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Technical Report 13

AGRICULTURAL PRODUCTION - PHASE II

INDONESIA

APPLICATION OF MOLASSES-UREA BLOCKS TO RUMINANT PRODUCTION IN INDONESIA

UNITED NATIONS DEVELOPMENT PROGRAMME
INTERNATIONAL ATOMIC ENERGY AGENCY

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AGRICULTURAL PRODUCTION - PHASE II

INDONESIA

APPLICATION OF MOLASSES-UREA BLOCKS TO RUMINANT PRODUCTION IN INDONESIA

Report prepared for
the Government of the Republic of Indonesia

by

the International Atomic Energy Agency
acting as Executing Agency for
the United Nations Development Programme

UNITED NATIONS DEVELOPMENT PROGRAMME
INTERNATIONAL ATOMIC ENERGY AGENCY

VIENNA 1991

Project UNDP INS/5/021-11-6605

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Duration: 25th March - 7th April

Location of Assignment - Centre for Application of Isotopes and Radiation (CAIR - BATAN)
Jakarta, Indonesia

Report Title: Assessment of programme - Application of Isotopes and Radiation to Increasing Agricultural Production Phase II

Assignment Duties: Assess progress in the application of molasses-urea biocks to ruminant production in Indonesia

Work Program:

For the period spent in Indonesia I discussed progress with farmers at many project sites and visited a local feed-lot - The program included visits to Bandung, Sumarony, Garut, Lamberg. A seminar was given in Bogar.

A paper was finalised during my visit to Indonesia which was then presented at an IAEA meeting in Vienna 15-19 April 1991.

Introduction

The enclosed paper summarises the research carried out under INS/5/021-11-6605.

Laboratory studies have been reported on by Dr. J.V. Nolan and the reproductive studies by Dr. K. Entwhistle and therefore I have not dealt with these here in detail.

Gauging the success of the project

The research undertaken in Indonesia can be traced back to The Coordinated Research Programme to determine the constraints to buffalo production initiated in 1978. The first meeting being held in Shri Lanka.

The project in Indonesia represents an enormous success for the Agency and the team leader in Indonesia and the overall UNDP project.

The project has demonstrated that from basic research, stimulated by in depth studies of basic rumen function, it is possible to apply the basic concepts in practice and have a large economic impact on buffalo, cattle, sheep and goat production in

Indonesia.

It has also demonstrated that the Co-ordinated Research Programmes can be used in aid programmes as catalysts requiring only small economic inputs which when further developed can stimulate improvement of livestock production.

This project represents the ideal as it has achieved the original objective of the concepts behind the Co-ordinated Programmes.

The achievement in brief are that the research has gone from:

* basic studies that recognised that rumen function in ruminants fed cut/carry grass was well below optimum (isotope dilution methods were used in this phase)
* to finding supplements that optimised rumen function.
* then discovering practical methods to ameliorate the constraint imposed by rumen inefficiency
* this was followed by progression to developing the appropriate technologies; which were urea molasses multinutrient blocks or UMMB to deliver the deficient nutrients to ruminants at the village-farm level
* from here the team moved to demonstrate the benefits of the UMMB technology for growth, milk production in cattle and reproduction of goats in villages throughout a wide area of Java
* finally the group has shown that the technology is highly economic and readily acceptable by farmers.

Whilst numerous field demonstrations are still needed the technology is now beginning to spread from the initial demonstration sites.

Continuing research

The project funding ceases this year but it seems that the success could be built upon in many ways. It is, however, important to move ahead rather then to remain static and allow the various government agencies to take over supervision of the use of molasses with nutrient blocks.

The basic concepts that are being built upon are:-

* to create the best conditions in the rumen to optimise digestibility and the ratio of microbial cells produced.
* to create the optimum efficiency of utilisation of the nutrients that arise from fermentative digestion by feeding a bypass protein.
* to optimise animal efficiency by manipulating the rumen to increase the role of synthesis of microbial cells relative to volatile fatty acids production. This

should involve studies of the use of natural defaunating agents

* to improve the overall digestibility of the cut/carry grass or crop residues by external treatment with urea ensiling.

This is only the first step in an overall strategy to be realised and now each of the others are now achievable.

The next step

The next steps should be carefully considered in the light of available resources. Protein concentrates are scarce in Indonesia so the manipulation of rumen fermentation to increase microbial cell availability should be a first priority. But eventually it will be necessary to discover new protein sources, produce these at the sites of population densities of ruminants in Indonesia and find ways and means to protect the natural protein resources.

The manipulation of rumen protozoal populations provides an alternative to protein supplementation; the removal or depression of protozoa altering the protein to energy ratio in the nutrients absorbed.

Straw treatment research

The fourth priority for improving animal productivity and therefore the income of village farmers in Indonesia presents itself because of a recent development from Australia which is poised to revolutionise the utilisation of crop residues. This new method preserves the relatively high digestibility of rice straw just after harvest of the grain, which usually disappears on drying

This new method for packaging straw, preserves it wet and at a stage shortly after the harvest of the grain. The technology can be used to simultaneously treat the rice straw to increase its digestibility.

Background

Rice straw, from the three crops per year that are grown in Indonesia, has to be rapidly removed from the land to facilitate the establishment of the new crop. The new method of packaging rice straw can facilitate this and thus encourage the use of feed material that is generally burned or allowed to rot.

The manipulation of rumen fermentation to reduce the influence of protozoa and increase the protein to energy in the nutrients absorbed combines well with the use of rice straw with improved nutritional value.

Recommendation

I would recommend that the Agency give consideration to extending the project to investigate production levels that can be achieved in cattle/sheep or goats fed crop residues applying the new technologies of packaging and treating straw and then combine this with the feeding of bypass protein and manipulating rumen fermentative digestion.

The project should have a three year period and should include the purchase of the SBS system for treating rice straw (see enclosure).

An outline of future research

1) Production levels on treated rice straw

A series of feeding trials are needed to assess the economics of production systems using the new systems.

The feeding trials will need to be carried out in a feed lot now closely associated with the laboratories. The general approach is to use Ongole cattle purchased at about 200kg liveweight and fed rice grass treated to improve its digestibility and given 3 or 4 levels of a protein concentrate. Optimum numbers/group would be 10 animals but the research could be carried out in a response surface design with 4 animals/group as follows:

Treatment 1	Ad lib treated rice grass (basal) + 1.kg/day Supplement (S)
Treatment 2	Basal + 1.75 kg S
Treatment 3	Basal + 2.50 kg S
Treatment 4	Basal + 3.25 kg S

Supplement (S) 40% rice polishings, 40% copra meal, 10% fish powder (1% salt, 1% limestone should be added to total diet).

The second experiment should repeat the first but include treatments with the addition of the local antiprotozoal forage.

Treatment	1 -	Basal + 1 kg S
	2	Basal + 1 kg S + 300 g dry tree forage
	3	Basal + 1.7kg S
	4	Basal + 1.75kg S + 300 g dry tree forage
	5	Basal + 2.5kg S
	6	Basal + 2.5kg S + 300 g dry tree forage
	7	Basal + 3.25kg S
	8	Basal + 3.25kg S + 300 g dry tree forage

The best treatments should then be extended to milk production trials with dairy cattle and reproduction trials with all ruminants.

Treatment of rice grass

The use of the term rice grass is to distinguish the material harvested green, immediately following harvest of grain, from rice straw which is the same material that has been allowed to sun dry and has lost most of its soluble sugars and is some 5-10 units lower in digestibility.

The straw is preserved by adding 3% urea to the wet straw (60-70% DM) as it is baled. It is highly likely that the antiprotozoal tree forage could be similarly treated and preserved for feeding. Initial studies would be needed to ensure that the antiprotozoal factor is not degraded in storage.

Recommendation for consultations

1992 Two visits by consultants; total 30 days
- Purchase (1) S.B.S. system (cost approx. $12,000 US)
- (2) Baler for tractor or static use of a tractor as a power source

1993 - 30 man-day consultation (2 visits) ($20,000 US)

1994 - 30 man-day consultation (2 visits) ($20,000 US)

SILAWRAP

S.B.S. RICE STRAW CONSERVATION

PHOTOGRAPH 1

The round baler picks up the freshly cut rice grass. The field is cut as soon as possible after the grain has been harvested. The rice grass is cut by conventional hay cutting equipment.

The baling can also be done by the self propelled baler or a static model (not pictured).

PHOTOGRAPH 2

As the bale is being formed, urea is added to the bale through the chemical feeder attached above the baler. This allows the urea to be evenly mixed within the bale.

Other ingredients can be added to the bale such as proteins, vitamins, minerals, protected fats, etc. The end result would be a complete balanced diet for the animal.

PHOTOGRAPH 3

When the bale chamber becomes full, the round baler, either trailed, self propelled, or static, emits a loud horn noise. The completed bale is then emptied from the bale chamber.

PHOTOGRAPH 4

Soon after the bale has been formed, it should be wrapped. The bale is wrapped on a S.B.S. wrapping machine. The wrapping machine can be run by electricity, generator or tractor P.T.O. The film covers the bale completely by two axis wrapping. The film has adhesive on one side which adheres to itself thus causing an hermetic seal that does not allow air to enter, but creates a sealed environment for the rice grass. As the rice grass is cut during a green stage of growth with a high moisture content being greater than 20%, the rice grass then becomes ensiled - at the same time, the urea reacts with the moisture of the plant and amonnia gas is created. The gas moves within the bale and preserves the rice grass, therefore retaining valuable sugars.

PHOTOGRAPH 5

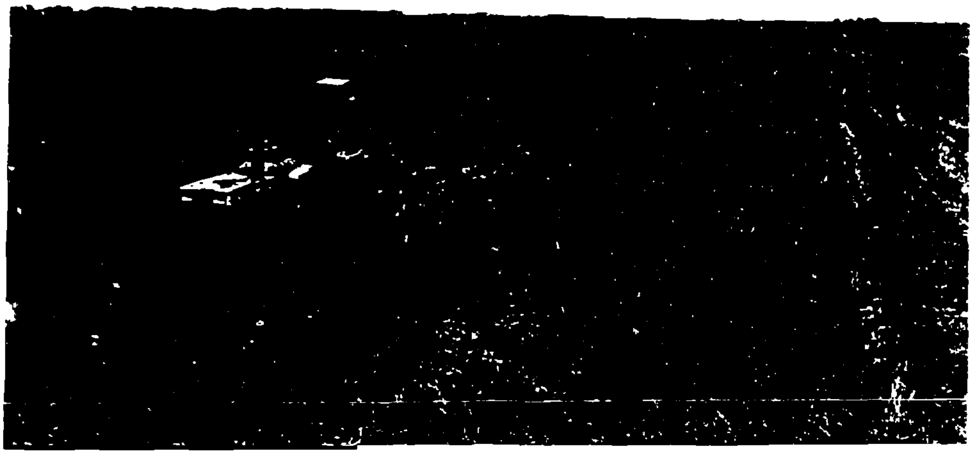
Once the bale has been wrapped, it can easily be stored inside a shed or in the open. The film will last for twelve months if left in the sun. The bale can easily be moved since it weighs only 35 kg. It can be moved from farm to farm or province to province and is easily stacked for storage.

PHOTOGRAPH 6

The unique Pre-stretch Unit on the Silawrap S.B.S. wrapper creates perfect stretch throughout the film thus creating a perfect seal around each bale.

The Silawrap S.B.S. Rice Grass Conservation System is covered by patents pending in:

Japan
Korea
Taiwan
Philippines
Malaysia
Thailand
India
Pakistan
Bangladesh
Indonesia



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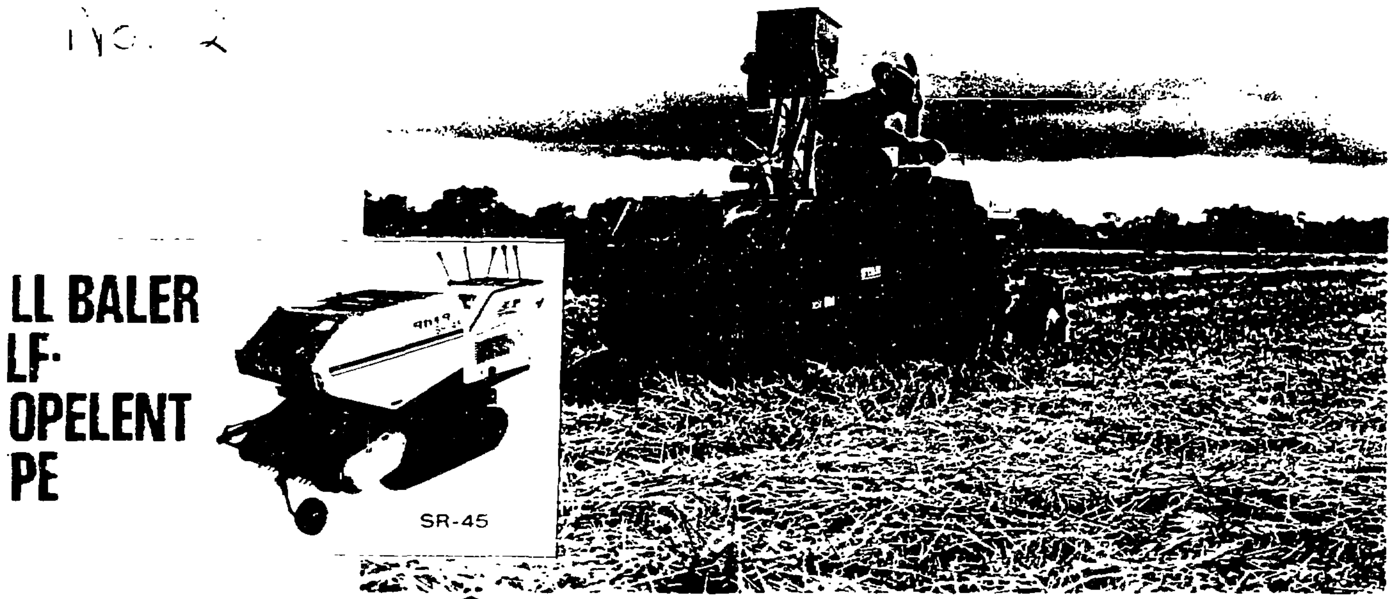

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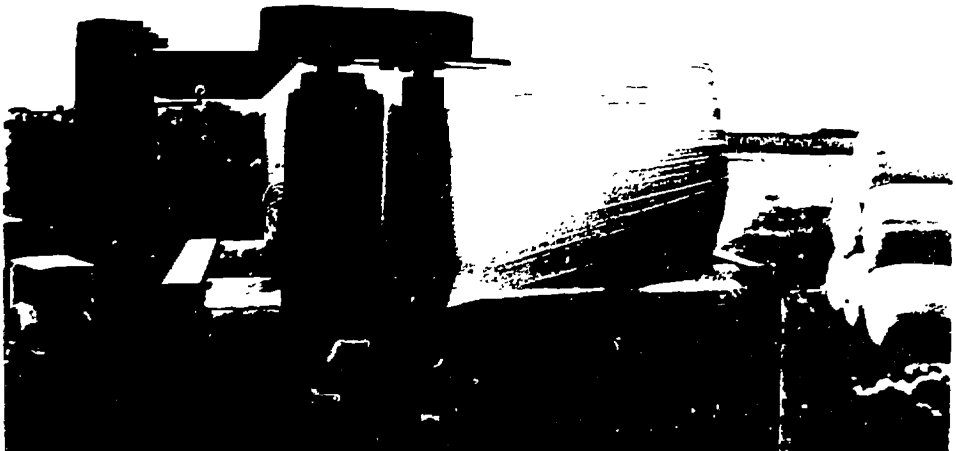
INC. 4

INC. 5



INC. 6