Paper # 21

Business Services for Small Enterprises in Asia: Developing Markets and Measuring Performance

International Conference
Hanoi, Vietnam - April 3-6, 2000

The Development and Commercialization of the *Pashu Poshak:* Applying the BDS Performance Measurement Framework to AT India's Livestock Feed Supplment Project

By
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USAID's Microenterprise Best Practices, managed by Development Alternatives, Inc. and AT/India

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The Development and Commercialization of *Pashu Poshak*: Applying the BDS Performance Measurement Framework to the AT India's Livestock Feed Supplement Project [1]

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February 2000

A Case Study submitted to the Committee of Donor Agencies for Small Enterprise Development for the International Conference on Business Development Services, Hanoi, Vietnam, April 2000

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[1] AT India is an Indian non-profit organization, established in August 1994. AT India's mission is to use cost-effective, environment-friendly, productivity enhancing technologies in building sustainable enterprises, thereby helping rural producers to increase their incomes and better their lives. Pashu Poshak is AT India's brand name for a molasses-urea product, an animal feed supplement that when eaten by cows and buffaloes in appropriate amounts enhances milk productivity and general livestock health.

[2] Paul Bundick of Development Alternatives Inc. (DAI) is Director of the USAID Microenterprise Best Practices Project. As lead researcher for the paper, he assumes responsibility for the opinions expressed herein. The case study, however, could not have been written without the detailed information, analysis, guidance and otherwise significant contribution provided by Sharmila Ribeiro, a Senior Program Officer at Enterprise Works Worldwide in Washington DC and also President of AT India. Significant contributions were also provided by Atindra Bose and Snehal Soneji, who are the Project Manager and Marketing Manager, respectively, of the AT India Pashu Poshak Project.

Abstract

The primary purpose of this paper is testing the usefulness and validity of a new performance measurement framework (PMF) by applying it to an existing project. A second objective is to draw out best practices from the case as appropriate for the benefit of our "newly emerging" field of business development services (BDS).

India is the largest milk producing country in the world. Despite the country's large volume of production, the average productivity of its animals is quite low. Most experts agree that poor nutrition of the animals is the main underlying cause. For years researchers have been working to develop an affordable user-friendly animal feed product, which if widely used could increase milk production by 10 to 15 percent per annum and increase incomes of literally tens of thousands of rural households. To address this opportunity, a project was designed by Enterprise Works Worldwide to develop and commercialize an animal feed supplement and bring economic benefits to rural households. Appropriate Technology (AT) India was established in 1994 to implement the project over a period of eight years. Initially, the project concentrated on the task of research and development. This effort culminated in an innovative user-friendly molasses-urea product branded as *Pashu Poshak.* The commercialization phase began in 1996. AT India in collaboration with the well-organized cooperative movement started production and marketing *Pashu Poshak* in four districts of Gujarat.

The PMF requires analysis at three levels: BDS market development, sustainability of the BDS supplier organization and the benefits to customers. Applying the PMF to market development proved challenging in terms of defining the level of analysis and the boundaries of the competitive environment. The PMF places great emphasis on developing competitive markets. In Gujarat, cooperatives dominate the milk sector and offer stiff competition to private companies trying to gain a foothold. For practical reasons, AT India is linked with the cooperatives in a kind of mutually beneficial strategic alliance. AT India, while advancing the sale of *Pashu Poshak*, has inadvertently stimulated a more competitive private market for animal feed supplements. Yet, as long as the cooperatives dominate the milk sector, the development of a diverse and competitive market, as envisaged by the PMF, for animal feed supplements is very unlikely.

In terms of sustainability, the subsidy element for *Pashu Poshak* has steadily declined over the four-year period. Break-even is now a real possibility. AT India now boasts a cumulative total of more than 22,000 households that have tried the product out of which about 50% are repeat users. The growth potential is huge, since only about 0.4 percent of the total number of animals have tried the product in the four districts of the project area. The option is still open as to whether AT India will exit and give up the "business" to third party (most likely the cooperatives) once commercial prospects have been demonstrated or go into commercial operations as business venture. In looking at the sustainability question through the lens of the PMF, the indicators seemed rather soft. No service is sustainable unless the organization delivering it is also viable. The indicators should be adjusted to reflect this reality.

The total monetary benefits derived from buying and feeding Pashu Poshak has been estimated by AT India based on field trials, surveys and other assessment tools. For regular users of Pashu Poshak, one can expect total gains (net savings plus increased income) for the average household with two animals to be more than $50 per annum. This is significant in a country where the average per capita GDP is about a dollar (US) a day. While the total project costs ($733,206) over the first three years are still more than the total benefits ($567,743), the gap is closing. Typical of technology development and commercialization efforts, the costs for R&D are heavily front loaded and the cumulative benefits continue to be generated (sometimes exponentially) well into the future.

In applying the PMF to the project, some indicators were found to overlap. The framework was found to be too complex and expensive to implement. Comparing data between projects remains difficult because of threats to validity, reliability and verification. An attempt is made to suggest a simpler version of the PMF, one that reduces the number of indicators, places donor organizations as key market players (buyers) and "facilitators" as suppliers of BDS management services to donors. The relevance of a more dynamic evolutionary model of market development is suggested as a possible theoretical foundation for the PMF.

In terms of "best practices", AT India has successfully carried out the research and development phase. They invested in learning about what their customers wanted and used the knowledge to continuously innovate. While the commercialization phase is still relatively young, much still needs to be done to accelerate the commercial use and diffusion of *Pashu Poshak.* The project has not yet passed through, what might be termed its "take-off threshold". Lessons gleaned from other research on diffusion networks and demonstration methods may yield more rapid results. But it is still too early to judge. There may be incipient contagion-like effects (often associated with the diffusion of innovation) forming beneath the surface which are difficult to detect until they manifest "full blown". Moreover the extent of outreach should not detract from the already commendable efforts AT India has made in using innovative market research tools and promotional strategies to sell *Pashu Poshak.*

If donors want their projects to be sustainable, it is essential they build into every design a process for achieving it. They should establish unambiguous sustainability (viability) objectives, set in place the right incentives, and permit the necessary flexibility to let it happen. One of the problems highlighted by the PMF is that donors tend to see themselves as external agents acting on systems and causing "impact", rather than seeing themselves as an integral part of the system itself. Typically both donors and facilitators are excluded from any market analysis when they are, in fact central to its functioning. We need to address the incentives and competitive forces underlying the 'development business" if we want to get a better understanding of how we can better catalyze the evolution of BDS markets. In our rush to carve out and define a new field of BDS, a more conscious holistic approach drawing insights from a range of disciplines is needed to avoid re-discovering many "lessons" that have already been learned in other fields.

1.0 Introduction

The Committee on Donor Agencies for Small Enterprise Development has developed the **Performance Measurement Framework** (PMF) as a tool (which is still in draft form) to assist both donors and practitioners more easily measure their performance against established indicators in business development services (BDS) programs.[3] BDS refers to a wide variety of non-financial services used to support the development of micro and small enterprises. BDS includes everything from the provision of simple communication services and training programs to complex technology development and market access interventions. Programs vary greatly in terms of purpose, services and expected benefits. The broad array of BDS programs makes it difficult to compare results between them in a meaningful way. The PMF is designed to help interested observers compare and contrast the relative strengths and weaknesses of BDS interventions and to generalize about best practices. The primary purpose of this paper is to assess the ease, usefulness and validity of the BDS PMF by applying the framework to an existing development project.

AT India's *Pashu Poshak* project in Gujarat was selected to "test" the PMF for two reasons. First, Enterprise Works Worldwide and its local partner organizations (such as AT India)[4] are well known for their project evaluation frameworks. Compared to most organizations engaged in development, they take data collection seriously and generally have done it well over the years. The lead researcher had little time to collect primary data (field time was restricted to just 3 days) and, therefore he had to rely on data already collected by the project. AT India also expressed a willingness to share its internal project information. Such cooperation is essential for a sound testing of the framework and should not be taken for granted.

Second, AT India's project is a good example of a long-term technology development and commercialization project. Such projects are less common in the world of BDS interventions than training, business consulting or market development projects. Because of its rather unique focus, the project represents an interesting case to test the versatility of the PMF framework.

2.0 The Opportunity

India produces more than 72 million metric tons of milk per year, making it the largest milk producing country in the world. Most of the milk is produced by rural farm households, which keep a small number of cows and/or buffaloes. Milk is an important supplement to rural income with the annual production valued at more than 13 billion US dollars, making it India's number one farm commodity.

Despite the large volume of production, the productivity of Indian animals is low by world standards. Yields average about 980 kilograms per lactation period. By comparison dairy cows in the United States average more than 7000 kilograms of milk per lactation cycle and even 1500 kilograms in China. The Indian figures seem even lower when one considers that 20% of the milk-producing animals are buffaloes, which produce more milk than the typical cows on the Indian subcontinent.

There are several reasons for the low productivity of Indian animals. While limited genetic potential is often cited as the main constraint, poor management practices appear to be the most serious problem. Most animals survive on crop residues, such as wheat and rice straw, sugarcane tops, etc.

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[3] USAID has been a major contributor to this effort through its Microenterprise Best Practices Project managed by DAI.

[4] Enterprise Works Worldwide (formerly Appropriate Technology International) is a US based not-for-profit organization that was founded by US Congress in 1978. It specializes in creating profitable, responsible and environmentally sustainable business development opportunities for small producers in Africa, Asia and Latin America. Enterprise Works established AT India in 1994 to operate the Pashu Poshak project.

that are deficient in nitrogen, carbohydrates and important minerals. Eating low quality residues reduces the effectiveness of digestive fermentation. As a consequence both cows and buffaloes become malnourished and milk productivity necessarily suffers along with the health of the animal. Most experts deem poor nutrition as the main cause underlying India's low level of milk productivity.[5]

Feed supplementation has been long recommended by scientists to improve productivity of cows and buffaloes that are being fed poor quality diets. Because conventional cattle feed can be relatively expensive in cash poor areas, experts have favored the development of a low-cost ruminant feed supplement based on urea laced molasses. If fed to animals in appropriate amounts, urea (a low cost non-protein source of nitrogen), molasses (a low cost source of energy in sugar producing areas) and required minerals can improve both the milk quantity (overall production) and quality (butterfat content). The fat content is important because it determines the selling price of milk—the higher the percentage the more it fetches in the market.

For many years, researchers have tried to develop and disseminate a low-cost molasses urea product or MUP, including urea treatment of straw, urea molasses licking cakes and molasses-urea liquid feeding. Little progress was made in developing an affordable user-friendly molasses-urea feed supplement, a product if successfully commercialized could boost the milk production of India by 15 to 20 percent and increase the income of literally tens of millions of rural households in India.

3.0 The Project

In 1991, Enterprise Works Worldwide took another look at the opportunity. After conducting a feasibility study, the US based development organization decided to push forward. They secured funding (most of it from private foundations) to develop a reasonably priced MUP that could be widely adopted by rural farmers.[6] The primary goal was to increase the productivity of dairy animals and thereby bring widespread economic benefits to small-scale dairy producers. An added social goal was to bring women into the mainstream of dairy development through training and entrepreneurship development.[7] The project was to be carried out over, at least, an eight-year period.
The project was designed around three components: research and development (R&D), production and marketing. The objective of the R&D phase was to find solutions to previous technology limitations and develop a new product based on an optimum nutrient formulation plus cost-effective methods of packaging and dispensing it. The production component sought both to retrofit an existing plant as well as set up a new production facility (to produce the new and improved MUP) that would subsequently become a commercially viable enterprise. The marketing component was intended to recruit and train village women and or married couples (households) to operate as small scale

[5] Cows and buffaloes are ruminants. They require an active colony of micro-flora in their rumen (initial stomach) to digest properly. Nitrogen and carbohydrates are required to keep micro-flora active to maintain proper digestion.

[6] Enterprise Works operates under a cooperating agreement with USAID whereby public funds are invested in the commercialization of innovative technologies, which are deemed to have great potential benefit for poor people in developing countries. Enterprise Works also raises money from private foundations to carry out its work. With both public and private funds, Enterprise Works provides grants for and makes investments in product and technology development and its commercialization in a broad range of commodity sectors (e.g. livestock, coffee, oilseeds, fruits and vegetables, etc.). Enterprise Works' partners are mostly private organizations.

[7] In rural Gujarat, women carry out most dairy-related tasks but are not generally allowed to make decisions about purchasing feed or feed supplements for animals. The project designers argued for special measures to bring women into the "mainstream" presumably meaning greater control over dairy related decision-making and a greater share of the income gains derived from milk production.

entrepreneurs in promoting and selling the new product. Implementing these components would eventually result in the commercialization of the technology by the end of the project.[8]

In 1994, AT India was established by Enterprise Works to implement the project. The new organization was registered as an Indian NGO (independent but affiliated to its parent organization in Washington DC). AT India is situated in Ahmedabad, the largest city in Gujarat. Four districts in the state of Gujarat were selected for the project: Mehsana, Gandhinagar, Banaskantha and Ahmedabad. Mehsana district has the highest level of milk production in the state. Gujarat was chosen because it had been the place of previously mentioned attempts to introduce the molasses-urea technology. Moreover, Gujarat has a strong reputation for enterprising people, well-organized dairy cooperatives, and close proximity to other collaborating partner institutions.[9]

During 1995, the project concentrated on its initial task of research and development. AT India worked closely with farmers to develop the concept of molasses-urea feeding into a user-friendly product appropriate to the farmer's needs. The earlier hot process MUP block developed by researchers did not gain wide acceptance by farmers because it was difficult to use, attracted many flies and animals could, on occasion bite off chunks causing sickness and even death from urea toxicity. NDDB researchers then developed the cold process block. While this was an improvement over the hot process block it had several of the same disadvantages. Unsatisfied with the MUP, AT India technical staff worked closely with farmers and innovated further. They developed the cold process hemispherical block that helped prevent over eating by animals because it was served in a metal cylindrical bowl, which constrained biting and encouraged licking.

While this innovation solved one important problem, it did not make the product any easier to use. After a short time, AT India learned that farmers were breaking up both the brick shaped and hemispheric blocks into half-kilogram portions, crumbling the solid blocks into a mash and mixing it with the animal's normal dry fodder rations. By observing farmer behavior, AT India developed the granular or mash form of MUP. This form proved to be much easier to use, attracted even fewer flies, reduced the chances of urea poisoning and still provided the same benefits as earlier versions of the supplement. Tests revealed a high farmer acceptance. The mash version was named *Pashu Poshak*, which roughly translates, as "Livestock Nutrition". In addition to the adapting the product form, the nutrient formulation was also optimized during the research phase. This continuous innovation and product adaptation continued into the commercialization phase.

The commercial demonstration phase began in 1996. AT India's defined role in the project was to establish a market for the *Pashu Poshak* and demonstrate its commercial viability. The PMF distinguishes between the roles of facilitator and supplier of the BDS. The role of the facilitator is to

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8 The project also has an environmental angle. One of the benefits of MUP feed supplementation for cows and buffaloes is reduced methane emission due to better digestion by the animals. Widespread use of MUP by hundreds and millions of animals could potentially reduce the amount of methane being released into the atmosphere to a point where it would have a noticeable positive effect on the global environment. These considerations are beyond the scope of this case study yet it remains central to the interests shown in MUP by environmentally inclined private sector foundations and their continued support of the project. Most of the Pashu Poshak project was made possible by support from donations made by two North American power companies.

9 The project was designed with a number of partners. One partner is the National Dairy Development Board. The NDDB is a powerful nationwide organization that coordinates policy and management of the dairy cooperative sector. NDDB experts assisted AT India in conducting research on product formulation provided liaison with District Development Unions (DDUs) and offered facilities for the production of MUP when the product was ready for wider dissemination. The National Dairy Research Institute (NDRI) assists in the implementation of the ruminant methane measurement and monitoring program. The BAIF Development Research Foundation assisted in carrying out base-line surveys of current practices and animal productivity as well as conducting feeding trials to scientifically document the positive and negative effects of MUP feeding. SEWA provided access to women's groups involved in the dairy production.

carry out the project on behalf of donor organizations and exit from the activity after the objectives are achieved. The role of the supplier is to become a viable business selling a given BDS in the market. To some extent, AT India was supposed to play both roles. According to the project document, AT India was supposed to facilitate the commercialization of the product and also provide marketing services directly to customers. Options were left open for a wide variety of possible outcomes to emerge in the course of the project, even the option of AT India going directly into the *Pashu Poshak* business. The most likely scenario, however, was AT India would exit from the activity by persuading a third party (most likely the powerful dairy cooperatives) into taking over the project and running it on a financially sustainable basis for the benefit of members. Rather than solely rely on the cooperatives for marketing, however, AT India's sought to develop village-based self-employed marketers to promote and sell *Pashu Poshak* on a commission basis working in parallel to the well-developed cooperative structure.[10]

The dairy cooperative sector in Gujarat is worthy of note. It is based on the three-tier structure (the famous Anand pattern) comprising village, district and state levels. At the village level, the cooperatives are intended to be open and voluntary associations of milk producers. Each village unit is responsible for milk collection, testing and payments as well as distributing services and inputs (such as cattle feed supplement, green fodder seeds, veterinary first aid and artificial insemination). All village cooperatives in a district are members of the District Dairy Union (DDU) which manages centralized facilities for purchasing, transporting and processing of milk. The DDU also supplies dairy inputs as well as provides extension support at the village level. The state level provides coordination to the DDU and is represented in the national apex body, the National Dairy Development Board. The cooperatives represent millions of members and dominate the lion's share of the dairy market. In Gujarat, dairy cooperative members account for more than 85% of the milk production and sales at the state level. This is big business indeed.

During the commercial demonstration phase, AT India assumed responsibility over the production of *Pashu Poshak*. A small pilot plant was first installed on the premises of Ahmedabad DDU. As demand increased a full-scale production unit was set up capable of producing 80 metric tons a day of *Pashu Poshak*. Production facilities were again established at the Meshana DDU adjacent to its animal feed factory to take advantage of the DDU's warehouse, raw materials supply and convenient logistics. The entire production and distribution of *Pashu Poshak* has been grafted onto the existing cooperative system. In other words, AT India used the DDU infrastructure (buildings, vehicles, organization of village cooperatives, village level storage facilities, network of village leaders, goodwill, etc) to reduce their initial investment. AT India pays for transport but receives the use of the facilities and village level infrastructure free of charge from the DDU and its village-based committees.

AT India's main role, and most challenging aspect was to launch an effective marketing campaign. This included door to door contact with farmers, awareness training for DDU members and farmer organizations, use of incentives and promotional campaigns to get the idea in the public mind. AT India currently manages a large distribution system with marketing agents in each village (selected by village cooperatives and paid only on a commission basis through the sale of *Pashu Poshak*). The village agents are in turn supported by marketing coordinators operating in a cluster of villages (paid a salary by AT India) who in turn are supported by marketing officers at the district level (also on salary). The marketing manager at AT India manages the overall system. Orders by marketing agents are delivered to the production supervisor. Orders are then manufactured and stocked in villages for distribution in warehouses owned by the village cooperative societies. Payment for *Pashu Poshak* is linked into the cooperative milk collection and payment system. Every 10 days the DDU pays a village society for its milk. The DDU deducts payment for *Pashu Poshak* from each society based on the amount purchased and then pays AT India directly. The village society deducts each member's

[10] See Annex 1 for a drawing of the project.

purchase of *Pashu Poshak* when it pays each household for its milk contribution. At the end of the cycle, AT India pays the village based marketing agent his or her commission by check every three months. Cash handling is minimized. By integrating the whole payment system into the normal operations of the cooperative societies, the project reduces both AT India costs and chances for corruption.[11]

In addition to developing a new product and commercializing it, the project aimed to bring economic benefits to small-scale dairy producers (defined in this case as household level microenterprises*)*. Unlike many projects, the potential benefits of *Pashu Poshak* are well documented. The project conducted long term controlled feeding trials to empirically determine the actual benefits that can be derived from **proper** feeding of *Pashu Poshak* to milk-producing animals. The benefits include a number income generating and cost saving factors, such as increased butter fat and milk production, reduced fodder wastage, better animal health and calving cycles and reduced purchases of other feed supplements.

4.0 Performance Measurement Framework: Market Development

According to the PMF framework, the "overarching goal of developing BDS markets is to develop vibrant, competitive and (primarily) private sector markets of relevant, differentiated services consumed by broad range and significant portion of small business" This section will deal with the market development questions.

4.1 Defining the Boundaries and Levels of Analysis

The first challenge encountered in trying to apply the PMF framework to a project is establishing the boundaries and levels of analysis, in terms of the BDS, organization, geography and market.

The PMF differentiates between the "facilitator" of the BDS (development organization) and the "supplier" (direct provider of services to customers). Yet from one point of view, the facilitator is also a direct supplier in its own right at a different level in the "development business" chain. Following this line of thought, the BDS being supplied by the project could be conceived of as the entire research-development-commercialization management service being supplied (sold) by Enterprise Works and AT India to a set of customers (the donor organizations), in this case mainly private foundations. Donors are the primary customers; perhaps the only serious buyers of long-term technology-based BDS projects like the one under consideration. If one chooses this boundary (the broader view) to define the BDS, the PMF market analysis leads down a very different road entirely.

The case study guidelines suggest that the BDS in question should be broader than the specific product offered by the program but narrow enough to represent a reasonable group of similar services. This seems to imply that *Pashu Poshak* should be framed as one of several dairy development services being supplied to farmers by private sector actors, government agencies and the cooperative movement. As noted above, the District Dairy Unions (DDUs) supply a number of services to members to improve their milk production (feed, fodder, veterinary services, milk powder-making facilities, marketing etc) and *Pashu Poshak* could easily be seen as being just one more. Nearly all of the *Pashu Poshak* users (AT India's direct customers) are members of a DDU through their village cooperative societies. The increase in milk and fat content resulting from the use of *Pashu Poshak* increases revenues for the cooperative structure as a whole. DDUs are, in effect, strategic partners of AT India. Both organizations benefit from this alliance. Again this leads to a very different kind of analysis if we adopt the frame of reference of the sector as a whole.

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[11] See Annex 2 for a graphic depiction of the marketing system.

At still another level, the BDS being (sold) to rural households (milk producing microenterprises) is an improved animal feed supplement which stands to increase farmer household income if fed properly to its milk-producing animals. As a BDS supplied to microenterprises this is the obvious choice. Yet this would seem to contradict the PMF case study guidelines indicating a BDS should be broader than the specific product offered by a program. If the guidelines were applied strictly, one would have to select a wider spectrum of services.

Is the “real” BDS being provided by the project an animal feed product, the package of services provided by the AT India--DDU alliance to increase milk production or the process of innovation and its commercialization? The answer seems to be “it depends” on the level and purpose of analysis one selects. Though there is room for disagreement, we have opted for treating the BDS as an animal feed supplement being sold to rural households. In this context households are defined as micro-businesses (SME customers) that purchase *Pashu Poshak* to increase income in relation to one line of business (dairy) out of many lines (diversified farming) being carried out at the household level. This is the frame of reference adopted by the project and therefore seems the most appropriate for testing the PMF.

If the BDS is defined as an animal feed supplement, how is the market to be defined? Is *Pashu Poshak* part of the larger animal feed industry or should it be analyzed only in terms of the market for other animal feed supplements which is relatively small and within which *Pashu Poshak* is well positioned? The animal feed industry is large. The sale of cattle feed in Mehsana district alone in the 1998-99 milking season approached 143,000 metric tons. This data reflects only the output of the organized feed manufacturers and ignores the sizeable contribution from the informal producers, the many mill owners selling de-oiled groundnut, castor and other oil cakes as a secondary by-product. Moreover, the numbers do not include the ubiquitous local gatherers who sell fodder in every village. By comparison, the amount of *Pashu Poshak* sold in Mehsana district (where *Pashu Poshak* sales are highest) reached 1,865 metric tons in the same period. While this does not include all the other supplements sold in the market, it does indicate how small the supplement market is when compared to the feed industry as a whole.

AT India insists that *Pashu Poshak* does not compete directly with animal feed industry in the same way that vitamins do not compete directly with food. As a supplement, consumers purchase *Pashu Poshak* along with feed. This would argue for treating the supplement market as relatively distinct. Sales statistics suggest that AT India’s assumption may be largely correct. Eastern Mehsana, where much of the *Pashu Poshak* sales have occurred, is a relatively prosperous area. Many farmers who purchase *Pashu Poshak* are already feeding their animals a fairly high quality diet at least during lactation periods; a diet that includes purchased cattle feed.[12] [13]

An even more difficult question in terms of drawing analytical boundaries concerns the potential indirect competition from other consumer products (food, clothing, tools, seed, etc) taking into account the buying behavior of cash-poor consumers. Do farmers buy seed instead of animal feed or supplements? Poor farmers are likely to benefit more from buying *Pashu Poshak* than well-off households because their animals are more likely to be malnourished. Feeding malnourished animals *Pashu Poshak* results in more dramatic increases in productivity than feeding it to healthier animals.

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[12] EDA Rural Systems (1998). It is still unclear however, if this is true for all potential users or not. Some farmers may think purchasing feed alone is enough, especially for those who have less cash to spend. In such cases commercial animal feed does compete with *Pashu Poshak* and should be part of the market analysis.

[13] Another possible blurring of the analytical categories might occur as the industry evolves. Some think it is likely that supplements such as *Pashu Poshak* will be combined with more specialized feed products, integrating supplements more closely into the larger feed market. This would have a major effect on how *Pashu Poshak* is positioned in the market

Yet, it is precisely these poorer farmers who are least likely to buy *Pashu Poshak* because of other demands on their meager cash flow. Indirect competition from other products is very likely, especially for this lower income market segment. How should the PMF address this?

Due to the general absence of data on the feed industry and even less information on the nuances of consumer buying behavior, the market for PMF in this case study will be defined in terms of feed supplements alone. [14]

Once the market is defined as animal feed supplements, the problem of geographic boundaries comes into play. Should the potential market for feed supplements encompass the more than 200 million cows and buffaloes in India or the million or more in the project area? AT India does not collect data on the size of the ruminant feed supplement market in India, Gujarat or the 4 districts constituting the project area. For the purposes of this case study, we will select the 4 districts of Gujarat in which the project is operating rather than the state or country as a whole, even though the selection of these boundaries seems rather arbitrary.

4.2 Competition from Other Feed Supplements

As indicated in the table below, there are several feed supplement products in addition to *Pashu Poshak* available in the market. These include calcium products, mineral mixtures, some grain mixtures and other types of MUP. None appear to offer real competition to *Pashu Poshak* on either quality or price. A grain mixture called *Pashu Ahaar* was positioned recently against *Pashu Poshak* on price (less than 4 Rs or about 9 cents a kilogram) but with little success. The product could not offer the added fat increases in the milk, which characterize the benefits of MUP. Neither do mineral supplements offer any real competition. Since *Pashu Poshak* provides essential minerals needed for animal health plus urea needed to increase total production and fat content, there is little direct competition from the mineral supplements alone. Farmers generally view these alternative AFS products, as inferior to AT India's offer. The brand name, *Pashu Poshak* seems to have been successful in pushing out competing molasses urea products as well, such as the licking block and the "chewing mixture" being produced and marketed by a few private individuals.

Animal Feed Supplements which Compete with Pashu Poshak in the Project Area

Product Type	Brands	Comment
Calcium Suspension Supplement	Glaxo, Taj, Vet Care, etc.	Use of *Pashu Poshak* makes calcium supplement largely obsolete
Mineral Mixture Supplement	Glaxo, Vrindavan	*Pashu Poshak* contains sufficient minerals to make these products somewhat redundant. But Vrindavan has imitated AT India in trying to build a partnership with the Mehsana DDU increasing competitive pressure on *Pashu Poshak*.
Cattle Feed	Sagar, Uttam, Kisan, Godrej, Ambuja, Amrut Dhara	May or may not compete depending on circumstances. Amrut Dhara has more molasses than *Pashu Poshak* and may compete more directly in the future.
De-oiled Cakes Feed	Packaged by local oil mills—not branded	Popular feed product, sometimes fed to animals along with *Pashu Poshak*
Grains (crushed Maize & Crushed Sorghum)	Pashu Ahaar and other local products	Position well against *Pashu Poshak* on price but but weaker on benefits. Consumer information is key for *Pashu Poshak* market leadership
Other MUPs	Chattan (licking block) and Churma (chewing mix)	Brand name of *Pashu Poshak* is preferred over non-branded products

[14] One of the reviewers of this paper felt there was no need to devote so much time to the issue of level since the feed supplement market is the obvious BDS choice. The authors respectfully disagree. The choice of level is not so obvious when one begins to unravel the complexity of the situation and think outside the "box".

The introduction of *Pashu Poshak* has contributed to creating a more competitive market for animal feed supplements. Competitors have increased aggressive marketing strategies (price reductions, credit to buyers and suppliers, promotion), and on occasion grossly exaggerated benefits through advertising to sell their products. Yet, *Pashu Poshak* remains the leader in feed supplements, not only because of its quality and price but also because of its strong association with the cooperative system and its well-organized distribution network. The extent to which direct subsidies by AT India and in-kind contributions by the cooperatives are undercutting and crowding out other private sector suppliers will be addressed in the Market Distortion section below.

4.3 The Dominant Market Position of Dairy Cooperatives

The major competitive factor influencing the dairy sector has been the rise to dominance of the cooperative movement. Milk cooperatives in India have generally viewed the private sector with suspicion and often hostility, going back to colonial times when monopolistic concessions were given to a few powerful milk "barons". The Anand-type cooperatives emerged in Gujarat to provide a steady dairy market for village producers and an effective barrier to keep out private sector operatives who were seen as exploiting the farmer. This was accomplished in two ways. First by investing in technology: milk chilling, pasteurization and most important milk powder plants giving them a clear competitive advantage over small private collectors. Second by using their government connections to create barriers through regulatory measures. The latter has been successful in keeping out the larger more efficient international competitors.

In the traditional milk collection system there was no economical way to capture the non-fat milk solids in the milk. Butter was the primary product. There was always a glut in the local market for liquid milk (what is left over after extracting the butter by churning). This milk had to be used quickly to prevent spoilage. As a consequence, butter prices were high in the Indian market because they included not only the value of milk fat but also some of the unrealized value of the non-fat solids. The technology of a milk powder plant (an investment made possible through large member-based organizations) allowed cooperative members to realize not only the high price for the butter but capture the previously underused portion of the milk solids. Cooperatives could even pay members a price for milk fat that was higher than the prevailing retail price of butter because of the captured value of the milk solids once the powder plant was in place. Contrary to many places in the world, powder making is more profitable in India than selling liquid milk. This gave the cooperatives a strong price advantage over any small private sector operatives.[15]

Besides offering a stable market for milk and butter, the large membership base allowed the cooperatives to offer other attractive incentives to members. Farmers generally obtain services more cheaply than what is offered by the private sector or through government agencies. These services include: a) the turn key system for local organizing, milk collection, equipment for fat testing and distribution, b) veterinary care provided at cost by competent doctors, and c) cattle feed at cost. The low cost feed competes with the private cattle feed manufacturers as well as lots of unorganized mill owners selling de-oiled groundnut, castor and other oil cakes.

The dominance of the cooperative movement is evident. In the four districts of the project area, between 85 and 90% of the milk is purchased and marketed by the District Dairy Unions (DDUs). The remaining amount is purchased by the private businesspersons. This includes the large number of informal sector milk traders that collect milk from the villages and sell it in the cities to households,

[15] Shah, Tushaar (1984): Producer Behavior, Market Structure and Technology in India's Dairy Industry. Agricultural Systems, XI (2).

sweet makers, hotels etc. In the project area there are only three formal private sector companies that purchase and process milk.

Cooperatives have also used political influence and regulations to maintain dominance and limit competition from private companies. In 1991, as a part of the economic reforms, the dairy sector was de-regulated. This effectively opened the industry to private entrepreneurs (including multinationals as they were allowed to raise their equity holding to 51%). As private enterprises began operating, the new entrants in some areas were accused of "poaching" into cooperative territory. Moreover, concerns about excessive capacity for milk products and “private trader misconduct” prompted the cooperatives to put pressure on the government to re-assert control over the dairy market by passing a new law requiring dairy companies to register with the government. New businesses are now allowed to register only after ascertaining the availability of marketable surplus milk in the facility proposed by the applicant. As we have seen, such surpluses are rare in areas controlled by the cooperatives. The Indian cooperatives have been able to establish legal barriers to entry for private international companies. In some cases, regulators have harassed private sector dairies through sanitary inspections and lengthy certification processes. [16]

In short, the cooperative dairy sector dominates the milk market in Gujarat and offers stiff competition to private sector companies which prevents them from gaining a foothold in either milk processing or feed production. They have effectively used a strategy of vertical integration and political networks to capture and maintain this dominant market position. Since the milk production in many ways drives both the feed and feed supplement markets, AT India’s *Pashu Poshak* business is, at least for the near future, inextricably linked to the cooperative movement, its market dominance, political influence and distribution infrastructure.

4.4 Market Distortion [17]

As a measure of market distortion, the PMF requires one to calculate the average subsidy content per unit of BDS provided. In our case, this would translate into the average subsidy per kilogram of *Pashu Poshak* sold. The PMF guides us to divide the total cost (both indirect and direct operational costs) less the selling price divided by the total costs.

Unraveling the subsidy element in this project is difficult, because of the cooperative-dominated business system in which the project is embedded. How should the in-kind contributions by the DDU or other partners be valued, if at all? How can the overall market distortion be factored in, and to what extent is it fair to judge the distorting effects of project when they are operating within the overall distorting effects of government policy? Moreover when calculating the total costs, what should be included? Should all facilitator costs be included or only the supplier? Should depreciation on equipment be included? At the minimum we need to be very explicit about what costs should be factored into the subsidy calculations to make them comparable across projects. The table below is an attempt to calculate the average subsidy element per kilogram of *Pashu Poshak* sold.

Production and Sales of Pashu Poshak for 1998-99 Season	
Cost of purchasing Pashu Poshak (ex factory)	$ 213,192
Depreciation on Equipment (20% per annum)	$6,095

[16] The Milk and Milk Products Order (MMPO) was put into effect in June 1992. MMPO establishes that all plants handling between 10,000 to 75,000 liters of milk per day or producing milk products containing more than 500 to 3,750 tons of milk solids per year are required to be registered with the state authorities. Those processing over 75,000 liters per day or more than 3,750 tons per year of milk solids are required to register with the central government.

[17] Data taken from the AT India audit reports which are for the Indian financial year period April 1 to March 31.

Selling costs (all direct and indirect of costs for marketing and distribution)	$ 97,817
Administrative Costs (50% of AT India's admin/overhead costs)	$34,447
AT India's Total Costs	$351,550
Sales Price recovered	$ 259,031
Total Subsidy	$ 92,519
Percent of subsidy (total annual cost – sales price recovered / total annual cost)	26.3%
Product sales in Metric Tons	2121.7 MT
Average Subsidy per MT	$43.60
Average subsidy per kg for period	4.4 cents
Average selling price per kg for period	12.2 cents
Target break even selling price for period	16.6 cents

Average Subsidy per Kilogram of *Pashu Poshak* Sold By Season			
1996-97	1997-98	1998-99	1999-00
25.0 US cents	7.4 US cents	4.4 US cents	2.7 US cents (projected)

The subsidy element has steadily reduced over the period of commercial demonstration. The project plan projected break-even in four years. This might have been achieved without the unexpected dramatic increase in the cost of production due to price hikes for molasses and mineral supplements. In addition to rising prices for inputs, DDU culture imposed an implicit "acceptable" limit on the *Pashu Poshak* selling price. The cooperatives offer a large potential market and good distribution system but AT India's margins must be kept "appropriately small" to benefit DDU members. Breakeven must come from more volume if AT India stays aligned with the cooperative movement. [18]

Regarding the earlier question posed as to whether or not the subsidies provided by AT India in the course of the project keep other private sector players out of the market, the answer seems to be "yes to a limited extent", especially smaller companies. Larger firms are still able to challenge AT India's position. As indicated in the above section, Vrindavan Phosphates, a leading supplier of mineral mix, imitated AT India's approach to marketing and tried to forge its own business alliance with the Mehsana DDU. They have to some extent successfully replicated AT India's marketing system with the DDU. Because of the potential marketing power of this large company, AT India met this challenge by starting to purchase from Vrindavan some of the mineral additives for the manufacture of *Pashu Poshak*. Also, AT India intensified its promotion campaign underscoring the real difference between mineral mixes and MUP products in terms of benefits. AT India seems to have successfully met this threat but subsidies must have surely helped.[19]

The most significant market distortion comes from government policies. This system is likely to change somewhat in the coming decade. India is expected to sign soon the WTO agreement that will lift quantitative restrictions on the import of nearly 1500 items including dairy products. This implies more intense competitive pressures for the Indian dairy industry, especially for the cooperatives and smaller players. Many registration restrictions will still apply (MMPO for example), but the trade barriers designed to protect Indian jobs and foreign exchange will not longer be in place. What influence this will have on the *Pashu Poshak* and the broader AFS market remains to be seen.

4.5 Market Development Table

The PMF requires the completion of a market development table, which addresses the level of supply, demand, competition, and the market share captured by the BDS supplier as well as the extent to

[18] See Annex 3 for Data Summary and Break even Analysis

[19] It is interesting to note that the company saw the way to compete with AT India was to forge an alliance with the DDU and not try to develop their own distribution channels. The dominance of the cooperative movement requires that new entrants take them seriously and try and work through them not in competition with them.

which a target group has been served. This section presents the data required by the table as well as supplementary information.[20]

Market Development for Animals Feed Supplements (AFS) in 4 districts of Gujarat					
Indicator	**Market: Total AFS**	**Program: for Pashu Poshak**			
		1996-97	1997-98	1998-99	Comment
Number of AFS Providers	Considerable number when you count informal sector suppliers of AFS	1	1	1	1 provider (AT India in collaboration with DDUs) with two production plants
Number of AFS Products	From 6 to 10 products which compete directly with *Pashu Poshak*	1	2	2	*Pashu Poshak* is now primarily in mash form but some hemispherical blocks are still sold.
Average price per AFS kilogram	Unknown	13.3 US cents	11.9 US cents	12.2 US cents	Average price is 12.2 US cents per kg over three years of sales
Price range for AFS products	One AFS product priced at 9 US cents per kg.	Current price is around 14.1 cents/kg. Some DDUs subsidize the price another 2 cents a kg. *Pashu Poshak* is well position on price against other feed supplements given its fuller range of benefits.			
Total AFS Operating Costs in USD	Unknown	104,962	276,694	351,550	733,206 (cumulative three year total)
Amount of AFS Sales Recovered in USD	Unknown	36,469	170,532	259,031	466,032 (cumulative three year total)
Total AFS Subsidy in USD	Unknown	68,493	106,162	92,519	267,174 (cumulative three year total)
AFS Sales in MT	Unknown	273.43	1424.90	2121.70	3,820.03 (cumulative three year total)
Average subsidy of AFS sold expressed as percentage	Unknown	65.3%	38.4%	26.3%	36.4% average over three years
AFS Market distortion	Unknown	Significant distortion created by government policies and dominance of cooperatives in the dairy sector. Difficult to evaluate AT India's total contribution to these distortions on the basis of subsidies provided. Increasing competition is evident in the AFS market despite these overall conditions.			
Number of households (SMEs) purchasing AFS	Unknown	1,855	8,316	11,939	22,110
Percent of total potential AFS market reached – households with animals and "pouring milk"	The market for *Pashu Poshak* and AFS is virtually the same, the number of milk pouring households in the 4 districts. Based on sales record in eight representative villages (though too small to be a real sample), we can estimate the following: • 27% of the total number of households contacted so far have tried *Pashu Poshak (approximately 82,000)* • 13.5% of the total number of households contacted are repeat users of *Pashu Poshak* • 50% of those who tried *Pashu Poshak* are repeat users. • Out of approximately 22,110 households that have tried *Pashu Poshak* about 11,055 are regular users. • Estimating an average number of animals of 2 per household, more than 22,110 animals are eating *Pashu Poshak* on a regular basis out of the estimated 44,220 animals that have tried *Pashu Poshak*. But this figure is still tiny in relation to the potential market. They're about 2 million buffaloes and cows in the project area (4 districts) and more than 11 million in all of Gujarat. About 0.4 % of the total number of animals in the project area have tried Pashu Poshak. The growth potential is vast. • 100% of households reached are rural and can be defined as micro enterprises. Poverty data is unreliable though there are some indications are that poorer households are trying *Pashu Poshak* less often than more affluent families.				

[20] The data for this table has been taken from AT India annual reports and built up from findings from the AT India evaluation "The Challenge of Molasses Urea Products, prepared by the consulting firm EDA Rural, September 1998

Percentage of customers who represent target group (women) and percent of target market reached	• The percentage of women customers is estimated at about 50% since most women are married and share the general benefits of household income, though not equally. The potential target market for women is about the same as the number of the milk pouring households. • The project has reached about 13.5% of the total number of households in the project area to date.

4.6 Comment on Market Development Indicators

Usefulness and Relevance of Indicators		
Indicator	**AT India's Perspective**	**Donor Perspective**
Number of AFS Providers Number of AFS Products Average price per AFS kilogram Price range for AFS products	Potentially useful for competition analysis in formulating business plan, but complete data not yet gathered nor analyzed by AT India. BDS Suppliers would probably choose a less costly rough grained (as opposed to fine-grained) analysis of market conditions if donors were not paying. Less detail would be sufficient to make business decisions.	Limited utility since the objective of the project is not to develop a diverse and competitive market for AFS products but rather to make the *Pashu Poshak* innovation widely available to potential consumers (dairy producers). The dairy sector as a whole might provide a more interesting analysis of the competitive factors underlying the project as indicated in the section on cooperatives
Market distortion: Average subsidy per kilogram of AFS	Useful in determining movement toward commercial viability but unfair comparisons with other projects may result if standard definitions are not used consistently.	Useful as a part of a larger analysis of how public money might be competing with potential private sector entrants in the market. Standard definitions of what to include are essential. Easy to miss the "forest for the trees" when assessing projects embedded in planned economies and other market distorting environments.
Number of households (SMEs) purchasing AFS Repeat customers only Amount of AFS Sales in MT Amount of AFS Sales in USD Percent of total potential AFS market reached –households pouring milk	Useful in terms of business planning and tracking progress on targets. The market for AFS products as a whole is not tracked by AT India, while good data is available in relation to the sale of *Pashu Poshak*. The potential market for *Pashu Poshak* is related to the number of animals more than the number of households.	A good indicator of customer use and diffusion of the innovation. Also useful in estimating benefits realized by users. The number of animals being fed *Pashu Poshak* is important for estimating benefits, not just the households.
Percentage of customers who represent target group (women) Percent of potential target market reached – women	Less useful in terms of the commercialization objectives but always relevant for reporting to donors. Unlikely to be collected unless donors are paying or women constitute the market segment to which the business is selling.	Useful in terms of tracking benefits for target groups. However, most women live in households with men. Therefore the percentage of target group can never climb much higher than 50% in the project. Again comparisons among projects may lead to misleading conclusions if not clarified.

5.0 Performance Measurement Framework: BDS Supplier

This section looks at the BDS supplier and its sustainability. Some of the relevant issues have been already addressed under our discussion of subsidy and market distortion. This section goes farther, however, in looking at the potential sustainability of AT India as BDS supplier.

5.1 Sustainability

The first difficulty in addressing the issue of sustainability is the lack of an AT India business plan or strategy for either going into business or exiting from the project. As we have seen, the PMF differentiates between the "facilitator" of the BDS (development organization) and the "supplier" (direct provider of services to customers). AT India now plays both of these roles. One might argue the project design implies that AT India would hand over the production and marketing of *Pashu Poshak* to the DDUs once the commercial viability had been demonstrated. As it now stands, this is only one of several options under consideration. These options include:

- AT India enters into an agreement with a private feed manufacturer to produce *Pashu Poshak* and receives a "small royalty" payment on sales for its brand name. This option is often discussed but from the lead researcher's point of view offers little chance of success. Since the formula and approach is easily copied there seems to be little hope that private sector companies would be willing to pay AT India for its product development work through any kind of royalty arrangement. Moreover, as we have seen, the cooperative movement has successfully excluded private companies from the high volume market, at least for the near future.

- AT India goes into commercial production and supply of *Pashu Poshak* as a private business. The current strategy for commercial demonstration is to increase volume of sales to 5000 metric tons by 2000-01 season and grow to 7000 metric tons by 2001-02 season. The sales in the current 1999-2000 season are expected to reach 3000 metric tons. Break even is achieved just over 5000 metric tons if the DDU infrastructure is used. (See annex for break-even analysis). It is unclear to what extent prices can be raised to keep pace with the rising costs of inputs, especially molasses and minerals. If a deal cannot be worked out with DDUs, AT India would have to factor in the capital and infrastructure costs required to start-up a new operation. If commercial viability can be demonstrated (covering the full costs of administration and operational costs, plus a reasonable profit) AT India would consider going it alone and even diversifying into animal feed and healthcare products building on lessons learned in its marketing program. The potential market for *Pashu Poshak* is huge. The project to date has only reached less than 0.4% of the market in the project area.

- AT India spins off its operation as a part of the DDU cooperative animal feed manufacturing business. This is the most obvious exit strategy and the one implied in the project document. Not only do cooperatives control large segments of the market but also provide the potential for large-scale production and distribution. Such a massive distribution system is required for low value products like *Pashu Poshak*. In Gujarat state alone, there are milk producer cooperatives with links to animal feed mills in 12 of the 19 districts, and there are 13 sugar mills producing large quantities of molasses as well as three large urea processing plants. This option, however, does not earn future revenue for AT India unless combined with other options below.

- AT India establishes Livestock and Environment Resource Center to attract additional public funds. Such a center could communicate project experiences, provide technical assistance, disseminate training manuals and literature, and conduct workshops on technical issues related to strategic feed supplementation. While this is generally not considered as sustainable from a donor's point of view, it may be a good business strategy for AT India, given the interest from funding agencies (and willingness to buy what AT India is offering) especially related to the environmental aspects of the project.

- AT India replicates the project in other regions of India or other countries with donor funds. The Indian states of Andhra Pradesh, Haryana, Karnataka, Maharashtra, Bihar, Rajasthan, Tamil Nadu, and Uttar Pradesh show tremendous replication potential since each state has a federation of milk producer societies modeled on the Anand pattern. The dairy cooperatives have more than 7 million members. Again this type of strategy is not generally thought of as "sustainability" from a donor's perspective, but it may be a good business strategy for AT India, as a private entity with its own interests to pursue.

This is not the place to evaluate AT India's business plan or exit strategy. But it does seem fair to say that if AT India has not yet decided on where it wants to go, any meaningful assessment of AT India's viability as a BDS supplier (or the viability of any other organizational entity) is premature. Currently, AT India is only attempting to demonstrate the commercial prospects of the service and not go into business for itself nor pass it off to a third party. There is a big difference between "viability" of a BDS supplier and the rather "soft" sustainability indicators asked for in the PMF, which tend to look only at the service itself.

The PMF defines supplier sustainability as the percentage of operating costs covered by customer sales or client fees. As stated in the PMF case study guidelines, these calculations should include "direct costs of service provision and indirect costs, such as organizational overhead cost in-country and abroad. These costs should **not** include those [expenditures] that would be considered research and demonstration, fundraising, monitoring and evaluation, or other start-up costs. Only ongoing operational and management costs should be included". First of all, the definition of start-up costs is not specified.

From a business point of view, start up costs must be factored into any investment to forecast the rate of return. There seems to be no good reason to exclude such costs, especially if buying and installing new equipment is required to expand production capacity. Moreover, as any manager will attest to, fundraising strategy or marketing is at the core of any business, profit making or not-for-profit alike. They are ongoing operational and management costs required for sustainability. Excluding research and demonstration costs is also ambiguous, especially in a project where it features as a central theme. These are essential costs related to business viability (the sustainability of the entity). All organizations (be they not-for-profit and for profit making) invest in research, new services, human resource development, fundraising, marketing, internal monitoring (controls) and evaluation (strategic planning) etc. They are essential functions of any viable organization. Furthermore, no service is sustainable unless the organization delivering it is also viable. The PMF not only leaves room for a wide and ambiguous interpretation on what should be included in the sustainability calculations, but what is asked for also falls short of the expected minimum to determine supplier viability.

5.2 Sustainability and Cost-Effectiveness Table

Having drawn a distinction between viability of the business and sustainability of the service, this section presents project data as asked for in the PMF.

Sustainability and Cost-effectiveness		
Indicator	**Comments**	
Breakdown of variable costs per Kg of *Pashu Poshak*	Cost of Pashu Poshak in India Rupees (42.48 to 1 USD)	4.27
	Promotion Incentives	0.50
	Commission to Field Agents	0.30
	Transportation	0.37
	Total Variable Costs	5.44
	Selling Price	6.00
	Contribution Margin toward Fixed Costs	0.56
BDS Supplier operational cost recovery from customer revenues	Revenues for *Pashu Poshak* sales divided by cost of production plus cost of sales (including variable costs plus fixed costs associated with marketing, e.g. salaries and travel), excluding administration, capital expenditures and depreciation **for 1998-99** season expressed as a percentage is **83.3% cost recovery.** If administration, capital expenditures and depreciation are included in operational costs, the percentage is **73.7% cost recovery**	
Cost-benefit assessment	See section 7.0 below. The cost benefit assessment must be looked at after the	

comparing total program costs to aggregate program benefits to customers	discussion of benefits in section 6.0.
Total Program costs (3 years)	$ 733,206
Total Program cost per supplier assisted (3 years)	$733,206 / AT India—the only supplier assisted to date
Total Program costs per customer served (3 years)	$733,206/22,110 households that have tried (served) is $33.16 per household
Total Program cost per $1 increase in provider revenue.	For 1998 only, $733,206/466,032 (sales recovered) is $1.57. For every $1 in provider revenue, $1.57 was spent

In filling out this table, the authors experienced some confusion as to what should be included in both the operational costs and the total costs. We have taken a conservative approach and taken the total costs to include 50% of AT India's administrative and overhead costs and depreciation at 20% on plant and equipment.

5.4 Comment on BDS Supplier Indicators

BDS Supplier operational cost recovery from customer revenues	Useful indicator for both donors and projects but falls short of viability. Viability considerations, not just operational cost-recovery should be the standard against which organizations are measured. Standardized definitions of indicators to assess viability are required to make this meaningful.
Cost-benefit assessment comparing total program costs to aggregate program benefits to customers	Very relevant for public policy but for a project like Pashu Poshak with an R&D component, allowance must be made to roll out the benefits over a significant period of time. Some fair limit on benefit accrual must be found. Assumptions on benefits and the time period must be clearly articulated. There is considerable room for error in making calculations by using overly project-friendly guestimates and unrealistic assumptions. The complexity of such calculations undermines the validity and reliability of data.
Total Program Costs	This is a subset of the indicator above—not useful
Total Program Cost per supplier assisted	This is not useful in that it skews analysis in the favor of short one-time services that are low in cost and value.
Total Program costs per customer served	Not useful for the same reason as above – bias is toward low value, low cost services. A one-day training program looks better than a three-day program—says nothing about the willingness to pay or the benefits derived.
Total Program cost per $1 increase in provider revenue.	Subset of previous indicators on subsidy, therefore redundant
An additional indicator	It seems useful to include the development of a business plan or detailed viability strategy (business plan) as an indicator of progress towards the sustainability goal. Developing a plan early will help focus the supplier on making the necessary institutional alliances and business decisions to become a viable concern.

6.0 Performance Measurement Framework: BDS Customers

The total monetary benefits derived from buying and feeding *Pashu Poshak* to milk producing animals is monitored by AT India in relation to two factors: 1) milk/butterfat related income gains and 2) producer cost savings. The benefits are calculated from observations and records of field staff, impact surveys, and then cross-checked against the results of controlled field trials.

As stated earlier, unlike many projects, the benefits of *Pashu Poshak* are well documented. The project conducted long term controlled feeding trials to empirically determine the actual benefits that can be gained from proper feeding of *Pashu Poshak* to ruminant milk-producing animals. The trials confirmed higher milk production and fat content for animals taking the *Pashu Poshak* supplement within two weeks. Better reproductive performance of the animals supplemented with *Pashu Poshak* was also clearly demonstrated. Eight calving were noted in crossbreeds and seven in buffaloes from the treatment group as compared to four and three in crossbreeds and buffaloes respectively from the control group.

In addition to controlled field and farm trials, detailed village survey in Parsa Village revealed even more benefits than the clinical or farm trials. Out of twenty farmers who invested a collective amount of Rs 40,000, the results of *Pashu Poshak* feeding to their animals netted Rs 266,415, more than a six-fold return on investment. The results of the Parsa Village survey are given in annex 1.[21]

The average is closer to a three-fold return on investment, as given below in the table. There seems to be considerable variation in how cattle and buffaloes respond to taking the feed supplement. Biological entities vary, sometimes unpredictably. Since there is a two to three week delay in visible benefits, some farmers conclude prematurely that the product is ineffective. Others feed too little to their animals to be effective. If fed correctly, as a general rule the more malnourished an animal (usually those animals owned by poorer households or herders) the more dramatic will be the results of using *Pashu Poshak.*

In addition to the field laboratory trials, AT India conducted farmer-level trials and surveys to re-confirm the laboratory results.[22] The documented benefits from regular and correct use of *Pashu Poshak* include:

Average Benefits per animal regularly and correctly using *Pashu Poshak*		
Benefit	**Percentage of farmers reporting the benefit**	**Estimated average annual income or cost savings in USD**
Reduction of dry fodder wastage	75% (cost savings)	$12.50 per annum cost savings
Increase in butterfat and milk production within two to three weeks (assumes a 150 days of lactation)	65% (income gains)	$12.00 per annum income earnings
Regularized estrous cycle for animals	50% (translates into future income gains)	Not monetized
Reduced need for other mineral supplements	60% (cost savings)	$2.08 per annum
Faster Live weight gains	25% (included in gains above)	Not monetized
No repeat Artificial Insemination required	5% (cost savings)	Not monetized
Early Maturation of heifers	5% (included in gains above)	Not monetized
Savings on Feed concentrates	not reported but probably included under reduced supplements	$6.63 per annum
Veterinary care savings	not reported but included in other indicators related to improved health of animals	$1.39 per annum
Cost of Purchasing *Pashu Poshak*	direct cost	Cost of $8.93 per animal per annum
Net gain per animal		$25.67 per annum
Return on Investment	For every $1 invested in *Pashu Poshak* (up to the biological limit) you gain through income and savings $2.87 per animal.	

[21] 20 farmers from Parsa village participated in data collection over the 1997-1998-milk production season. The farmers kept data on number of animals, milk produced, percentage of fat recorded, amount of money received from sales, difference from previous years as recorded in cooperative log book and the amount spent on *Pashu Poshak*. The return on investment was calculated by AT India.

[22] AT India conducted sample surveys of user and non-user households

6.1 Customer Benefit Table

BDS Customers—Buyers of Pashu Poshak	
Indicator	**Comments**
Customer Satisfaction	Data collected by AT India suggests about 50% of those who try *Pashu Poshak* end up as repeat users. This would figure would increase if the product were being used correctly all the time–fed in the right amount and at the right time. Currently one can say there is a 50% customer satisfaction with the product.
Repeat Customers	50% of total farmers who try *Pashu Poshak*—again this could be increased if some farmers would continue to use the product until results are seen (there is a delay of 2 to 3 weeks in noticeable benefits). A farmer can try it, not see immediate effects and then discontinue use without giving the product a fair chance to demonstrate results.
Percentage of customers who reduced costs and increased earnings	75% of the repeat *Pashu Poshak* users report savings on dry fodder. This is generally recognized as the first visible benefit of *Pashu Poshak* use.
Change in Value Added	A five or six-fold return on investment can be attained when properly used by farmers with undernourished cows. The average is closer to a three-fold return on investment up to the point of proper usage.

6.2 Comment on Customer Indicators

BDS Customers—Comments	
Indicator	**Comments**
Customer Satisfaction	Useful—focus groups and surveys can help collect more accurate data
Repeat Customers	Generally a good indicator except for a one-time BDS offers
Percentage of customers who reduced costs and increased earnings	Good indicator but is probably synonymous with customer satisfaction. Sampling techniques should be given as part of the PMF methodology.
Change in Value Added	Return on Investment is a better indicator. If I buy a service, how much can I realize? Vague about how value added should be calculated and what it really means in terms of customer benefits. Probably better to drop it.

7.0 Cost-Benefit Assessment [23]

This section compares the total program costs with the estimated benefits over three years of the projected 8-year project. It begins with the start-up of the commercial demonstration through the 1998-1999 milk production season.

Cost Benefit Assessment				
	1996-97	1997-98	1998-99	Cumulative
Total Program costs	$104,962	$ 276,694	$ 351,550	$733,206
Number of Households trying *Pashu Poshak* (triers + regular users)	1855	8316	11939	22110
Number of animals using *Pashu Poshak* on a regular basis (50% of households trying with average of 2 animals per household	1855	8316	11939	22110
Annual cost savings in reduced concentrate purchases estimated at $ 6.63 per animal	$12,299 (savings)	$55,120 (savings)	$79,139 (savings)	$146,559 (savings)
Annual cost savings in reduced mineral supplement use estimated at $2.08 per animal	$3,866 (savings)	$17,324 (savings)	$24,873 (savings)	$46,063 (savings)
Annual costs savings in reduced veterinarian visits at $1.39 per animal	$2588 (savings)	$11,597 (savings)	$16,650 (savings)	$30,834 (savings)
Annual cost savings in fodder wastage estimated at $12.50 per animal	$23,193 (savings)	$103,945 (savings)	$149,239 (savings)	$276,377 (savings)

[23] Based on standard 1997 estimated prices and costs taken from Enterprise Works and AT India reports.

Cost of *Pashu Poshak* to farmers at 8.93 per animal (for the flush season lasting 5 months)	$16,567 (cost)	$74,246 (cost)	$106,599 (cost)	$197,412 (cost)
Total cost savings	$25,379	$113,740	$163,302	$302,420
Income from increased sale of milk produced by animals eating *Pashu Poshak*. Paid on the basis of butter fat estimated at 3 kg per animals per year @ $4.00 per kg. Total income gains per animal is $12.00	$22,266	$99,787	$143,269	$265,322
Total monetary benefits realized (cost savings plus increased income as a result of project)	$47,644	213,527	$306,571	$567,743
Total gain per household (net savings plus increased income) for two animals (average)	$51.35 per annum			

8.0 PMF Framework: Recommendations for Improvement

The following version of the PMF is reflects the authors' view that the framework can be simplified without losing any of its value. It is offered for consideration.

Proposed Simplified PMF Framework	
Objectives	**Indicators**
Market Development (Broader Business System that Encompasses the BDS in Question	
Create a more dynamic and differentiated market for BDS services	Increase in number and type of private sector services available Increased dynamism (speed of change as measured in start-ups, firms going out of business, innovation) Increase in consumer choices on price and quality Increase in the "bought-in" services (business linkages) among private firms Waning of subsidies by donors and governments
	Average public subsidy content of the BDS services and the overall market in question.
BDS Supplier Sustainability	
Achieve Supplier Sustainability	Percentage of BDS supplier full cost recovery (fixed and variable costs) from business operations. Subsidy must be factored into the financial analysis as income from other sources.
	Prospects for commercial viability of the BDS suppliers as presented in business plan with strong market and competition analysis
Benefit to Customers and Target Groups	
Increase customer benefits by means of service rendered	Number of Customers (target beneficiaries) paying for service or % of service: willingness to pay is chief indicator of demand.
	Other Satisfaction Measures such as opinions, repeat purchases (though latter is biased against one-time services)
	Increasing incomes either measured directly or indirect by proxy indicators such as purchase of new consumer goods
	Imputed benefits on the basis of controlled field experiments and other tests such as in feeding trials
Cost Benefit Assessment for Public Investments	
Improve Program Cost Effectiveness in relation to Public Objectives	Total Benefits derived from investment divided by Total Public Investment (Subsidy). Benefits should be rolled out over a standard number of years.

Additional thoughts on testing the PMF are:

- In applying the framework, some indicators were found to overlap in practice, (for example, average content subsidy and percent of cost recovery). Duplication should be omitted.

- The framework is complex and therefore expensive to implement accurately. This will add significant costs to project implementation because it will require "high priced" consultants to help implementing organizations collect and interpret information. PMF may have great employment creation potential for development consultants. Thus the need for a simpler framework.

- Defining the BDS and level of analysis is a critical decision in completing the framework. It reminds one of the strategic planning mantra "what business are we really in?" What is the BDS we are talking about presents a similar kind of analytical puzzle. Different choices about the level of analysis may lead to wholly different perspectives on the market and the service being delivered. Boundaries naturally spring from the choice of customer. Perhaps a multi-level market analysis should be required looking at the market environment and competitive dynamics at the level of donors, facilitators as well as suppliers.

- Comparing the data between projects will remain difficult because of the validity and reliability of the data cannot always be verified when different organizations are collecting it. This is especially a problem when calculating the cost-benefit assessment. Standard definitions and methodologies are not given which leaves the door open for wide interpretation. Also the "business" interests of both facilitators and suppliers compounds the problem of validity. While donors may want a tool to measure the benefits of public investments, practitioners want to grow as organizations in pursuit of their chosen objectives. There is little incentive for practitioners to embrace the PMF unless it will help their image. The PMF is a donor tool that will be used to evaluate the performance of practitioners. A good "score" will improve chances of future funding. Since there is a strong incentive to look good in the eyes of their major clients (the donors) some practitioners may be tempted to exaggerate data and turn the PMF into marketing tool. Donor organization will be unable to verify much of the data presented without spending lots of money for detailed external evaluations. Even then, information can be easily skewed.

- Organizations and companies try to avoid direct competition while donors following the market development paradigm attempt to increase competition in service of the consumer. There are business strategies and donor goals. The two are not the same. Implementing organizations should not be expected to undermine their business position by developing diverse and competitive markets unless it is an explicit deliverable under the contract. The implicit perspective of the PMF is from the point of view of the donor and not the company or organization supplying the service. Despite some rhetoric to the contrary, this is a donor tool.

- The indicators in the PMF should be geared to the specific objectives of a given project. It is not fair for projects to be evaluated against new criteria such as the "development of competitive markets when these objectives were not part of the grant agreement or contract. It's tantamount to changing the rules in the middle of the game.

- Donors should be judged on how well their designs meet public policy objectives. We need a framework to evaluate the performance of donors themselves. As it now stands, facilitators and suppliers are judged by the PMF for project design that are purchased by donors. Perhaps a "new paradigm" donor evaluation framework should be developed, especially since public sector institutions are driving most of the programs in the BDS field.

- The PMF seems to imply an idealized model of perfect competition where no one can be better off without at least one person being made worse off. In this conception, the ideal is to have a large number of separate BDS firms maximizing their profits by adapting their outputs to a given ruling price. One supplier from this perspective is highly undesirable as it reduces competition at the expense of the consumer. The public role is to continually intensify competition.

- Alternative frameworks do exist, one being the "evolutionary process approach". From this perspective markets never achieve equilibrium due to the constant "creative destruction" of entrepreneurship. Also single suppliers in a market may simply be the result of past successful entrepreneurial initiative and dynamic competitive activity. From this perspective, donors should be less concerned about the number of suppliers and market share and more focussed on the emerging changes in the market, business networks and alliances, the choices being offered to consumers, and how to stimulate innovation, entrepreneurship and market dynamism.

- This condition of near "perfect competition" is often seen in microenterprise clusters characterized by low barriers to entry, lots of tiny enterprises with low levels of differentiation competing fiercely with each other driving margins to virtually nothing. This is something we are trying to change not foster.

- Rather our ideal market development should be viewed as a complex evolving system more like an interdependent ecology than a number of atomized individuals or firms engaging in fierce competition. The image should be in tune with the process of evolutionary dynamics, increasing complexity and differentiation, niche formation, cooperation (symbiosis) as well as competition, selection, adaptation and innovation. Perhaps we need to have a philosophical oriented economist take a critical look at the PMF and ferret out the underlying metaphors and implicit assumptions, so they will be clear to all.

9.0 Inferences for "Best" (Good) Practices from AT India's *Pashu Poshak* Project

As distinct from many BDS projects, AT India's *Pashu Poshak* project was designed as a technology development and commercialization effort, which generally follows a series of distinct phases although not always in neat succession. Typically, such projects begin with the identification of a problem, need or market opportunity, proceed to a research and development (R&D) phase and move toward the commercialization of the innovation (once developed) in the form of a new product or service.

Commercialization generally depends on wide scale adoption (diffusion) of the innovation by consumers and the capacity to meet the rising demand with a sustainable supply, usually organized around one or more viable business enterprises. The consequences of the innovation are evaluated over time. As the diffusion process continues beyond the original project's temporal and spatial boundaries, benefits (and sometimes harm) often accelerate, sometimes exponentially as a "critical mass" threshold is crossed. At this stage, benefits hopefully outdistance the original investment costs, which are typically high for the research and development phase itself.

In relation to this classic design, AT India has performed well in research and development phase. They have continued to innovate and adapt the technology throughout the project. They have done so by staying close to the customer and understanding the problem from his and her perspective. Field trials and frequent contacts have kept feedback loops open creating the pre-conditions for what is commonly referred as a "learning organization" in today's management lexicon. As a consequence of AT India's approach, they have been able to galvanize the existing dairy establishment to begin adapting their own research to feedback signals from the field (customer-oriented) rather than expecting the field to adapt to the research of the academic experts (supply-driven). AT India's research and development can be ranked high in terms of "good practices".

While the commercialization phase is still relatively young, much still needs to be done to accelerate the commercial use and diffusion of *Pashu Poshak.* Given the clear benefits (perhaps the do not seem so clear to the farmers), it is surprising that demand is not accelerating faster. Perhaps the time lag of several weeks before any noticeable change occurs is a critical factor. Also, one may surmise that some are not using the product correctly, and the benefits are therefore less evident. Some do not use the product long enough before they stop buying it. Few animal owners who feed *Pashu Poshak* to their stock could really tell how much more milk and fat they are producing. They tend to notice the appetite changes first. In general, farmers appear not to calculate very accurately the costs and benefits of using *Pashu Poshak*. Closing this gap between actual benefits and those perceived by farmer is the essential rationale for AT India to intensify its promotion campaign. How much longer will these intense promotional activities be required before the product demand crosses a critical threshold and takes off?

Since the mid-1960s, social science researchers have studied the contagion-like process that sometimes occurs in the diffusion of innovation. In many respects, the diffusion of innovation mimics epidemics when recursive positive feedback loops or “snowballing effects” began driving the process into unpredictable non-linear patterns. The “contagion process” when used to model innovation diffusion seems to be directly linked to interpersonal networks providing communication avenues for the exchange of subjective evaluations (perceived costs and benefits) of the innovation. This chain-reaction or snowballing effects do not happen for relatively isolated individuals who lack close contacts with peer-networks. [24]

One of the lessons learned from previous work in agricultural extension was to distinguish between two types of demonstrations: 1) experimental demonstrations and 2) exemplary demonstrations. Each has a different purpose and methodology. Experimental demonstrations (as carried out in the *Pashu Poshak* feeding and field trials) are conducted to evaluate the effectiveness of an innovation under field conditions. Exemplary demonstrations in contrast are conducted to facilitate the adoption of an innovation. While the project has carried out experimental demonstrations, they need to focus more on exemplary ones as a definite marketing technique. As indicated, exemplary demonstrations are intended to persuade potential adopters. Years of research on the diffusion of innovation have conclusively shown that the degree to which the results of an innovation are visible to others is positively related to the rate of adoption.[25]

Demonstrations designed to market innovations should be carried out with high public visibility. Likewise demonstrators should be respected “opinion leaders” in the community. Good results may be obtained from a series of carefully segmented exemplary demonstrations with opinion leaders who are well placed within the village status hierarchy and perhaps the cooperative political structure. This might be more fruitful in stimulating demand than the more general promotional schemes now being employed. Once leaders are convinced that something is worthwhile, others tend to follow their example. This is not to detract from AT India’s commendable use of innovative market research tools and promotional strategies to sell *Pashu Poshak*. Significant headway is also being made as indicated by the decline in the level of subsidy each year as the marketing effort works its magic.

Lower income households with under nourished animals are targeted in the project plan. While the beneficial effects of *Pashu Poshak* for poorly fed animals are greater than for well-fed ones, the lower income households can least afford to purchase a supplement nor are they usually well connected to high status social networks useful for rapid diffusion of the innovation. Women experience additional barriers, in that they are generally not in charge of household buying decisions. Men decide whether or not to purchase feed supplements and normally women do not play a key role as opinion leaders in the rural village context. In such cases, targeting women and poorer households may actually inhibit the take-off of effective commercial demand if it becomes associated with lower status groups. Social and commercialization objectives cannot always be pursued in the same project with the same strategy to achieve good results.

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[24] See Rogers, Everett, (1995) **Diffusion of Innovations,** New York: Free Press, for an excellent review of research findings on innovation and its diffusion over the last four decades.

[25] Rogers (1995)

A further lesson, which should be emphasized here, concerns the difficulty of moving a project to a viable business entity. It is not easy to transform a project into a viable company no matter what the situation. The successful transition from a project to a company requires intense motivation, willingness to take risks, new market-oriented skills, sometimes the bringing in new people and always a fresh way of seeing the world. Projects are inherently different than companies and they operate using different management logic. Projects have a beginning, middle and an end, and therefore no long-term identity. Short-term impact and cost-effectiveness are the important issues. By contrast companies strive to survive and grow in a competitive environment. Their central concern is to maintain a core identity while innovating and adapting to the texture of an ever-changing marketplace. Companies are self-creating entities intent on pursuing long term viability within the context of many other actors and system constraints. Though it is overly simplistic, one might say projects are “other created” and successful companies are “self-created. If donors want their projects to be sustainable, it is essential they build into every design a process for achieving it. They should establish unambiguous sustainability (viability) objectives, set in place the right incentives, and permit the necessary flexibility to let it happen.

One of the lessons, we learned from doing this exercise was how deep the tendency goes on the part of donor organizations **not** see themselves as part of the BDS market. Donors tend to see themselves as external agents acting on others to cause “impact”, rather than being an integral part of the system themselves. From the implementing organization’s point of view, the donor is the primary customer and a major driver of the BDS market. Donors are definitely inside (not outside) the system. The role of the facilitator is also a “donor constructed category” since they are really just another kind of supplier (in the market system) selling management services to donors. Somehow this reality needs to be brought into the PMF analysis explicitly. We need to address the incentives and forces underlying the ‘development business” if we want to get a better understanding of how we can catalyze the development of BDS markets.

Finally, we would like to end with a plea to adopt a more interdisciplinary approach to BDS market development, one that draws on knowledge from sociobiology, psychology, systems theory, business management, organization theory, sociology, complexity theory as well as development management and economics. Many so-called lessons appear to be merely changes in vocabulary rather than substantive new insights. In our rush to carve out and define a new field of BDS, a more conscious holistic approach and interdisciplinary multilogue is needed to avoid re-discovering many “lessons” that have already been learned by theorist and practitioners in other fields.

Annex 1
Parsa Village Survey of Farmers using Pashu Poshak

Farmer #	Number of Cows	Number of Buffaloes	Total # of Animals	Milk Poured 1997-98 (liters)	Milk Poured 1998-99 (liters	% Fat 1997-98	% Fat 1998-99	Income 1997-98 in Rs.	Income 1998-99 in Rs	Difference over previou[s] year
1	0	3	3	3971	3619	7.5	7.8	45355	48191	28
2	0	4	4	4622	5311	8.5	7.7	65434	64579	-8
3	0	5	5	7739	6626	6.9	8.0	83409	68557	-148
4	1	5	6	6412	8505	6.0	6.9	65157	77546	123
5	0	4	4	5094	10020	7.1	7.2	56160	108184	520
6	0	3	3	940	3716	6.4	7.6	9129	37302	281
7	10	0	10	12940	12832	4.5	7.3	94334	109691	153
8	8	0	8	8298	8304	4.3	7.0	61315	68827	75
9	8	0	8	8875	9774	4.3	7.7	67598	78352	107
10	7	0	7	12388	12271	4.3	5.5	88449	97663	92
11	0	4	4	5197	4222	5.7	7.2	52047	48993	-30
12	0	2	2	2480	2967	7.0	7.4	27859	23932	-39
13	0	3	3	2912	3386	6.5	6.7	17559	49413	318
14	0	3	3	1743	4635	7.0	7.6	29400	52364	229
15	0	3	3	2750	5197	7.0	7.4	29410	59503	300
16	0	2	2	665	2873	7.1	7.4	7148	33553	264
17	0	5	5	6530	7198	7.0	7.1	71947	80276	83
18	0	2	2	1067	2328	6.8	7.8	12337	29552	172
19	0	5	5	6845	7568	6.8	7.5	69990	91035	210
20	0	3	3	2464	4785	7.1	7.7	27263	60202	329
Total	34	56	90	103932	126137	127.8	146.5	981300	1287715	3064
Average	1.7	2.8	4.5	-636	6307	6.4	7.3	49065	64386	153
Average per Animal										
%										

Annex 2

Appropriate Technology India - Data summary table and Break even Analysis

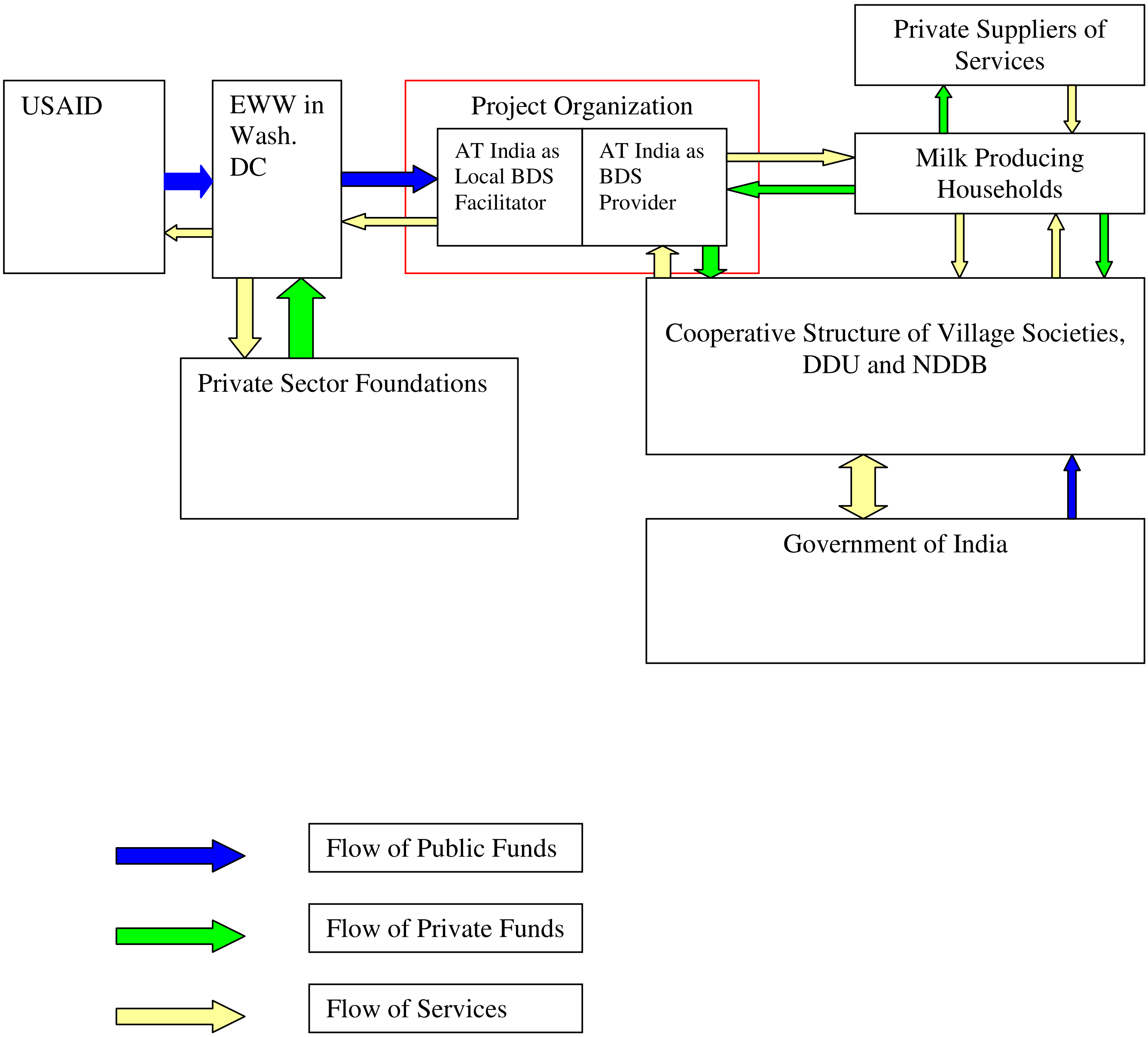
	1996-97		1997-98		1998-99		1999-2000		2000-2001		2001-2002		2002-2003	
Exchange rate		35.85		39.13		42.48		43		43		43		43
	Rs	$	Rs	$	Rs	$		$		$		$		$
Cost of purchasing PP	885683.38	24705.25	5699177.00	145647.25	9056387.37	213191.79	12900000.00	300000.00	22500000.00	523255.81	33600000.00	781395.35	52500000.00	1220930.23
Selling Costs (direct&indirect)	1758377.09	49048.18	3175414.15	81150.37	4155249.56	97816.61	5194061.95	120792.14	6492577.44	150990.17	8115721.80	188737.72	10144652.25	235922.15
Admininstration Costs	859929.25	23986.87	1693534.92	43279.71	1463306.92	34446.96	1463306.92	34030.39	1463306.92	34030.39	1463306.92	34030.39	1463306.92	34030.39
Fixed Capital Costs 1294500														
Depreciation	258900.00	7221.76	258900.00	6616.41	258900.00	6094.63	258900.00	6020.93	258900.00	6020.93				
TOTAL COSTS	3762889.72	104962.06	10827026.07	276693.74	14933843.85	351550.00	19816268.87	460843.46	30714784.35	714297.31	43179028.71	1004163.46	64107959.16	1490882.77
Sales price recovered	1307412.00	36468.95	6672907.00	170531.74	11003643.50	259031.16	16500000.00	383720.93	30000000.00	697674.42	45500000.00	1058139.53	68250000.00	1587209.30
Total subsidy		68493.10		106162.00		92518.84	3316268.87	77122.53	714784.35	16622.89	-2320971.29	-53976.08	-4142040.84	-96326.53
Product Sales in MT		273.43		1424.90		2121.70	3000.00	3000.00	5000.00	5000.00	7000.00	7000.00	10500.00	10500.00
Subsidy per MT		250.50		74.50		43.61	1105.42	25.71	142.96	3.32	-331.57	-7.71	-394.48	-9.17
Subsidy per kg		0.25		0.07		0.04		0.03		0.00		-0.01	-0.39	-0.01

Assumptions

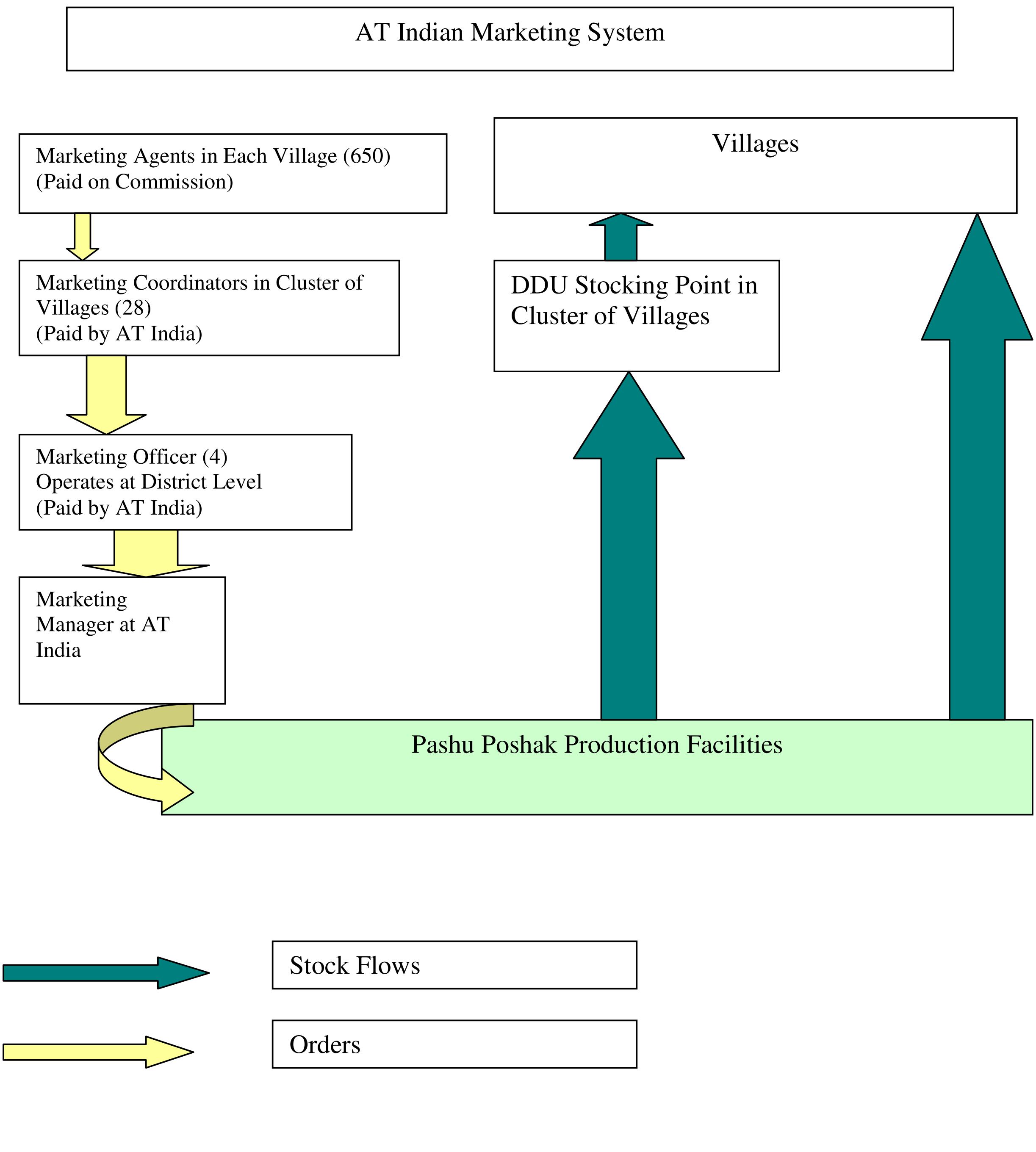
Model used is the current one where AT India works in collaboration with DDU
Selling costs include all direct selling costs plus salary and travel of the entire marketing staff
Administration costs for the BDS are assumed to be 50% of AT India admin/overhead costs
Fixed capital includes the plants at Ahmedabad and Mehsana. These 2 plants can produce upwards of 10,000 MT per annum
Depreciation is taken at 20% per annum
All data for 3 years (96/97, 97/98 and 98/99) are actuals from the AT India audit reports
For 1999/2000 onwards, selling costs are assumed to rise at 25% per annum while admin costs stay the same
An increase is factored into the PP purchase price each year as well as the selling price

Annex 3

Diagram of Service Delivery Model of Pashu Poshak



Annex 4


AT Indian Marketing System
Marketing Agents in Each Village (650)
(Paid on Commission)
Villages
Marketing Coordinators in Cluster of Villages (28)
(Paid by AT India)
DDU Stocking Point in Cluster of Villages
Marketing Officer (4)
Operates at District Level
(Paid by AT India)
Marketing Manager at AT India
Pashu Poshak Production Facilities
Stock Flows
Orders