

## INVESTMENT APPRAISAL AND EVALUATION OF COMMUNITY BASED PRODUCTION OF BALANCE FEED

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**ABSTRACT:** Livestock sector plays an important role in the economy of Pakistan with a share in national and agricultural GDP estimated to be 11.3% and 51.8% respectively. Pakistan accounts for 143 million animal heads in 2006. However, livestock population and fodder production are inversely related. The fodder area per adult animal unit has significantly declined from 0.067 ha to 0.035 ha and production declined from 1.31t to 0.80t from 1986 to 2006. Inadequate nutrition is one of the major constraints limiting livestock production in the country. Feed accounts for almost 70% of total cost of production of milk or meat. The trend for concentrate feeding to livestock is changing from the conventional concentrate feeding to a formulated compound feed. Considering the importance of livestock in the livelihood of the people, scarcity of green fodder three feed producing units were provided under Community Action for Livestock Development Project in Pakistan. From the technical and scientific points of view, the balance feed technology works reliably in improving livestock productivity. Breakeven Point, Internal Rate of Return (IRR) and Net Present Value (NPV) were calculated for investment appraisal of the feed mills. Assessment of the intervention based on the farmers' perception regarding the acceptability and compatibility of the balance feed was done through survey of the participating and fellow farmers at the project sites. Paired sample 'T' test was used to compare the difference in milk yield. Farmers reported 0.5 to 2 liters per day increase in milk yield with the use of balance feed. The paired sample 'T' test depicts statistically significant difference ( $P < 0.05$ ) in milk yield before and after the use of balance feed. The locally produced balance feed was found cost effective along with better animal productivity over the conventionally used cotton seed cakes. The intervention provided better competitiveness, sustainability, accessibility with inclusiveness of small holders along with scalability option for the entrepreneurs.

*Key Words: Livestock; Balance Feed; Investment Appraisal; Farmers' Perceptions; Pakistan.*

### INTRODUCTION

Livestock sector plays an important role in the economy of the Pakistan with a share in national and agricultural GDP estimated to be 11.3% and 51.8% respectively. The value of livestock is 6.1% more than the combined value of major and minor crops (GoP, 2009). The role of livestock sector in the rural economy of Pakistan is very critical as 30-35 million rural population of the country are engaged for their livelihood. Within the livestock sector, milk is the largest and the single most important commodity. Pakistan is the fifth largest milk producer in the world. The total

value of milk produced is higher than the value of two major crops, that is, wheat and cotton. The contribution of livestock to the national economy takes different forms such as, yielding milk, providing meat and by-products like leather, hide and manure. Its products constitute an important source of foreign exchange earnings (Herani et al., 2008).

Natural fodders along with crop residues are important forage feeds of livestock both in rainfed and irrigated areas of Pakistan. The severity of fodder shortages in rainfed areas is high as compared to irrigated areas. To improve production, the

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farmer should optimize the efficiency of utilization of the available feed resources. This is done by the use of supplements that provide the deficient nutrients, especially protein. The trend for concentrate feeding to livestock is changing from the conventional concentrate feeding to a formulated compound feed. Pakistan has 215 feed mills, but only few are preparing compound feed for livestock. Generally, mixed compound feeds are prepared at home by farmers. Feed accounts for almost 70% of total cost of production of milk or meat. Hence a balanced feed will positively affect milk and meat production of livestock (Shahid, 2007).

Considering the importance of livestock in the livelihood of the people, scarcity of green fodder, three small scale feed producing units were provided under Community Action for Livestock Development Project in three villages in Pakistan. The main objective of feed production through micro enterprise development at community level was to provide doorstep quality feed at cheaper prices. The present paper on investment appraisal of small scale feed enterprise would enable the entrepreneurs and the planners with the cost and revenue implications of their venture decisions through real time break even analysis, and investment dashboard indicating the danger zones in investments during accelerated growth. The financial viability and sustainability issues for the development of feed enterprise are also focused in the discussion.

#### **MATERIALS AND METHODS**

The overtime fodder supply situation compared with livestock population is reported based on the review of literature and calculations based on the recent data reported in various issues of Agricultural Statistics of Pakistan and Pakistan Livestock Census 2006 (GoP, 2006).

Out of three feed production units provided in the Project, two were installed and became functional in 2008. One unit installed at rainfed site in village Lodhay, Tehsil Gujar Khan, District Rawalpindi and second at irrigated site in Chack No. 105

SB, Sargodha. Technical support and formulation of the balance feed for milking and meat animals was also provided by the experts to the entrepreneurs at community level. The required information about the machinery and equipment cost, labor charges involved in the installation, level of production and input costs involved etc. were collected from the individual entrepreneurs.

Investment appraisal analysis was carried out to determine the extent of incentives for future investment in balance feed enterprise. The entire subsidy and the expenditures of the farmers in the establishment of the enterprise including the construction/rental charges of the buildings and family labor were included. The present market cost of the inputs was used. To calculate the fixed cost depreciation @ 5% on initial investment and 12% interest rate was used.

If the feasibility study or business plan shows that project will bring direct tangible benefits, the classical methods of project evaluation can be applied (Brzozowska, 2007). Having data of projected capital expenditures, projections of turnover, income and cost statement projections and effect on expected cash flows the further evaluation can be lead through different stages. The one is the calculation of the payback period ratio, accounting rate of return and break-even-point (Mishan, 1982). The second one, the most popular, is the assessment based on changes of value in time that is calculation of discounting ratios, like as NPV or IRR and others like sensitivity analysis, different scenarios or simulation game (Myers, 1984).

The formula used to calculate a breakeven point (BEP) is based on the linear cost-volume-profit (CVP) Model (Martin, 2009) which is a practical tool for simplified calculations and short-term projections. Breakeven point refers to the level of output where total revenue (TR) = total cost (TC). This is the minimum output the firm need to produce its costs. Any output thereafter will grant profit to the firm. Usage of breakeven point for corporate deci-

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sion making is called breakeven analysis. At breakeven point total cost is equal to total revenue. After breakeven point the profitability begins. The output less than breakeven output shows losses. Every firm aims at breakeven level of output in the beginning. The breakeven level is a no profit no loss condition. In other words it is case of normal profits. The costs cover only the fixed cost and there is no surplus over that. It is similar to the condition  $AR = AC$ .

Therefore,  $TR = TC$  (1)

Equation (1) can be written as

$$P \times Q = TFC + AVC \times Q \quad (2)$$

And breakeven quantity is derived from equation (2) as

$$Q = TFC / (P - AVC) \quad (3)$$

where,

TR = total revenue

TC = total cost

P = price of output

AVC = average variable cost

TFC = total fixed cost

Q = output

Two simple methods are commonly used to appraise investment decisions: (i) "Payback period" and (ii) "Return on Capital". Payback period is simply based on the time taken to repay the capital invested, a guide for decision-making. In other words, if a project has the ability to pay back the investment within a predetermined period, it is worth investing, otherwise no need to invest. This method can also be used for comparing the project in hand with other projects, i.e. the projects can be ranked based on speed of "pay-back". The earliest paying-back projects are naturally most favored over the slow ones (Lumby, 1991).

"Return on Capital" is used for investment decision-making. In this method profit from an investment is estimated after deducting depreciation cost and before incorporating taxation allowance (Lumby, 1991). Both methods have pros and cons. In addition, there are two more advanced techniques based on analysis of discounted cash flows (DCF) that are "Net Present Value" (NPV) and "Internal Rate of Return" (IRR).

## Net Present Value (NPV)

The basic criterion of this assessment is that an investment is said to be worthwhile, when the money received from an investment is at least equal to the money invested. The decision rule of this technique is to accept those projects which have a positive or zero net present value and reject those investment which have a negative net present value (Lumby, 1991). The present value of an investment is the sum of its net discounted future cash flows:

$$NPV = \sum_{t=0}^n \frac{A_t}{(1+r)^t} \quad (4)$$

Where, " $A_t$ " is the project's cash flow (either positive or negative) in time (takes on values from year '0' to 'n'. where 'n' represents the point in time when the project comes to the end of its life) 'r' is the annual rate of discount or the time value of money (which is here assumed to remain a constant over the life of the project).

## Internal Rate of Return (IRR)

The internal rate of return (IRR) is known as the rate of discount, which applied to an investment's cash flow, produces zero net present value (NPV). Simply IRR is the value of 'r' which satisfies the following expression:

$$\sum_{t=0}^n \frac{A_t}{(1+r)^t} = 0 \quad (5)$$

The decision rule in this approach is to accept that investment having an IRR greater than or equal to the market rate of interest.

These two methods were used to assess the financial viability of the enterprise. In addition to it the per unit production cost was calculated with different levels of the production to identify the breakeven point.

To get farmers' perceptions and effect on milk yield a survey of the farmers using the balance feed from both the villages was carried out through purposive random sampling. In total 40 farmers were interviewed. Descriptive analysis was carried out and compared "T" test was used to get comparison of the milk yield before and af-

ter the use of balance feed.

## RESULTS AND DISCUSSION

### Overtime Fodder Availability

The livestock population in Pakistan is at present under severe nutritional stress, as the base for its feed supply has been progressively eroding. This is due mainly to the exploitative system of utilizing plant and animal resources; 60% of the geographical area of Pakistan, nearly 48.56 million ha out of 80.95 million ha (mainly used at present for grazing of livestock) is threatened with desertification. The carrying capacity of rangelands has been reduced by 10-50% of their potential (Muhammad and Naz, 1985). Around 16-19% of the total cropped area is planted to fodder crops annually. The area under fodder crops has been reduced during the past decade or so without significant corresponding increase in yield of fodder crops (Gill et al., 1979). The situation has further worsened and the present fodder production in the country is far from satisfactory. Area under fodder crop has declined from 2.75 million ha in 1986 to 2.45 million ha in 2006. The number of livestock heads has increased from 110.238 million heads in 1996 to 154.289 million heads in 2009. The livestock population and fodder production are inversely related. The fodder area per adult animal unit has significantly declined from 0.067 ha in 1986 to 0.035 ha in 2006.

### Ownership and Investment in Small Scale Feed Enterprise

The community members selected the

entrepreneurs for the running of the feed units. Both the persons are socially linked very well with the farming community and also have some entrepreneurship skills and business orientation. Both the units are funded through the project with machinery cost of around Rs. 80,000/- each. The installation cost, building along with the provision of electricity and inputs were provided by the entrepreneurs at both the sites. However, technical guidance along with feed formulation was provided time to time by the concerned experts from NARS involved in the project.

### Ingredients of the Balance Feed

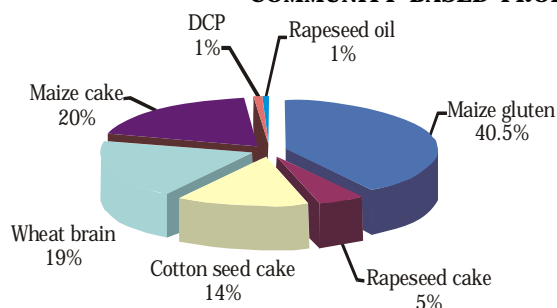
The prices of inputs may vary from season to season. The prices of inputs purchased during January 2009 at irrigated site and during March 2009 at rainfed site are reported (Table 1). The formulation was done according to the availability and prices of different potential ingredients keeping in view the quality aspect in terms of percent protein and energy in the feed. At rainfed site the maize gluten followed by maize cake, wheat bran and cotton seed cake (CSC) are the main ingredients both in terms of input and cost except for CSC which is ranked third in terms of cost and fourth in terms of weight. Composition of feed ingredients and their percent share in the cost are presented in Figures 1 and 2.

At irrigated site the formulation was little different with cotton seed cake making the major share both in terms of weight (47.5%) and cost (53.4%) followed by wheat bran, maize gluten and maize cake (Table 2). Percent share by weight and cost of different ingredients used at irrigated site

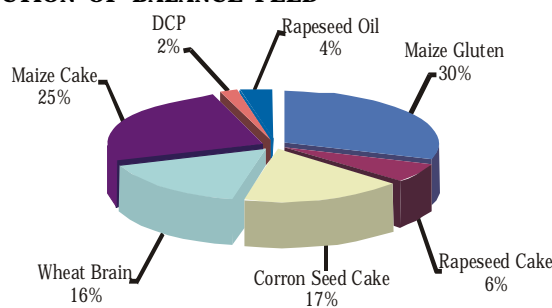
**Table 1. Formulation and input prices of balance feed at rainfed site**

Inputs	Prices	Percent Share	
	Rs kg <sup>-1</sup>	Inputs	Cost
Maize gluten 30% protein	15.00	40.5	30.45
Rapeseed cake	24.77	5.0	6.21
Cotton seed cake (CSC)	23.97	14.0	16.82
Wheat bran	16.97	19.0	16.16
Maize cake	25.00	20.0	25.06
Dicalcium phosphate (DCP)	36.00	1.0	1.80
Rapeseed oil	140.00	0.5	3.51

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**Figure 1. Feed composition at rainfed site feed unit**



**Figure 2. Cost composition at rainfed site feed unit**

feed unit (Figure 3 and 4).

**Breakeven Analysis**

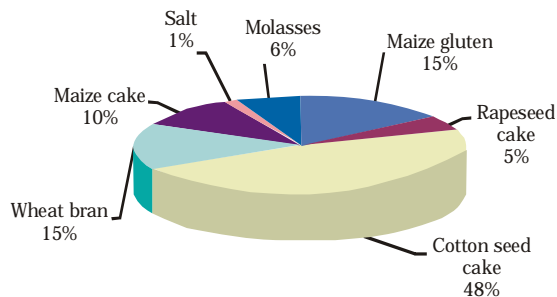
The Breakeven Analysis is an important management tool and control device. The analysis shows the point at which a business has covered its expenses and begins a profit. It is based on breaking down costs into 'variable costs' (costs that are directly related to the manufacture or production of a product or those necessary in providing a service) and 'fixed costs' (costs that remain fairly constant and are not affected by a change in output) and comparing those costs to certain levels of sales.

Breakeven point is the point at which the product stops costing money, and starts to generate a profit for the venture. The principle behind this is to plot a graph of the total cost and total revenue against the volume of production. The intersection of the lines is the breakeven point and it indicates the minimum units to be produced to come out of loss situation. The given volume of production, the break even can also be found out in terms of time.

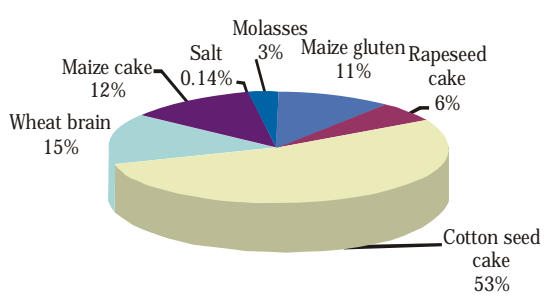
The daily units breakeven are 60 kg at rainfed site and 67.7 kg at irrigated site with daily revenue breakeven of Rs. 1283 and Rs. 1313 respectively (Figure 5 and 6). Based on the results of breakeven analy-

**Table 2. Formulation and input prices of balance feed at irrigated site**

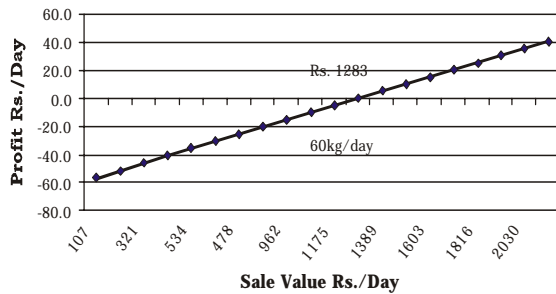
Inputs	Prices Rs kg <sup>-1</sup>	Percent Share	
		Inputs	Cost
Maize gluten	13.0	15.0	10.97
Rapeseed cake	21.5	5.0	6.05
Cotton seed cake	20.0	47.5	53.44
Wheat bran	17.4	15.0	14.64
Maize cake	21.3	10.0	11.95
Salt	2.0	1.3	0.14
Molasses	8.0	6.3	2.81



**Figure 3. Feed composition at irrigated site feed unit**



**Figure 4. Cost composition at irrigated site feed unit**

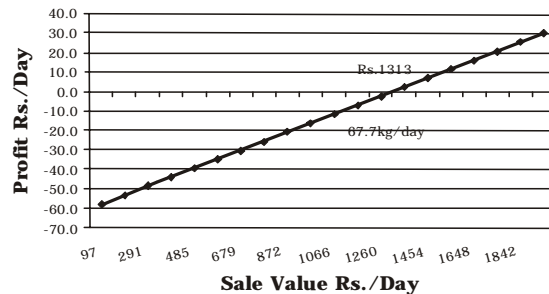


**Figure 5. Breakeven for feed unit at rainfed site**

sis 1.8t of feed in a given month be sold to breakeven and have at least sales of Rs. 38436 per month at rainfed unit. Similarly unit at irrigated site have to keep sales of at least Rs. 39375 per month by sale of about 2.04t of feed.

**Investment Appraisal**

The balance feed production unit at rainfed site was installed in August 2008 and at irrigated site, in September 2008. Both work on electric power. The investment cost includes the cost of feed mixer, grinder, weighing machine, electric meter charges, installation charges, cost of building etc. The total cost of machinery was about Rs. 80000. The other fix costs such as installation and electricity connection was about Rs. 7000 and was paid by the entrepreneurs. Depreciation, interest on the investment, fix rent of building, monthly electricity meter charges, etc were also included in the fixed cost. The labor cost, rental charges and output levels were calculated mainly by the information provided by the concerned producers on the number of laborer used per day, wage rate and the number of bags produced per day etc. At present these entrepreneurs were selling the feed mix at no profit no loss base that just cover the input, labor and power cost. For commercial purpose profit @ 5% over the variable cost was used as desired by both the producers. Assuming the sales of around 0.6t day<sup>-1</sup> (220t year<sup>-1</sup>) at half of the production capacity and 25 years of life of the machine, the NPV was positive and the IRR was also very high 205% for feed



**Figure 6. Breakeven for feed unit at irrigated site**

unit at irrigated site and 225% for feed unit at rainfed site. These two factors provided a good justification for the investment. Although the installed capacity is much higher yet keeping in view the marketing and other unforeseen problems the sale level was kept low at around 50% per working day (Table 3).

**Table. 3 Investment appraisal**

Variable	Lodhay (rainfed)	Chack 105 SB (irrigated)
Cost Rs. kg <sup>-1</sup>	20.35	18.46
Sale price Rs. kg <sup>-1</sup>	21.37	19.39
Fixed cost Rs. day <sup>-1</sup>	61.08	62.50
NPV	5,885.16	5,968.22
IRR	225%	205%

**Economic Production Levels**

The balance feed was being sold mainly in the project villages at comparatively cheaper prices than the feed available in the market. There are competitors from the private sector in feed mixtures like National Feeds and other companies. Generally farmers used to feed cotton seed cake and it was still considered as good concentrate. However, the entrepreneurs were hopeful in the business of balance feed as the quality of this feed was much better due to the first-rate formula and good quality inputs than the other concentrates available in the market. Difference in sale and produce price was only about Rs. 1 kg<sup>-1</sup>. The fixed cost and maintenance charges per unit of output decreases as the production level increases therefore, main difference in profit may vary with the difference in production levels (Table 4).

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**Table 4. Profit range according to the sale volume at two sites**

Sale (kg/day)	(Profit Rs./day)	
	Lodhay (rainfed site)	Chack 105 SB (irrigated site)
0	-61.1	-62.5
40	-20.4	-25.6
80	20.3	11.4
200	142.4	122.1
400	345.9	306.8
600	549.5	491.4
800	753.0	676.1
1000	956.5	860.7
1200	1160.0	1045.4
1400	1363.5	1230.0
1600	1567.0	1414.6

**Current Sale Levels**

In the beginning feed experiments were conducted and feed was provided free to the participating farmers for three months. There were also problems in operating the machine. Feed production and marketing was also a secondary source of income for the selected entrepreneurs. However, due to the constant follow up and demonstration through feed experiments demand had been generated among the community as a result the interest of the entrepreneurs was developed further. Therefore, the sale of the balance feed had increased from 1.5t month<sup>-1</sup> from January 2009 to 4.18t month<sup>-1</sup> at irrigated site and 17.76t at rainfed site during October 2009. The concerned person at rainfed site has started marketing outside the village and also supplying at feed stores in the nearby town market where as the key person at irrigated site was selling at the production point only.

**Farmers' Perceptions about Balance Feed**

In the opinion of the participating and fellow farmers, balance feed introduced in the project significantly improved milk yield, health of the animals and the level of cash benefits through the sale of additional milk. Farmers reported 0.5 to 2 liters per day increase in milk yield with the use of balance feed. The paired sample 'T' test depicts statistically significant differ-

ence ( $P < 0.05$ ) in milk yield before and after the use of balance feed. The balance feed was being sold at competitive prices with other available feed rations in the market. There is also saving in terms of time (1-2 hours per visit) and transportation cost (Rs. 10-15 bag<sup>-1</sup>) incurred if farmers had to purchase from market. Furthermore, the locally produced balance feed was cost effective over the conventionally used cotton seed cakes. Although there was no significant improvement in the milk yield with balance feed over cotton seed cakes yet farmers' reported that it was better than cotton seed cakes in terms of quality and effect on animal health.

The intervention provided better competitiveness, sustainability, accessibility with inclusiveness of small holders along with scalability option for the entrepreneurs. As the enterprises were at its initial stages of development and there was need of more demonstration for rapid adoption of the balance feed. Demonstration and sale promotion activities would help the entrepreneurs to expand the balance feed production and achieve sale targets. Keeping in view the scale of livestock sectors in the country there is need to develop such small scale enterprises for increasing the productivity and profitability on one hand and employment generation on the other hand.

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