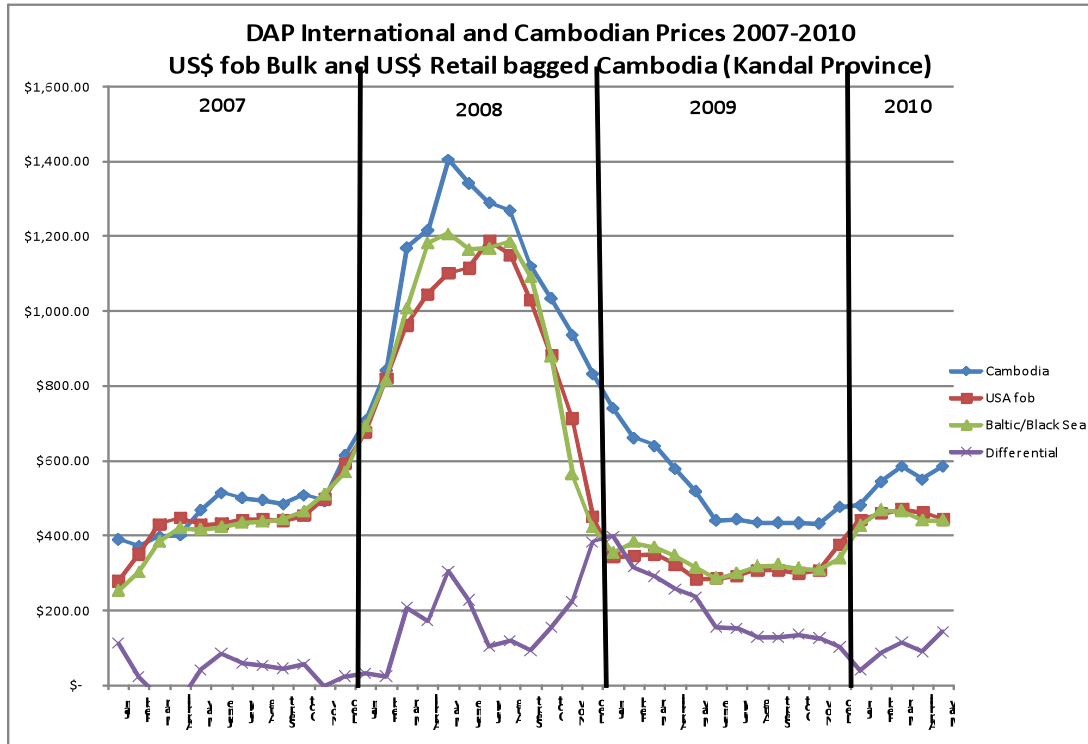
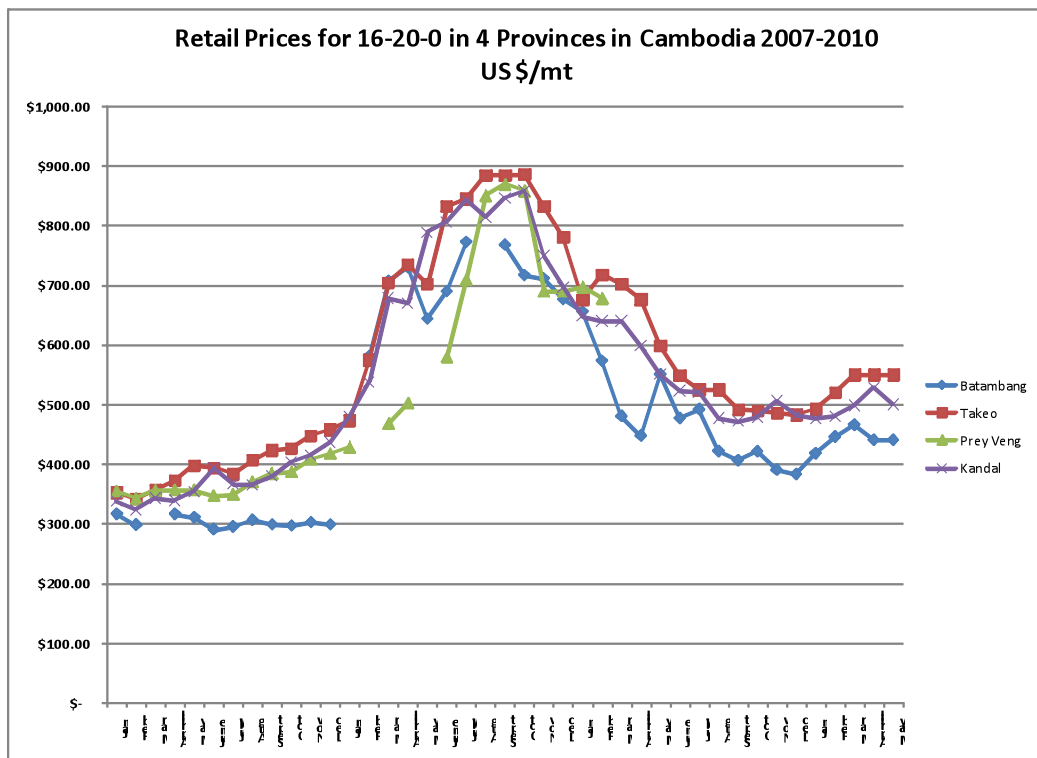


Figure 6: Monthly retail prices for 16-20-0 fertilizers in Cambodia



33. The multi-transaction value chain is competitive and with the increasing certification of retailers and wholesalers, more regulated, but it also includes middlemen purchasing truckloads of fertilizer from district retailers for delivery and sale to farmers in the villages. Some of these middlemen provide sales on credit, a legitimate though costly service to farmers. There is the opportunity to adulterate the fertilizer in this process and it was observed that reports of “fake” fertilizer were more numerous in the south where retailers reported sales to middlemen of 30 percent to 60 percent of total sales. The certification of retailers means little when these operators are unidentified and unregulated. At a minimum, registration of these operators should be enforced.

34. Estimated value chain points are estimated in Table 4 for urea imports from Vietnam based on the data collected and interviews conducted. Vietnamese urea producers have to match the import parity prices to be competitive and hence the value chain starts with the international fob bulk price. As can be seen, the mark-ups beyond the Cambodian importers are minimal due to the competitive nature of the domestic market. As a result, retail prices for Cambodian farmers are only about 50 percent higher than international bulk prices fob. When operational costs are accounted for, the mark-ups do not allow high profit margins and the most value added beyond the producers’ factory gates accrues to the importers.

Table 4: Cambodia urea value cost chain, May 2010

	\$/mt	\$/50 kg	Percent of f.o.b.	Percent of Retail
Bulk Prilled Urea fob Arab Gulf	300.00	15.00	100.00	66.60
Ocean freight & insurance	28.00	1.40	9.33	6.22
Discharge and inland freight	10.00	0.50	3.33	2.22
Bagging	15.00	0.75	5.00	3.33
Markup	8.00	0.40	2.67	1.78
Urea Bag Cost ex Importer Vietnam	361.00	18.05	120.33	80.14
Barge transport to Cambodia (Takeo)	6.00	0.30	2.00	1.33
Into store	1.00	0.05	0.33	0.22
Cost into Border Warehouse	368.00	18.40	122.67	81.69
Importer's markup 5%	18.40	0.92	6.13	4.08
Importers Selling Price	386.40	19.32	128.80	85.77
Transport to province (200 km @ 0.15)	30.00	1.50	10.00	6.66
Distributor markup and handling	5.00	0.25	1.67	1.11
Into store Provincial Distributor	421.40	21.07	140.47	93.54
Provincial distributor markup 3.5%	14.75	0.74	4.92	3.27
Distributor selling price	436.15	21.81	145.38	96.82
Transport to village dealer (30 km)	4.50	0.23	1.50	1.00
Into store at village dealer	1.00	0.05	0.33	0.22
Dealer markup for cash sale (2%)	8.83	0.44	2.94	1.96
Retail Cash Price	450.48	22.52	150.16	100.00

3. Fertilizer Quality Control and Import Process

35. The fertilizer import licensing procedures are complex, out of touch with market demand and restrictive to competitive market operation. The Bureau of Agricultural Material Standards (BAMS) is responsible for administering fertilizer import licensing and is a branch of the Department of Agricultural Legislation (DAL).

36. In 2008 the partial mandate of the GDA for inspection of agricultural inputs quality was transferred to BAMS together with the GDA analytical laboratory. In 2009 the pesticide laboratory, previously under the Department of Plant Protection, was transferred to the GDA laboratory. The equipment and human capacity of this laboratory is being updated under the three-year QCAM project funded by JICA (together with upgrading of the BAMS laboratory).

37. The laboratories perform fertilizer, pesticide and soil analysis. The BAMS laboratory analyzes only fertilizer. Equipment has been upgraded under the QCAM program. The fertilizer testing facilities of the former GDA laboratory are essentially used for analyzing samples for import, generally with a one-week turn-around (see later section on import procedures). This laboratory now has equipment in place for analyzing phosphate, potash (but not potassium sulfate), sulfur, magnesium, calcium, iron and manganese. New N analytical equipment remains to be installed. This former GDA laboratory has also been upgraded for pesticide analysis and 16 active ingredients can now be analyzed in this laboratory and capacity will be increased to 24 by 2011. The laboratory has ISO 9000 certification. In 2009 only 100 soil samples were analyzed.

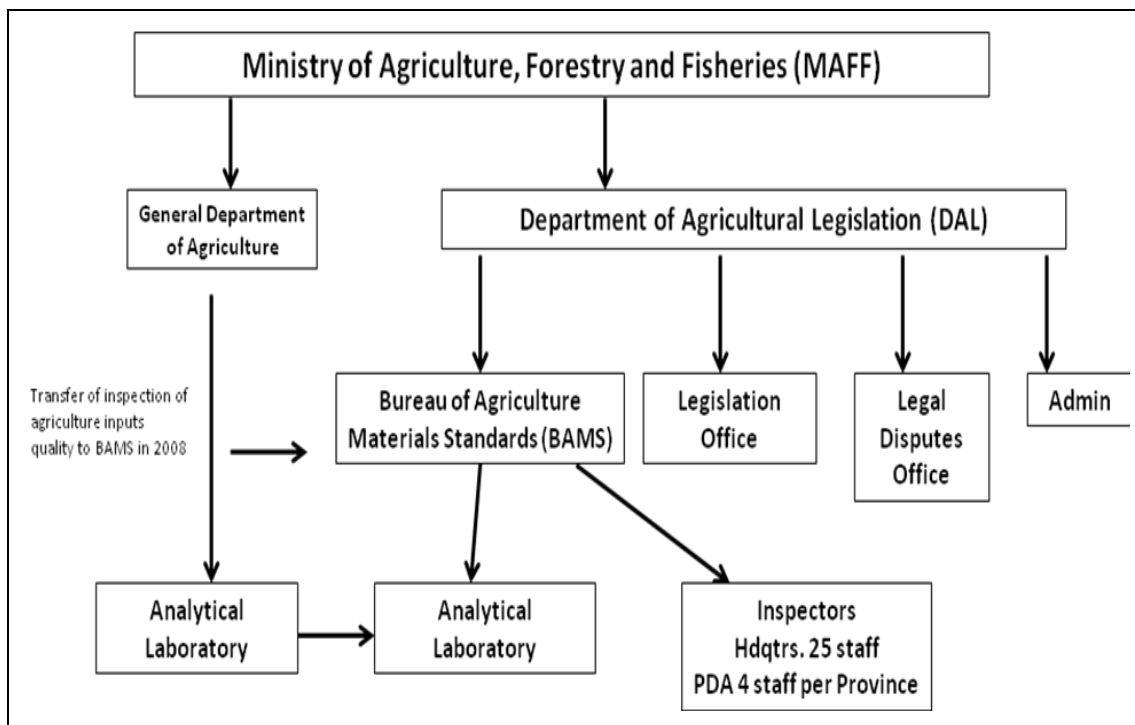
38. In the field, the DAL has four staff members in each province who are responsible for certifying wholesalers and retailers, inspecting premises and training private sector fertilizer and pesticide dealers. Fertilizer inspection to date has been essentially visual inspection due to the lack of analytical capacity at headquarters in Phnom Penh.

39. DAL inspectors are authorized only to enter shops but are required a legal approval to inspect any secondary warehouses. This the reason why DAL's inspection can only be of very limited value. Visual inspection of fertilizer can only detect very obvious adulteration and control requires capacity to chemically analyze products. The DAL has no mandate to check bag weights. This provision is vested with the Ministry of Commerce and new legislation and regulations are forthcoming.

40. During the past two years to counter the reported rash of “fake” fertilizer, the DAL in the Provincial Departments of Agriculture have made a concerted effort to:

- Provide fertilizer quality training to retailers and wholesalers.
- Increase certification of dealers, which was below 40 percent in most provinces.
- Visually inspect premises at least two times per year.
- Instruct dealers on signs of adulterated fertilizer such as oil contamination, re-bagging, etc.
- Instruct dealers on requirements for fertilizer packaging to be in Cambodian language.
- Instruct dealers and importers that country of origin should be on labels.
- Issue letters of warning to suspect dealers.

Figure 7: Agricultural inputs quality control institutions



3.1 Import license requirements

41. Fertilizer imports are controlled by the MAFF through the DAL and BAMS. To import fertilizer, a complicated process has to be adhered to, which is not transparent and subject to rent-seeking. Although no firm evidence of rent-seeking was established, the widely held belief is that facilitators who expedite the issuing of licenses through the eight government departments requiring approval provide the means by which rent-seeking activities occur. It is widely reported that some businesses acquiring import licenses sell them to other companies and the consultants were informed directly by an importer that his company imported under another company's import license and the company holding the license handled the paperwork and clearance for a fee of between two and three percent of the import value. Needless to say prices charged for these imports were higher than average.

42. Importantly, each import license is restricted to a maximum of 30,000 mt per annum. This prevents the larger importers from cost effectively importing from the international market and forces importation through either Vietnam or Thailand, which adds to transaction costs.

43. Fertilizer importers have to be registered businesses with the Ministry of Commerce and Taxation and apply to the MAFF for specific product imports. In submitting the application for an import license, details have to be provided on the products and quantities to be imported and a business plan outlining distribution and sales plans together with product samples. Each application for single or multiple products is restricted to a maximum of 30,000 mt. Each product registration requires a laboratory analysis to confirm quality. An official \$75 fee applies for each product registration application.

44. The MAFF approves the product registrations and recommends on the import quantity to be approved. BAMS initiates the process of obtaining opinions from eight MAFF offices:

1. Technical office
2. Deputy Director General of Legal Department
3. Director General (DG) of Legal Department
4. Deputy DG of MAFF
5. DG of MAFF
6. Undersecretary of State
7. Secretary of State
8. Minister

45. This process of registration and approval takes between four and 12 weeks and requires an official license fee of \$150. The license is valid for a year. A government decree or instruction exists that requires documents to be approved by government ministries within one month of receipt. The MAFF is not complying with this instruction. In order to expedite the process, most potential importers hire a liaison to ensure the smooth passage of the applications through the Ministry. It has been reported⁵ that many unofficial fees are paid through the liaison to ensure granting of the licenses. No evidence of this was forthcoming but neither were the allegations refuted. The critical part in this process is that the MAFF can and does adjust the license tonnages applied for, instituting a quasi-quota system. The officially approved tonnages for import were 129,300 mt and 146,350 mt of inorganic fertilizers in 2008 and 2009 respectively plus 32,840 mt and 17,610 mt of organic fertilizers. These quantities are less than the estimated total imports based on Thai and Vietnamese trade data and suggest that the quota system encourages illegal imports. Certainly, one importer provided evidence that it uses another company's import license to secure import on its own behalf and pays between 2 percent and 3 percent of the import value as a fee to the license holder. MAFF staff is not present in border entry points. "Inspection" is made by Camcontrol officials, who check only the validity of an import license.

46. Once the importer has imported the licensed tonnage a report has to be submitted on activities and sales when applying for a license renewal. The renewal process reportedly takes two to three months. The power vested in the MAFF to determine import tonnages per importer is contrary to all market principles. Reportedly, the reasons given for these import controls are based on annual assessment of farmers' needs, environmental protection needs and health and safety considerations. The last two reasons should be covered in comprehensive legislation on product registrations and labeling and the first reason should not be a government role for controlling the market but only for providing guidance. The private sector, as in all market economies, should be free to determine supply quantities based on market and commercial risk assessments. The government role then should concentrate on monitoring quality based on "truth in labeling" legislation.

47. Apart from the risks and costs of rent-seeking behavior that the quota system engenders, there are considerable commercial drawbacks to the import licensing system. Paramount is the inability of importers to negotiate freely with producers and traders on price and quantity when there are considerable delays and uncertainties in obtaining import licenses. During 2008, due to the extreme volatility of the market, price quotations by exporters were frequently only valid for a period of a few days to a week. Maximum license tonnages of 30,000 mt per year for individual firms was probably introduced to ensure increased competition among importers, but such a measure restricts economies of scale that would bring benefits to Cambodia's farmers.

⁵ JDL/Global Development Solutions, 2009

4. Fake Fertilizer

48. It is estimated by government officials and importers, that as much as 30 percent of fertilizer used to be fake during 2007-2008. A significant “fertilizer quality problem” arose in Cambodia as a result of the huge price spike in 2007-2008 that created an incentivized opportunity for malfeasance in the fertilizer sector in response to farmers’ demands for “cheaper” fertilizer. Popularly described as “fake” fertilizer, the major practices reportedly included adulteration and dilution, re-bagging less expensive fertilizer in bags that were labeled as higher analysis, short-weighting bags and disguising lower analysis NPK fertilizer as higher analysis diammonium phosphate (DAP) fertilizer by coating it with oil to change the product appearance.

49. With the decline in prices in 2009 reflecting the international price trends, the incentives for malfeasance were greatly diminished. In all provinces visited, senior PDA staff and retailers estimated that the problem was now affecting only between five and ten percent of sales and was diminishing. In addition to the price decline, the major reasons for the improvement are:

- Farmers have realized that “cheap” fertilizer does not provide the nutrients and crop responses obtained from quality fertilizer.
- The MAFF and the PDA cracked down on “fake” fertilizer through increased certification of retailers, more inspections, retailer training and increased farmer training and awareness.
- An improved level of sophistication by the major fertilizer importers and increased competition between them for market share in a small total market has helped.

50. Farmer complaints on “fake” fertilizer were almost universally reported to the consultants by farmers, fertilizer retailers and PDA officials that fertilizers either “did not work” or “was not as good as the previous year’s fertilizer” based on after-the-fact observations of crop growth. Such claims are almost impossible to substantiate as being due to the fertilizer alone because of the many variables, ranging from seasonal conditions to seed quality and crop management. The reports tend therefore to exaggerate the “fake” problem. Specific examples reported were few and included DAP mixed with soil and oil additive (reported by MAFF central laboratory) and alleged re-bagging by an importer in YETAK bags of non-YETAK imports – a case brought to court but withdrawn after long delays and inconclusive evidence.

4.1 Fertilizer samples – physical and chemical analysis

51. In order to measure the degree to which the problem of “fake fertilizer” existed in May 2010, 102 fertilizer samples were taken at random from 21 provincial, village and market retailers and four importers in 10 provinces plus a briquette sample from a development project (Table 5).

Table 5: Number of fertilizer samples taken by product and province

Product	Number	Province	Number
Urea	28	Phnom Penh	11
DAP	21	Kampong Chan	11
16-20-0	17	Kandal	6
20-20-15	12	Svey Rieng	15
25-20-10	1	Kampong Chang	3
15-15-15	11	Pursat	8
16-16-16	1	Battambang	24
16-8-8	8	Banteay Manch	2
3-2-2 (organic)	1	Siem Reap	17
Muriate of Potash	1	Kampong Thom	6
NPK Briquette	1		
Total	103		103

52. Samples were taken by core from single bags at each premise or by scoop from open bags. Sample sizes ranged from 100 to 200 grams. As such, the sampling technique was not fully representative of stocks in stores because composite samples were not taken from a representative number of bags of each product. Time constraints and the voluntary nature of retailers’ providing samples and the fact that sampling was not for regulatory purposes dictated the sampling procedure. Because no data was available on the total market for each individual product, representative numbers of samples for each product could not be taken. In general terms the samples reflected the product mix encountered in the market. It was interesting to find that in spite of official sanctioning and encouragement of organic fertilizers, only two establishments visited had stocks of commercial organic fertilizer.

53. The physical appearance of the samples was recorded and the samples were sent to IFDC headquarters for chemical analysis. All the samples, except the urea samples, were riffled, and all of the samples were finely ground. The urea, DAP and samples containing only N and P were analyzed for total N and S by combustion analysis. Total N on the other samples was done by AP1015, the Macro Kjeldahl method. Total phosphorus determinations were done by AP1017⁶, digestion and by AP1019, spectro-photometric measurement. Potassium determinations were done by

⁶ Standard chemical analysis methods as designated by AP1017 etc. are detailed in Annex 1.

AP1021, an oxalate extraction followed by determination of K by ICP-OES. Finally the total sulfur determinations on potassium containing fertilizer samples was done by AP1024, digestion with bromine and nitric acid and measurement of SO₄-S by ICP-OES.

4.2 Physical appearance

54. Standard physical properties on bulk density, granule/prill strength, abrasion resistance, particle size distribution, flowability, angle of repose and caking tendency were not conducted. Visual observations were made at the time of sample collection. These general observations included:

1. Fertilizers sold from open bags were frequently moist due to extended periods of exposure to the humid air.
2. Urea samples from China included both very small prill sizes with dust to medium-sized prilled and granular samples.
3. Granular urea samples were generally good with some variation in granule size.
4. DAP samples varied in color from light brown to dark brown to black, reflecting the characteristics of the phosphoric acid and phosphate rock source used in manufacture.
5. DAP samples included very angular granules of even size distribution and more spherical granule samples frequently with a large range in granule size.
6. Excellent physical appearance of NPK compound fertilizers from Thailand.
7. Uneven granule size of NPK compound fertilizers of Vietnamese origin.
8. Excellent granule size and size distribution of NP compounds from Philippines.
9. Some blended fertilizer samples with apparent well-matched granule size components.
10. Most blended fertilizers with poor granule size matching.
11. One particular source of blended fertilizers with very poor size matching, including the use of standard (fine) muriate of potash with granular urea and phosphate source.
12. Generally very little bag-set in dealers stocks.

55. The sales by retailers of poor physical quality urea with very small prill size was claimed to be a provision of a lower priced product. Certainly these urea stocks were sold at lower prices than larger prill products, usually \$2/50-kg bag lower and \$3/50-kg bag lower than granular urea. One example of very poorly bagged urea was observed where the bag liner was not folded or tied inside the outer bag as seen in Figure 7 next to properly closed (stitched) fertilizer bags. This was Chinese urea and may or may not have been stitched improperly by the manufacturer or the primary importer.

Figure 7: Picture of improperly stitched urea bags



4.3 Chemical analysis

56. Under the American Association of Plant Food Chemists Organization (AAPFCO) Uniform State Fertilizer Bill, investigational allowances may be made for fertilizer samples provided sample collection and analytical procedures of the Association of Official Analytical Chemists (AOAC) are followed. The Uniform Bill or Model Bill states “A commercial fertilizer shall be deemed deficient if the analysis of any nutrient is below the guarantee by an amount exceeding the values in the following schedule or if the overall index value of the fertilizer is below 98%.”

57. All 16 of the blended fertilizer samples analyzed failed to meet the guaranteed analysis in one or more nutrients as shown in Table 6. In all but one sample, sample 97, the total nutrient content (overall index value) was below 98%. All samples except one were below guaranteed analysis in potash, eight samples were

low in phosphate content and 10 samples were low in nitrogen (i.e. below the investigational allowances).

Table 6: Fertilizer nutrient investigational allowances

Guaranteed %	Nitrogen %	Available Phosphate %	Potash %
04 or less	0.49	0.67	0.41
05	0.51	0.67	0.43
06	0.52	0.67	0.47
07	0.54	0.68	0.53
08	0.55	0.68	0.6
09	0.57	0.68	0.65
10	0.58	0.69	0.70
12	0.61	0.69	0.79
14	0.63	0.70	0.87
16	0.67	0.70	0.94
18	0.70	0.71	1.01
20	0.73	0.72	1.08
22	0.75	0.72	1.15
24	0.78	0.73	1.21
26	0.81	0.73	1.27
28	0.83	0.74	1.33
30	0.86	0.75	1.39
32 or more	0.88	0.76	1.44

58. The 15 blend samples below overall index value averaged 83.4% of the total guaranteed nutrient analysis. One blend was exceptionally low at 48.9%. This was a blend that was made with fine muriate of potash (MOP) and obviously subject to segregation. Removing this, the remaining blends averaged 85.86% of the overall index value. Because it is certain that the nitrogen content of the urea component and the potash content of the muriate of potash were on specification, then it is certain that the low analytical results were not due to component segregation but to under-formulation. The cause of this could have been overuse of inert filler in the blends or under-analysis of the phosphate component of the blends which was either DAP or ammonium phosphate sulfate (APS) (16-20-0). The most consistent fault was low potash content. This may have been due to segregation of poorly sized MOP and would indicate that the blenders were using lower priced but smaller sized MOP.

59. All of these blends were produced in Vietnam and phosphate component quality may have been the critical factor. However, this was not the case in eight of the blends where the phosphate content met specification. Blend quality is dependent on five factors: (1) size matched quality components; (2) raw material chemical composition; (3) the accuracy of the component weighing equipment; (4) the quality

of the blending machinery; and (5) the length of time allowed for blending in either batch or continuous blenders. Several makes of batch blenders recommend three minutes mixing time but better mixing is obtained with mixer retention times of four to five minutes. With several of the blends, the quality of the granular urea used was such that there was a noticeable variation in granule size; in one blend fine MOP was used and in other blends standard MOP rather than the more expensive granular MOP. There was also variation in the granule size of the DAP and ASP used as the phosphate source.

Table 7: Blended fertilizer samples nutrient analysis

Sample #	Product	% Total N	% Total P ₂ O ₅	% Total K ₂ O	% Total Sulfur	Total Nutrient %
5.	20-20-15	21.90	10.50, 11.40	9.00		77.00
12.	20-20-15+TE	16.40, 16.80	16.70, 17.40	14.20		88.00
21.	20-20-15+TE	17.10	18.20, 18.00	13.60		68.22
24.	20-20-15	17.70, 18.50	19.50	11.60		90.18
28.	20-20-15	20.70	19.60	9.77		91.04
34.	20-20-15+TE	17.20	17.50, 17.30	12.80		86.36
38.	20-20-15	17.80, 18.10	21.20	10.40		90.36
42.	16-16-8-13(S)	13.90	5.51, 5.47	0.15	12.10	48.90
43.	16-8-8-13(S)	17.20	8.66	2.85	15.60	89.72
46.	20-20-15-13(S)	24.60	12.80, 12.20	11.90	2.12	89.64
60.	16-8-8-13(S)	16.30	6.80, 6.92	3.47	15.00	83.41
73.	20-20-15 + TE	17.80, 19.00	20.30	9.41		88.56
88.	20-20-15 + TE	16.10,16.20	20.30	11.70		87.64
92.	20-20-15 +TE	15.80,16.10	21.10	9.79		85.44
97.	25-20-10 +TE	23.00	19.60	12.30		99.82
102.	20-20-15 + TE	21.60	16.20, 16.60	9.43		86.60

Note: Two analysis results denote a recheck of the original analysis. Figures in red denote below investigational analysis levels.

60. The quality control measures of the blending operations in Vietnam were not investigated and should be as a consequence of these analytical results. Furthermore, these results should be brought to the attention of the Vietnamese producers and Cambodian importers.

61. A disturbing result in the chemical composition of compound NP and NPK fertilizers was the below specification of NP and NPK compounds produced in and imported from Vietnam. Conversely, NP and NPK compounds from Thailand all met guaranteed analysis.

Table 8: Compound NP and NPK fertilizer samples below specification

Sample #	Product	% Total N	% Total P ₂ O ₅	% Total K ₂ O	% Total Sulfur	Total Nutrient %
9.	15-15-15	14.50	16.10	13.30		97.56
23.	16-16-8-13(S)	14.60	15.40	5.84	11.70	89.60
29.	16-16-8-13(S)	13.90	13.20, 13.20	5.45	11.90	81.38
32.	16-16-8-13(S)	14.30	13.70, 13.90	7.64	11.60	89.60
75.	16-20-0 + TE	15.60	17.30, 17.20		11.10	91.39
84.	15-15-15	14.50	13.90, 14.30	15.00		97.33
86.	16-20-0+Mg, Ca, S	12.50	16.00, 16.00		8.86	79.17
92.	16-20-0 +TE	14.30	18.20, 18.00		8.98	90.28

Note: Duplicate results indicate two analyses to check first result.

62. In Table 8 the origin of Sample nine was China and all of the others were from Vietnam. Two samples, numbers nine and 84 from China and Vietnam respectively, were only marginally below the total nutrient content index of 98%. The analytical results indicate that in all samples analyzed one, two or three of the major nutrients (N, P₂O₅ and K₂O) were below specifications. These products were manufactured using steam granulation of ammonium sulfate, DAP and MOP. In this process it is critical that all raw materials achieve some degree of solubilization to effectively form homogeneous granules. In order for this process to be effective, the temperature in the granulator bed has to be at least 160⁰ F. Of the raw materials used, the MOP is the one with lowest solubility. If granulator temperatures do not reach the recommended value, the MOP fails to bind to the granules and the powdered MOP is exhausted through the ventilation systems and accumulates in the process building and surrounding areas.

63. The low phosphate levels in the NPK samples were probably due to the use of off grade DAP. Worldwide DAP is traded as 18-46-0, commonly called commodity grade and no other NP material below this grade could be sold as DAP.

Below specification DAP is due to the use of low quality phosphoric acid in the manufacture of DAP. The Vietnamese manufacturers of these NPKs are relying on imported DAP as the source of P₂O₅ and it would appear that the DAP used to produce the above grades was below standard specification, causing the low P₂O₅ analysis of the final products. If this is the case then the manufacturers' quality control systems should be evaluated.

64. An alternative explanation of the below-specification products is that the products were diluted in the distribution chain by the addition of a filler. This is not an acceptable explanation as the granulated products showed no visual sign of the addition of separate fillers and the bags from which the samples were taken were original and factory stitched. Although small hand-held stitching machines are available to the Cambodian importers, there is neither incentive nor reason to believe that any of the importers have the facilities or equipment to open bags, blend in a filler and re-bag the products. The cost of such an operation would exceed the gain of a 10% dilution apart from the fact that the major importers are attempting to build brand image for quality.

Table 9: Analytical results of NP and NPK compound fertilizers at or above guarantee

Sample #	Product	% Total N	% Total P ₂ O ₅	% Total K ₂ O	% Total Sulfur	Total Nutrient %
3.	15-15-15	17.50	16.60	15.80		1.11
4.	16-20-0	16.90	20.90		8.75	1.05
6.	16-16-16	16.50	15.50	16.50		1.01
7.	15-15-15	16.40	16.60	15.50		1.08
13.	15-15-15	15.90	16.00	15.70		1.06
20.	16-16-8-13(S)	15.80	15.70	7.73	13.20	0.98
22.	16-20-0	16.10	20.60, 20.40		8.63	1.02
41.	16-16-8-13(S)	15.10	16.40	7.83	13.30	0.98
44.	16-20-0-9.4(S)	16.00	20.40		9.44	1.01
47.	16-20-0-9.4(S)	15.60	20.10		9.79	0.99
51.	16-20-0-9.4(S)	16.20	20.90		8.70	1.03
54.	16-20-0-14(S)	16.30	19.50		11.70	0.99
55.	16-20-0-9.4(S)	16.40	20.00		8.63	1.01
66.	16-20-0-9.4(S)	16.40	20.60		9.28	1.03
68.	15-15-15	15.60	17.00	16.10		1.08
70.	16-20-0-9.4(S)	16.30	20.00		9.37	1.01
72.	15-15-15	16.40	16.80	16.00		1.09
74.	15-15-15	16.50	15.50	16.10		1.07
76.	16-20-0	16.10	19.30		8.95	0.98
79.	16-20-0-9.4(S)	17.00	20.40		9.16	1.04
81.	16-20-0-14(S)	16.80	21.90		10.70	1.08
83.	16-20-0-9.4(S)	16.60	20.70		8.65	1.04
91.	16-20-0-9.4(S)	16.30	20.10		9.06	1.01
96.	15-15-15	16.30	16.10	16.90		1.10
98.	15-15-15	15.40	17.00	16.20		1.08
99.	16-20-0-9.4(S)	16.80	20.50		9.25	1.04
57.	15-15-15	16.30	16.50	16.50		1.10

65. Table 9 lists the analysis results for all other NP and NPK compounds. All 25 samples are within investigational allowances and 24 are above the guaranteed analysis. Seventeen of the samples were manufactured in Thailand and four in Vietnam. Other products originated from Russia and the Philippines.

66. Table 10 lists the results of the chemical analyses of the DAP samples. Four of the 19 samples were below standard specification although three of these were only marginally so. One sample imported from Thailand but claimed to be of USA origin had a P₂O₅ content of less than 33% although its N content was within investigational allowance.

Table 10: Analytical results of DAP samples meeting and below guarantee

Sample #	Product	% Total N	% Total P ₂ O ₅	% Total K ₂ O	% Total Sulfur	Total Nutrient %
2.	DAP	18.20	46.10		2.51	100.47
8.	DAP	17.50	47.00		1.67	100.78
17.	DAP	18.00	46.10		2.52	100.16
18.	DAP	17.10	46.30		1.60	99.06
31.	DAP	18.00	46.20		1.86	100.31
35.	DAP	17.70	47.30		1.74	101.56
37.	DAP	17.30	46.30		1.65	99.38
40.	DAP	17.60	45.80		2.12	99.06
45.	DAP	18.10	47.10		1.83	101.88
48.	DAP	17.50	46.60		1.78	100.16
53.	DAP	18.00	46.90		1.90	101.41
58.	DAP	17.80	47.10		1.82	101.41
59.	DAP	17.80	47.30		2.22	101.72
62.	DAP	17.90	46.00		2.10	99.84
71.	DAP	17.70	46.20		2.13	99.84
101.	DAP	17.90	46.30		2.00	100.31
103.	DAP	17.90	46.60		1.71	100.78
85.	DAP	16.90	45.40		1.92	97.34
82.	DAP	17.60	32.60, 32.60		6.37	78.44
27.	DAP	16.60	45.50		1.94	97.03
14.	DAP	16.70	45.90		1.76	97.81

Table 11: Urea samples analytical results

Sample #	Product	% Total N	% Total P ₂ O ₅	% Total K ₂ O	% Total Sulfur	Total Nutrient %
1.	Urea	46.6				101.30
10.	Urea	46.6				101.30
11.	Urea	46.5				101.09
15.	Urea	46.2				100.43
16.	Urea	46.4				100.87
19.	Urea	46.4				100.87
25.	Urea	46.4				100.87
30.	Urea	46.3				100.65
33.	Urea	46.6				101.30
36.	Urea	46.4				100.87
39.	Urea	46.6				101.30
49.	Urea	46.5				101.09
50.	Urea	46.8				101.74
52.	Urea	46.5				101.09
56.	Urea	46.5				101.09
61.	Urea	46.5				101.09
63.	Urea	46.5				101.09
64.	Urea	46.4				100.87
65.	Urea	46.5				101.09
67.	Urea	46.4				100.87
69.	Urea	46.9				101.96
77.	Urea	46.5				101.09
78.	Urea	46.6				101.30
87.	Urea	46.7				101.52
89.	Urea	46.7				101.52
93.	Urea	46.5				101.09
94.	Urea Agrotain	46.4				100.87
100.	Urea	46.6				101.30

67. This was not due to dilution with an inert substance (otherwise the N content would have been low) but either to a manufacturing process deficiency of unknown and unlikely cause or it may have been a 50:50 blend of 16-20-0 and 18-46-0. This appeared to be the most likely explanation as an equal blend of the two products would result in a 17% N and 33% P₂O₅ analysis. Visual inspection of the product showed it to be uniformly black, medium-sized granules similar to that manufactured by some USA producers. However, when a few granules were cut open, some were uniformly black throughout (untypical of this type of DAP) while others were grayish white inside with a black surface coating. It is almost certain that this sample is DAP and the black granules were an unknown product that been produced with a black dye. Attempts will be made to separate and analyze the components separately.

68. The other three samples from the USA, Russia and unknown origin were below 17% N content. Overall the ranges of N and P₂O₅ content were from 16.6% to

18.2% N and from 32.6% to 47.3% P₂O₅. The 32.6% analysis, which was re-analyzed as a check procedure, is a complete anomaly from a manufacturing perspective as it does not conform to the mole ratio required for DAP production and is strongly suspected to be a blend with 16-20-0.

69. All of the urea samples analyzed had, as expected, the guaranteed 46% N content. The final two samples analyzed were a sample of MOP provided by an importer that had 58.5% K₂O content, below the guaranteed 60% but within investigational allowance, and a sample of 2.5 gram NPK briquettes which analyzed at 29.2% N, 10.7% P₂O₅ and 9.96% K₂O compared to a declared 30-10-10 analysis. Again, this sample was within investigational limits.

4.4 Summary of fertilizer quality findings

70. No evidence was found of any obvious fertilizer adulteration. However, all NPK blends originating from Vietnam were found to be deficient in nutrient content. These deficiencies may have been due to dilution with filler, inaccurate weighing of component materials or poor blending and component segregation. Certainly improvements can be made in the selection of component materials, especially MOP, to ensure size matching. Blending and product quality control monitoring procedures at the Vietnamese factories obviously need improvement.

71. Similarly the NPK compound fertilizers from Vietnamese producers are variable in nutrient content with seven of 11 samples being deficient in either potash, phosphate or all three nutrients. The steam granulation processes used to manufacture NP and NPK compound fertilizers in Vietnam should be investigated for process controls and again the quality assurance monitoring programs need immediate improvement.

72. All NP and NPK compound fertilizers manufactured in and imported from Thailand met guaranteed analysis. These products are also produced by steam granulation and demonstrate that this process with good process and quality control measures can produce NPK fertilizers to specification and guaranteed analysis.

73. Urea, DAP, APS and MOP imported into Vietnam and Thailand in bulk and then bagged for export to Cambodia are variable in physical quality, color and in a few instances in chemical composition. One sample of DAP imported from Thailand was blatantly fraudulent being almost certainly a blend of DAP and 16-20-0. The DAP and APS from China, most frequently used by Vietnam is particularly prone to low chemical analysis. Chinese DAP is produced in three grades (A, B and C) and only A grade conforms to a standard 18-46-0 grade analysis. It may be that the lower grades of DAP with sub-standard P₂O₅ content may be bagged in Vietnam and sold as Grade A DAP or used in blends as though it were 18-46-0 grade causing overall deficiencies in the blend analyses.

74. For dilution and adulteration to take place, warehouse, blending and bagging facilities are required. The only locations where these facilities may exist would be in the importers' and large provincial retailers/wholesalers' warehouses. No evidence was observed that such operations take place. Alternatively, traders in either Vietnam or Thailand could have the opportunity for malpractice as was identified for one sample of DAP.

75. Unsubstantiated farmer claims that fertilizers used were not effective or not as effective as previously used may be accounted for by the below-grade analysis of blends and Vietnamese compounds although with one or two exceptions the results from the below-grade products would be difficult to observe in field crops and poor crop performance may have been due to other factors. During the price spike and especially at the height of the season there was certainly incentive to sell lower-priced fertilizer and the incentive to defraud farmers was high. Farmers have learned though that one gets what one pays for and "cheap" fertilizer is cheap for a reason –it is being sold knowingly with adulteration or dilution. Vigorous cautionary action and publicity by the MAFF (especially at the provincial PDA level) has created a greater awareness among farmers that quality fertilizer has to be paid for and it is apparent that competition at the retail level is sufficient to ensure that price gouging is not occurring and that retailers want to sell good quality fertilizer.

76. There is no doubt that there is a problem with some fertilizer quality, essentially confined to blended NPK and NP fertilizer, most NP and NPK compounds from Vietnam and some phosphate products from China. There may be some blending of 16-20-0 with 18-46-0 and bagging and selling the resultant product as DAP. Visual inspection might not detect this. At the retail price level there is a price difference of around \$70/mt so the illegal profit would be \$35/mt, less the cost of blending and re-bagging product. The incentive to do this is not high. The government authorities need adequate legislation and analytical resources to ensure that Cambodian farmers and retailers are protected from sub-standard products. It should be noted that there are at least 10 Vietnamese importers bagging and re-exporting products such as urea, DAP, APS and MOP that have been sourced in bulk on the international market. Quality control monitoring in Vietnam is reportedly not very stringent and any fines imposed are very light, leaving much room for malpractice to occur. In Cambodia the MAFF has already recommended that the country of origin of fertilizer should be marked on the bag or label or both and strict enforcement of this should be adhered to in order to monitor the source of products.

5. Fertilizer Legislation

5.1 New draft legislation

77. The current inadequate fertilizer and pesticide legislation is being re-drafted under the JICA- funded QCAM project. A copy of the draft law (Annex 3) was reviewed. Although the draft law is comprehensive and designed to be used in conjunction with specific regulations in sub-decrees that can be amended without parliamentary approval by the Ministry of Agriculture, Forestry and Fisheries, two specific articles are indicative of the constraints that the proposed legislation implies.

Article 3: “This Law applies to:

- All kinds of pesticides, fertilizer, animal feeds, additives, and veterinary drugs as well as raw materials used as component parts and active ingredients of these products.
- All activities by natural persons or legal persons relating to trade in pesticides and agricultural inputs, pesticide use service, commercial advertisement, giving, disposal, destruction of all kinds pesticides and agricultural inputs in the Kingdom of Cambodia.”

Article 66:

- “The Minister of Agriculture, Forestry and Fisheries shall determine an appropriate quantity of pesticides and agricultural inputs that are produced or imported for supply/distribution in the Kingdom of Cambodia based on the study/assessment of needs of agricultural production in the country and based on the scientific, economic, social aspects and the environment.
- The basic quantity or trade, whole-sales/retails of pesticides and agricultural inputs in the capital and provinces shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.”

78. Article 3 includes pesticides, fertilizer, animal feeds, additives and veterinary drugs under the same law provisions and collectively refers to these throughout the draft as “Pesticides and Agricultural Inputs.” The proposed law does not refer to seeds although these are also agricultural inputs. Approximately 90% of the draft law is designed to address the specific needs of regulating the registration, trade and use of pesticides. The requirements for regulating pesticides are quite correctly closely aligned to safety and environmental hazards that are quite different from requirements pertaining to fertilizers, animal feeds, veterinary drugs and seeds.

79. As a specific example of how the joint legislation would impact fertilizer, Article 51 would prohibit the sale of fertilizer taken from correctly labelled 50-kg bags and repacked in smaller quantities of 1- to 5-kg unless the new containers were also fully labeled. Many smaller retailers sell 10% to 20% of their total fertilizer sales in repackaged plastic bags. (“No substances of pesticides or agricultural inputs

shall be added to or taken out of a container when the container of pesticides or agricultural inputs is stuck with approved information labels in compliance with provisions and procedure under this Law.”)

80. Article 66 perpetuates the current practice of the MAFF determining the national and provincial requirements for pesticides, fertilizers and other agricultural inputs and is counter-productive to the operation of a market economy. In a draft report⁷ the consultants wrote that “While these policy considerations may be valid, their practical implementation shows that they are both out of touch with the actual developments in the marketplace and encourage rent-seeking behavior among officials, thus indirectly stimulating illegal imports. Trade statistics from Vietnam and Thailand show that Cambodian imports of fertilizer exhibited a steady growth of 13% a year, on average, from 2004 to 2007. By contrast officially licensed import quantities exhibit wide year-on-year variations. This extremely high variation in import license quotas awarded each year suggests that import licensing has very little to do with considerations of farmers’ annual fertilizer needs or with other officially proclaimed rationales behind the fertilizer import quotas such as health, safety and the environment. Instead, the poorly managed import licensing is most probably encouraging illegal imports and rent-seeking behavior.” IFDC agrees with this assessment.

5.2 Recommendations on new legislation

81. It is recommended that either the draft law be proposed for pesticides only with separate laws developed for fertilizer, seed, animal feeds and feed additives and veterinary drugs, or the draft law be amended to cover only the generalized aspects of the role of the Ministry of Agriculture, Forestry and Fisheries in implementing regulations for the separate commodities. Separation of the draft law from the specific commodity regulations provides increased flexibility to amend regulations under the law.

82. Fertilizer law and regulations should be designed to protect farmers and market participants including importers, distributors, wholesalers, retailers and the public from:

- Malpractices such as adulteration, mislabeling and short weights
- Unsubstantiated claims of product benefits
- Environmental hazards
- Public health hazards

These safeguards can be incorporated into the regulations through the principle of “truth in labeling.”

⁷ JDL/Global Development Solutions, 2009

83. It is recommended that the MAFF should study the Association of American Plant Food Control Officials' (AAPFCO) official publication "Uniform State Fertilizers Bill" before finalizing the fertilizer regulations for Cambodia and incorporating relevant provisions. The regulations should include:

- Definitions of fertilizer materials including inorganic and organic fertilizers, slow and controlled release fertilizers and fertilizer amendments.
- Definitions of plant nutrients and guaranteed analysis including micronutrients.
- Other definitions.
- Firm and product registration procedures and officials.
- Definitions and specifications of label requirements including language.
- Definitions of plant nutrient deficiencies.
- Definitions of adulterated fertilizer product.
- Defined permissible limits on heavy metal content of fertilizer.
- Inspection authority.
- Sampling procedures.
- Analytical procedures.
- Penalties for breach of the regulations.

84. In addition it is recommended that the MAFF consider the following recommendations:

1. Amending the fertilizer import licensing regulations to abandon the MAFF's power to control individual licenses to specific quantities of fertilizer. This measure will simplify and speed up the licensing process and remove the need for "liaison" to expedite the issuing of import licenses.
2. The review of import license applications be restricted to the DAL/BAMS and the MAFF Technical Department for approval of the product registration only.
3. Importers should be required to furnish details of all fertilizer imports on a quarterly basis to the DAL and the MAFF should publish quarterly summaries of fertilizer imports by product grouping to provide total market information.
4. The DAL inspectors should be provided with the means to take spot check fertilizer samples at border crossings.
5. The DAL fertilizer inspection services should concentrate monitoring efforts on blended fertilizers and granular NP and NPK fertilizers imported from Vietnam.
6. All imported fertilizer should include the manufacturer's factory source of origin or in the case of re-exports the original country of origin. This will enable identification of sources of sub-standard fertilizer.
7. A certificate of analysis should accompany all imported fertilizer from an internationally accredited quality control organization. This may not be practical with the small import lots such as truckloads or small barge loads but a practical solution should be discussed with the major importers.

8. In addition to certification of wholesalers and retailers, the provincial DAL should take steps to also certify the third parties who purchase fertilizer and deliver it to villages for re-sale to farmers. At present, these individuals and firms have no regulation at all with regard to fertilizer quality.

6. Fake Pesticides and Pesticide Quality

85. Pesticide qualities and its regulation are far more serious problems than the problems with fertilizer quality. Staff members of DAL believe that up to 80% of all pesticides sold in Cambodia are either products on the banned list or in some way “fake” – either diluted, mislabeled, unlabeled or adulterated. This is obviously a far more serious health and environmental problem than the problems related to fertilizer quality. The JICA-funded and supervised QCAM project with the MAFF has recognized this and redesigned project activities to concentrate on pesticide quality and regulation. The upgrading of the laboratory for analysis of pesticide active ingredients is a critical measure to improve quality monitoring and control.

7. Seed Quality

7.1 The use of improved rice seed varieties

86. The adoption of improved rice seed varieties by farmers is increasing from year to year. For dry and early wet season, it is hard to find traditional varieties being grown. In the wet season, farmers are also growing some improved rice seed varieties, mostly high quality aromatic for cash and traditional varieties for their home consumption. For irrigated land, farmers prefer to grow improved varieties. With increasing introduction of farm mechanization equipment (such as seeders and combine harvesters), many farmers are changing their cultural practices toward growing improved varieties that are suitable for these farm mechanization introductions.

87. In recent years, as the export demand for rice has been high, a number of private companies have invested in large areas of rice cultivation that require both improved varieties and farm mechanization. Also, the area of irrigated land is dramatically increasing and this is increasing the demand for improved varieties with higher yield potential.

88. The duration of farmers retaining seed is contracting. Normally, farmers retained their seed for up to four or more years. However, as a result of improved storage and seed selection, farmers are changing their habits by reducing the duration to one or two years, or just buying seed every year without worrying with the seed storage and selection themselves.

89. The three major sources of improved rice seed varieties are AQIP Seed Company, CEDAC Rice Intensification Program and rice out-grower schemes. However, these are supplemented by smaller firms and most farmers who live in the provinces neighboring Vietnam are obtaining improved rice seeds across the border. This seed can be purchased for cash or on credit. The input credit (seed and fertilizer) is provided in exchange for selling their paddy back to the seed suppliers at guaranteed market prices. Recently, there has been an expansion of this practice into other non-border provinces (e.g. Pursat, Battambang, etc.).

90. Over the last few years, there were high demands for improved rice seed varieties, not only from farmers but also many donor-funded projects (for example, ADB Food Emergency Project and EU Food Facility Project) required high volumes of improved rice seed varieties to distribute among farmers who had suffered from natural disasters as well as the very poor farmers. As a result of high demand and limited production from existing seed suppliers, a number of other sources of improved seed variety suppliers emerged (private companies, NGOs

and farmer associations that are able to provide improved rice seed varieties to the market).

7.2 Price versus quality of improved rice seed varieties

91. The concept of having certified seed is very new for Cambodian farmers.

In most cases, farmers are exchanging their seed between themselves or trying to retain their own seed. It is very important to train farmers on what are good quality seed management techniques (such as proper seed multiplication, proper seed storage, how long seed can be retained, how to differentiate between poor and good quality seed). A concern for farmers is that quality seed should be true to label and of the quality paid for. In most cases, farmers are buying seed based on their ‘trial and errors’ experiences. For example, if the seed from the source that they purchased from is good quality, then they return to the same source; otherwise, they change to other sources.

92. “Certified” seed is on the market in Cambodia that is not truly certified.

It is important to have properly certified seed that is true to label circulated in the market. Thus, it is crucial to pay more attention to the improvement of the seed certification mechanism, to awareness of good quality seed by farmers and traders and enforcement of the implementation of the law on seed management and plant breeders’ rights rather trying to enforce ‘certified’ seed. However, this certification should not be considered as an additional cost to the current seed price, which is already high (as it already is inclusive of 10% VAT), otherwise, the adaptation of improved varieties will be impacted.

93. However, when considered using a cost/benefit analysis, commercial certified seed is not expensive.

Over the last few years, it has been proven that when good quality improved rice seed is used, combined with recommended cultivation techniques, farmers only need from 25 to 35 kg to transplant one hectare of land. On the other hand, for a traditional variety to transplant one hectare requires about 80 kg of seed. Thus the total cost of seed will not be much different but the potential yield from the improved varieties is two or more times greater than from the traditional varieties.

94. As the number of new seed suppliers increase, there will be stronger competition in the seed market,

which will result in lower prices and higher quality seeds available in the market. The introduction of seeds from neighboring countries will also make competition stronger. As with fertilizer, farmer education regarding seed quality and the benefits of quality seed remains an important task in the market.

8. Future Trends

95. Some of the important future trends expected in Cambodia in relation to fertilizer quality are listed below:

- New Agricultural Inputs Legislation with separation of fertilizers and pesticide regulations.
- New fertilizer factory in Cambodia – Five Star Company for NPKs, both blends and granulation.
- Increased farmer education on quality fertilizer.
- Continuing dealer education.
- Progressive fertilizer company competition and ethical operation.
- Absolute need for improved site-specific fertilizer recommendations.
- Development of Sihanoukville port and removal of quotas will allow firms to import directly from international market, possibly saving \$10/mt.

9. Annexes

Annex 1: Draft Law on Pesticides and Agricultural Inputs

**Drafted by: the Ministry of Agriculture, Forestry and Fisheries
Department of Agricultural Legislation
Draft 6 June 2010**

Results of Revision by the Steering Committee on Drafting the Law on Pesticides and Agricultural Inputs

Chapter 1 General Provision

Article 1

This Law aims at regulating the control of standard requirements for all kinds of trade in pesticides and agricultural inputs and pesticide use service in the Kingdom of Cambodia.

Article 2

This Law has the following purpose:

- To support the National Agriculture Sector Policy in enhancing the potential of agricultural productivity;
- To ensure effective control of pesticides and agricultural inputs;
- To enhance public awareness on implementation of standard requirements in safe trade in pesticides and agricultural inputs, pesticide use service, occupation, and use of pesticides and agricultural inputs;
- To protect the interest of farmers in agricultural production and other relevant users by ensuring food security, food safety, public health and sustainable agronomy environment.

Article 3

This Law applies to:

1. All kinds of pesticides, fertilizer, animal feeds, additives, and veterinary drugs as well as raw materials used as component parts and active ingredients of these products;
2. All activities by natural persons or legal persons relating to trade in pesticides and agricultural inputs, pesticide use service, commercial advertisement, giving, disposal, destruction of all kinds pesticides and agricultural inputs in the Kingdom of Cambodia.

Traditional pesticides or agricultural inputs produced by farmers through combination of natural substances for use in household agricultural production or for noncommercial/service use shall be determined by a separate Sub-Decree.

Article 4

Key terminology used in this Law is provided in an Appendix.

Chapter 2 Jurisdiction

Article 5

The control and law application on all activities related to pesticides and agricultural inputs in the Kingdom of Cambodia shall be under the general jurisdiction of the Ministry of Agriculture, Forestry and Fisheries.

Article 6.

For the purpose of this Law, the Ministry of Agriculture, Forestry and Fisheries shall have the competency and shall fulfill the missions as follows:

- Ensure effective control of pesticides and agricultural inputs in accordance with the National Agriculture Sector Policy;
- Study and develop legal framework for all activities related to trade in pesticides and agricultural inputs and pesticide use service;
- Evaluate compliance with standard requirements before registration of trade in pesticides and agricultural inputs and pesticide use service;
- Analyze/verify assurance standard of pesticides and agricultural inputs at a laboratory and carry out tests of bio-efficacy in a field in order to indentify data for assessing a request for registration;
- Implement procedures for registration, issuance of licenses, and permits for trade in pesticides and agricultural inputs and pesticide use service, and for collection of service fees for these activities, which are required under this Law;
- Implement awareness raising programs and training programs on pesticides and agricultural inputs for traders of pesticides and agricultural inputs, pesticide use service providers and possessors/users in order to increase public awareness of safe and effective use and responsibilities in trading and servicing these products;
- Collaborate and coordinate with relevant ministries/agencies and the private sector in a framework of extending information, public awareness and effective implementation of this Law;
- Assign inspection agents of pesticides and agricultural inputs in order to monitor, supervise, and to take measures to enforce this Law on all trade in pesticides and agricultural inputs / service activities and enforcement of standard requirements on all kinds of pesticides and agricultural inputs in the Kingdom of Cambodia;
- Implement international cooperation and serve as the national focal point agency responsible for leading and implementing relevant obligations under international conventions or agreements on pesticides and agricultural chemicals;

- Implement other tasks within the jurisdiction of control of pesticides and agricultural inputs in compliance with this Law and relevant existing regulations.

Chapter 3 Control of Pesticides

Section 1: National Council for Pesticides

Article 7

The Royal Government shall establish a National Council for Pesticides to be led by the Minister of Agriculture, Forestry and Fisheries, with the Department of Agricultural Legislation of the Ministry of Agriculture, Forestry and Fisheries serving as its Secretariat.

The National Council for Pesticides shall be led by the Minister of Agriculture, Forestry and Fisheries, and shall have membership of representatives from relevant technical ministries/ agencies including the Ministry of Environment, the Ministry of Health, the Ministry of Commerce, the Ministry of Economy and Finance, the Ministry of Industry, Mines, and Energy, the Ministry of Interior; and the Director of the Department of Agricultural Legislation of the Ministry of Agriculture, Forestry and Fisheries serving as a permanent member.

Article 8

The National Council for Pesticides shall play the following roles:

- Determine, monitor, and evaluate the implementation of national policies and strategies for the control of pesticides;
- Provide recommendations to the Royal Government on the importance of pesticide-related international conventions and agreements;
- Provide recommendations and guidance to pesticide-related competent agencies for effective and safe control of pesticides;
- Decide on the classification and listing of pesticides in the Kingdom of Cambodia;
- Decide on requests for addition, revision, deletion of a kind or classification of pesticides of the pesticide list in the Kingdom of Cambodia;
- Decide on internal regulations for the conduct of the National Council for Pesticides;
- Serve other functions related to pesticides at a national level as necessary.

The organization and conducts of the National Council for Pesticides shall be determined by a Sub-Decree.

Section 2: Registration of Pesticides

Article 9

No natural persons nor legal persons may be able to conduct trade in pesticides and agricultural inputs, produce, export, import, package or repackage, stock, transport, supply, distribute, whole-sell, retail, provide use service, and advertise an pesticide in

the Kingdom of Cambodia unless the pesticide has been registered, and licensed or authorized in compliance with provisions under this Law.

Article 10

A natural person or legal person who trades in pesticides and agricultural inputs, imports, exports pesticide products in the Kingdom of Cambodia must apply for registration of the types of pesticides in advance at the Ministry of Agriculture, Forestry and Fisheries.

Only a natural person or legal person who holds commercial registration in the Kingdom of Cambodia and has obtained a license to trade in pesticides and agricultural inputs pesticides, issued by the Ministry of Agriculture, Forestry and Fisheries in compliance with this Law may apply for registration of pesticides.

Article 11

The types of pesticides that are allowed for registration in compliance with provisions of this Law are as follows:

1. Pesticides in the classification authorized for use and the classification authorized for severely restricted use of the pesticide list in the Kingdom of Cambodia.
2. Pesticides used to be registered, but have changed commercial name with maintenance of same or similar formulation.
3. New pesticide products that are not classified highly hazardous.

Article 12

The pesticide list in the Kingdom of Cambodia shall be reviewed once every 3 (three) years and may remove, revise, add kinds or classification of a pesticide as necessary.

Introduction of a pesticide list in the Kingdom of Cambodia shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries in compliance with the National Council for Pesticides.

Article 13

The certificate of pesticide registration issued by the Ministry of Agriculture, Forestry and Fisheries shall be as follows:

1. Full registration;
2. Provisional registration.

Article 14

A natural person or legal person who applies for pesticide registration must meet administrative procedure requirements and standard technical requirements by providing full and correct information for consideration, evaluation of, and decision

on registration. The Ministry of Agriculture, Forestry and Fisheries shall decide to decline registration or reject a request for registration of a pesticide based on the following criteria:

1. Information/data attached to the application documents are vague, untrue, or insufficient according to standard requirements;
2. The pesticides requested for registration are highly hazardous to public health or have more risks than benefits for the use of such pesticides;
3. The pesticides requested for registration are products that are toxic to plants and cannot offset losses to crop outputs;
4. The efficacy of pesticides is lower than the standard confirmed in the application;
5. The pesticides are persistent in plants and in the surrounding environment.

Article 15

The Ministry of Agriculture, Forestry and Fisheries may allow registration and imports of a highly hazardous pesticide for a public use as necessary in compliance with procedure under this Law.

Article 16

The Ministry of Agriculture, Forestry and Fisheries may only exempt registration of pesticides that are in the list for authorized use in the Kingdom of Cambodia for a specific public need or for use in education and scientific research with prior approval from the Minister of Agriculture, Forestry and Fisheries of the types of pesticides, quantity and authorized import for the target use.

Registration and import of pesticides for needs other than for the purpose of trade in pesticides and agricultural inputs or service shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 17

All kinds of pesticides requested for import/export or for production in the Kingdom of Cambodia must undergo experiments, analyses, tests, bio-efficacy and risk assessment of the pesticide risk in order to fully evaluate compliance with standard requirements.

Experiments and analyses of pesticides shall be carried out at the National Agricultural Laboratory or a laboratory recognized by the Ministry of Agriculture, Forestry and Fisheries.

Tests of bio-efficacy of pesticides shall be carried out at an agricultural experiment station of a technical unit of the Ministry of Agriculture, Forestry and Fisheries or by a researcher recognized by the Ministry of Agriculture, Forestry and Fisheries, and must apply a technical test protocol to determined by the Directorate General of Agriculture of the Ministry of Agriculture, Forestry and Fisheries.

Article 18

Certificate of origin of pesticides certifying results of experiments, analyses, tests, bioefficacy, approaches to formulation analyses, bulletins of safety information and other technical information is a standard requirement that must be attached to an application for registration of pesticides for assessment by researchers and the registrar.

Article 19

Applications and information on technical standard requirements for pesticide registration must assure legitimacy, which is confirmed by a lawyer who is a member of the Bar Association, or a notary of the Kingdom of Cambodia.

Procedures and standard requirements for pesticide registration shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Section 3: Trade in pesticides and agricultural inputs and Pesticide Use Service

Article 20

No natural person or legal person has the right to trade in pesticides and agricultural inputs in all forms or to provide all kinds of pesticide use service the Kingdom of Cambodia without a license or without a valid permit, which is in contrary to the provisions and procedure under this Law.

Article 21

A natural person or legal person who trades in pesticides and agricultural inputs, produces, imports, exports, stocks, and supplies/distributes pesticides throughout the Kingdom of Cambodia must have a license to trade in pesticides and agricultural inputs pesticides issued by the Ministry of Agriculture, Forestry and Fisheries.

A natural person or legal person who trades in pesticides and agricultural inputs, whole-sells, retails pesticides in the capital city, each province must obtain a permit to trade in pesticides and agricultural inputs, whole-sell, retail, issued by a respective capital/provincial department of agriculture.

Article 22

A natural person or legal person who imports/exports pesticides for purpose of trade in pesticides and agricultural inputs, supply, distribution, or for purpose of provision of pesticide use service must have an import/export permit issued by the Ministry of Agriculture, Forestry and Fisheries.

A pesticide import/export permit may be granted only for the types of pesticides that have been registered in compliance with provisions and procedure under this Law.

Article 23

Production of all pesticides must comply with the following rules:

- Must have appropriate location ensuring safety of surrounding environment and have a system to drain waste under control;
- Must implement good production practice in accordance with engineering rules for pesticide production;
- Must apply formulation of active ingredients with low toxicity in compliance with international technical standards or consistent with technical specifications required by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) or other relevant standards;
- Must employ skilled employees and implement labor safety rules in order to ensure the safety of workers, nearby communities and the surrounding environment.
- Implement standard requirements in packaging, information labels and implement other measures in compliance with provisions under this Law.

Article 24

The Ministry of Agriculture, Forestry and Fisheries may issue a license to trade in pesticides and agricultural inputs, pesticide repackaging in case applicant implements the following requirements:

1. Repackaging must be under a production chain that ensures good production practice in compliance with rules for pesticide production as stated under Article 23 of this Law.
2. Pesticides that are repackaged have been registered in compliance with provisions under this Law.
3. Repackaging must maintain the original standard of pesticides from the producing institution or country of origin.
4. Repackaging must be made at a location that has been assessed and authorized by the Ministry of Agriculture, Forestry and Fisheries.

Article 25

Stock storage of all pesticides for display for sales or for distribution must be located outside a public market place and must ensure the safety of the surrounding areas.

Establishment or relocation of a production site, repackaging site, and stock storage of pesticides must be assessed and approved by the Ministry of Agriculture, Forestry and Fisheries.

Guidelines on production, stock, and repackaging of pesticides shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 26

Transport of pesticides in the Kingdom of Cambodia must comply with the following requirements:

1. For the purpose of import/export, import/export permits and certificate of pesticide distribution granted by the Ministry of Agriculture, Forestry and Fisheries must be attached.
2. For the purposes of supply/distribution or other purposes, a certificate of origin specifying clearly the types, quantity, and targets for supply/distribution of pesticides must be attached in compliance with provisions under this Law.
3. Transport or loading of pesticides together with passengers or other goods affecting public safety and health must be avoided.

Article 27

Transport of pesticides across the Kingdom of Cambodia must comply with the following requirements:

1. Must notify the Ministry of Agriculture, Forestry and Fisheries at least 15 working days before pesticides arrive at the entry point;
2. Attach a list of pesticides to be transported, an export permit issued by the competent authority of the exporting country, technical specification documents, safety information bulletins, and other documents as necessary;
3. Must ensure safety to avoid leakage of containers and transport means of pesticides, or avoid the spread of pesticides;
4. Must implement the requirements as stated under international agreements on transport of hazardous goods.

In case of leakage of containers and transport means of pesticides, the responsible individual(s) or owner(s) of the transport means must report immediately to a nearest agriculture unit, or relevant authorities, or local authorities in order to take appropriate measures.

Article 28

A natural person or legal person who provides all kinds of pesticide use service to control pests in all locations in the Kingdom of Cambodia must a license of pesticide use service issued by the Ministry of Agriculture, Forestry and Fisheries.

Pesticides that are used as means for pesticide use service must be registered and have an import source or production source in compliance with provisions and procedure under this Law.

Article 29

It is absolutely prohibited all forms of trade in pesticides and agricultural inputs that:

- Have a production source, are imported, repackaged in breach of provisions under this Law;
- Have no registration number nor certificate issued by the Ministry of Agriculture, Forestry and Fisheries;
- Do not have efficacy or have sub-standard efficacy, or expire;
- Counterfeit guaranteed analysis or have guaranteed analysis of component parts and active ingredients that different from the specification on information labels or different from confirmation during registration;
- Counterfeit containers, Khmer information labels, registration number on the container;
- Are in prohibited classification under the Prakas of the Ministry of Agriculture, Forestry and Fisheries
- Are allowed for use only for purposes other than trade in pesticides and agricultural inputs and pesticide use service.

Article 30

Procedure, control of trade in pesticides and agricultural inputs and pesticide use service shall be determined by shall be determined by the Ministry of Agriculture, Forestry and Fisheries.

Section 4: Safety in Utilization, Disposal of Waste and Destruction of Pesticides

Article 31

A natural person or legal person who utilizes pesticides must have knowledge and implement the following rules:

1. Must select the types of pesticides that have Khmer information labels on their containers, have a registration number provided by the Ministry of Agriculture, Forestry and Fisheries and have an origin of supply/distribution in compliance with provisions under this Law.
2. Must have technical knowledge to utilize pesticides in treating pests;
3. Must know safety rules in order to prevent hazard for him/herself, others, and the environment.

Article 32

To ensure safety for people, animals, and the environment in the following activities:

1. Transport, loading, display for sales, stock for sales, all kinds of pesticide use service and other related activities;
2. Disposal of waste or used pesticide containers;

3. Stock for use and direct utilization of pesticide in a farm in order to treat crops and other uses.

Article 33

A natural person or legal person who utilizes pesticides in all kinds of farms has an obligation to take part in all education activities on safety rules carried out by competent officials of the Ministry of Agriculture, Forestry and Fisheries.

Guidelines on safety rules in utilization and disposal of pesticide waste shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 34

All citizens shall have an obligation to report to a nearest local agriculture unit or local authority any cases of utilization of pesticides that threaten public health or the environment in order to take appropriate measures.

A natural person or legal person who utilizes pesticides must be responsible in front of existing laws in case of causing damages to other people's property, public health and the environment.

Article 35

The Minister of Agriculture, Forestry and Fisheries has the right to declare an emergency and issue a Prakas to ban marketing any pesticides as necessary by requiring those traders/retailers who are responsible for import and supply/distribution to recall those pesticides when the Ministry has found that those pesticides have brought hazard and threaten public health and the environment.

Article 36

Counterfeit standard pesticides, ineffective or expired pesticides, pesticides produced without technical bases, pesticides prohibited by this Law or by other relevant laws and pesticides that have origins in breach of provisions under this Law shall be subject to temporary seizure or forfeiture for destruction in compliance with penalties this Law. Procedure and rules for destruction of pesticides and pesticide waste shall be determined by a Joint Prakas of the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Environment.

Chapter 4 Control of agricultural inputs

Article 37

No natural person nor legal person shall have the right to trade in all kinds of pesticides and agricultural inputs in the Kingdom of Cambodia without a license to trade in pesticides and agricultural inputs or without a valid permit, which is in contrary to provisions and procedure under this Law.

Article 38

A natural person or legal person who trades in pesticides and agricultural inputs, produces, imports/exports, stocks, repackages, and supplies/distributes agricultural inputs in the Kingdom of Cambodia must have a license to trade in pesticides and agricultural inputs, issued by the Ministry of Agriculture, Forestry and Fisheries.

A natural person or legal person who trades in pesticides and agricultural inputs, whole-sells, retails agricultural inputs in the capital city; each province must have a permit to whole-sell/retail, issued by a respective capital/provincial department of agriculture.

Article 39

A natural person or legal person who trades in pesticides and agricultural inputs, produces, imports/exports agricultural inputs in the Kingdom of Cambodia must apply for prior registration of the agricultural inputs with the Ministry of Agriculture, Forestry and Fisheries.

Procedure and standard requirements for registration of agricultural inputs shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 40

A natural person or legal person who imports/exports agricultural inputs must have an import/export permit from the Ministry of Agriculture, Forestry and Fisheries.

The Minister of Agriculture, Forestry and Fisheries has the right to tolerate registration and import of agricultural inputs for public purposes or for specific non-commercial needs as necessary.

Registration and import of agricultural inputs for specific non-commercial needs shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 41

A production institution, a repackaging institution and stock storage of agricultural inputs must fulfill the following requirements:

- Must have appropriate location and must implement good production practice that ensures labor safety, public health and the surrounding environment;
- The agricultural inputs to be produced, repackaged, and stocked have been registered in accordance with provisions and procedure under this Law;
- Must ensure or keep the guaranteed analysis of nutritional substances, component parts of agricultural inputs in accordance with the original standard affirmed during registration.

Establishment, relocation of a production institution, repackaging institution, and stock storage of agricultural inputs must be assessed and approved by the Ministry of Agriculture, Forestry and Fisheries.

Guidelines for production, stocks, and repackaging of agricultural inputs shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 42

Transport of agricultural inputs in the Kingdom of Cambodia must meet the following requirements:

1. For purposes of import/export, an agricultural inputs import/export permit and validation of distribution granted by the Ministry of Agriculture, Forestry and Fisheries must be attached.
2. For purposes of distribution or other purposes, a relevant certificate of origin must be in compliance with provisions under this Law.

Article 43

It shall be prohibited to use chemicals inducing irregular growth for all kinds of plants and animals or to use genetically modified products to mix, produce, process all kinds of agricultural inputs.

Article 44

It is absolutely prohibited to trade in all kinds of pesticides and agricultural inputs as follows:

- With a production source or an import source in breach of laws or with other sources in contrast to provisions under this Law
- Without efficacy or with sub-standard efficacy or with expiry date;
- Counterfeit guaranteed analysis or with guaranteed analysis of nutritional substances or component parts differing from affirmation on information labels or differing from affirmation during registration;
- Counterfeit containers, counterfeit Khmer information labels, counterfeit registration number on the containers
- Fake/counterfeit sub-standard agricultural inputs or ex-standard agricultural inputs
- Agricultural inputs authorized for import for non-commercial needs.

Article 45

Procedure, control of trade in pesticides and agricultural inputs shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Control of trade in pesticides, agricultural inputs, and veterinary drugs shall be determined by a Joint Prakas of the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Health in compliance with the Law on Management of Medicine.

Chapter 5 Standard Requirements, Packaging, Information Labels and Advertisement

Section 1: Packaging and Information Labels

Article 46

All pesticides and agricultural inputs that can be traded in all forms or served in the Kingdom of Cambodia must ensure full information on standard requirements as follows:

1. Guaranteed analysis of nutritional substances, formulation, active ingredients consistent with the original standard from production;
2. Bio-efficacy provided by results of experiments and field tests;
3. Safety for users and disposal of waste;
4. Safety for the environment;
5. Packaging and information labels in Khmer.

Article 47

Packaging and repackaging of pesticide or all kinds of agricultural inputs must be carried out in a location or by an institution that has received authorization from the Ministry of Agriculture, Forestry and Fisheries in accordance with this Law.

Employees working in a packaging or repackaging institution of pesticides or all kinds of agricultural inputs must have professional capacity in safeguarding labor safety and preventing hazard caused by toxicity of chemicals.

Article 48

Packaging and repackaging of pesticides or all kinds of agricultural inputs for trade in pesticides and agricultural inputs and pesticide use service in the Kingdom of Cambodia must meet the following requirements:

- Must ensure safety for public health and the environment;
- Must ensure or maintain efficacy of products under an ordinary condition for keeping during a valid period;
- Containers of pesticides or agricultural inputs must be made from materials that is durable, weather-proof; with unchanging quality, weight, or size; is safe for transport, loading, stocks, and usage;
- Containers of pesticides must be made under such a design that they are not reusable or refill-able, and display safety labels, in particular for children;

- Must not package or repackage pesticides in a food or drink container;
- Containers of pesticides must not look similar to those of food;

Article 49.

All kinds of containers of pesticides and agricultural inputs that are traded and served must ensure Khmer information labels, which show a minimum brief text as follows:

- Name and address of the holder, registration or the license holder of trade in pesticides and agricultural inputs;
- Guaranteed analysis of nutritional substances, component parts, and active ingredients of the product;
- Registration number provided by the Ministry of Agriculture, Forestry and Fisheries;
- Origin country of production or origin country of export;
- The general name or the commercial name of pesticides or agricultural inputs;
- Net volume or weight of the product in the container;
- Instruction on usage, valid duration, safety in usage, and disposal of used containers;
- Prohibition and cautions, specifying signs of toxicity, safety rules; must implement measures of health protection and first aids;
- Danger symbols and caution signs for highly toxic pesticides;
- Lot number, production date, expiry date;
- Other relevant information required by the Ministry of Agriculture, Forestry and Fisheries.

Article 50

All information labels of pesticides and agricultural inputs must be in Khmer and must be attached or printed on the surface of a container in such a way that all information of the labels are legible, easy to understand, and not easy to fade away.

All information labels of pesticides and agricultural inputs that are marketed must not be torn, erased, changed, counterfeited, or damaged, either wholly or partly, which affects existing regulations.

It is prohibited to display for sales, to stock for sales, or to market those pesticides and agricultural inputs whose information labels in a foreign language or whose Khmer information labels are torn, erased, changed, counterfeited, irregularly damaged; do not have a registration number or have a counterfeit registration number, or use an expiry registration number, which is contrary to provisions under this Law.

Article 51

No substances of pesticides or agricultural inputs shall be added to or taken out of a container when the container of pesticides or agricultural inputs is stuck with approved information labels in compliance with provisions and procedure under this Law.

Article 52

Standard of pesticide information labels is determined in compliance with the Global Harmonization System (GHS) of classification and labeling of chemicals.

Standard requirements for packaging and information labels of pesticides and agricultural inputs shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Section 2: Advertising pesticides and agricultural inputs

Article 53

In addition to provisions under other laws related to advertisement, no natural person nor legal person has the right to advertise pesticides or agricultural inputs without registration and without a license to trade in pesticides and agricultural inputs or without a permit, which is contrary to provisions under this Law.

All commercial advertisement texts on pesticides or all kinds of agricultural inputs must be approved in advance by the Ministry of Agriculture, Forestry and Fisheries.

Article 54

Advertisement of pesticides and agricultural inputs shall implement the following rules:

- Advertisement text must have appropriate technical contents and be consistent with technical, scientific data / information of the Ministry of Agriculture, Forestry and Fisheries;
- Advertisement must tell buyers or users to read the information label on the container to understand clearly and to be pay attention to instructions, danger signs, and prohibition signs;
- The advertisement text must provide clear information on correct implementation of usage methods and the time gap for harvest after use
- Employees who work in commercial advertisement of pesticides and agricultural inputs must have professional capacity to provide correct, clear information on the products to be sold/distributed to users.

Article 55

Advertisement of pesticides and agricultural inputs must avoid:

- Providing gifts to encourage usage
- Promote excessive use over technical requirements
- Deceive buyers by lying or exaggerating about efficacy and safety of products through written or oral persuasions

- Direct comparison of efficacy or safety with other pesticides or agricultural inputs.

Chapter 6 Obligations of Traders/Retailers and Service Providers

Article 56

A natural person or legal person who trades in pesticides and agricultural inputs or provide all kinds of pesticide use service are obliged to abide by and follow the provisions and procedure under this Law.

A right holder of a license, certificate, registration, or a permit under provisions of this Law shall be bound to the implementation of the order and validation period that are stated in the license, certificate, registration, or a permit.

Transfer of right to a license, certificate, registration, or a permit to a third person must be approved in advance by the Ministry of Agriculture, Forestry and Fisheries. The individual who receives the right shall have the same obligations in implementing provisions and procedure under this Law.

Article 57

A natural person or legal person who applies for a license to trade, to provide service in and to register or to re-register all kinds of pesticides and agricultural inputs shall have an obligation to pay a service fee into the national budget according to each item.

The service fees for a license to trade, to provide service in and to register or to reregister all kinds of pesticides and agricultural inputs shall be determined by a joint Prakas between the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Economy and Finance.

Article 58

A natural person or legal person who applies for an analysis, experiment, test of a sample of all kinds of pesticides and agricultural inputs shall have an obligation to pay a service fee into the national budget according to each item.

The service fees for the analysis, experiment, test of a sample of all kinds of pesticides and agricultural inputs shall be determined by a joint Prakas between the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Economy and Finance.

Article 59

Traders/retailers and service providers of pesticides and agricultural inputs shall have the following obligations:

1. Be responsible in front of laws for all pesticides or agricultural inputs that are displayed for sales or stocked in their trade institutions or service institutions by assuring import sources, production sources, or supply/distribution sources in compliance with provisions and procedure under this Law;
2. Must display in their trade institutions or service institutions their licenses or permits to trade.
3. Must keep the certificate, registration of all kinds of pesticides or agricultural inputs that are displayed for sales, stocked, or served.
4. Must have a trade log book in compliance with the sample log book introduced by the Ministry of Agriculture, Forestry and Fisheries and other documents related to their trade and services.
5. Must report to or inform local competent agriculture unit of hazard or impacts of pesticides or agricultural inputs that they have traded or served for providing basic data for measures to be taken by competent ministries.
6. Must collaborate and enable all education, inspection, and enforcement activities by competent pesticide and agricultural input inspection agents of the Ministry of Agriculture, Forestry and Fisheries.

Article 60

All institutions that trade in, produce, import/export, repackage, and supply/distribute all kinds of pesticides or agricultural inputs and all institutions that provide pesticide use service in the Kingdom of Cambodia must have one or more responsible, technical person(s) who has/have a bachelor's degree in agronomy and whose professional experience is recognized by the Ministry of Agriculture, Forestry and Fisheries.

Article 61

All pesticides and agricultural inputs that may display for sales, or stock for wholesales/retails in the Kingdom of Cambodia must have an origin from a legal production institution, repackaging institution, or import institution holding a trade license or permit issued by the Ministry of Agriculture, Forestry and Fisheries and must register those products in compliance with provisions under this Law.

Article 62

All institutions that produce, import, repackage pesticides and agricultural inputs may supply/distribute only to a whole-sale/retailer institution or their branches that hold a wholesale/retail permit issued by a respective capital/provincial department of agriculture in compliance with provisions under this Law.

Article 63

An owner of institution that produces, imports/exports, repackages pesticides and agricultural inputs and an institution that provides pesticide use service shall have an obligation to be accountable for the operation of trade in pesticides and agricultural

inputs of traders/retailers, service providers that are branches or institutions that supply/distribute their products in a capital/province.

Article 64

Traders/retailers that apply for a permit to trade in pesticides and agricultural inputs, to whole-sell/retail pesticides and agricultural inputs in a capital/province must have professional capacity and must undergo a professional capacity training course in accordance with the substance study determined by the Ministry of Agriculture, Forestry and Fisheries.

A certificate affirming undergoing a professional capacity training course is a precondition for issuance of a permit to trade in whole-sale/retails of pesticides and agricultural inputs.

Article 65

The Ministry of Agriculture, Forestry and Fisheries must provide services in implementing professional capacity training programs for traders/retailers and service providers of pesticides and agricultural inputs in all the capital/provinces as stated under Article 64 of this Law.

The service fees for the professional capacity training courses for traders/retailers, service providers of pesticides and agricultural inputs shall be determined by a Joint Prakas between the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Economy and Finance.

Article 66

The Minister of Agriculture, Forestry and Fisheries shall determine an appropriate quantity of pesticides and agricultural inputs that are produced or imported for supply/distribution in the Kingdom of Cambodia based on the study/assessment of needs of agricultural production in the country and based on the scientific, economic, social aspects and the environment.

The basic quantity or trade, whole-sales/retails of pesticides and agricultural inputs in the capital and provinces shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 67

It is prohibited to trade, to display for sales, or to stock for sales pesticides in the compound of a market, a commercial center, and other public places, or to display for sales with all kinds of food products or with other goods that may cause hazard to public health or the environment.

Rules for display for sales of pesticides shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 68

Traders/retailers or drivers who transport pesticides or agricultural inputs to supply/distribute to institutions that trade in pesticides and agricultural inputs are obliged to show a permit or a relevant document required under this Law for inspection by competent pesticides and agricultural inputs inspection agents.

All transport of pesticides and agricultural inputs for mobile sales or direct supply/distribution to users without a trade, whole-sell/retail permit and with a source in breach of this Law shall be absolutely prohibited.

Chapter 7 Research on pesticides and agricultural inputs

Article 69

The Ministry of Agriculture, Forestry and Fisheries must establish a research team to carry out technical study and assessments of activities related to pesticides and agricultural inputs.

The pesticides and agricultural inputs research team shall be led by a representative of the Minister of Agriculture, Forestry and Fisheries and shall have a membership of representatives of relevant technical agencies related to pesticides and agricultural inputs under the jurisdiction of the Ministry of Agriculture, Forestry and Fisheries.

Organization and conducts of the pesticides and agricultural inputs research team shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 70

The pesticides and agricultural inputs research team shall fulfill the following tasks:

- Carry out study, research on agricultural chemicals that are use in agricultural production in the Kingdom of Cambodia;
- Carry out study, research, classification, and listing of pesticides in the Kingdom of Cambodia consistent with a universal standard;
- Carry out study, research of technical standards for pesticides and agricultural inputs that are authorized for use in the Kingdom of Cambodia;
- Carry out research and assessments of impacts caused by agricultural chemicals, micro-organisms, and propose measures for safe use of pesticides and agricultural inputs;
- Study/assess and propose to remove, revise, add kinds or classification of a pesticide in the pesticide list in the Kingdom of Cambodia.
- Study and assess technical requirements for registration new kinds of pesticides or agricultural inputs
- Implement other functions as determined by the Minister of Agriculture, Forestry and Fisheries.

Chapter 8 Validation of Distribution of Pesticides and Agricultural Inputs

Article 71

All kinds of pesticides and agricultural inputs are classified as products requiring risk management and may have validation of distribution for trade in pesticides and agricultural inputs, pesticide use service, and utilization in the Kingdom of Cambodia unless these products have undergone first-instance inspection on standard requirements in compliance with procedure under this Law.

Article 72

A natural person or legal person who holds a trade permit, produces, or imports/exports pesticides and agricultural inputs must notify the Ministry of Agriculture, Forestry and Fisheries at least 15 (fifteen) days prior to receiving the validation of distribution for supply/distribution in the Kingdom of Cambodia or before transporting for export.

Article 73

The Ministry of Agriculture, Forestry and Fisheries shall have the right to appoint pesticides and agricultural inputs inspection agents to work at checkpoints at all international and border entries in order to ensure risk management and to inspect pesticides and agricultural inputs when imported into the Kingdom of Cambodia.

All pesticides and agricultural inputs that must undergo first-instance inspection when imported or before issuance of validation of distribution must extract samples for analysis/verification with the original standard affirmed during registration.

Inspection of pesticides and agricultural inputs for import/export and provision of validation of distribution shall be determined by a Sub-Decree.

Article 74

All kinds of pesticides and agricultural inputs that have received validation of distribution in accordance with procedure under this Law shall be marked by a validation label on the containers.

A label of validation of distribution for pesticides and agricultural inputs shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 75

In case that analysis results confirm that the pesticides or agricultural inputs that have been produced or imported or for export have a standard contrary to the affirmation during registration, the Ministry of Agriculture, Forestry and Fisheries has the right to take the following measures:

1. Not to grant validation of distribution to supply/distribute those products.

2. Require a natural person or a legal person who produces, imports or exports to collect those products to storage for solutions according to procedure.
3. Require destruction in compliance with provisions of existing laws.
4. Require to send back to the source of origin or country of origin.

Chapter 9 Pesticides and Agricultural Inputs Inspection Agents

Article 76

Pesticides and agricultural inputs inspection agents of the Ministry of Agriculture, Forestry and Fisheries shall have the competency and serve as justice police officers and justice police agents in carrying out inspection and enforcement on offences of pesticides and agricultural inputs occurring in their respective competent territory.

Granting the title as justice police officers and justice police agents to pesticides and agricultural inputs inspection agents shall be determined by a Joint Prakas between the Ministry of Justice and the Ministry of Agriculture, Forestry, and Fisheries in compliance with the Penal Procedure Code of the Kingdom of Cambodia.

Article 77

When carrying out inspection and enforcement, pesticides and agricultural inputs inspection agents must wear uniforms with a signage, rank sign and must have a service order. Uniforms, signage, and rank signs of pesticides and agricultural inputs inspection agents shall be determined by a Sub-Decree.

Article 78

Competent pesticides and agricultural inputs inspection agents shall have the right to inspect and take measures as follows:

1. Inspect production and import/export of pesticides and agricultural inputs before granting validation of distribution in the Kingdom of Cambodia or for export in compliance with provisions and procedure under this Law.
2. Carry out ongoing monitoring, research and inspection of all institutions that trade in pesticides and agricultural inputs, production institutions, stock storages, and service providers of all kinds of pesticides and agricultural inputs.
3. Inspect means of transport of pesticides and agricultural inputs that are suspected to be in breach of this Law by requiring the driver or owner to open the container or loading means for inspection.
4. Require traders/retailers, service providers to present a license, a permit and documents related to trade in pesticides and agricultural inputs and pesticide use service.
5. Take measure to ban trade in pesticides and agricultural inputs and pesticide use service that have been found to cause hazard in agricultural production or affect public health and the environment.

6. Take samples of pesticides or agricultural inputs that are the subject of inspection and experiment/verification for standard.
7. Seize proofs of breach.
8. Seize a license, a permit, certificate of registration or relevant documents in case the respective holder breaches this Law.

Article 79

Pesticides and agricultural inputs inspection agents shall have the right to inspect and take measures in compliance with provisions under this Law on an actual offence committed in the compound of an institution or property that displays for sales, stocks for sales, or trades in pesticides and agricultural inputs, provides all kinds of pesticides and agricultural inputs.

In case that an offence occurs in a compound of an institution / property that has no owner nor claim as owner of proofs of the offence, in implementing a search warrant of a prosecutor, competent pesticides and agricultural inputs inspection agents must collect proofs of breach for seizure and must stick a list of proofs of the offence on the property as evidence until a settlement of the offence is completed according to procedure.

Procedure for inspecting an institution and trade and service in pesticides and agricultural inputs shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 80

In all inspection of pesticides and agricultural inputs, in case that prohibited proofs are prohibited products under this Law or are hazardous in the process of dealing with the offence according to procedure under this Law, the Ministry of Agriculture, Forestry and Fisheries may request a decision by the prosecutor to the trial court of the respective capital and province to destroy according to procedure.

Samples, expenses on sample analyses of pesticides and agricultural inputs and expenses on loading, transport, maintenance, destruction of proofs when carrying out inspection in enforcing this Law shall be the responsibility of the owner of the proofs.

Article 81

Pesticides and agricultural inputs inspection agents have the right to request for forces from all levels of local authorities, armed forces, or other relevant competent authorities to take part in suppressing an offence of pesticides and agricultural inputs.

Competent pesticides and agricultural inputs inspection agents shall prepare a report for the respective unit and file a dossier of the offence to send to a court or shall have the right to address the offence in compliance with provisions and procedure under this Law.

A dossier of an offence of pesticides and agricultural inputs shall be determined by a Joint Prakas between the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Justice.

Chapter 10 Offences and Penalty

Article 82

Offences of pesticides and agricultural inputs are a criminal offence that applies to all offences related to pesticides and agricultural inputs as stated under this Law.

Penalty of offences of pesticides and agricultural inputs includes written warning; revocation or suspension of licenses, certificates of registration, permits; coordination fines; seizure of proofs; forfeiture of proofs; destruction of proofs; requirement for reparation of damages; civil compensation; monetary compensation; and imprisonment.

Article 83

Written warning; revocation or suspension of licenses, certificates of registration, permits; coordination fines; seizure of proofs are the competency of the Ministry of Agriculture, Forestry and Fisheries.

In case that an offence cannot be addressed by penalty in compliance with paragraph 1 of this Article, competent pesticides and agricultural inputs inspection agents must file a dossier of the offence to send to a court according to procedure.

Article 84

The Ministry of Agriculture, Forestry and Fisheries shall have the right to impose coordination fines on an offence of pesticides and agricultural inputs as stipulated under Article 87 Article 88 and Article 89 of this Law.

Coordination fines on an offence of pesticides and agricultural inputs may be applicable in case that the offender(s) confess(es) and consent(s) to paying a coordination fine according to the penalty under this Law.

Procedure and coordination fines shall be determined by a Prakas of the Ministry of Agriculture, Forestry and Fisheries.

Article 85

A coordination fine, a fine based on judgment or a court's sentence or the proceed from sales of proofs, which have been forfeited as State property by a court, shall be paid into the State budget and used to give as an award to those who are outstanding in suppressing the offence.

A monetary award for those who are outstanding in suppressing an offence of pesticides and agricultural inputs shall be determined by a Joint Prakas between the

Ministry of Agriculture, Forestry and Fisheries and the Ministry of Economy and Finance.

Article 86

A person committing any of the following offences shall receive written warning, suspension of license, certificate of registration or permit:

1. Transfer holding rights or receive holding rights of a license, certificate of registration, or permit without prior approval from the Ministry of Agriculture, Forestry and Fisheries;
2. Trade in pesticides and agricultural inputs, sell or stock for sales pesticides and agricultural inputs without a trade log book; with failure to display a trade license or a permit, and with failure to keep a certificate of registration of the types of pesticides and agricultural inputs that are displayed for sales or stocked for sales, as well as documents related to their trade or service in pesticides and agricultural inputs.

In case of repetition, a coordination fine under Article 87 of this Law shall be applied, and all kinds of related licenses, certificates, and permits shall be completely revoked.

Annex 2: Terms of Reference for the Rapid Appraisal of Fertilizer Quality in Cambodia

February, 2010

A. Background

1. The World Bank is supporting the Royal Government of Cambodia to respond to the food crisis through Smallholder Agriculture and Social Protection Support Development Policy Operation (DPO). The rationale for this targeted support is that agriculture is a major component of Cambodia's economy, contributing to over 30% of Cambodia's GDP and about 57% of total employment. Over 90% of Cambodia's poor live in rural areas, with agriculture as the primary source of their livelihood, which means that productive smallholder farmers are key components of this initiative. The Government's policies and strategies such as rectangular strategy, National Strategic Development Plan and others recognize smallholder farmers and farmers' organizations (FOs) as leading contributors to poverty eradication. The DPO is complemented by World Bank managed AusAid funded Trust Fund for Food Crisis Capacity Support Partnership (FCCSP) which supports analytical work and technical assistance for implementation of DPO reforms.

2. Agricultural productivity and yields in Cambodia are less than what can be achieved through the use of modern technology and fertilizers. Government and Development Partners are investing in irrigations schemes to ensure that farming goes beyond rain fed production and the use of fertilizers is also encouraged. Cambodia relies on imports for its fertilizer supplies whereby the supply chain may get corrupted between warehouse and the farm gate leading to dubious fertilizer quality. The farmers have to endure the high prices and poor fertilizer quality. The high prices of fertilizers are some of the key challenges for smallholder farmers; however of the major concern is that poor fertilizers qualities do not lead to improved farm yield. This lack of improvement, even with the use of fertilizers, can easily erode the farmers' confidence in the use of fertilizers and other production enhancement methods.

B. Objectives of the appraisal

3. In order to enhance agricultural production in Cambodia, the World Bank has to support improvement in the efficiency and functional performance of the fertilizer supply and marketing system in Cambodia. Special attention is placed on market integrity issues, including fertilizer quality assurance; understanding price levels and how they are determined as indicators of market efficiency factors. The objectives of the appraisal are to provide insight to and an understanding of two key issues often cited as key constraints to improved farmer use of fertilizers - prices and quality. The assessment will involve the following activities:

- a. Identify the cost structure for fertilizers in Cambodia, with attention given to costs involve in importation, logistics/distribution in Cambodia, and at the retail level.

- b. Assess margins at each level in the market chain.
- c. Assess farm level prices vis-à-vis international market prices.
- d. Assess main governance issues in the fertilizer value chain
- e. Assess fertilizer quality by visual inspection to determine physical characteristics of fertilizers.
- f. Identify issues that may contribute to poor physical condition.
- g. Determine nutrient content analysis via sample collection and technical analysis.
- h. Determine major nutrient content against bag labels.
- i. Assess the potential of introducing deep placed urea into Cambodia.

C. Methodology

4. This appraisal will provide analytical evidence on the issues related to fertilizer quality, which will provide rationale to review and refine regulatory framework guiding fertilizer market and distribution. Specifically, this assessment will:

- a. Investigate by rapid appraisal methods the quality relative to label of fertilizer products in four market areas in Cambodia,
- b. Collect samples of commercial fertilizer products at various locations and stages of the supply chain and send them for analysis to determine whether the nutrient content of the product is as purported.
- c. Analyze approximately 100 (5 each for 20 locations) samples of fertilizer products in laboratory facilities to determine nutrient content compared to bag specifications.
- d. Estimate marketing margins for each key segment of fertilizer value chain and identify main issues which affect competitiveness/efficiency of the chain;
- e. Carry out qualitative assessment/mapping of key players in fertilizer value chain and their incentive structures and apparent main vested interests; identify whether the key stakeholders in the fertilizer chain are seen as working for (or against) or against establishment clear governance rules for the chain;
- f. Identify sectoral implementation capacity of the main agencies/ministries for the implementation and enforcement of clear governance rules for fertilizer chain and whether perceived bottlenecks are due to weak accountability/incentive structure or genuine capacity constraints;
- g. Note and report on ancillary issues involving seeds and pesticides that might have a bearing on the effectiveness of fertilizer usage.
- h. Carry out assessment of opportunities for introducing deep placed urea into Cambodia.
- i. Identify technical and commercial issues that may be an obstacle to more efficient fertilizer sector performance.

D. Reporting

5. This engagement will result in two reports:

1. A complete trip report within 7 days of the completion of field work. The report will identify:
 - a. Itinerary and activities conducted in the field.
 - b. List of persons consulted.
 - c. Significant issues arising during field work.
2. Final report of the rapid assessment within 30 days of the conclusion of field work. The report will include:
 - a. Results of the fertilizer samples analysis.
 - b. An analysis of fertilizer quality in general.
 - c. Report on fertilizer market assessment

E. Qualifications

6. The consultant firm will have extensive experience in fertilizer sector development gained from different countries, the relevant laboratory facilities for technical analysis of fertilizer samples and have the following capabilities:
 - a. Capacity to provide expertise on market appraisals to assess economic and functional efficiency of the fertilizer market;
 - b. policy analyses to identify policy deficiencies that impeded/strengthen sub-sector performance;
 - c. soil fertility assessments and review and updating of soil and crop specific fertilizer recommendations;
 - d. fertilizer supply/raw material assessments;
 - e. marketing cost and price analyses;
 - f. fertilizer regulatory system design to support quality assurance;
 - g. the design and implementation of market information systems to improve market transparency;
 - h. credit program design and implementation for fertilizer dealers; and
 - i. human capacity development for both private sector fertilizer enterprises and government officials.

F. Duration

7. The assignment will be completed in about 50 days as detailed in the reporting section. The team leader can discuss variation to this time based on factors that cannot be predicted at the onset.

G. Reporting

The consultant will report to Mr Paavo Eliste of the World Bank. It is expected that consultant consult with JICA (Hamaguchi Toshinori, who is supporting the Ministry of Agriculture, Forestry and Fisheries through the Capacity Building for Quality Standard Control of Agric Materials Project.