

*Capacity building workshop for effective
policy implementation under the Effort Sharing
Decision (ESD)*

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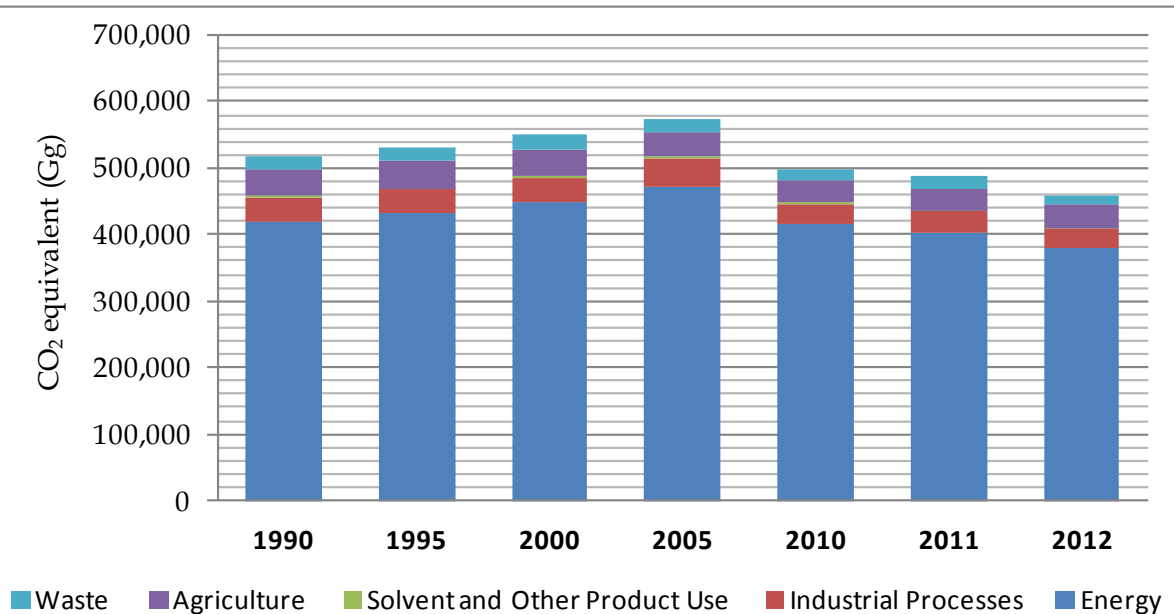
**The production of biogas-electricity from animal manure and
the use of solid biomass for electricity production**

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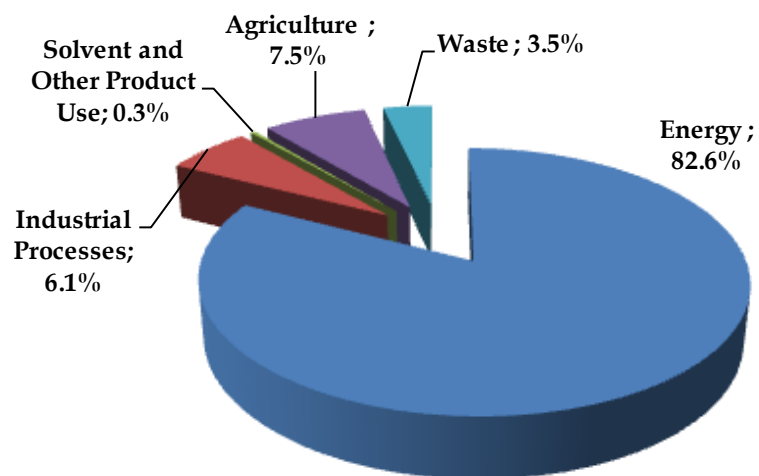
ISPRA - Institute for Environmental Protection and Research, Italy

- GHG national emissions and a focus on agriculture sector
- European policies and measures for the agriculture sector
- National policies to emission reduction
- Biogas plants of the agriculture sector
- Impact of the measures
- Promotion of agricultural biomass
- Effectiveness, acceptability, impacts, weaknesses of the policy

National GHG emissions inventory - 2012



Total greenhouse gas emissions, in CO₂ equivalent, excluding emissions and removals from LULUCF, have decreased by 11.4% between 1990 and 2012, varying from 519 to 460 CO₂ equivalent million tons (Mt), whereas the national Kyoto target is a reduction of 6.5%, as compared the base year levels, by the period 2008-2012.

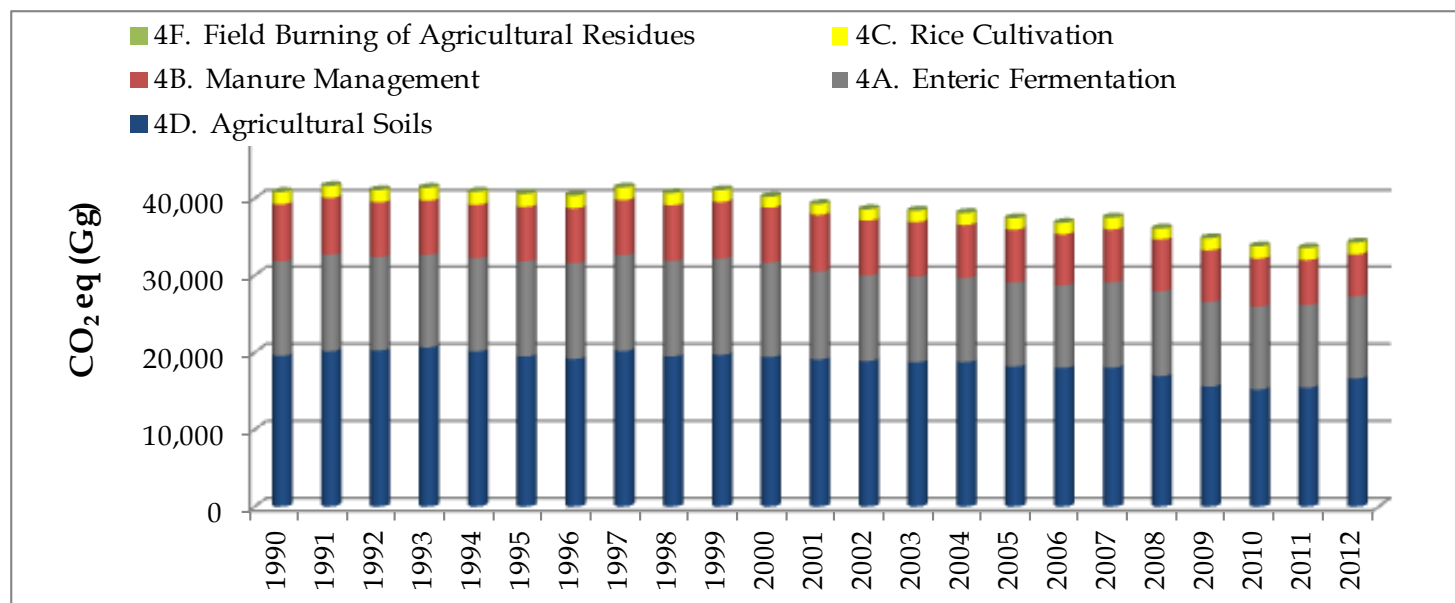


The greatest part of the total greenhouse gas emissions is attributed to the energy sector, with a percentage of 82.6%, followed by agriculture and industrial processes, accounting for 7.5% and 6.1% of total emissions, respectively, waste contributing with 3.5% and use of solvents with 0.3%.

GHG emissions from agriculture sector - 2012

Source categories	1990	1995	2000	2005	2010	2011	2012	2012/1990
	CO ₂ eq							%
A. Enteric Fermentation	12,278	12,348	12,246	10,914	10,732	10,753	10,667	-13.1%
B. Manure Management	7,401	7,080	7,152	6,868	6,275	5,828	5,446	-26.4%
C. Rice Cultivation	1,576	1,671	1,391	1,472	1,565	1,550	1,533	-2.7%
D. Agricultural Soils	19,557	19,487	19,411	18,169	15,193	15,423	16,624	-15.0%
F. Field Burning of Agricultural Residues	17	17	17	18	18	18	19	9.1%
Total	40,830	40,602	40,218	37,442	33,783	33,572	34,289	-16.0%

Emissions refer to **CH₄** and **N₂O** levels, which account for 40.6% and 59.4% of the total emissions of the agriculture sector, respectively. The decrease observed in the total emissions (-16.0%) is mostly due to the decrease of CH₄ emissions from **enteric fermentation** (-13.1%) and due to the decrease of N₂O (-15.0%) from **agricultural soils**, which account for **31.1%** and **48.5%** of the total sectoral emissions, respectively.



EU policies and measures /1

The main measures, which are currently related to emissions, are based on:

- a) **Common Agricultural Policy (CAP);**
- b) **Nitrate directive;**
- c) **IPPC directive.**

Both the nitrate directive as well as the IPPC one are directly involved in **ammonia emission reductions**, therefore, there is also a direct reduction in greenhouse gases (GHG).

For the case of the IPPC, assumptions on the Best Available Technologies (BAT) widespread in Italy have been taken into consideration for the ammonia emission inventory.

The CAP measures are directly linked to the **reduction of the main driving forces of emission**, such as the livestock number, crop surface and production and the use of fertilizers.

The CAP, established in 1958, serves many purposes including: it helps farmers to produce enough safe, high-quality food, and at the same time to protect the environment, to improve animal welfare, to contribute to a diversified economic development in rural areas.

EU policies and measures /2

In the nineties the **system of "quotas" of production** has guaranteed farmers a minimum price level of goods and the equitable sharing between EU countries of a guaranteed production quota .

With the reform of 2003, the **CAP** is based on two pillars, one relating to direct payments (decoupled from production) and the other rural development measures. The reform establishes a link between the market policies and virtuous behavior of farmers in the environment, landscape and healthy food production and quality.

Regarding dairy cattle, a **reduction of livestock number and an increase of average milk production per cattle** has to be noted. In particular the livestock reduction is directly affected by the CAP, which has established a ceiling related to the milk production, country by country resulting in an increase of the intensive management systems.

In Italy the ceiling was particularly severe, respect to the milk production in the nineties, resulting in a reduction in 2012, in the livestock number, equal to 29.7% respect to the 1990.

The milk quota system, which constrains the production, led to a reduction in the number of animals and a significant increase in productivity per head (+ 60%), other than the total volume of milk production, which has changed little (+ 6%).

EU policies and measures /3

In 2013 a political agreement on the **reform of the CAP 2014-2020** has been reached. The agreement provides for an amendment to the ecological payment (greening). From 2015, the CAP introduces a new policy instrument in Pillar 1, the **Green Direct Payment**. This accounts for 30% of the national direct payment and rewards farmers for respecting three obligatory agricultural practices, namely maintenance of permanent grassland, ecological focus areas and crop diversification (EU Regulation 1307/2013).

Rural development will continue to play a central role in achieving the CAPs environmental objectives and in combating climate change. The focus of the second pillar on sustainability is clearly visible by the fact that at least 30% of the budget of each **Rural Development Program** (RDP) must be reserved for voluntary measures that are beneficial for the environment and climate change. These include agri-environmental-climate measures, support for organic farming or projects associated with environmentally friendly investment or innovation measures.

Among the **environmental priorities** of RDP the use of renewable energy sources and the use of by-products and waste materials, the reduction of emissions of greenhouse gases and ammonia from agriculture, the promotion of the conservation and sequestration carbon in the agricultural and forestry sector are promoted.

National policies to emission reduction /1

As regards the **conservation and sequestration carbon in the agricultural and forestry sector**, ISPRA along with the Agricultural Research Council (CRA) and other public entities has prepared a Life proposal. The proposal is focused on GHG measurements and carbon stock sampling from agriculture soils; the project will design, implement and test a monitoring station for the continuous field monitoring of GHG emissions from soils, to be used in a future Italian GHG monitoring network. The outcomes will allow Italy to update the estimation methodology for soils pool using highest IPCC Tiers.

In particular, the **mitigation potential** relative to different agriculture **management practices** will be assessed, allowing the plan and implementation of national strategy to reduce emissions from agriculture.

Main emission reduction activities are predominantly supported by two rural development measures: farm modernization (code 121) and agri-environment (code 214). The first promotes, inter alia, the **production of biogas**; the second one supports the **rationalization in the use of fertilizers**.

National policies to emission reduction /2

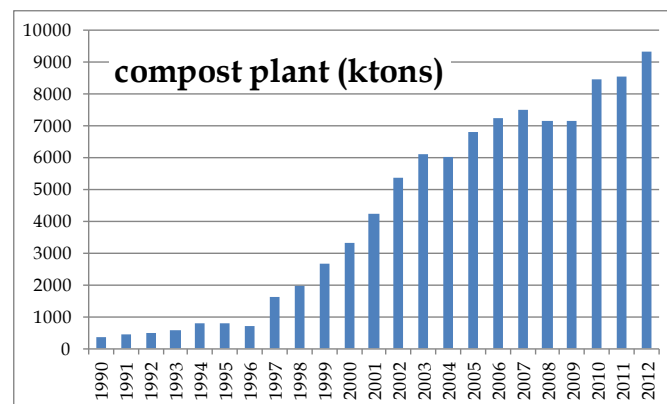
Emissions of nitrous oxide from agricultural soil

Emission reduction from the agricultural soil source is mainly related to the **rationalization in the use of fertilizers**. RDPs 2007-2013 are contributing with this emission reduction measure (code 214). In order to achieve the objective it is essential to consider ongoing efforts to raise awareness on the code of good agricultural practices (such as fertilizer application limits and spreading conditions, manure storage methods, livestock density limits and crop rotation requirements), the integrated agricultural production and organic farming.

PROSPETTO 1. FERTILIZZANTI DISTRIBUITI PER TIPO. Anni 2002-2012, quantità in milioni di quintali

CATEGORIE O TIPI	ANNI										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
CONCIMI	42,1	42,2	42,9	39,8	38,9	41,2	34,7	26,4	26,8	28,4	31,3
Minerali semplici	20,8	20,8	20,8	19,5	19,4	19,6	17,0	12,4	12,6	12,6	16,1
Minerali composti	14,5	14,3	15,1	13,7	13,0	14,1	10,8	8,4	8,9	9,5	9,9
A base di mesoelementi	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
A base di microelementi	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,2	0,1	0,1
Organici	3,2	3,3	3,2	2,9	2,9	3,3	3,6	2,8	2,9	3,0	2,9
Organo-minerali	3,5	3,6	3,7	3,5	3,5	4,0	3,1	2,5	2,3	3,2	2,3
AMMENDANTI	8,3	9,8	10,4	10,6	10,7	11,9	12,4	16,0	15,1	17,2	12,2
Vegetale	1,3	2,2	2,0	2,0	2,2	2,2	2,1	3,8	3,2	3,6	2,4
Misto	2,9	3,3	3,7	3,9	3,6	4,2	5,2	6,2	6,5	7,3	6,2
Torboso	1,5	1,7	2,2	2,2	2,6	3,1	3,0	2,7	2,6	2,7	0,8
Torba	0,8	1,0	0,9	0,9	0,8	0,8	1,1	2,0	1,9	2,6	2,1
Letame	0,6	0,4	0,5	0,5	0,5	0,5	0,5	0,5	0,6	0,6	0,6
Altri	1,1	1,2	1,2	1,2	1,1	1,1	0,6	0,8	0,4	0,4	0,1
CORRETTIVI	0,2	0,2	0,3	0,6	0,6	1,3	1,9	1,9	1,9	2,8	3,1
SUBSTRATI DI COLTIVAZIONE (a)		-	-	-	0,0	0,1	0,1	0,1	0,2	0,2	0,9
PRODOTTI AD AZIONE SPECIFICA		-	-	-	0,0	0,0	0,0	0,0	0,0	0,1	0,0
FERTILIZZANTI IN COMPLESSO	50,7	52,2	53,6	51,0	50,3	54,4	49,1	44,4	44,0	48,7	47,5

(a) Dato rilevato a partire dal 2006 in base al D.L. n.217/2006



Agricultural holding characteristics	1982	1990	2000	2010
Number of agricultural holdings	3,133,118	2,848,136	2,396,274	1,620,884
Utilized agricultural area - hectares	15,832,613	15,025,954	13,181,859	12,856,048
Total agricultural area - hectares	22,397,833	21,628,355	18,766,895	17,081,099
Average size of the agricultural holdings	5.1	5.3	5.5	7.9

National policies to emission reduction /3

Emissions of methane from manure management

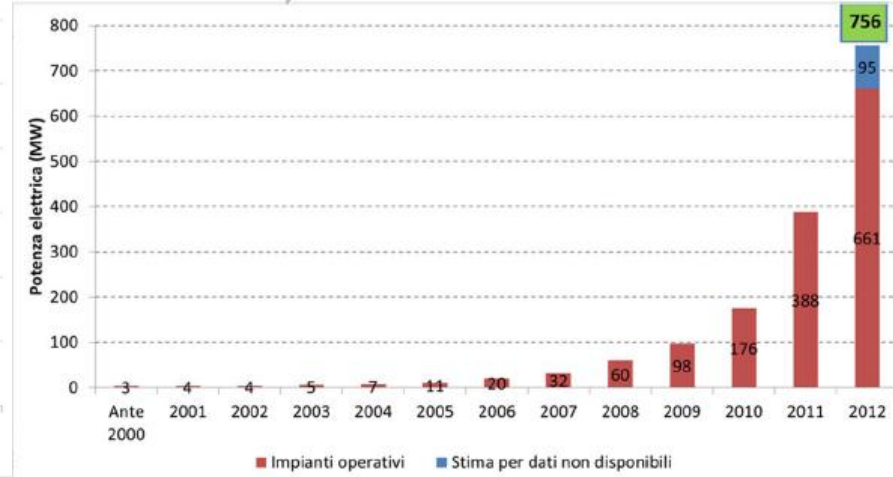
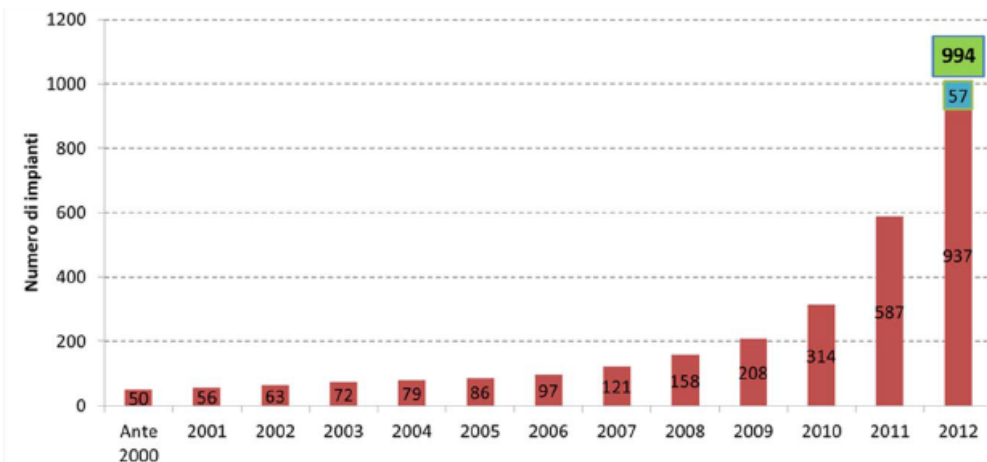
Currently, incentives for biogas production are available in the RDPs 2007-2013.

Moreover, the Ministry of Economic Development has approved **incentives for the production of electric power from renewable energy**. A special tariff (called “tariffa omnicomprensiva”) for small agro-energetic facilities (in operation after 31/12/2007) of less than 1 MW feed with biogas, biomass or vegetal oil, has been fixed. Instead, for facilities of more than 1 MW a multiplying factor of 1.8 for estimating green certificates is contemplated, specifically for facilities using agricultural biomass.

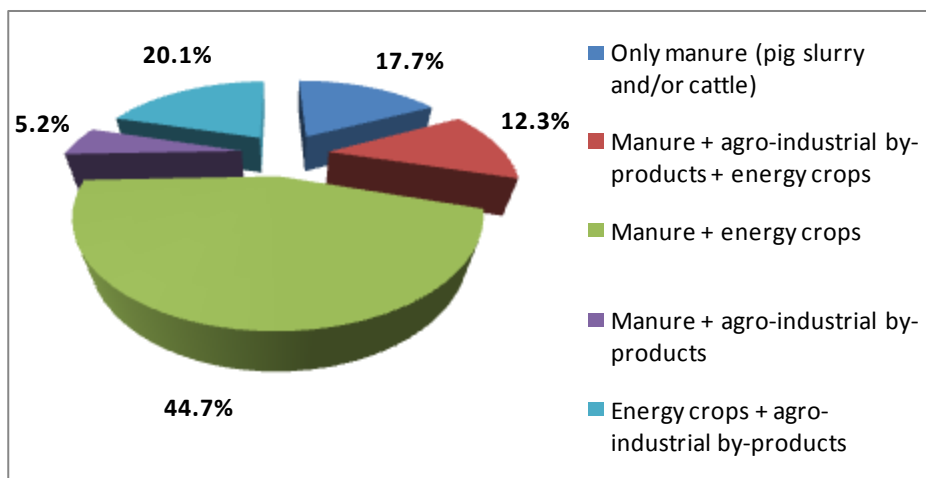
Incentive system based on “**tariffa omnicomprensiva**” of 280 €/MWh for the biogas expired on 31/12/2012. From 1 January 2013 the incentive system for the production of biogas was amended. In 2012 the **biogas plants** are 994 units for a total installed power of 756 MW (about 60% of the plants is in the range 600-1000 kW of the installed electrical power). According to TERNA (the leading electricity transmission grid operator in Italy) the production of electricity from biogas from animal manure is equal to 518.6 GWh (0.2% of the total energy produced).

Ministerial Decree of 06/07/2012: limiting of electric power installed annually; introduction of a system in ranking; introduction of fee based on the size of the plant and the substrates used; extension from 15 to 20 years of the comprehensive tariff; introduction of bonus for the promotion of the thermal energy and the recovery of nitrogen in the digestate.

Biogas plants of the agriculture sector



Age of operating plant	Plant (numbers)	Plant (%)
> than 15 years	36	3.6
Between 6 and 15 years	85	8.6
Between 1 and 5 years	466	46.9
Less than 1 years	353	35.5
Data not available	54	5.4
Total operating	994	100



Data processing done by the CRPA

Impact of the measures

Summary of policies and measures in the agriculture sector

Name of PAM	Target and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	TOTAL GHG Reduction (Mt CO ₂ eq.)	
						2015	2020
Nitrogen fertilizer	Rationalization in the use of nitrogen fertilizer	N ₂ O	Regulatory	Implemented	Governament	0.79	0.79
Animal storage	Recovery of biogas from animal storage system	CH ₄	Regulatory	Implemented	Governament	0.4	0.4

Source: ISPRA

The values in the table refer to an estimate of emission reductions due solely to the introduction of the measures indicated. The reduction is of the same magnitude for 2015 and 2020, as in 2020, no further reductions are planned. It is calculated based on the difference between the scenario with measures (BAU) and the scenario without measures for the years indicated.

Promotion of agricultural biomass

The legislative Decree n. 205 of 03/12/2010, which transposed the new EU legislation on waste (Directive 2008/98/EC of the European Parliament) promotes different management of agricultural crop residues.

The options available to farmers are basically three, adopting practices with high benefits for soils:

- chopping and burying total or partial;
- composting;
- collection and energy recovery.

The immobilization of carbon incorporated into the soil is a key advantage as it reduces the CO₂ emissions of the agricultural sector and contributes to climate change mitigation.

Effectiveness, acceptability, impacts, weaknesses of the policy

The policy of the biogas recovery is successful for several reasons: recovery and production of renewable energy; reduction of greenhouse gas emissions; control of malodorous emissions; stabilization of the agronomic biomass before use (particularly for vulnerable areas under the Nitrates Directive).

The policy is effective in terms of reducing emissions.

The acceptability of the policy is measured by observing the exponential growth in the years based on reliable technology that allows to achieve the desired results.

The policy has had a positive impact on the population due to the distribution of a product with a lower olfactory impact.

The weaknesses are related to: the analysis of the environmental impact of digestate; the preliminary review of the manure management in the farm; livestock waste have lower yields than the vegetable biomass.

An important warning: it is necessary to avoid a distorted use of incentive policies that encourage the production of energy waste at the expense of traditional agricultural production.

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Thank you

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