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Integration of the fibrous feed improvement methods in the feeding systems in Asia as influenced by socio economical aspects

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Summary - The objective of the paper is to discuss some of the aspects related to adoption rates of fibrous feed improvement methods in Asian feeding systems, principally those influenced by socio-economic factors. Following a description of the circumstances in which uptake have taken place, the paper identifies strong institutional support in the form of well functioning extension, marketing and credit services as pre-conditions for uptake. Lack of research with a farmer (problem-led research) perspective is another constraint.

Introduction

Kossila (1984) estimated that in 1981 there were 2 070 kg DM/livestock unit of all fibrous crop residues in Africa and 2950 kg in Asia. Earlier, Jackson (1978) in his report to FAO had stressed that alkali treated fibrous crop residues can replace hay or silage provided they are adequately supplemented with oil meals. Jackson also recommended village trials were undertaken in order to determine the benefits of alkali treatment of straw in physical and economic terms.

Subsequently, a considerable effort has been put into crop residue research. Thus, Devendra (1991) estimated 28 meetings had been conducted in Asia in 17 years and yet farmer uptake was limited. The objective of the paper is to discuss some of the reasons for this situation.

Characteristics of crop residues

Preston and Leng (1987) have provided the following general characteristic of fibrous crop residues:

- they are low in nitrogen content
- they are composed of cell wall components with little soluble cell contents and therefore have to be digested by rumen fermentation.

However, these properties are also typical of many tropical grasses.

Methods to enhance fibrous crop residue utilization

Several approaches have been researched and technically the most promising are urea-ammonia treatment (Doyle et al, 1986; Singh and Schiere, 1993), nitrogen supplementation by protein meals and various legumes (Preston and Leng, 1987), a urea-molasses block (Leng, 1983; Sansoucy, 1986), and surplus feeding, allowing the animals to select and reject feed (Owen, 1994).

Features of the research results

It is typical of the research results that only some are discoveries by scientists. Many findings can be classified as documentation of farmer practices. Alkali treatment and urea-molasses blocks are examples of scientist led discoveries and attempts are now made in several countries to introduce them. As a byproduct these efforts have draw attention to the potential benefits that may be obtained in pursuing further research in the area of variation in the quantity and quality of fibrous crop residues (Joshi et al, 1994). The work has also indicated that in very intensively cropped areas with little access to grazing, cattle have gone through a process of natural selection for high fibrous crop residue intake (Mould et al, 1982; Chowdhury, personal communication).

Other areas, which in recent years have received much research attention are the concept of luxury or surplus feeding, which allows the animal to select for the most nutritious parts; protein meal or «bypass» protein supplementation and supplementation of fibrous crop residues with legumes to stimulate rumen function (Silva and Orskov, 1985; Preston and Leng, 1987). Luxury or surplus feeding allows the animal to select the most nutritious parts of the plant (Owen, 1994) and surveys in India have shown that in dry regions the value of the sorghum stover in such a traditional feeding system can almost equal that of grain and in very dry years have higher value (Kelley et al, 1991).

While Preston and Leng (1987) presented the general principles to follow in nutritional terms for feeding of fibrous crop residues, several cases can be cited to prove that most of them contain strong elements of traditional farmer practices. Thus, it is a common routine in many countries to allow ruminants to graze cereal fields after harvest, permitting the animals to do selective eating. Likewise it is common farmer practice in many countries to supplement stallfed animals some high protein meals and green grass or legumes to the bulk of fibrous crop residue feed.

It is thus concluded that whatever promising technologies scientists have discovered in recent years have strong components of traditional farmer practices.

Characteristics of uptake

While farmers in some parts of the World for generations have practised some of the technologies now advocated, uptake has not been as expected of some of the science driven technologies.

However, where uptake has taken place to any significant extent, political and institutional support have typically been strong.

Ammonia treatment in China

Starting in the middle of the nineteen eighties, China supported by FAO has undertaken work on ammoniation of fibrous crop residues. In 1995 Tingshuang (personal communication) reported 16 million tonnes were treated on 7 million small farms, mainly by application of the urea-ammonia technology (Dolberg and Finlayson, 1995). It was shown that already in 1992 nearly three times more cattle were marketed for slaughter from Henan, one of the project provinces with intensive wheat, maize and cotton production, in comparison to the pastures of Inner Mongolia.

Strong government support, plenty of crop residues with practically zero opportunity cost, presence of an extension service, on-farm trials and conducive prices (Dolberg and Finlayson, 1995) are important factors explaining uptake.

Urea-molasses block and bypass protein work

The National Dairy Development Board of India has undertaken considerable work to introduce both the urea-molasses block and «bypass» protein meals to its five million milk producers and village trials have demonstrated nutritional benefits in milking animals (Garg, 1991). However, process of manufacture and plant cost have continued to occupy the attention of scientists, although it is now expected a cold process (Sansoucy, 1986) conducted in a cheap plant will take the process forward (Garg, personal communication) as it avoids the cost associated with heating.

Supplementation of basal diets of crop residues with protein from an oilcake (expected to partly escape rumen fermentation) is essential and there are large responses to small supplements (Table I) as demonstrated in recent data from China.

On-farm trials in Mauritius (Boodoo et al, 1991) in which sugarcane tops constituted the basal diet demonstrated that a supplement of 0.25 kg cottonseed cake plus minerals were comparable to 0.50 kg of a concentrate mixture consisting of wheat bran 5%, rice bran 11.5%, maize 20%, cottonseed cake (or groundnut cake) 30%, molasses 30%, common salt 1% and calcium carbonate 2.5% per kg of milk in terms of milk yields (approx. 2850 kg milk/lactation) and cow fertility. However, such trials have not been undertaken with alkali treated or untreated straws and stovers fed to milking cows and makes the foundation for practical recommendations to farmers weak.

Treated straw in India and Bangladesh

A considerable number of on-farm trials have been conducted in India with urea-ammonia treatment of fibrous crop residues (Singh and Schiere, 1993, 1994 and 1995) and the emerging conclusion is that the relevance of the technology is in areas with no space for green fodder production, but for moderate to good potential for milk production in the animals. However, in general terms uptake has been sporadic and not on any large scale. It is possible there are socio-economic reasons for this as for example in the gender division of labour, that has not received sufficient attention so far in crop residue research.

Gender

The gender aspects have been dealt with in a report from India (Muylwijk, 1994).

Studies were undertaken at sites where the technology had been introduced on-farms. In the state of West Bengal, the following gender division of work was noticed (Table II).

The same work (Muylwijk, 1994) points at some problem areas, which have not received much research attention in the particular example resulting in wrong extension messages. Thus, it is reported how the technology is restricted to dry areas and seasons as it is mentioned straw has to be dry before treatment to avoid losses due to fungi and mould. This statement lacks appreciation of the technical fact that urea-ammonia treatment actually can be used to preserve wet straw and therefore ought to have particular relevance in wet regions and seasons as a method of preservation. However, this aspect has only recently (Chowdhury and Huque, unpublished data) received research attention.

It was further noted that fodder shortage was greatest during harvest, when people are busy. When income is controlled by the husbands, women may not feel any incentive to put in the extra labour. Some women also mentioned that treated straw resulted in a looser dung, which is less suitable for dung cakes, traditionally used as fuel.

Women in the North Indian state of Haryana reported much less problems with treated straw and were generally enthusiastic about the technology (Muylwick, 1994) leaving the impression that inadequate extension effort was the main reason for lack of adoption of the technology.

The study showed that small farmers' wives were the group with highest interest in the technology as the wives of rich farmers do not generally tend to animals, while many landless women have no access to straw both due to high cost involved in acquiring straw and to lack of space to do the treatment.

Bangladesh

In the early nineteen eighties a considerable amount of work on the urea-ammoniation technology was undertaken in Bangladesh (Saadullah, 1984), but uptake has been disappointing (Dolberg, 1992).

However, in recent years innovative credit programmes undertaken by NGOs for landless people and small farmers in Bangladesh (Fuglesang and Chandler, 1993) have lifted an

Table I. Effect of supplementing protein to ammonia treated wheat straw in China (Dolberg and Finlayson, 1995)

Cottonseed cake kg	0.00	0.25	0.50	1.50	2.00	2.50
Number of animals	8	8	8	8	8	8
Initial weight kg	137	159	183	192	175	194
Final weight kg	143	193	231	263	250	274
Daily gain, g	63	370	529	781	829	892
D.M. int.,% of live wt.:						
Straw	2.7	2.5	2.3	2.0	1.8	1.7
Cottonseed cake	0.0	0.1	0.2	0.5	0.8	0.9
Total	2.7	2.6	2.5	2.5	2.6	2.6
F.C.R.	60	12	10	7	7	7

Table II. Gender division in straw treatment (Muylwijk, 1994)

Type of work	Done by	
	women	men
carry straw	x	
carry water	x	
urea and water mixing	x	x
sprinkling of solution	x	x
trampling	x	x

important constraint for them and it has meant that both the urea-ammonia treatment and the urea-molasses technology are now finding uptake in the country. Thus a recent survey (Saadullah et al, unpublished data) showed 73 per cent of the farmers applying one of the technologies had obtained loans in the US dollar 50 - 100 interval per farmer.

Preconditions for uptake

Two factors present themselves as important for uptake or lack of it.

Institutional support

Where available technologies are fitting and have been adopted, it can be concluded that the institutional support has been strong such as in China, the National Dairy Development Board of India and the NGOs in Bangladesh. As livestock extension services in developing countries are weak as a rule, this may constitute an important part of the explanation for the lack of adoption.

Lack of problem-led research

However, the question also needs to be asked, whether research has been sufficiently relevant. There is very little work reported in areas such as preservation of wet straw (Chowdhury and Huque, unpublished data), overcoming animal feeding labour constraints during harvest and women's problems of dung cake manufacture from loose dung or treatment of straw in homesteads with limited space, just to mentioned some of problems reported from the field.

Therefore a general lack of problem-led research is seen as an important factor explaining - after all - limited uptake.

Direction of future work

In the second part of the paper some ideas are presented concerning the strategy and direction of future work.

Towards a framework for farmer focused research

It is thought provoking to reflect on the fact that technologies beginning to find uptake among small farmers in developing countries such as «bypass» protein and surplus fibrous crop residue feeding, in fact are well established old farmer practices to which a scientific understanding now has been added.

Restricted suckling (Preston and Leng, 1987) is another example to mention.

It therefore seems obvious to suggest that to fully exploit the potential small farmers possess for increased animal production, more work is required to scientifically describe and understand their current practices and to test new ones under their conditions.

Interaction for technology research and development

Generating much feedback from farmers and deal with it constructively is, according to Bunch (1982), a most important condition for success, although, however, it has been difficult to put into practice (Merrill-Sands and McAllister, 1989). However, in the author's experience, the following procedure is a way ahead.

Identification of strengths and weaknesses
Instead of the conventional sequence of event : «from laboratory to research station to farmer testing to wide-scale application through the extension system», it is argued that early in the technology research and development phase it is important to get out and make a test on-farm. Not so much to promote the technology as for the project planners and scientists to learn about weak and strong points of the technology and project design. It is an iterative process, and it is important to stress this is a learning phase (Chambers, 1993) for the planners, project personnel, scientists and farmers alike. It is argued that if more technologies claimed to be ready on the shelf for extension were subjected to this test, it would be realised that many of them are in fact not ready and, logically, project planning would become more realistic.

Expansion of methodological tool kit
A further important reason to get out on farms is to develop and improve researchers' awareness of the methods for data collection and analyses, which can be applied under these conditions.

Assuming some researcher creativity,

bringing more of them out to work with farmers is expected to foster consciousness of many more analytical methods to apply.

There is a particular lack of information of appropriate experimental methodology for the evaluation of integrated systems dealing with multiple inputs and outputs, which modern statistical science according to Riley (1995) is quite capable of addressing.

Creation of a farmer x extension x scientist alliance

If successful, it is likely the iterative process outlined above has identified leaders at farmer, extensionist and scientist levels, who by joining forces can do the necessary research and development of the technology in situ. The approach is still sparsely used, but teams using it can reinforce each other by communicating with collegial groups elsewhere in the World through modern means of communication (Speedy, 1993). By offering scholarships to host country students (Dolberg, 1991), projects can meet several objectives at one time: baseline data can be collected, ongoing monitoring and evaluation can be conducted and future scientists and extensionists can be trained.

In the words of Biggs (1995) the basic problem may be that this coalition so far is too weak to generate the impact the approach promises. But the alternative is certainly available for decision-makers to support and some of the most promising work is conducted by non-governmental organisations (Farrington et al, 1993).

Conclusion

Many research findings of relevance to small farmers contain strong elements of indigenous knowledge and only a few can be described as pure scientific discoveries. Limited uptake of fibrous crop residue technologies is ascribed to lack of problem led research and weak livestock extension services.

Where uptake has taken place this has been associated with one of the following ingredients: strong institutional support to extension service, milk marketing and credit for landless and small farmers. However, institutions capable of conducting such work in an effective manner on a large scale are still very limited in developing countries.

In future, research should to a much greater extent start by involving farmers, generate feedback from farmers and let this feedback serve as a foundation - in parallel with the standard literature review - for definition of research problems.

A small start has merit with regard to testing and large-scale application of a technology. It is a means to identify farmers, researchers and extensionists with a natural talent for the work and such people are critical for future expansion of rural livestock production.

When such people - and institutions - are identified on-farm work will accelerate the research process and make it move faster than if the scientists confined themselves to the research station and laboratory. If the technology is a failure, it is easier to redirect or close down a small than big project.

An important condition for success of that approach is that the leading scientists take it serious and are prepared to spent time in the field with farmers, demonstrating to their juniors how to deal with feedback from farmers and convert that into researchable problems, leading to scientific publications and promotions comparable to laboratory and on-station work.

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