SILAGE PRODUCTION : AN OVERVIEW

"Silage: A Viable Solution for Fodder Crisis

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Possible Reasons for Non-adoption of Silage Making in India – a Practioner's View

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Introduction

In India, dairy development has played a major role in increasing milk production, improving income level in rural areas, generating employment opportunities and improving the nutritional standards of the people, especially for small and marginal farmers. Dairying is facing the problems of inefficient management practices and health care, lack of high quality breeds, lack of proper breeding programme to improve the existing dairy cattle resource, high input (feed and fodder) and low output prices leading to lower productivity. In given situation, by efficient use of available feed and fodder resources that constitute about 60-70% cost of any livestock enterprize, livestock productivity can considerably be improved.

In countries like India, where agriculture is dependent on rain and other environmental constraints such as long dry season or drought limit sufficient year-round fodder supply of reasonable quality to match the nutritional demands of livestock and support satisfactory livestock production. Forage conservation technologies could mitigate the dry season green fodder scarcity problems. Conserving forage as silage is an option to alleviate green fodder constraints and maintain animal productivity during dry periods but their adoption in smallholder systems has so far been low. Various reasons have been suggested by researchers and extension workers for slow or low adoption of silage conservation technology by dairy farmers especially by resources poor smallholders. Usually, smallholder farmers are not adopted to use all types of improved technologies in dairy farming. However, high level of technology adoption include a direct impact on milk yield and household's income generation as well as dairy development.

Silage making has been strongly advocated as a means of meeting green fodder requirement of livestock during the dry season, when green fodder is scarce. The recommendations are based on the assumption that surplus green fodder would be available in the rainy season that could be conveniently ensiled and used in the lean period to supplement dry fodder and round the year availability can be ensured. Several research projects, field demonstrations and special schemes (with subsidies) were initiated in the colonial period and are continuing. Except for institutional or commercial farms, the adoption of ensiling technology by small farmers is very low.

It is understood that higher level of silage making adoption is linked to enhanced milk yield and improved dairying, which has a direct impact on income generation, poverty alleviation and availability of animal protein. Thus, to increase the milk production adoption of existing silage technology would be beneficial for the smallholder dairy farms.

Policy-makers and extension practitioners need insights regarding the underlying reasons for low adoption of silage making technologies that enhance livestock production and productivity for programme formulation and implementation at field level. Despite extensive work done in research and development on silage making technology but with very poor adoption. There is a shortage of valid proof on factors related to various stakeholders that have an effect on silage technology adoption in the dairy farming sector.

Like a few other technologies in agriculture, silage making was one that was considered technically sound and beneficial, since the green fodder requirements can be met in the lean period. Most of the trial reports at institutional farms and demonstration at farmers' doorstep on silage making are favourable. Targeted programmes, with subsidies, were implemented to encourage small-scale farmers to construct silo pits or trenches, as well as to purchase a chaff cutter for chopping the crop. It was presumed that, at least during the rainy season, some surplus fodder or naturally growing grass would be available for silage making. A number of organised and institutional livestock farms adopted silage making and use of silage for feeding during lean periods, although even on these farms the use of ensiled fodder is fully adopted.

This chapter is aimed at exploring the factors affecting adoption of silage making technologies that enhance the production and productivity of livestock with particular emphasis on dairy production. This study evaluated factors that affect silage making technology adoption in the broader context by integrating household, dairy value chain, institutions and policies. By understanding the factors affecting silage-making adoption, it can provide insights on the underlying constraints that impede technology adoption by the livestock farmers. This knowledge in turn permits us to identify interventions that might help to overcome the constraints or mitigate the adverse effects of the constraints to silage adoption in livestock farming.

Measuring Technology Adoption

Adoption is a decision –making process in which an individual goes through a number of mental stages before making a final decision to adopt an innovation. The decision making is the process through which an individual passes knowledge of an innovation, to forming an attitude towards innovation, to a decision to adopt or reject, implementation of new ideas, and confirmation of decision.

It is observed that an improved husbandry practice that introduces to smallholder farmers by itself does not guarantee its wide spread adoption and efficient use. For efficient utilization of the improved dairy husbandry practice, the fulfilment of specific socio-economic, technical and institutional conditions are required. From the farmers' perspective, the improved practice should be economically more profitable than the existing alternatives. Also should be technically easily manageable by smallholder and adapted to the surrounding socio-cultural situations. Similarly, the availability of the improved practices and all other necessary inputs to smallholders at the right time and place and in the right quantity and quality should be ensured.

According to adoption perceived attribute theory, an innovation is judged for adoption by a farmer: when it can be tried out (trialability), that results can be observed (observability), that it has an advantage over other innovations or the present circumstance (relative advantage), that it is not overly complex to learn or use (complexity), that it fits in or is compatible with the circumstances into which it will be adopted (compatibility). Therefore, presenting improved dairy husbandry practice with those attributes can be adopted at higher level by trained dairy farmers.

Reasons for Non-adoption of Silage Making

Many reasons are cited for low or slow adoption of silage technology by dairy farmers in India. Some key reasons are described here.

1. **Perceived Need of the technology -** Farmers must perceive a need for the new technology in order to adopt. Many innovations from research and training institutions are not accepted because they are not demand driven. If improved practices are compatible with existing farmers conditions they are most likely to be adopted quickly. These include farmers' economic, technical and social status. Improved technology and capabilities' of farmer is a necessary condition for adoption of enhanced fodder conservation practices because smallholder farmer can only adopt improved practice if it is within his/her means.
   The technology what looked extremely promising, technically and economically achievable, was every so often not acceptable to the smallholder farmer. Hence, it is crucial to learn why the technology has not adopted. Involvement and experience in rural areas showed that answers or explanations are not available from technical persons, but have to be sought from farmers, and that there is a lot to be learnt from them.
2. **Initial Capital Requirement -** Initial cost refers to the initial cost of buying the smallest unit of the technology. Initial costs determine the decision to adopt a technology especially to resource poor smallholder farmers. Lack of initial investment among smallholder farmers contributes enormously to rejection of innovations, for well-paying innovations. For example, during rainy seasons when there was plenty green fodder , farmers purchased fodder-off farm since the price was low rather go into fodder conservation, which involved expenditure on materials and labour. This indicates that improved dairy husbandry practice that cost little to implement are likely to be adopted quicker than those requiring large expenditure.
3. **Risk Aversion Attitude -** When an innovation first appears potential users are generally uncertain of its effectiveness and tend to view its use as experiment. This attitude show that uncertainty

declines with learning and experience thus induce more risk-averse farmers to adopt an innovation, provided it is profitable. Innovators and early adopters are believed to be more inclined to take risk than are "early" and "late majority farmers". Late adopters and Laggards are likely to be even more risk averse.

4. **Perception of Double Handling of Forage -** Despite the numerous extension programs promoting silage as a potential quality forage, smallholder farmers do not want to readily adopt it because it requires 'double handling' of forage, just like wilting fresh forage to reduce excess feed water. Once they have manually harvested the forage, most smallholder farmers simply want to feed it to their animals. A simple, easy to demonstrate and implement practice is more quickly adopted. Simplicity means that a greater number of farmers regardless of their educational background would be able to understand the method and its advantages and forecast the benefits. Generally, farmers consider the recommended process of silage making to be cumbersome and labour intensive.
5. **Green Fodder is More Nutritious than Silage -** Farmers find it easier, time and labour saving and had the idea that green fodders are more nutritious than silage. Therefore, farmers are generally more interested in feeding green fodder rather than making silage and only when they will produce it in large quantities and much more than the requirement, they will be interested in silage making. Farmers having irrigation facilities preferred to grow 2-3 crops of fodder and prefer to feed these fresh forages to their animals.
6. **Lack of choppers/chaff cutters -** The most common reasons for non-adoption were the lack of a chopper/ chaff cutter (manual/mechanised). It is found that availability of manual chaff cutter does not affect adoption of silage making. Silage making requires mechanised chaff cutter to complete the tasks of chopping, filling and sealing in short period of time, which is available for silage making. In many parts of India, chaffing of fodder is not practised and farmers find chaffing burdensome, labour intensive. However, this issue of lack of chaff cutters could be over-come by its cooperative purchase, rent and use arrangements.
7. **Scarcity of Surplus and Quality Fodder –** When there is paucity of surplus and quality fodder suitable for silage making, adoption will be poor. In many areas, fodder production is mainly carried out in winter. Legume fodder crops are grown in small plots and these crops are not very much suitable for ensiling. Surplus grass was available in some rain fed areas but its ensiling was too labour intensive. In US and European countries, where easily-ensiled maize was a more common crop, the spread of silage was much more rapid.
8. **Return on Investment -** Farmers are the best economists for their livelihood development. Research or technology development should not only be technically sound but also economically beneficial (to producer) and adoptable (by animal owners most being smallholders or resource poor). While economics is an important factor, farmer perception of economics is different from conventional economics, and there are two other equally important factors – convenience and risk

perception. So, recommendations may be initially accepted if they are apparently beneficial but if it becomes too inconvenient or time consuming, it may not be adopted. It is observed if farmers' animals are low milk yielders then they feel that cost and trouble of silage making do not provide sufficient returns. The cost factor is also not very straightforward. It is linked with fodder production and the farmer will compare crops and technologies before making a decision. It again boils down to returns from animals. There is therefore need to compare costs of concentrates versus silage. However, the convenience factor may override the cost factor. It is much more convenient to supplement with concentrates during the summer, with hay or straw, albeit of lower quality.

9. **Poor Extension Services -** Generally, extension plays a great role in popularizing improved dairy husbandry practices like silage making to farmers. The role of extension may include building the capacity of farmers and farmer's organization to pursue their development goals. This can be influenced by close follow up which enable them to examine their farming situations. This in turn, develops farmers' aspiration for change through adopting farm technologies. Also, linking farmers and farmers' organization to other support agencies including credit facilities, market and input systems creating platform for their interaction and facilitating negotiations between the different stakeholders.

   Training programs often cover the communication aspect but rarely bring behavioural changes in farmers for adoption. This requires continuous and strong technical backup visits to farmers after training, which unfortunately is frequently missing in many of our extension systems. Once trained, farmers are generally left on their own and seldom visited again.

   The successful and sustained use of silage may require more time and efforts than are allocated in most development projects and programs. Farmer motivation and participatory technology experimentation, evaluation and development are particularly important in areas where silage is less known. Thereby, farmer constraints and objectives should be linked to the purposes and objectives of silage making. Establishing the basis for wider silage adoption (i.e. identifying and training leader farmers) may last two years. Development projects should not stop at this stage but should scale-out adapted and efficient silage technologies through demonstrations and exchange of experiences using an integrated and participatory approach involving smallholders as well as larger-scale farmers.

10. **Level of Expertise of Extension Workers** – Silage making is not only limited to crop harvesting, chopping, filling and sealing of silo or silage pit but also it goes beyond that. A limitation in silage making is the lack of experience and sufficient understanding of silage-making principles, not only by farmers but also by extension workers at field. This becomes especially important when fodder, low in dry matter and water-soluble carbohydrates, is to be ensiled. The complex biochemistry of silage was more difficult to grasp. There is considerable adverse impact observed in cases where ensiling was not effective for various reasons and many lost faith in silage making technology.

11. **Education level –** Generally it is observed that farmers with higher levels of education adopt new technologies more rapidly than farmers with lower education. The late adopter or laggards are associated with lower education. This condition is also applicable for silage adoption. Farmers with higher education adopt the silage technology at earlier but the adoption decision is dependent upon many other considerations.
12. **Gender -** Gender is one of the most important factors influencing adoption of improved husbandry practices. The utilization of improved practices in developing human and material resources can be considerably enhanced when females are included since they are responsible for 50-60% of dairy production and most domestic tasks. In Indian social contexts, women have limited access to resources, especially land and to information. In addition, Women have many other jobs to perform and responsibilities to handle – in a mixed farming, smallholder situation. Moreover, in case, they smell some risk (such as spoilage during ensiling or treatment); the adoption is difficult since they cannot afford to take further risks.
13. **Lack of Proper Communication Channel –** There is lack of structured communication channel among various stakeholder, which is very essential for adoption of any technology. There is a need to develop a system of regular and planned interactions between research and development organisations (both government and non-government), farmer organisations etc. for scientist groups to understand production systems, problems/constraints faced by livestock.
14. **External Factors -** Changes in production systems due to external factors could necessitate adoption of certain improved practice. In this case, adoption of zero grazing and cultivated fodder production was triggered by external factors namely land and population pressure. Therefore, technologies selected by researchers for propagations should have been carefully tested and considered in terms of their perceived attributes from the farmers' point of view, differences in perceptions between researchers and farmers could help differences in adoption rate expected by scientists and that observed in the field condition.
15. **Lack of information -** As far as information is concerned, with all the attention given to silage at agricultural shows and demonstrations, in advertisements, press articles, radio and television programmes, and by advisers, it would be difficult to argue that farmers were unaware of the technique. However, awareness by itself was not enough to provoke adoption, and the slow uptake of silage provides a good illustration of the other factors.
16. **Availability of Cost Effective Packing Material -** Besides the requirement of quality plastic bags, proper compaction and air-tight sealing, silage pits/bags need to be protected from animals and direct sunlight to ensure success. Rats and mice were also reported as problems by farmers Therefore, some form of protection is recommended, either within an existing shed, or in a specialized building. With the advent of wrapped big bales made by a fodder entrepreneurs, even those operating on a very small scale could go over to silage.

Conclusion

The level of silage making adoption by smallholder dairy farmers is poor and highly dependent on farmer's education, farming experiences, financial status and extension services. The socioeconomic circumstances also influence adoption of technologies to a great extent. Unless a common farmer has animals producing adequate to warrant the trouble and cost of silage making, the adoption would be poor and subsidies would be of little help. The only way to change behaviour of farmers is through seeing and believing and understanding the direct economic benefits. The lesson learnt is to undertake studies and have repeated discussions with farmers to understand their situation, and to look for those farms where the technology would fit well. It is crucial to ensure that benefits are visible to farmers and that they feel the need. This applies particularly to the women who are the important stakeholder but neglected in decision-making. However, there are not many such situations, and one can save a lot of time and money through situation analysis before deciding to introduce a technology or any other intervention. Unfortunately, such an approach is not common in livestock development or research in India. There is need to develop strategies to enhance adoption of forage conservation technologies by the resource poor farmers, thus enabling them to increase animal production and enter expanding markets for livestock products. Technical support and better access to markets are often required, as well as the fostering of human and social capital through participation of farmers in the selection and adaptation of inexpensive and efficient technologies

About Author

Dr. Manvir Singh is a seasoned dairy development professional having about 19 years of field experience of working with smallholder dairy farmers across India. He is graduate of College of Veterinary Sciences, Pantnagar and did MVSc (Animal Nutrition) from Indian Veterinary Research Institute, Bareilly. He served Animal Husbandry Department and Uttarakhand Livestock Development Board (Govt. of Uttarakhand) in various capacities. Currently He is associated with NDDB Dairy Services, Delhi. He can be reached at drmanvirsingh@gmail.com

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