

DEVELOPMENT OF CONSERVATION AGRICULTURE IN VIETNAM

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Introduction

Background

- Vietnam is situated in South East Asia,
- Vietnam lies in the region of monsoon,
- Tropical weather with a high temperature of 7500oC/year,
- Rainfall volume of 1800-2000mm/year and is not evenly distributed among the months of the year.
- The Vietnam climate is of 2 zones, 6 regions and 19 sub-regions of agricultural

I.Introduction

Background

- Natural land: 33,099,093 ha
- Agricultural land: 5,523,899 ha
- Forestry land is 9,641,142 ha (in which planted forest of 779,438 ha and natural forest of 8,841,704 ha).
- Virgin land: 14,217,845 ha
- Bald hills and empty land : 11,478,000 ha

I.Introduction

Background

- Vietnam is known as an agricultural country,
- With 75.8% of its manpower involved in agriculture, forestry, and fisheries.
- This sector contributed 21,8.0% of the national GDP in 2003
- The output value structure of agriculture, forestry, and fisheries in 2003 was 76.6%, 5.0%, and 18.6%, respectively.
- Among these, the output values of the sub-sectors in agriculture, such as cultivation, livestock, and service, were 77.70, 19.70, and 2.60%, respectively.
- Thus, cultivation is the most important sub-sector in Vietnamese agriculture.

I.Introduction

Background

- The main crops include rice, maize, coffee, tea, pepper, coconut, and rubber.
- Their planted area and output in 2002 and 2003 are presented in the table

		Total	Rice	Maize	Coffee	Tea	Pepper	Coconut	Rubber
Area (1000 ha)	2002	12662.3	7485.4	810.4	531.3	106.8	43.5	147.1	429.0
	2003	NA	7449.3	909.8	500.0	99.0	48.8	135.8	NA
Output (1000 ha)	2002	NA	34063.5	2314.7	691.7	100.5	50.0	840.6	327.4
	2003	NA	34518.6	2933.7	771.2	85.1	90.0	920.0	NA

I.Introduction

Conservation Agriculture

Disadvantages of Conventional agriculture:

- Conventional agriculture is generally harmful to the environment: crop residue burning or deep soil inversion by tilling to control weeds.
- Increase soil deformation by compaction,
- Increase erosion
- Increase river contamination with sediments, fertilizers and pesticides.
- Increase the emission of CO₂ into the atmosphere, contributing to global warming and reduce the sustainability of agriculture by lowering soil organic matter and fertility, -
- Decrease in biodiversity
- Tillage operations require considerably higher inputs in machinery investment and maintenance, fossil and labour

I.Introduction

Conservation Agriculture

- CA is based on optimizing yields and profits, to achieve a balance of agricultural, economic and environmental benefits.
- CA combines social and economic benefits gained from combining production and protecting the environment including reduced input and labor costs, reduced use of fossil fuels, pesticides, and other pollutants, and through conservation of environmental integrity and services
- CA is the integration of ecological management with modern, scientific, agricultural production.

I.Introduction

Conservation Agriculture

CA mainly characterized by:

- Minimal disturbance of the soil by tillage (zero tillage), balanced application of chemical inputs (only as required for improved soil quality and healthy crop and animal production),
- Permanent soil cover and crop rotation.
- Careful management of residues and wastes.

So CA reduces land and water pollution and soil erosion, reduces long-term dependency on external inputs, enhances environmental management, improves water quality and water use efficiency, reduces emissions of greenhouse gases through lessened use of fossil fuels.

I.Introduction

Conservation Agriculture

- Conservation Agriculture is gaining acceptance in many parts of the world.
- Practice of conservation agriculture on a large scale emerged out of Brazil and Argentina,
- Similar developments were occurring in many other areas of the world, notably North America in zero tillage, and Africa

I.Introduction

Conservation Agriculture

- In Vietnam,
- Development of conservation agriculture is slow and unremarkable.
- Convention agriculture still is mainly accepted in production with intensive crop and increasing crops.

Opportunities and challenges

Opportunities

- Government stimulate development sustainable agriculture
 - Conservation agriculture has successfully been developed in many countries in the World , so we can learn experience lessons from them.
 - The great numbers of qualified technicians, engineers, research institutions, institutes have experienced in successful development of agricultural techniques in Vietnam for many years.
 - Many advanced techniques and technologies are extensively applying in the conservation agriculture.
 - Investment and cooperation and supports from international Organizations and Governments for development of conservation agriculture techniques
 - The advanced achievements and experiences in promotion on conservation agriculture in the world provides enormous information, research materials and facilities to the research and application in Vietnam

I.Introduction

Challenges

- Agricultural production is still poor and backward, mainly manual with small scale and low capacity
- Conventional agriculture has closely attached to farmers for very long time. Conventional agriculture is mainly accepted in production with intensive crop and increasing crops.
- Development of conservation agriculture is slow and unremarkable
- The initial lack of knowledge. To be widely adopted, farmers have to clearly understand all benefits on economic, agronomic, environment of conservation agriculture.
- Lack of transfer of technology. Research has demonstrated that these techniques can be applied and well as their benefits, but these results have not been showed to farmers and technicians.
 - Lack of technology. It is needed an adaptation of the machinery or techniques used in one country to the other country
 - Lack of institutional support. Institutions have not concentrated to assistance farmers to practice conservation agriculture.

Development of Conservation Agriculture

Soil resources:

- Soil is a limited natural resource on which agrarian activities (agriculture, livestock and forestry) are carried out.

It is interconnected with other natural resources, which are also essential for human life, such as the air, water, fauna and flora.

The soil is well managed, the effects of agriculture on the environment will be acceptable

Conversely, if it is badly managed agriculture will deteriorate other resources needed by humans (water, fauna, flora, and atmosphere). .

Development of Conservation Agriculture

Soil resources:

- Traditional agriculture bases most of its operations or practices on soil tillage; i.e., inversion tillage such as mouldboard plough or disk harrow
- Soil tillage drastically alters its original structure, breaking up its natural aggregates and burying the residues of the previous crop.
- The bare soil becomes unprotected and exposed to the action of the wind and rain. So water and soil erosion and sediment runoff are likely to occur.
- Soils are important reservoirs of active carbon (C) and play a major role in the global C cycle.
- Soil erosion is a major environmental threat to the sustainability and productive capacity of conventional agriculture world-wide. Water resources also decrease due to erosion.

Development of Conservation Agriculture

Soil resources:

With zero tillage:

- Organic matter of the surface layers of zero tilled land increases, due to reduced erosion, organic mulch is developed on the soil surface, and this is eventually converted to stable soil organic matter, increased biomass from improved crop yields, greater diversity of types of organic matter from increased rotation and cover crops, reduced erosion and differences in the assimilation and decomposition of soil organic matter from reduced surface soil temperatures and increased biodiversity.
- Profit margins with zero tillage are normally better than under conventional tillage systems, and this enhances the sustainability and future continuity of the CA farming systems.

Development of Conservation Agriculture

Soil resources:

In Vietnam:

Zero tillage and minimum tillage have initially been accepting for crops on the wet land and dry land at low level.

Zero tillage:

- Zero tillage has been applied for soybean.
- Soybean is directly seeded by machinery to rice field just after harvesting rice of summer crops and covered by rice straw without tillage. With extra soybean crops in the 2 rice crops at the rice-grew provinces of Red River Delta in recent years, farmers get more income and increase on rice soil fertility. As the effective cultivation mode applied conservation agriculture in the region of greater rice production has been adopted fast and actively, Agricultural Extension General Department positively supports farmers to develop more soybean area and seeding machines. In 2006, in the Hatay province, 40% area of 2 rice crops grew the soybean of winter crops with the rezo tillage.

Development of Conservation Agriculture

Soil resources:

In Vietnam:

Figure 2. Soybeans are sowed directly to the rice field without tillage, just after rice harvested



Development of Conservation Agriculture

Soil resources:

In Vietnam:

Minimum tillage:

- Wet soil for rice crops in wet soil is tilled by rotary cultivator / or tilling cages attached with small 2-wheeled tillers with horse-power 12 engine (BS-12), instead of mould board plows mounted to big 4-wheeled tractors with horse-power 50 / or 80 engine (MTZ-52 / 82). Numbers of times of tiller running in the rice field also reduces. So cost for tilling also decreases to 60% and soil quality is improved, trafficability on the wet soil is improved.
- Soil prepare for sugarcane is tilled by the no-conversion subsoiler instead of moldboard plow attached with 4-wheeled tractor with horse-power 50 / or 80 engine (MTZ-52 / 82). Numbers of times of tractor running in the rice field also reduces. So cost for tilling also decreases to 40% and soil quality is improved,
- Soil prepare for crops on the dry land such as soybean, peanut, coffee, tea, vegetable, est. ... by rotary cultivator instead of moldboard plow attached with small 2-wheeled tiller with horse-power 12 engine (BS-12) or 4-wheeled tractor with horse-power 30 / or 50 engine. Numbers of times of tractors running in the field also reduces. So cost for tilling also decreases to 50% and soil quality is improved,

Development of Conservation Agriculture

Cover crops.

A permanent soil cover is important to:

- Protect the soil against the deleterious effects of exposure to rain and sun; to provide the micro and macro organisms in the soil
- Improve infiltration and retention of soil moisture
- Increase humus formation.
- Create to source of food and habitat for diverse soil life: creation of channels for air and water, biological tillage and substrate for biological activity through the recycling of organic matter and plant nutrients.
- Consequentially reduce runoff and erosion.
- Create to better conditions for the development of roots and seedling

Development of Conservation Agriculture

Cover crops.

In Vietnam,

- Azolla (water-fern) on the surface of rice field in the Red River Delta and Mekong River Delta is good soil cover crop and supplies for rice field as good green manure. it can produce 10 ton to 15 ton to 1 hectare in one crop
- Some of bean-family weeds are effectively grown as soil cover crops in fruit farms, coffee, ...
- Permanent soil cover with a mulch of PVC film for peanut makes increase to 30% of output in some peanut areas in the North provinces

Development of Conservation Agriculture

Soil resources:

Figure 2. Peanuts is covered on the soil-surface by nylon film



Development of Conservation Agriculture

Crop rotation

Crop rotation is an essential element in the success story of no-tillage expansion.

The effects of crop rotation:

- Higher diversity in plant production
- Reduction and reduced risk of pest and weed infestations.
- Better distribution of water and nutrients through the soil profile.
- Exploration for nutrients and water of diverse strata of the soil profile by roots of many different plant species
- Increased nitrogen fixation through certain plant-soil biota symbionts and improved balance of N/P/K from both organic and mineral sources.
- Increased humus formation.

Development of Conservation Agriculture

Crop rotation

In Vietnam

- There are a lot of effective systems of crop rotation and intercrop, depending on crops condition such as :

the rice – soybean/maize/vegetable/potato - rice,
rice – fish, soybean – maize,

- Intercrop of sugarcane with peanut/soybean,
green bean / maize with sweet potato, maize with soybean

Development of Conservation Agriculture

Crop rotation

In Vietnam

Picture 3: Peanut are intercropped to sugarcane



Development of Conservation Agriculture

Fertilizers application:

In Vietnam,

-Nitrogen fertilizers is mainly used for rice, sugarcane, vegetables and other crop,

-Microorganism fertilizer is widely applied for crops: rice, sugarcane, peanut, coffee, tea. Product of crops gives good quality.

Development of Conservation Agriculture

Fertilizers application:

In Vietnam,

Picture 4. Plant for producing microorganism fertilizer



Development of Conservation Agriculture

Water resources.

Soil water content is often a very important limiting factor in agricultural productivity.

- Conservation techniques increase the water content in the soil profile in comparison with conventional techniques.
- The straw over the soil decreases soil water evaporation, while each tillage operation increases it.
- Water quality is seriously impaired by conventional agriculture. Soil sediment from eroded agricultural land is by far the most important contaminant of surface water.
- Conservation agricultural systems greatly reduce soil erosion
- The adoption of these systems significantly improve surface water quality by reducing sediment.

In Vietnam

system of water and irrigation and drainage have basically met the demands on agricultural development in the low land areas, but still lack for dry land, inclined land areas.

Solution for conservation agriculture

Conservation soil and water.

- Use of appropriate/improved seeds for high yields as well as high residue production and good root development.
- Use of various cover crops, especially multi-purpose crops, like nitrogen-fixing, soil-porosity-restoring, pest repellent, etc.
- Optimization of crop rotations in spatial, timing and economic terms.
- Transfer step by step monocrops system to crop rotation system
- Design and implementation of crop rotations according to the various objectives: food and fodder production (grain, leaf, stalks); residue production; pest and weed control; nutrient uptake and biological subsurface mixing / cultivation, etc.
- Establishment to system of water irrigation and drainage, dams, water reservoirs sufficiently supplies to crops

Solution for conservation agriculture

Development biotechnology

- Development biotechnology in agriculture for improves capacity and quality of crop products; promote wide application of bio-technology and preservation of gene pools of local plant.
- Apply on advanced techniques and technologies in agriculture biotechnology.
- Varieties: Use of appropriate / improved seeds for high yields as well as high residue production of above-ground and below-ground parts, given the soil and climate conditions

Solution for conservation agriculture

Biodiversity:

- Strengthen conservation of biodiversity in agriculture, protect environment
- Biodiversity is reduced in conventional agriculture since bare soil for a long period of time does not provide food and shelter for wildlife at critical times. In contrast, high-residue crop production systems have been shown repeatedly to be attractive and valuable for helping several forms of wild life to thrive in agricultural areas (birds, small mammals, reptiles and soil invertebrates especially predators of key pests).

Solution for conservation agriculture

Fertilizer:

- Establishment of microorganism fertilizer plants supply to crops, develop production of organic and biological fertilizers, fertilizers with slow dissolubility for the development of conservation agriculture.

Pesticide:

- Produce of organic pesticide to protect environment.

Solution for conservation agriculture

Machinery.

Improve and develop equipment and machines being suitable to conservation agriculture techniques,

For small and medium sized mechanized farms we would recommend that farmers buy no-tillage machine and direct seeder suitable for wide row crops (i.e. soybeans, maize, sorghum, sunflower) and for narrow row crops (wheat, oats, rye and green manure cover crops in general).

Solution for conservation agriculture

Enhance awareness on conservation agriculture

The most important limitation in all areas where conservation agriculture is practiced is the initial lack of knowledge all new technology needs to have benefits and advantages that attract a broad group of farmers who understand the differences between what they are doing and what they need. In the case of conservation agriculture these benefits as:

Economic benefits:

- Time saving and thus reduction in labour requirement.
- Reduction of costs, e.g. fuel, machinery operating costs and maintenance, as well as a reduced labour cost.

Agronomic benefits:

- Adopting conservation agriculture leads to improvement of soil productivity: organic matter increase, in-soil water conservation.
- Improvement of soil structure,

Environmental benefits:

- Reduction in soil erosion,
- Improvement of water quality,
- Improvement of air quality, biodiversity increase, carbon sequestration.

Solution for conservation agriculture

Support from Government

- Strengthen investment from Government for developing conservation agriculture.
- Government need to support farmers adoption of conservation agriculture in the form of financial resources for buying equipment as well as for agricultural research and extension

International cooperation:

- there are policies to expand the cooperation and exploitation of international collaboration and investment for develop conservation agriculture in Vietnam

Solution for conservation agriculture

Conclusion

- Conservation agriculture aims to achieve sustainable and profitable agriculture and subsequently aims at improved livelihoods of farmers through the application of the three conservation agriculture principles: minimal soil disturbance, permanent soil cover and crop rotations.
- Conservation agriculture holds tremendous potential for all sizes of farms and agro-ecological systems, but its adoption is perhaps most urgently required by smallholder farmers, especially those facing acute labour shortages. It is a way to combine profitable agricultural production with environmental concerns and sustainability and it has been proven to work in a variety of agro ecological zones and farming systems
- Conservation agriculture has been successfully implemented in North and South America, Africa, Australia for many years and brings benefit to economy and environment.

Conclusion and Recommendation

Conclusion

- In Vietnam, agricultural country is still poor and backwards. Conventional agriculture still is mainly accepted in production with intensive crop and increasing crops.
- Development of conservation agriculture is slow and unremarkable.
- But it has initially gained a number of achievements in development of conservation agriculture due to strong investments and people's correct awareness.
- conservation agriculture has good prospect in the coming years

Conclusion and Recommendation

Recommendation

- Rice is essential crop and grew in the wetland in Vietnam and some countries in the Asia, up to now I have not found any document mentioning to practice conservation agriculture for the rice areas, especially no-tillage culture for rice. So in this workshop, I would like to ask for finding appropriate solutions to acceptance conservation agriculture for the rice areas.
- Conservation agriculture will get economic benefit at the later stages. So during the initial stage of adoption, some people worry that adoption of conservation agriculture will take risks to decrease output of product and it is difficult for them to acceptance conservation agriculture. They need actively support from international Organizations to establish demonstration sites and disseminate good practices in Vietnam

**Thank you for
your attention**

