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ASSESSMENT OF GOAT BREED IMPROVEMENT THROUGH DISTRIBUTION OF BEETAL BUCKS IN RAINFED POTHWAR, PUNJAB

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ABSTRACT: The present paper is based on the assessment of goat breed improvement intervention through supply of 65 Beetal bucks in rainfed Pothwar. To judge short term impact and assessment, a survey was carried out of both buck holder and non-holder beneficiaries in six project tehsils, after one year of buck distribution. Data were collected from a sample of 38 buck holders and 31 beneficiary farmers using a structured pretested questionnaire. The main influencing factor in keeping bucks was goat breed improvement. All the sample respondents were convinced of the benefits of crosses with Beetal buck and reported that the offsprings Beetal were of higher body weight (40% higher), good looking and well built. Regarding the suitability of Beetal with fodder and forage in the area, majority of the farmers (73%) considered it more suitable. There was a price difference of Rs. 1277 for male kids and Rs. 697 for female kids of the same age than the kids from local buck crosses. The farmers believed that the price difference was not only due to the higher weight but a better look and better structure of the Beetal goat. Farming community showed keen interest in using this intervention on a regular basis.

Key Words: Beetal Buck; Goats Breed Improvement; Assessment; Survey; Pakistan.

INTRODUCTION

Small ruminant production constitutes an important part of agricultural economy, contributing substantially to household income and food security. Many studies on small ruminants in developing countries have indicated their importance to the livelihood of farmers (Ngategize, 1989; Teufel et al., 1998; Braker et al., 2002).

Among the small ruminants, goat is a multi functional animal and plays a significant role in the economy and nutrition of landless, small and marginal farmers in Pakistan. Goat rearing is an enterprise which has been practiced by a large section of population in rural areas (Khan et al., 2006). Goats can efficiently survive on available shrubs and trees in adverse harsh environment in low fertility lands where no other crop can be grown (Fisher, 1983).

Goats possess characteristics like versatility in harvesting forage and ability to survive under adverse foraging conditions that set them apart from other livestock species. Tolerance of goats toward bitterness plays an important role in maximizing grazing capacity and in biological control of weeds (Lu, 1988). In general, goats have heat resistant characteristics and less susceptible to heat stress than their livestock counterparts (Lu, 1989).

Goat keeping has been a traditional activity in rainfed Pothwar area of Pakistan. It is also a primary source of livelihood for people below the poverty line. Furthermore women are mainly involved in rearing the livestock as Ahmed et al. (1988, 1993) had reported that majority of rural women are engaged in livestock related activities with up to 70% contribution for the sector. Freedman and Wai (1988) have pointed out that livestock production and management is mainly the job of women in *barani* agriculture. Masood and Mahjabeen (1989) also noted that women are engaged in 10 out of 14 livestock production and management activities in the *barani* areas of Pakistan. Taj et al. (2007) who studied the gender involvement in rainfed agriculture of Pothwar in Pakistan

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have reported similar trend in which women role in livestock related activities is high (60-90%). According to Pakistan Livestock Census (GoP, 2006) the total goat population in Punjab was 19.83 million which was about 37 % of total goat population in the country. Isani and Baloch (1996) have described 34 breeds of goat, of which the most important are Beetal, Dera Din Panah, Kamori, Nachi and Teddy. These breeds are of varying potential in producing meat, milk and fiber. Amongst the goat breeds of Pakistan "Beetal" goat is important due to its better production performance. Beetal particularly the Brown Beetal goat breed is of high repute both for meat and milk production. As Khan et al. (2006) has described that the Beetal breed is used for meat and milk production. The males have long twisting horns. The breed is similar to the Jamnapari but is superior to it in that it is more prolific and more easily adaptable to different agro ecological condition. Males are raised especially as sacrificial animals for slaughter on Eid-Ul-Azha.

Acharya et al. (1982) reviewed the research done on the genetic aspects of goat production in India and concluded that Beetal could be considered as possible improver breeds for increasing size and milk production. On the basis of purebred performance the Beetal can also be considered the best dairy breed followed by Jamunapari, Jhakrana, Barbari, Marwari and Sirohi.

There are only a few examples of genetic improvement programmes (successful or otherwise) of goats belonging to smallholders in low input production systems in developing countries (Kosgey et al., 2006). Yet, genetically-improved, efficient goats are extremely important for these very poor goat keepers. In the rainfed Pothwar, however, the local and mix breed goats have low productivity partly due to slow growth rate which is mainly attributed to breed type, although other factors such as disease challenges, poor nutrition and management are known to contribute to this. Keeping in view the number of goats and their contribution to the livelihood of poor farmers, particularly landless and women initiatives for the improvement of local goat breeds in Pothwar area were also taken through provision of Beetal Bucks in Barani Village Development Project (BVDP). The main objective of this intervention was to improve meat, milk and fiber potential of native goat breeds through crossbreeding with brown Beetal. A study was planned specifically for assessment of breed improvement intervention with the objective to understand farmers' perceptions for the adoption of the goat breed improvement, to assess the benefits and impact of distribution of Beetal buck and provide feedback to the concerned scientists and development departments.

MATERIALS AND METHODS

Improvement in performance of flock or livestock population over time can arise through improvement in management and feeding conditions and through genetic improvement by the use of genetically superior animals (Singh and Acharya, 1982). To improve performance of local goats in the project area, a crossbreeding trial was conducted at Integrated Research Site (IRS). This was done by crossing Beetal buck with local goats by provision of buck to the community, the experiment was conducted at one IRS of BVDP where bucks were provided to selected farmers (from now on called "buck holders") with a promise to provide breeding facility to the community farmers (from now on called "other beneficiaries") free of cost. The resulting crosses from this programme had more birth and weaning weight than local with faster growth rate. Therefore, to improve goat productivity, and hence economic returns and increased income from small ruminants' improvement in goat breed came out as a potential research outcome of BVDP applied research component. Crossbreeding with this breed was done on wider scale through provision of 65 bucks in different community organization in the six project tehsils. For short term impact and assessment, survey was carried out for both buck holders

and the beneficiaries in six project tehsils after one year of bucks distribution. The buck holders had availed maximum services and could provide information on the buck performance. Therefore more emphasis was made on the buck holders. Data were collected from a sample of 38 buck holders and 31 beneficiary farmers using a structured pretested questionnaire (Table 1).

Data was collected on farmers' socioeconomic characteristics, size of land holding, herd size, adoption, diffusion process, and benefits and constraints of Beetal buck intervention along with comparison with the off springs from local bucks (Table 1). Descriptive analysis was carried out to analyze the data. Paired sample 'T' test was used to compare the differences and impact of Beetal crosses. Qualitative aspects were also studied and analyzed using crosstabs and chi-square statistics. The conclusions and recommendations are made on the basis of the results and group discussions with the community members.

RESULTS AND DISCUSSION

Socioeconomic Profile of the Sample Respondents

Buck Holders

The buck holders were relatively more educated with nearly 9 years of education on average. Only 5% of the buck holders were illiterate and half of them were having ten years of education. The average age of buck holders was about 41 years. Majority of them (95%) were Community Organization (CO) members. The buck holders were also classified into farm categories and it was found that one fourth of the sample respondents were small farmers having less than 2 ha of land, two thirds were medium farmers having 2-5 ha of operational land holding. The remaining 42% were large farmers having above 5 ha of land. Bucks were given to farmers having more number of goats. Half of the buck holders were herder cum farmer while the other half were mix crop and livestock farmers.

Beneficiary Farmers

They were having six years of education with average age of 37 years and 15 years of farming experience. Literacy level of the beneficiary farmers was low as 71% were educated as compared to 95% in buck holders. The average land holding of the sample beneficiary farmers was 6.41ha. Almost similar characteristics of the sample farmers were noted by Devendra and Coop (1980) who had outlined the characteristics typical of small-scale farmers and their livestock in many parts of the world.

It was noted that even landless people, rearing goats, were getting the benefits from this intervention. They also identified the landless agricultural labourer as a further category of goat owner. Often the person who cares for the animals is a woman. This can result in problems of communication in countries where most of the extension agents are men, and there are social or religious barriers between them (Jiabi and Sinn, 1992; Sinn and Wahyuni, 1996). When the beneficiary farmers were classified according to the farm category 10% were landless but rearing goats, 39% were small, 16% medium and 35% large farmers. It is evident from the results that goat farming is a common activity regard-

Table 1. Sample size by Tehsil

Tehsil	Buck Holder		Beneficiary		Overall
	Frequency	Percent	Frequency	Percent	Frequency
Jand	8	21	8	26	16
Attock	5	13	4	13	9
Pindi Gheb	9	24	8	26	17
Talagang	6	16	7	23	13
Gujar Khan	2	5	2	6	4
Pind Daddan Khan	8	21	2	6	10
Total	38	100	31	100	69

less of the land holding/ownership as landless to large farmers were interested in the goat breed improvement. Majority of the beneficiaries (77%) were mix crop livestock farmers, 17% were herder-cum-farmers while 7% were herders only.

Livestock Composition of the Sample Respondents

The animal heads were converted into animal units. It was found that the buck holders were having 12.31 animal units. Out of the total animal units more than half (51.37%) were small ruminants. While out of total 41% were goats. So it was apparent that goats were the main livestock of the buck holders. Out of the small ruminants 80% were goats while 20% were sheep. Other beneficiary farmers who availed the services of Beetal buck had 8.34 animal units, of which more than 50% animals units were of small ruminants (Table 2). Even within the small ruminants major share was of goats. The results depicted that goat farming was a major activity in the project area.

Influencing Factors to Keep Beetal Buck

Goat-keeping households regularly take decisions regarding which bucks should be used for breeding or which does should be culled (ISGP, 1993). The main influencing factor for buck holders to keep the buck for breeding was goat breed improvement of own and the fellow farmers. As the farmers were selected through CO, collective action, common interest and welfare of the fellow farmers was also considered equally important by the buck holders. Most of the farmers (84 %) wanted to have first hand experience and wished to be known as early adopters. Majority of the farmers (58 %) were nominated by the CO while the remaining were volunteers and received bucks through direct contact with the concerned agencies involved in the distribution of bucks.

Breeding Service Mechanism

At present in most of the areas farmers having bucks provide free services to the community for natural breeding of goats. As it is clear from the results, that 90% of the buck holders reported that free service is the prevalent norm in the area. Out of the sampled buck holders only five (13%) were getting service charges @ Rs. 25 per goat. Although free service was a prevalent norm in the area yet 60% buck holders who charged for service reported that farmers paid the charges happily while the rest reported that the beneficiary farmers showed reluctance.

Regarding the method to provide services 70% buck holders reported that they provided services to other farmers only if the latter brought goats at their farms while 23% gave bucks to other farmers in the same village if desired. Only 6% buck holders gave buck to farmers from other villages. All farmers considered that this mechanism is suitable for goat breed improvement. However few also demanded that along with Beetal buck Beetal goats should also be provided. Regarding the requirement of the area with respect to number of goats in the village, buck holders were of the view that they could not meet the requirement of the village/area. At present only about 36% farmers of the village were getting services of Beetal buck.

On an average each buck extended 77 services since these were distributed. Only few buck holders gave buck to the farmers in other villages and the number of other villages ranged from 1 to 6. However the

Table 2. Livestock composition of the sample respondents

	Buck Holder	Beneficiary	Overall
Animal Units	12.31	8.34	10.53
Large Ruminants (%)	48.63	48.84	48.70
Small Ruminants (%)	51.37	51.16	51.30
Goats (%)	41.21	38.64	40.30
Sheep (%)	10.16	12.52	11.00

farmers from other villages brought their goats and on an average 20 services for other villages in a radius of 5 km were provided. The buck holders lending the bucks reported that farmers kept bucks for one to twelve days. No problem in getting back the bucks was reported as the farmers themselves returned the buck. The buck holders were of the view that buck could provide only 4 services (2-8) per day at maximum.

Cost of Rearing Beetal Buck

Extra care and feed was given to the Beetal bucks by almost all the sample buck holders. Farmers reported that they used to feed concentrate to the buck throughout the year except only for about three months when there was excess of green fodder availability. Cotton seed cakes (CSK), wheat bran and grains mixed with wheat straw were the main concentrates fed to the bucks. Some farmers also reported feeding gram. In addition to these concentrates oil and *desi ghee* were also fed each season mostly twice a year. The total concentrate cost per year estimated was nearly 1900 while the fodder/grazing and management cost was approximately Rs.23 day^{-1}. The total cost of feed and management was about Rs. 28 day^{-1}.

Benefits Realized from Beetal Buck Crosses

Crossbreeding is a logical step to improve milk production of indigenous goats, and has been done in many countries (Galal, 1987; Ricordeau, 1981). Crossbreeding with European dairy goat breeds has in most cases resulted in large increases of milk production, even where environmental and management factors may not have been ideal (Sahni and Chawla, 1982). The option of crossbreeding to introduce suitable genetic material for milk production is a much more rapid method than that of attempting to improve milk yield of local goat breeds by selection (Sands and McDowell, 1978). Meat is usually the most important product of goat farming, and can also be a significant source of income for fiber and milk production enterprises (Smith, 1992). It is an important source of protein in many developing countries of the world (Casey, 1992), especially in Asia (Saithanoo and Huq, 1992). Although the present paper is based on a short run assessment of breed improvement, yet almost similar results were reported by all the sample respondents who were convinced of the benefits from the crosses with Beetal bucks and reported that the kids after crossing from the Beetal buck were of higher body weight, good looking and well structured. One of the means of increasing the contribution of meat from goats is the greater exploitation of available genetic resources (Devendra, 1987), especially meat breeds in Asia, large breeds of goats have been crossed with smaller breeds to achieve faster growths. Cross-breeding of Beetal with Alpine and Saanen revealed a nearly two fold improvement in growth rates over a 12-month period in Alpine x Beetal and Saanen x Beetal males (Raghavan, 1987). Some of the farmers who availed the benefits by selling at Eid reported that they received higher prices. Less disease incidence was also reported by some farmers. Regarding the suitability of Beetal with fodder and forage, majority of the farmers (73%) considered it more suitable. Only few farmers had kept goats of F_1 and positive impact on the milk yield in F_1 goats was reported.

However some of the farmers were also of the view that there was no difference in milk yield between the F_1 goat and her mother (Table 3).

Comparison with Local Bucks

As most of the sample farmers were crossing some of their goats with Beetal and some with local (mix breed) bucks, therefore a comparison of both on different aspects was also recorded during the survey (Table 4). The analysis shows that the buck holders had crossed most of their goats (70%) with Beetal buck while the beneficiary farmers had crossed nearly half of the goats with Beetal buck. The information about the goats crossed was also collected.

Table 3. Benefits realized from Beetal buck crosses (Percent Response)

	Buck Holder	Beneficiary	Overall	Sig.
Higher body weight of kids	100	100	100	a
Good looking and well structured animals	100	90	95	0.113
Higher value at Eid	46 (11)	68 (21)	58 (32)	0.087
Less disease incidence	19	35	27	0.000
Suitable for fodder/forage at farm	62	84	73	0.002
Effect on milk yield in F_1				0.524
High	16	13	14	NA
No difference	5	13	9	NA
Not observed/Sold	79	74	77	NA

a =No statistics are computed because higher body weight to fetch better prices is a constant.
NA=Not Applicable

Table 4. Comparison of Beetal buck with local buck

Parameter	Buck Holder		Beneficiary		Overall		Sig.*
	Beetal	Local	Beetal	Local	Beetal	Local	
No. of goats crossed	11.00 (70%)	4.66 (30%)	6.42 (43%)	8.38 (57%)	8.94 (61%)	5.67 (39%)	0.017
Age of goat (No. of kidding)	2.52	2.46	2.13	2.03	2.33	2.23	
Success rate (%)	97.42	96.92	97.68	89.64	97.54	93.15	0.024
No. of kids born per goat	1.29	1.61	1.82	1.83	1.55	1.73	0.059
Present age of kids if not sold (months)							
Male	2.6	2.8	3.0	2.9	2.8	2.9	
Female	2.9	2.9	2.7	2.9	2.8	2.9	
Present price Rs.							
Male	2248	1707	2339	1544	2290	1636	0.000
Female	2024	1383	1905	1468	1969	1418	0.000
Price difference over local (Rs.)							
Male	541		795		654		
Female	641		437		551		
Weight difference (%)							
Male	46	30	38	0.000			
Female	49	28	38	0.000			
Age at selling (months)							
Male	4.33	4.75	7.08	7.59	6.44	7.03	0.324
Female	7.00	7.00	8.50	8.80	8.29	8.50	
Selling price							
Male	2900	2250	5120	3770	4592	3517	0.001
Female	4000	3100	3700	2917	3738	2845	0.025
Price difference (Six month age)							
Male	1176		1359		1277		
Female	771		623		697		

**Using paired sample t-test*

Majority of the goats were in second and third lactation age and of mix breed. No significant differences in the success rate and number of kids born was observed between the inbred and crossbred cases as beetal crosses produced 1 to 2 kids. These results are similar to those summarized by Devendra and Burns (1983), ranging from 1.0 to 2.3 kids per parturition. This was also in agreement with the data reported by Sands and McDowell (1978), with a range of 1.0-2.0. Mrema (1996) in Botswana reported an average of 1.5 kids per female goat each year, which would indicate a good reproduction rate. The present age of the kids was less than three months. Difference in present prices and weight of the same age kids was inquired and it was found that Beetal male kids fetched 650 rupees more price than the local ones and female kids fetched 550 rupees higher price. Data on the sold animals was also recorded according to their age and then the prices were converted into six months age. It was found that on the actual selling prices there was a price difference of Rs. 1277 for male kids and Rs. 697 for female kids. Higher price difference was observed by the beneficiary farmers than the buck holders. Similar to prices there was a clear difference in body weight of the kids. According to the farmers' estimates based on judgement nearly 40% higher body weight of three months kids (available with farmers) was reported. The farmers were of the view that the price difference was not only due to the higher weight but a better look and better structure of the Beetal goat were also contributing factors.

Net Profit

A programme will not be adopted if it is not perceived to be of benefit and to be self-sustaining. The economy of the household, which involves family labour and time allocation as well as money, must be considered (Low, 1986). Therefore the economics of this development activity was evaluated within the context of the recipient community.

Assuming the same number of kids born per goat as reported by the sample farmers (Table 4) and 1:1 male female ratio from both local and Beetal bucks, net profit per year per goat is calculated using price difference at the age of six months. Farmers gained an additional price of Rs. 1979 from male off-springs and 1080 from female off-springs from Beetal buck resulting in net profit of Rs. 3059.7 per goat.

On an average the sample households (both buck holders and beneficiaries) have crossed 8.94 goats with the Beetal buck. The analysis on per farm basis depicts very promising results as farmers could gain upto Rs. 27353 per year (Table 5).

The information on the service mechanism was also collected from the beneficiary farmers also. The beneficiary farmers were satisfied about the buck distribution mechanism and the selection of the buck holders. However they were of the view that only one buck in the village could not meet the requirement as according to their guess at present the Beetal buck was fulfilling only 13% of the total demand.

The results indicate that goats constitute a major portion of the livestock and were kept by all farm categories including

Table 5. Net Profit through crosses with Beetal buck

No. of kids born per goats with Beetal cross		1.55
Male female ratio (assumption)		1:1
Additional price from male six months age		Rs. 1277
Additional price from female six months age		Rs. 697
Additional profit from male offspring	Rs. goat^{-1} year^{-1}	1979.35
Additional profit from female offspring	Rs. goat^{-1} year^{-1}	1080.35
Net profit through crossing with Beetal buck	Rs. goat^{-1} year^{-1}	3059.70
No. of goats crossed with Beetal buck per farm		8.94
Profit per farm (sample respondents)	Rs. year^{-1}	27353.72

landless non-farm rural households. As the survey was conducted taking purposive random sample of the farmers having goats and who had availed the services of the Beetal buck, therefore it was natural that the number of goats may be higher at sample farms/households than the overall average. An increasing trend in the adoption of the Beetal breed through crossing with the local goats was observed as the buck holders were crossing majority (70 %) of their goats with the Beetal buck. Similarly the perceptions of the beneficiary farmers were also positive about the performance of Beetal buck crosses. The other economic benefits were also apparent and most of the farmers had gained higher returns (prices) of the kids from Beetal buck cross. The adaptability of the breed with local conditions was also high and compatible with the feed resources available. It was reported that the kids from Beetal cross were more suitable to graze at bushes top because of more height. No additional feed or management was required. The increase in milk yield would also play a vital role in the milk requirement and livelihood of the people in this region. The bucks were distributed late after the heat period was over but still farmers' acceptability was high. Therefore, the impact of the goat breed improvement through distribution of Beetal bucks would be more clear and significant in the coming years.

The farmers had experienced returns ranging from Rs. 700 to 1300 per animal more than their traditional breeds. Farming community was keen in using this intervention on a regular basis as they were fully convinced of the benefits of this intervention. The selection of the buck holders was good except for in few cases where bucks were provided to very large farmers who were not easily approachable for the fellow farmers. Farmers considered it against the norms to charge or pay for the buck services. It is recommended that care should be taken in selecting the buck holders so that access to the bucks is ensured.

No proper mechanism had been conveyed to the COs and the buck holders for replacement of the Beetal bucks. Very few farmers had kept the male kid for future crossing with the Beetal offspring. Further more some farmers were of the view that the buck holders should have also been provided pure Beetal goats to get the pure offspring for further crossing and also for getting pure breed. In light of these observations it is recommended that a proper mechanism should be devised through which CO under the supervision of livestock department should replace the bucks with the new young Beetal bucks. The older bucks could be sold and the income could be utilized for purchase of new bucks. CO funds could also be utilized if some additional money is required to continue this activity on sustainable basis.

As at present the bucks provided could not meet the demand of even one village, therefore it is recommended that communities should be motivated to purchase more Beetal bucks. The demonstration of benefits through brochures and field days could be helpful to motivate the goat farmers to purchase/replace their bucks with Beetal. However the livestock department should play a facilitative role in this regard.

It was found that farmers were feeding oil, *desi ghee* and eggs to sensitize and activate the bucks to get more services. The buck holder had very limited knowledge about the proper feed of the bucks. Therefore along with the bucks proper management and feed knowledge should also be transferred to the buck holders. The buck holders should keep bucks in top condition well before breeding season. They expend a lot of energy even without the actual breeding as they go into a "rut-type" period. The bucks should not be allowed to over breed and proper rest and pause needs to be recommended to get the best results on sustainable basis.

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