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Full Length Research Paper

Socio-economic, food and nutrient intake factors and nutritional status indicators associated with successful Livestock Development Programmes in Western Kenya

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Livestock projects were established to improve household food security and the nutritional status of household members by increasing the consumption of dairy products. Dairy farming dominates the livestock contribution to household economies and is one of the highest deliverer of the per capita milk availability in sub-Saharan Africa. Effort was been made to identify factors that associated with the success of dairy programmes by comparing beneficiary and non-beneficiary households of a dairy project on selected household variables in Kenya. Successful dairying was associated with increased; expenditure of time and income expended in the dairy enterprise, on veterinary services, and in knowledge on dairy management; increased consumption of milk and milk products and green leafy vegetables; increased intake of protein, vitamin A. The identification of household factors that were improved by dairy projects had promising returns for sustainable dairying, improved food and nutrient intake in households, and nutritional status of women and their preschool children. Inclusion of livestock as a policy issue in national goals and objectives could result in improved nutritional status and improved living standards.

Key Words: Livestock, dairy project, food and nutrient intake, women, preschool children, Western Kenya.

INTRODUCTION

Livestock Development Projects were established to improve household food security and the nutritional status of household members through increased availability and intake of dairy products in Western Kenya. The general goals of the livestock development projects [LDP] were to generate income and meet growing demand for animal-source-food [Hoffman, 2003]. Farming in rural Kenya is mixed crop-livestock systems with productivity per animal of land unit well below those of industrialized countries [Randolph *et al,* 2007]. Agriculture contributes over 25% to the Kenyan Gross Domestic Product, of which livestock contributes over half. Most of Kenya's dairy cattle are kept by smallholder farmers in crop-livestock systems in areas of high and medium cropping potential with low-external-input subsistence production [Hoddinott, 2006]. Smallholder dairying contributes directly and indirectly to food security and poverty alleviation of the smallholders in Kenya. Livestock play diverse economic and social roles in the national economies of Sub-Saharan Africa, often contributing to multiple livelihood objectives and offering pathways out of poverty [Randolph *et al,* 2007]. Keeping livestock is considered an alternative form of insurance, providing the family with assets that can be sold in times of crisis [Moll, 2005]. Considerable value is placed on livestock as an indicator of social importance within the rural community to strengthen social bonds, including the use of livestock to pay dowry [Wilson, *et al,* 2005]. Higher social status may translate into access to or authority over a broader base of resources in the community [Randolph, 2007]**.** Livestock provide meat and milk for households and cash income that is often invested in households' demands and crop production technologies [Powell, *et al*, 2004]. Intensification of dairy production has been shown to potentially raise milk production and income, especially where demand and infrastructure is favorable [Thorpe, *et al,* 2000]. Dairying is a very

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significant source of income and food for over 625 000 smallholder producer households and for those involved in the marketing of milk, in totals some 25% of all households [Muriuki *et al*, 2001].

Dairy production and marketing dominates the livestock contribution to household economies in Kenya and is one of the highest deliverer of the per capita milk availability in sub-Saharan Africa [Muriuki *et al*, 2001]. A majority of smallholder dairy producers rely on informal milk markets providing a source of employment for small-scale market agents [Staal, 2001]. Milk can help mitigate the effects of often large seasonal fluctuations in grain availability [Wilson *etal, 2005*].The household may own livestock forthe express purpose of producing for the market and for sales to meet urgent need for cash [Wilson*et al,* 2005]**.** Livestock can produce a regular supply of nutrient-rich Animal Source Foods [ASF] that provide a critical supplement and diversity to staple plant-based diets [Murphy *et al*, 2003]. Dairying has potential to improve nutrient adequacy [Azadbakht *et al*, 2005], reduce blood pressure and risk of stroke [Massey, 2001; Steffen *et al,* 2005], regulate weight gain [Rosell *et al*, 2006], and improve body mass index [Hollis et al, 2007]. Further, a lower prevalence of stunting and improved nutritional status, increased milk consumption and better food security situation been reported in households keeping dairy cattle [Mbagaya *et al*, 2004].

Livestock can worsen human nutrition and health when allocation of household resources such as land and labor to livestock reduces production, consumption and sales of other foods. Smallholder management systems are low-or-no-input, letting animals forage for themselves, feeding on plants or waste that otherwise would not be used [Randolph *et al,* 2007]. The relative prices for livestock products and feeds discourage farmers from using purchased inputs to develop intensive production systems [Rueda *et al*, 2003].

Resource constraints hinder productivity among the poor, whose livestock serve multiple roles and is a great contributor to the households' livelihoods base, strengthening the asset base. Livestock activities are integrated within household consumption and production decisions [Randolph *et al,* 2007], increasing drudgery among women. The labor allocated to livestock can increase total household labor demands, particularly for females, and reduce time and quality of care and feeding of young children, and thus affect their nutritional status. However, the introduction of livestock activities in households and the need to increase productivity of existing livestock does not necessarily translate into increased animal source foods. Smallholder dairy farms are not typically market-oriented management systems that are more intensive and dependent on purchased inputs, and the production is not consumed on-farm but sold to meet household demands [Hoffman, 2003]. Income-mediated effect on nutritional security may become diluted because only a portion of the income gain goes to food expenditures. Diets may not improve as income and food expenditures increase [von Braun *et al*, 1994].

Malnutrition remains a large persistent problem in this community, with diets based mainly on cereals, and low in several micronutrients [Neumann *et al*, 2003]. Cereal diets are important sources of phytic acid and dietary fiber, which inhibit absorption and (or) retention of nutrients such as iron and zinc [Gibson, 1994]. Malnutrition lowers human capital development and productivity constraining macroeconomic performance and potential for economic growth [Waithaka *et al*, 2006]. However several agricultural projects failed to demonstrate any improvement in the nutritional status of vulnerable groups and also improve the household food security situation [von Braun *et al*, 1996; Kennedy, 1988; Rubin, 1988; Kennedy *et al*, 1990; Rubin, 1990].

Livestock development projects seek to increase productivity of livestock products and improve household food security by introducing the exotic dairy bred that not only have higher milk-yield potential but also replace the low genetic potential zebu cattle that dominate the area. These projects may contribute to the general social and economic improvement in households, which may not necessarily have been part of the project objectives. The purpose of the present study was to identify socio-economic, food and nutrient intake factors and nutritional status indicators associated with successful Livestock Development Programmes in Western Kenya.

MATERIALS AND METHODS

The study was carried out in Vihiga County, Western Kenya using a cross sectional survey design, with a case-control model. Livestock interventions have been initiated in this area in view of the manifestation of negative developmental characteristics, including high levels of poverty. The Project targeted women farmers who were members of active women groups who must have had an established a Nappier grass plot (Pennisetum purpureum), constructed a zero-grazing unit and must have acquired basic facilities for disease control. Women beneficiaries of the LDP were trained in basic dairy management skills and were provided with chuff-cutters, rain water catchments roof tanks, relevant on a cost-sharing basis to reduce drudgery. The programme had to create motivating conditions for more productive participation by women in the ownership and dairy management through training and provision of workload easing facilities.

Women heads of households were the respondents who provided information on selected variables of the study. Data on food and nutrient intake, weights and heights

Body mass index (BMI) was used as an indicator of nutritional status of women. Women falling below 18.5 were considered malnourished, while those below 16 were classified as severely malnourished.

Recruitment Strategies

Qualification for inclusion in this study was based on a woman's participation in the dairy program for at least three consecutive years. Women non-beneficiaries of the range, socio-economic status and time duration as mixed crop- livestock farmers.

The measure of the program participation for the beneficiary women was continued membership in a women group for at least five years. Definition of non-beneficiary comparison was based on non-beneficiaries in the dairy program who lived in the same geographical area, of similar age and near-comparison socio-economic status as the beneficiaries.

Data analysis

All variables were entered into a correlation matrix with nutrition status of preschool children. The Stepwise Discriminant function analysis was undertaken to trace the order and best sets of variables which have the highest power of discrimination between beneficiary and non-beneficiaries. This method was one of selecting a linear function, which would best discriminate between beneficiaries and non-beneficiaries of a livestock development projects on the basis of certain selected variables. Discriminant functions were fitted for socio-demographic factors, patterns of food intake in households by women and preschool children, and patterns of nutrient intake in households, and by women and preschool children. The significance of each Discriminant function fitted was assessed by the Mahalanobis D2 and Fishers 'F' test of significance. The relative importance of all the discrimination functions was assessed by comparison of the absolute values of 'F' ratio showing the significance of each linear discriminating function and by testing the significance in relation to each other.

RESULTS AND DISCUSSION

Population composition by age and sex, and the dependency ratio. The total population under 15 years was 38% and 39% males in households with beneficiary and non-beneficiary women respectively. There were less females (36.6%) in households with beneficiary women than in those with non-beneficiary women (43%). The mean age of women was 24 years among beneficiary and non-beneficiary groups respectively. Females from beneficiary households tended to be older than those from non-beneficiary households. About 14.7% of households of women beneficiary and 18.5% of households of women non-beneficiary had small families (less than 5 members). While 27.3% of households of women beneficiary had medium family (5-6 members), about 35.8% of households of women non-beneficiary had medium families. Large families (over 6 members) were observed in 58% of households of women beneficiary and 45.7% of households of women non-beneficiary. The mean family size was 7.04 in beneficiary and 6.54 in non-beneficiary groups respectively. Dependency ratio was 1.1.68 in households with beneficiary women and 1:1.37 in those with non-beneficiary women. Dependency ratio is worked out as a ratio of population between 15-65 years old over those below 15 years and those above 65 years, the population that is not economically active.

Education level and occupation in households

Among the female heads of households, 57.4% and 76.8% of women beneficiary and non-beneficiary of the Livestock Project respectively, had low education. The education level of male and female heads of households was higher among women beneficiary of the Livestock Project (LDP) than in women non-beneficiary of the LDP, though the level of illiteracy was high in both groups. However, there was no significant difference in the education level among the male and female heads of households from both groups. More beneficiary women (57.3%) were employed compared to only 38.4% non-beneficiary women. Statistically significant differences were observed between the two groups regarding employment ($P<0.01$) and occupation structure. More beneficiary women were employed in the teaching profession than the non-beneficiary women. Education was vital in the provision of livestock veterinary services, interpretation of extension material and maintenance of farm records, and for both understanding and interpretation of project objectives. There was a direct link between education and employment, evidenced through higher employment rate in the beneficiary over the non-beneficiary households. Both factors had a resultant and determining effect on the occupation and income earned in a household, and on their ability to purchase staple food.

Income levels in households

The monthly household income ($P<0.05$) and mean household income ($P<0.001$) was significantly higher in households of women beneficiaries of the LDP. While 30.7% women beneficiaries earned over 5000 Kenya shillings (KShs.), 51.4% non-beneficiaries earned less than KShs. 5000 a month. Only 25.6% beneficiaries had per capita income of KShs 600.00 compared to 35% non-beneficiaries. Though mean per capita income was higher among the beneficiaries than the non-beneficiaries, the difference was not significant. Household income had no effect on the nutritional status of preschool children. Kennedy and Oniang'o (1990) also found no association between nutritional status of preschool children and income. The extra income earned is hardly spent on food but goes for non-food purposes. Though dairy projects could be seen as important sources of income in households, it was not easy to pinpoint this decreasing trend to the effects of the dairy projects singly given that many rural development programmes that had been initiated in this area.

Composition of the livestock herd and income expenditure in the dairy enterprise

There was a significant change in the size and composition of the livestock herd between the two groups. Significantly less women beneficiaries (14.5%) kept local bred and cross bred cattle compared to 96.8% women non-beneficiaries. Beneficiaries spent more

Table 1: Scores of Socio-demographic, agro-economic, food and nutrient intake and nutritional status (mean ± SD) of beneficiary and non-beneficiaries of Livestock Development Programmes.

Variable	Ideal Score	Beneficiary Household	Non-beneficiary Household	Z-Value	Significant level
Demographic factors	20	3.49 ± 0.98	2.78 ± 1.45	4.97	<0.001
Economic factors	75	4.19 ± 3.81	3.04 ± 3.01	2.90	<0.01
Dairy cooperative factors	45	0.74 ± 0.67	0.40 ± 0.40	5.24	>0.001
Production, consumption and marketed surplus milk	75	6.23 ± 1.37	2.10 ± 1.45	25.35	<0.00001
Nutritional awareness of women	90	5.04 ± 7.78	4.97 ± 7.71	0.77	NS
Food and nutrient intake	270	33.54±10.20	28.45 ± 9.43	4.50	<0.001
Nutritional status of women and preschool children	25	4.28 ± 0.51	4.20 ± 0.44	1.60	NS

Ns – Not significant

income on dairy inputs (p<0.001) including the purchase of Napier grass (*Penniseteum purpureum*) from other farms and the purchase of dairy supplements. There was no difference in the use of cow dung between the two groups, as they all tended to use it as farm manure and for building purposes. The use of cow dung as farm manure could increase food crop production possibly increasing crop sales, household income, and household food crop consumption.

Labour Provision in the dairy enterprise

Women beneficiaries provided 71.3% of the total labor requirements in the dairy enterprise, the non-beneficiaries provided 69.5%. Women were responsible for cleaning the cattle shed, watering the animals, fetching green fodder, stall feeding and milking the cows. Women beneficiaries spend on average 7.07±3.67 hours in the dairy enterprise compared to only 2.5±3.0 hours by the non-beneficiaries (p<0.00001). Changes in time-use across and within agricultural households could create important shifts in production and consumption outside nutrition that may have favorable effects on the welfare of some project population. However**, t**he labor allocated to livestock can increase the total household labor demands, particularly for females, and reduce time and quality of care and feeding of young children, and adversely affect their nutritional status.

Profit utilization in the dairy enterprise

Beneficiaries received more income from the disposal of calves than the non-beneficiaries and spend more on hired labor (p<0.001). Though there was no significant difference between the two groups concerning expenditure on veterinary services, mean expenditure among the beneficiaries was more than that of the non-beneficiaries. The relative prices for livestock products and feeds discourage farmers from using purchased inputs to develop intensive production systems. More beneficiaries used the profit from the dairy enterprise to repay loans, for agricultural improvement, and for non-food purposes. Profit derived from the dairy enterprise was spent on non-food items**.** Livestock and livestock products offer diverse range of value to farmers.

Livestock products are sold in the market, the livestock transformed into cash for to meet pressing demands and thus providing an instrument of liquidity and consumption smoothing in households. However most of the profit is not used to improve the dairy enterprise but to meet other pressing household demands

Land ownership and food security

While only 8% beneficiaries owned less than 0.5 hectares of land, 29% non-beneficiaries owned 0.5 Hectares of land. Landholding size was significantly higher (P<0.001) among the beneficiaries. More beneficiaries (24.7%) sold crops harvested than the non-beneficiaries (18.5%). On the other hand 80.4% and 88.2% beneficiaries and non-beneficiaries respectively were purchasing staple to meet nutritional requirements of their family members. A significant difference was found regarding the ability of households to purchase staple (P<0.001), with more households suffering food insecurity due to increased inability to purchase staple foods.

Milk production, consumption and marketed surplus

Mean milk production was 268.14 liters per day in

Table 2:Order and best set of socio-demographic and agro-economic variables that are different between participant and non-participant groups

S. No.	Order and Best Set of Variables	D^2	D.F.	F-Ratio	Percent Miscalculation
1.	**ORDER OF VARIABLES**				
	Milk price	7.81	18, 28	30.59	9.7
	Time expenditure in dairy:				
	Enterprise				
	Income expenditure on animal supplements				
	Change in dairy size				
	Mean age of household members				
	Income expenditure on government				
	Veterinary Service				
	Ability to purchase staple				
	Knowledge of diary management				
	Occupation of women heads of households				
	Employment of household members				
	Milk yield				
	Income expenditure on green fodder				
	Person managing dairy enterprise				
	Milk consumption by preschool children				
	Income expenditure on staple				
	Income from subsidiary sources				
	Income expenditure on veterinary medicines				
	Knowledge of diary cooperatives.				
2.	**BEST SET OF VARIABLES**				
	Milk Price	7.28	12, 28	43.69	
	Time expenditure in dairy enterprise				
	Income expenditure on animal supplements				
	Change in dairy size				
	Mean age of household members				
	Income expenditure on government				
	Veterinary service				
	Knowledge of dairy management				
	Occupation of women heads of households				
	Employment of household members				
	Milk Yield				
	Income expenditure on green fodder				

Table 3: Order and best set of foods that are different between participant and non-participant groups. (household, women and preschool children)

Order and Best Set of Variables	**D^2**	**D.f.**	**F-Ratio**	**iscalculation**	1.
HOUSEHOLD					
All variables	4.53	6.53	10.36		15.0
Milk and milk products					
Green leafy vegetables					
Roots and tubes					
Other vegetables					
Sugar					
Fats and oils.					
BEST SET OF VARIABLES					
Milk and milk products		3.10	1.58	46.45	
2. **WOMEN**					
ALL VARIABLES	4.92	6.53	11.25		11.7
Milk and Milk products					
Green leafy vegetables					
Other vegetables					
Fats and oils					
Sugar					
BEST SET OF VARIABLES			3.71	2.57	27.36
Milk and milk products					
Green leafy vegetables					
3. **PRESCHOOL CHILDREN**					
ALL VARIABLES		5.57	7.30	6.23	
10.5					
Green leafy vegetables					
Other vegetables					
Roots and tubes					
Pulses					
BEST OF VARIABLES					
Milk and milk products					
Green leafy vegetables		3.17	2.35	14.46	

of beneficiary women and 89.7 liters in households of non-beneficiary women ($p<0.0001$). Variables that showed correlations with milk production included milk price, milk marketing structure, milk consumption, and knowledge of dairy management, use of supplements and green fodder, and time input in dairy enterprise. Milk consumption in households was 240.9g/day those of beneficiary women and 79g/day those of non-beneficiary women ($p<0.001$), and 170g/day for preschool children from households of beneficiary women and 30g/day for preschool children from households of non-beneficiary women. The mean marketed surplus milk was 7.4 liters and 2.5liters per day for the beneficiaries and non-beneficiaries respectively. Mean income from marketed surplus of milk was KShs. 181.40 per day in households of beneficiary and KShs. 56.19 per day households of non-beneficiary women. Factors associated with marketed surplus milk were milk price, milk yield, expenditure on green fodder and supplements, knowledge of dairymanagement, expenditure on veterinary services and use of hired labor.

The Discriminant Function model for socio-economic factors

The mean scores of all the socio-economic factors were that included the demographic factors, economic factors, dairy cooperative factor, production, consumption and marketed surplus of milk presented in table 1 were significantly higher among the beneficiaries than the non-beneficiaries. There was a significant increase in the production, consumption and marketed surplus milk ($p<0.00001$), food and nutrient intake ($p<0.001$) among the beneficiaries. There was no significant difference in the nutritional status of women and preschool children, and, awareness of nutrition value of milk between the two groups. The socio-economic variables entered into a Discriminant function model are presented in Table 2. The important variables with the power to differentiate between beneficiaries and non-beneficiaries were: milk price, time expenditure in dairy enterprise, income expenditure on animal supplements, change in dairy size, mean age of household members, income expenditure on Government veterinary service, ability to purchase staple, knowledge of dairy management, milk yield, and income expenditure on green fodder. These variables except income expenditure on Government veterinary services were significantly improved in the beneficiary group.

Nutritional status of preschool children

Nutritional status was measured by underweight, stunting and wasting. Level of underweight was 1.25% and 2.9% amongst preschool from beneficiary and non-beneficiary groups respectively. Level of stunting as measured by height-for-age was 1.25% in beneficiary and 1-% non beneficiary group. However, the prevalence of stunting, on the whole, was significantly higher ($P<0.05$) in the non-beneficiary group. Wasting was not a problem in this community. Factors which showed correlation with nutritional status of preschool children were Body Mass Index [BMI] of the mother, number of preschool children in a household, time input by women in the dairy enterprise, and amount of milk consumed by preschool children. Preschool children from households where mothers were well nourished tended to be well nourished. Though there seemed to be a direct link between the preschool child nutritional status and the mothers' body mass index, there were some special cases where a mother's body mass index was normal and yet the child's nutritional status was low and vice versa. Such cases were common in households where children had experienced prolonged illnesses, or children were left under the care of housemaids. Nutritional status of preschool children from households of beneficiary women tended to be poorer than that of preschool children from households of non-beneficiary women. On the contrary, Mbagaya *et al* [2004] found a lower prevalence of stunting and improved nutritional status, increased milk consumption and better food security situation in households keeping dairy cattle. Further, other studies that compared participants and non-participants of Kenya Sugarcane Outgrowers programme found no significant difference in the nutritional status of preschool children from the two groups [von Braun *et al*, 1996; Kennedy, 1988; Rubin, 1988; Kennedy et al, 1990; Rubin, 1990].

Nutritional status of women beneficiary and non-beneficiary of the Livestock Project

The mean Body Mass Index [BMI] was 23.4 for the beneficiaries and 22.9 for the non-beneficiaries respectively and was higher than the national average of 21 for Kenya. The mean height of 1.61m in both groups was higher than the national average of 1.59 m while the mean weight was 60.9 kgs for the beneficiaries and 59.2 kgs for non-beneficiaries respectively are higher than the national average weight of 56 kg for Kenyan women (KDHS, 1992). While 6.7% and 7.3% beneficiaries and non-beneficiaries had BMI less than 18.5 cut-off point, 0.7% beneficiaries and 1.3% non-beneficiaries fell below 16 cut-off points for severe malnutrition. Prevalence of obesity was higher (6%) among beneficiaries than among women from non-beneficiaries (4.5%). BMI was associated with the sell of crops harvested, the ability of households to purchase staple, and the person managing the dairy enterprise. The sell of surplus crops harvested by households added extra income to the households to meet immediate pressing demands (e.g. payment of school fees to offset bills etc.).

Patterns of Food Intake of Nutrient Intake

The foods fitted into the Discriminant model included

Table 4:Order and best set of nutrients that are different between the participant and non-participant groups (Households, Women and Preschool Children)

Order and Best Set of Variables			D^2	D.f.	F-Ratio	Percent
Miscalculation						
1. HOUSEHOLD						
All variables	**3.19**	**4.55**	**11.35**	**21.7**		
Protein						
Vitamin A						
Energy						
Calcium						
BEST SET OF VARIABLES						
Protein	**2.99**	**3.56**	**14.43**			
Vitamin A						
Energy						
2. WOMEN						
All variables						
Protein	**3.95**	**4.55**	**14.05**	**13.3**		
Vitamin A						
Energy						
Calcium						
BEST OF VARIABLES						
Protein			**3.75**	**3.56**	**18.09**	
Vitamin A						
Energy						
3. PRESCHOOL CHILDREN						
All Variables						
Protein	**3.14**	**4.33**	**6.77**	**26.3**		
Energy						
Calcium						
Vitamin A						
BEST SET OF VARIABLES						
Protein,						
Energy	**2.6**	**4.35**	**12.06**			

animal foods, cereals, pulses, green leafy vegetables, roots and tubes, milk and milk products, fats and oils, and sugar is presented in table 3. The best sets of foods that differentiated between households of beneficiaries and non-beneficiaries were consumption of milk and milk products. Intake of milk and milk products, and green leafy vegetables formed the best set of foods with discriminatory power between women beneficiaries and non-beneficiaries. Mean intake of these foods was higher in the participant group. The best sets of foods that had the power to discriminate between preschool children of beneficiaries and non-beneficiaries were the consumption of milk and milk products and green leafy vegetables.

The nutrients fitted into the Discriminant model included energy, protein, calcium, iron, vitamin A, thiamin, riboflavin, niacin and ascorbic acid and is presented in Table 3. The best set of nutrients that differentiated

between households of beneficiaries and non-beneficiaries were protein, vitamin A and energy. Intake of protein, vitamin A and energy in that order formed the best sets of nutrients that differentiated between wom beneficiaries and non-beneficiaries, while protein and energy in that order were the best set of nutrients with discriminatory power between preschool children of beneficiaries and non-beneficiaries women. Owning livestock increased the intake of protein, vitamin A and energy, the consumption of Animal Source Foods (ASF) and the nutritional status of the beneficiaries. The improvements in nutritional status and nutrient intakes among the beneficiaries over the non-beneficiaries were not significant. Increase in income and food expenditures did not translate into improved diets since only a small portion of the income gain was spend food. However, dairying has potential to improve nutrient adequacy and improve body mass index.

Implications for Research and Practice

This study demonstrates the interaction of livestock projects, poverty and households factors, and nutritional status of women and preschool children. To improve the household factors and reduce poverty funding from external sources is essential if the very poor are to be targeted. Efforts should be directed toward reducing poverty among the poorest of the poorest of the society. Inclusion of livestock as a policy issue in national goals and objectives could result in improved nutritional status and improved living standards. Analysis of the participation criteria in the dairy project discriminated farmers initially endowed with better livelihood assets; the identification of household factors that are improved by dairy projects has promising returns for sustainable dairying, improved food and nutrient intake in households, and nutritional status of women and their preschool children. The project selection criteria for beneficiary women do not allow argument for pure independent effects of the programmes on welfare of beneficiaries in relative to the precedent significant investments made by the dairy management.

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