



**Rebuilding Agricultural Markets Program, Afghanistan
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RAMP Impact Assessment # 2

Assistance to the Livestock Sub-sector Program in Afghanistan,

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Summary

Livestock husbandry is an integral part of agriculture in Afghanistan, providing livelihoods to 80% of the population and generating substantial revenue from export earnings. Benefits from livestock development in particular accrue to the poor and rural women, primarily because they tend to be more associated with livestock production than with crop production. Smallholder livestock production is also more labor intensive than crop production in generating on-farm employment.

As with the livestock sector, the poultry sector is critical for incomes. The major production is free range and traditional in which poultry birds scavenge in backyards for feed. Women almost exclusively deal with village poultry production.

The Dutch Committee for Afghanistan (DCA) and the Food and Agriculture Organization of the United Nations (FAO) are the two the principal contractors to RAMP's assistance to the livestock and poultry sub-sector activities. Operating in 24 provinces, the DCA provides vaccinations and treatments against diseases in large and small ruminants, equines, camels and in poultry. The FAO poultry program works with village women in three provinces to increase poultry production through the distribution of pullets, provision of vaccines, training and market organization. An assessment was undertaken to evaluate the economic benefits of the interventions for the period up to December 2004. The major findings are:

The DCA has provided vaccination to 1.45M cattle and goats (about 72.5% coverage) and treated/medicated 115,622 equines and camels (about 50% coverage). On average each cattle and smallstock was vaccinated three times against the common diseases. Mortality rate is expected to fall by 45% for adult cattle and 52 to 54% for adult sheep and goats. Mortality is also expected to fall by 37% for calves, 48% for lambs, and 12% for kids. Assuming a 70% attribution to RAMP, the head value of cattle and smallstock saved through the veterinary campaign is US\$6M, and that of equines and camels is US\$0.04M. The annual productivity gain from cattle and smallstock covered by the vaccination and treatment campaign is US\$90M; the productivity gain from equines and camels, measured in terms of traction and transport, is US\$16M. The DCA has established 246 field units, of which 123 are run by DCA itself and the rest by its sub-contractors (PRB 40, AVA 83) and trained 51 paravets and a large number of basic veterinary workers (BVWs) to operate in remote villages where veterinary services are unavailable to farmers.

In the poultry sector, the project has distributed 56,000 pullets to about 6,000 women (23% coverage) and provided over 160,000 vaccinations and achieved a 16% coverage against planned target over the "life of the project". Vaccination against common poultry diseases has reduced mortality in poultry to 5% from the current level of 65%.

The productivity gain from poultry, measured in terms of the value of eggs produced, is about US\$0.2M. With multiplication, the poultry population has increased by a further 452,000 chicks (valued at US\$1.4M), enough to benefit 38,000 more women at the current rate of distribution. The project has established 291 producer groups (58% achievement) and one feed processing unit against the planned target of 5.

The total gain from animals saved through the veterinary and poultry programs and the productivity gains made during this period is US\$113M.

1. The Significance of Livestock in Afghanistan

Livestock husbandry is an integral part of agriculture in Afghanistan, providing livelihoods to 80% of the population. There are two major livestock production systems in the country— semi-nomadic and irrigated sedentary. The semi-nomadic system involves raising livestock on open access grazing lands. The Kuchis, who account for 7 to 10% of the population and depend entirely on livestock, are the inhabitants of Afghanistan's rangelands. Until recently, the Kuchi livestock accounted for a third of the sheep, 39% of the goats, 5% of the cattle, 54% of the horses, 14% of the donkeys, and 63% of the camels in the country (IDEA, 2003)¹. The remaining livestock population is kept by smallholder farmers under irrigated system where cattle dominate the herd composition. Most sedentary smallholders also keep some equines for farm power and transport.

Prior to the war, the livestock sub-sector accounted for 40% of total export earnings, but over the years this share has shrunk so much that in 2002 export earnings from karakul skins and wool, excluding carpets, accounted no more than 2-5% (Guimbert, n.d.)². Between 1978 and 1990, total output of livestock declined at an average rate of 5.5 percent per year (Ulfat and Iqbal, 2000)³. By late 1990s, the livestock population had almost reached the pre-war level and output was on the increase only to be decimated from the drought, disease, crisis sales and low reproduction rates over the past five years (see Figure 1).

Before the war, per capita meat consumption was 11.5kg annually with an average of 4kg per capita for rural and urban poor. Milk consumption was 60kg per capita (Nyrop and Seekins, 1986)⁴. This ratio was reasonably high by most developing countries standard but has fallen since. Statistics are hard to come by, but an indication of the decline is that aggregate milk production from cows and sheep in 2002 was about 964,270 metric ton giving a meager per capita of 36kg⁵ and aggregate meat production (including beef and small ruminant meat) was 322,000 metric ton, which on a per caput basis averaged 12kg per annum (Earth Trends, 2003)⁶, compared with about 19kg in Pakistan.⁷ The low level of milk and meat availability is primarily due to the low level of output which in turn is a consequence of the fall in livestock population and low productivity of animals.

¹ International Development Economics Associates, 2003 "State of Afghan Agriculture".

² Guimbert, Stephane "Structure and Performance of the Afghan Economy", Technical Annex 1 to Chapter 1, World Bank (not dated).

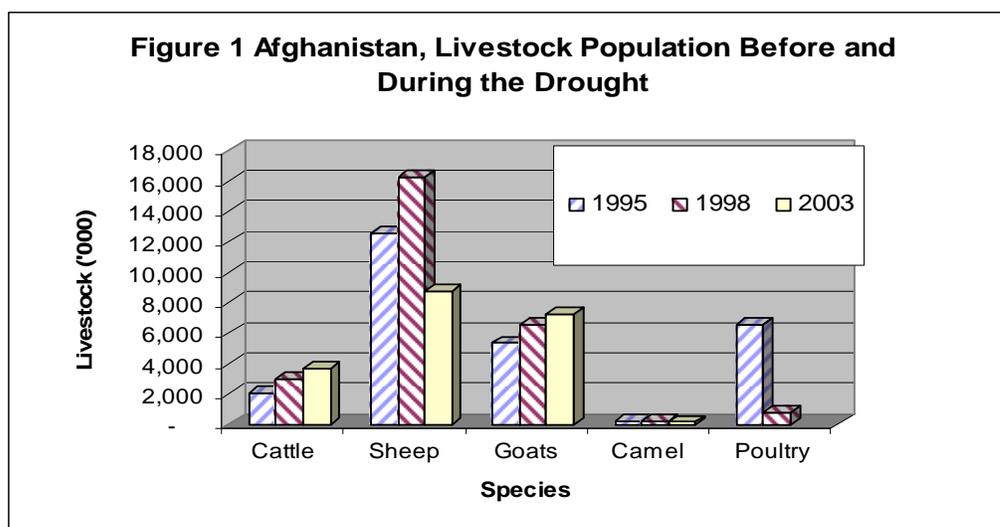
³ Ulfat-un-Nabi Khan and Muzaffar Iqbal (2000) Role and the Size of Afghanistan Livestock Sector in Afghanistan. World Bank, Islamabad

⁴ Nyrop, F. Richard and Seekins, M. Donald (1986) "Afghanistan Country Study". Foreign Area Studies, The American University

⁵ Derived from FAO (2003) "Afghanistan National Livestock Census" and having applied productivity coefficients stipulated in Annex 1E.

⁶ http://earthtrends.wri.org/pdf_library/country_profiles/agri_cou_004.pdf

⁷ www.pakissan.com/english/allabout/livestock/dairy



Note: The drought started in the later year of the 1990s, overwhelming the country in 1999 and peaking up in 2002. Source: FAO/WFP 2001, FAO 2003⁸.

Livestock offer opportunities to increase incomes and employment. Generally, the income elasticities for livestock products are higher than for cereals. With rapid population growth of about 2.0% per annum and increased urbanization and incomes, demand for livestock products in Afghanistan is likely to grow at a faster rate over the coming years.⁹ Mellor (2003)¹⁰ estimates that when incomes grow rapidly, say at 5 percent per capita, the demand for livestock products grows at between 6 and 8 percent per year. And if the livestock sector meets this growth in demand it will double in size every 10 years and its share of agricultural GDP could also be 50%. In effect the agriculture sector will also grow at a much faster rate. The case for promoting increased livestock production is pressing given the growing demand for animal products and a large proportion of the population living in extreme poverty, most of whom are dependent, at least in part, on food and income derived from livestock.¹¹ Benefits from livestock development will in particular accrue to the poor and rural women, primarily because they tend to be more associated with livestock production than with crop

⁸ FAO/WFP “Crop and Food Supply Assessment Mission to Afghanistan” Special Alert No. 315, 8 June 2001; FAO, 2003 “Afghanistan National Livestock Census 2003” Interim Report.

⁹ As domestic production cannot keep pace with demand, growth in consumption of livestock products occurs at the expense of increasing net imports. An indication of this is that between July and August 2002, Afghanistan imported animals worth Rs 30 million (about US\$ 5M) from Pakistan. This is to supplement a large yet unrecorded number of animals smuggled through the border
www.pakissan.com/english/allabout/livestock/dairy

¹⁰ Mellor, W. John (2003) “Agricultural growth and Poverty Reduction – the rapidly increasing role of smallholder livestock” Key Note Address, International Workshop on Livestock and Livelihoods: Challenges and Opportunities for Asia in the Emerging Market Environment” 10-12 November 2003, Anand, India.

¹¹ GDP per capita in Afghanistan was growing at annual rate of 20 to 27 percent. Obviously this level of growth cannot be sustained for long, especially if poppy that powers the economy is eradicated. Nevertheless the underlying assumption would remain the same – that, demand for animal products will continue to increase in the coming years, even if growth falls to a single digit number.

production. Smallholder livestock production is also more labour intensive than crop production in generating on-farm employment.

However, the livestock sub-sector faces immense problems: loss of livestock and lack of restocking support, decreased productivity due to declining feed and overgrazing, and the spread of animal diseases. Much of the irrigated land that supported a large proportion of the livestock is now without water to grow feed. The drought that persisted for five years has decimated about 40 to 60% of the livestock population in the country. The Kuchis apparently suffered the worst loss. Before the drought, a Kuchi family owned on average, about 300 head, of which 83 percent were sheep and 13 percent goats. However, during the drought the Kuchis lost an estimated 80 to 95 percent of their flocks, of which 70 to 80 percent of the losses were due to distress sales at a time when livestock prices were depressed (ICRAD, 2002)¹². The impact has been severe particularly in the South where most Kuchis lost all their animals and are compelled to work as labourers on agriculture fields. Encroachment into traditional grazing pastures by sedentary farmers and the subsequent clearing of bushes and pastures has further deprived the Kuchis opportunities to rebuild their depleted herd.

There is a burgeoning need for technical assistance, including development of improved, low cost feed, veterinary services, breeding program and restocking if livestock is to play its full role in economic development. Livestock production systems in Afghanistan are traditional and subsistence oriented in which there is minimal management input in terms of breeding, disease control and nutrition. Typically producers follow multiple production objectives that are driven more by their immediate needs rather than the demands of a market. Subsistence production generally follows low-input and risk averse strategies, and producers strive to maximize total system output. While monetary returns are the driving force in a high-input system like commercial ranches, subsistence requirements and cultural values define subsistence livestock production systems of Afghanistan.

Cattle are important for milk production and cultivation of land. Most farm families keep oxen to cultivate the land but milk production is at the centre of the livestock production systems. Generally milk is not sold in the rural communities. But milk is processed into various products – dry yogurt and cheese - and sold in both rural and urban markets. Cattle are therefore a direct source of food and cash income.

Cattle are rarely slaughtered for domestic consumption. Cattle are slaughtered during specific occasions and functions such as weddings, religious and cultural festivals. Small ruminants and chicken are slaughtered for meat to supplement beef from butcheries for home consumption.

Cattle are also a source of manure. Manure is mainly used as fertilizer by sedentary communities. Agriculturally, given their centrality in nutrient cycling, livestock thus play a vital role in the development of sustainable and environmentally sound mixed crop-livestock farming systems.

¹² ICRAD, August 2002 “Needs Assessment on Feeds, Livestock and Rangelands in Afghanistan” Draft Report.

Cattle are therefore multipurpose animals, supplying a wide range of outputs to families. Inevitably farmers seek certain genetic traits in the animals (like the potential to survive and reproduce under traditional systems where the environment also poses a major constraint) and maximize the multitude of outputs.

Smallstock have greater adaptability and resilience to dry environments than cattle. They breed fast and are a means of generating cash income as well as a source of meat/milk for direct household consumption. They are a low-cost and inflation-proof alternative saving. Their value provides asset (financing) and security (insurance) benefits at times of difficulty. This explains why smallstock are preferred by Kuchis.

The herd composition typifies the production strategies specified above. Ratios are estimated and presented in a 3x4 contingency table (Table 1). In 1976, there were more goats and sheep than cattle, but fewer sheep than goats. Over the years, the ratio of sheep to goats and cattle has changed drastically. There are still more goats than cattle, but the ratio in 2003 has halved. It seems that at the start of the drought (1998/9) stock keepers retained more sheep and goats and disposed of their cattle. Sheep now outnumber goats and cattle, the latter almost by two-and-half fold. Karakul sheep have received special attention due to Karakul pelts. It was estimated that Karakul sheep breed accounted for a third of the national sheep population before the war (ICRADA, 2002). The population of Karakul sheep had been restored after the war if it was not for the recent drought that drastically reduced the sheep population.

Table 1. Estimated Livestock Ratios for Afghanistan

	1976	1995	1998	2003
Sheep:Goat	0.34	2.33	2.46	1.21
Sheep:Cattle	1.31	6:00	5.40	2.36
Goat:Cattle	3.90	2.57	2.19	1.96

Source: 1976 data from Afghanistan Gazetteer; 1995 and 1998 data from FAO/WFP "Crop and Food Supply Assessment Mission to Afghanistan", 8th June 2001; 2003 data from FAO "Afghanistan National Livestock Census" Interim Report, 2003.

Like the livestock sector, the poultry sector in Afghanistan is also subsistence oriented. In prewar Afghanistan, a few large-scale commercial poultry operations were developed on government farms, but the major production was free range and traditional in which poultry birds scavenged in backyards for feed. The war has seriously disturbed both production systems. The commercial farms have gone, and the traditional system is making a steady recovery. Women almost exclusively deal with village poultry production. It is assumed that since 1996, the number of poultry birds is increasing at a rate of 4 percent per annum with annual production of 5,000 tons of meat and 350 million eggs (Ulfat and Iqbal, 2000). However, demand for poultry products exceeds domestic supply and large quantity of poultry meat and eggs is imported from as far as Brazil. The indigenous breeds have very low production potential with annual mortality of chickens often reaching 65% of the population under the traditional system. The most important constraints to the sector are inadequate technical knowledge of the producers and lack of vaccines for the prevention of diseases, and feed.

2. Intervention Priorities

Prior to the war, the infrastructure for livestock development included facilities for providing in-country veterinary education, a number of veterinary clinics in the major centers, several veterinary pathological laboratories and local production of certain vaccines against major livestock diseases. Much of this infrastructure was unfortunately destroyed during the war. Animal health service has been accorded the highest priority by aid organizations during the war and continued to date. However, coverage is limited, the government veterinary infrastructure is still weak and/or absent in large parts of the country, disease is rampant and farmers need to be convinced of timely vaccinations and treatments. Traditional measures used by farmers, such as spraying, use of herbs for flies and deworming are ineffective in preventing mortalities and outputs from falling¹³. Table 2 lists the most prevalent animal diseases in the country.

Table 2. Common Livestock Diseases and Parasites

	Cattle	Sheep	Goat	Poultry	Equines
Anthrax	xxx	xxx	xxx		
CCPP		xxx	xxx		
Enterotoxamia	xxx	xxx	xxx		xxx
Foot and Mouth	xxx	xxx	xxx		
Black Leg	xxx				
Hemorrhagic Septicemia	xxx				
PPR		xxx	xxx		
Parasites	xxx	xxx	xxx	xxx	xxx
Colic		xxx	xxx		
Pox Disease		xxx	xxx	xxx	
Newcastle Disease				xxx	
Fowl Pox				xxx	
Gumboro				xxx	

High mortality rate is probably the major problem acting on the present level of output. Mortality rates are high because veterinary services are not available to farmers and Kuchis. Even in areas where there is relatively better knowledge and use of veterinary services, animal mortality is high by most developing countries' standard (see Table 5). Many of the diseases are thought to be controllable, given the right infrastructure and personnel. The Dutch Committee for Afghanistan (DCA) is the principal contractor to RAMP veterinary program. Operating in 4 primary and 20 target provinces,¹⁴ the DCA provides vaccinations against major infectious diseases in large and small ruminants, equines, camels and in poultry. Vaccinations are done regularly against anthrax, blackleg,

¹³ As an example, FAO reported that an affluent Kuchi in Herat had 800 sheep and goats and six tents, but his herd produced just 200 lambs because the flock conception rates were down due to anthrax, sheep pox, enterotoxamia and parasites (FAO, 2001) "Crop and Food Supply Assessment Mission to Afghanistan, 8th June, 2001.

¹⁴ The DCA operates in Parwan, Ghazni, Nangarhar, Kunduz and 20 other provinces, except in Bamiyan, Helmand, Laghman, Nuristan, Nimroz, Samangan, Uruzgan, Zabul and Kandahar.

enterotoxemia, hemorrhagic septicemia for cattle and smallstock, and against Newcastle disease for poultry. In addition, the DCA provides and administers curative treatments against common parasites and certain diseases affecting livestock, including equines.

Besides vaccination and treatment campaigns, the DCA is building local capacities to overcome the constraints posed by shortage of qualified veterinarians. It has established 246 field units, of which 123 are run by DCA itself and the rest by its sub-contractors (PRB 40, AVA 83) and trained 51 paravets and a large number of basic veterinary workers (BVWs) to operate in remote villages where veterinary services are unavailable to farmers. Complementing other veterinary services provided by NGOs, the DCA program thus strives to rehabilitate the veterinary infrastructure and services in Afghanistan.

In the poultry sector, the RAMP program augments interventions by the UN and NGOs that propagate poultry production and use poultry birds as an instrument for income generation projects. Modelled on the concept of “village poultry production” first developed by FAO in 1999 in Northern Afghanistan, the RAMP poultry program works with village women to increase poultry production in three of the five primary provinces – Parwan, Kunduz and Nangarhar, the exceptions being Ghazni and Helmand. The program is carried out by female trainers for village women. It includes intensive training of village women, supply of improved chickens, regular vaccination against Newcastle Disease, fowl pox and in some cases gumboro which is common in Kabul, Parwan and Jalalabad and is largely associated with poultry imported from Pakistan, improvement of chicken houses, preparation of mixed feed and marketing of eggs. The project targets 25,000 women, each receive 12 pullets of 6-8 weeks age. Poultry Producers Groups (PPGs) are established for groups of village women to maintain the supply of inputs and to arrange vaccinations. Marketing of eggs is also to be organized through the PPGs.

This impact assessment covers the period up to December 2004. In the case of the DCA veterinary program, this will be a 13 month coverage from the contract date (December 2003 till December 2004); in the case of the FAO poultry program, the coverage will be a 15 month period (October till December 2004). As the projects are implemented intermittently over an extended period of time, lags in output gain can be expected in areas where implementation was most recent.

3. Methodology

There is a dearth of reliable data on animal mortality and productivity. Also, the Afghan herd structure is not well established and many of the production parameters are not known or based on rather dated figures. The DCA has launched a survey to measure these and other coefficients. Probable coefficients are computed using information from the literature and by extrapolating from comparable agro-pastoral economies from Sub-Saharan Africa. Some of the coefficients are also derived by manipulating basic data obtained from livestock specialists. Some of the coefficients were also derived by

manipulating basic data obtained from livestock specialists. The coefficients were discussed with FAO, DCA and RAMP specialists.

3.1 Baseline Data

The basic data for this assessment was compiled from the monthly progress reports submitted by the respective implementing partner. However, the DCA data has many limitations for this assessment. To begin with, the progress data reported to RAMP was in a highly aggregated form. That is to say, the data does not show the coverage broken down by species; cattle, sheep, goats, equines and camels are all summed together and reported as animals vaccinated/treated. Moreover, upon a closer look at the data and discussion with RAMP specialists, it became clear that the DCA was reporting not the number of animals that are vaccinated/treated through the veterinary campaign but the number of vaccinations and treatments. It has taken a good deal of data manipulation work to disaggregate this lumpy vaccination/treatment data and establish the actual number of cattle, sheep and goats by province.

The DCA has a cumulative target of 6M vaccinations and 2M medications and treatments up to the end of December 2004. On the assumption that 6M of the vaccination target is given to cattle and smallstock (equines and camels are not vaccinated), this figure was divided by the average number of vaccines normally administered to cattle and smallstock. Cattle are generally vaccinated against the most common diseases: anthrax, blackleg, hemorrhagic septicemia, and foot-and-mouth. While anthrax is regular and widespread, vaccination against blackleg depends on outbreak of the disease. Foot-and-mouth vaccination is also not regular, mainly because the vaccine is not locally available and storage is also a problem. For smallstock, the most common diseases are pest des pititis ruminants, enterotoxemia, sheep pox, and anthrax. These days hemorrhagic septicemia is also administered to sheep and goats. Sheep pox is not endemic; it is seasonal. However, it is not localized; it is countrywide. To derive at the number of animals DCA is targeting in its 18 month contractual campaign, the total number of vaccinations given to cattle and smallstock is divided by a factor of three.

Similarly, the vaccination coverage figure to date of 4,352,325 has been divided by a factor of three to derive at an estimated number of animals vaccinated. This approach was presented to DCA specialists and they concur.

In the second stage, to establish the baseline data, livestock data from the 2003 and 2004 PRA surveys were reviewed first, but it turned out that the data compiled from these surveys departed by a big margin from the FAO 2003 livestock census data. For practical reason therefore the FAO census data has been used as a baseline.

In the third stage, the ratio of each species in the total herd for Afghanistan has been determined. To derive at the number of animals planned for vaccination in each province, the ratio of total livestock covered by the DCA veterinary campaign to the total livestock population in the DCA program provinces (target:total herd) was estimated and this ratio

was then multiplied by the number of animals (base year figure). To derive at the actual number of each species vaccinated, first the ratio of DCA coverage to the total target (achievement:target) has been derived and this ratio was multiplied by the livestock number planned for vaccination for each of the four primary provinces and 20 non-primary but target provinces in aggregate. The same procedure was applied to estimate the number of camels, horses and donkeys, the planned targets for treatment/medication and the actual achievement to date.

Medication and treatment figures overlap with vaccination and complicate the estimation. The same animal (cattle, sheep or goat) can have multiple vaccinations, medications and treatments. On the other hand an animal may have just treatment and no vaccination. Often equines and camels are not vaccinated, except on rare occasion against tetanus and rabies. The general practice is to treat equines and camels for digestive disorders due to low quality feed, respiratory diseases caused by bad shelter, and some infectious diseases, worms and colic. It is assumed that 90 percent of the 2M medication/treatment target was meant for cattle and smallstock which are already covered by the vaccination target. Thus, in order to avoid double counting, only the vaccination figures are considered for cattle and smallstock.¹⁵ To derive at the equine and camel population targeted for treatment and medicated, 10 percent of the 2M target was considered, and this figure was divided by a factor of two, because each animal is on average treated/medicated twice as suggested by DCA specialists. Of the reported treatment/ medicated figures of 136,025 and 2,176,409, 10% was again considered for equines and camels and the resulting figure was divided by a factor of two. There are proportionally more donkeys than horses (a ratio of 10:1) and more donkeys than camels (a ratio of 9:1).

Intervention in the poultry sub-sector involves both distribution of pullets and vaccination campaigns. This is done in three primary provinces – Parwan, Kunduz, Nangarhar. The project has so far distributed about 56,000 pullets to just under 6,000 women and provided over 160,000 vaccinations against Newcastle, fowl pox and gumboro diseases (Table 3).

All pullets are vaccinated against Newcastle disease before distribution. The project also vaccinates poultry owned by households not participating in the program in an effort to avert possible outbreak of disease. On average every chick is vaccinated at least three times in a follow up program. FAO estimates that out of the total vaccinations given so far, about 16% are for poultry birds owned by village households not part of the program. Roughly, this will be about 8,600 birds. This study reports the impact of the veterinary campaign on the poultry population distributed by the program. The impact on the non-program poultry population will be addressed in the next round of impact assessment.

¹⁵ It is possible that the health and hence productivity of a cattle or a smallstock treated and medicated may increase. But this gain would be insignificant if the animal is not simultaneously vaccinated against the major diseases. The critical input for cattle and smallstock is vaccination.

Table 3. Poultry Project Targets and Performance Indicators

Activity/Performance Indicators	Performance Targets	Cumulative Up to December 2004
No of pullets distributed	300,000	55,805
Parwan		29,597
Kunduz		17,208
Nangarhar		9,000
No of women trained in poultry management	25,000	5,743
Parwan		2,563
Kunduz		1,470
Nangarhar		1,710
No. of producer groups established	500	291
Parwan		113
Kunduz		121
Nangarhar		57
No. of PG revolving funds established	500	291
Parwan		113
Kunduz		121
Nangarhar		57
Vaccination programs implemented (Newcastle Disease)	1,000,000	161,559
Parwan		84,257
Kunduz		41,919
Nangarhar		35,383
Feed processing units established	5	1

3.2 Herd Structure

Knowledge of the Afghan herd structure is important to estimate the output values as well as the values of the animals saved by the veterinary program. In the dry environment, smallstock outnumber cattle. In the irrigated livestock system, where cattle also provide draught power, farmers maintain more male cattle than in the open access system. Extrapolating from agro-pastoral systems in Sub-Saharan Africa (FAO, 2002), approximate scenarios were constructed for the Afghan herd structure (see table 4).

The proportion of smallstock to cattle is high, indicating the herd rebuilding strategy pursued by stock keepers (smallstock breed fast and are the best species for recovery from drought). There are also proportionally more females than males, indicating the priorities producers assign to herd rebuilding and milk-based farming rather than beef. The male to female ratio of 41:59 is similar to that noted in Kenya (Kajiado), Sudan and

other Sub-Saharan Africa countries.¹⁶ Also, somewhat similar to the herd structure in East Africa, animals over 3 years of age constitute a considerable proportion in the Afghan herd structure.

Table 4. Percentage of Livestock in Each Category

Cattle			Smallstock			
					Sheep	Goat
Males:		41	Males:		18	18
	Bulls > 3 yrs	7		Rams/bucks	10	7
	Oxen > 2 yrs	22		Lambs/kids	8	11
	Steers 1-3 yrs	7				
	Calves < 1 year	5				
Females:		59	Females:		82	82
	Cows > 3 yrs	36		Ewe/does	60	62
	Heifers 1-3 yrs	15		Lambs/kids	22	20
	Calves <1 year	8				
Total		100				

The percentage of breeding females, 36% for cattle and 60% for sheep and 62 for goats is high and could be due to the importance of milk to farming households. It may also be the result of an attempt by farmers and Kuchis to overcome the limitations imposed on herd growth by high mortalities and low conception rates. Moreover, it is a clear indication of stock keepers desire to rebuild their depleted herd.

The number of adult breeding bulls in the herd gives a mating ratio of 1:5.1. This ratio is higher than for Ethiopian highlands (1:1.97) but close to the migratory (1:5.9) and sedentary (1:6.9) herds in Sudan (Ibid). The Afghan bull:breeding female ratio however compares favourably with the recommended ratio of 1:50 under natural service.

3.3 Mortality

Annual mortality rates differ between species, and without vaccination and after vaccination. Based on a survey of four districts carried out by the Dutch Committee for Afghanistan, Schreuder et al. (1996)¹⁷ compared average annual mortality rates for livestock in areas covered by veterinary program with areas not covered. The coefficients reported by Schreuder et. al. were applied to estimate mortalities in the provinces covered by the veterinary program. Given the absence of area specific mortality coefficients no adjustment was made to the mortality rates to capture provincial differences. The mortality coefficients are given in Table 5.

Table 5. Mortality Coefficients for Cattle and Smallstock (in percentage)

¹⁶ FAO (2002) "Cattle and Small Ruminant Production Systems in Sub-Saharan Africa, A Systematic Review", Rome; International Livestock Research Centre, Nairobi, "On-farm Phenotypic Characterisation of Kenyan Zebu Cattle".

¹⁷ Schreuder, B.E.C. et. al. (1995) A Benefit-Cost Analysis of Veterinary Interventions in Afghanistan based on a Livestock Mortality Study. Preventive Veterinary Medicine 26, PP 303-314.

Adults	Cattle	Sheep	Goat
Mortality base year	6.5	15.1	13.6
Improved mortality	3.6	7.2	6.3
Young	Calves	Lambs	Kids
Mortality base year	23.1	31.4	29.5
Improved mortality	14.5	16.3	17.8

Losses are estimated as a function of the value of the animal. Assuming that price reflects the expected future income from an animal, the cost of mortality is calculated by applying the price of an animal in each category. An attempt is made to estimate the loss by classifying animals by age/sex and applying percentage mortality in each category. The net gain is therefore a weighted average of different age/sex class of animals.

Mortality among equines and camels is low. It is assumed to be 2 percent without treatment, falling to 1.5 percent after treatment.

Mortality rate in poultry is high, approaching 65% under traditional system, but with vaccination against Newcastle Disease and improved feed and management of birds, this could be lowered substantially. It is assumed that mortality for poultry covered by the FAO program will be 5% (Haroon Nessar, NPPP Poultry Production, FAO, Personal Communication).

To estimate the number of animals saved, mortality coefficients for two scenarios were applied: without vaccination, and post-vaccination deaths. The difference between the two is a net gain for RAMP. To actually value this gain, the proportion of each category of animal in a herd is first derived (e.g. cows, calves, heifers, bulls, oxen, and steers) and multiplied that proportion by the average price of the animal. The same estimating technique has been applied to derive the value of sheep and goats as well as transport animals of horses and donkeys saved.

The head value of each species is based on farmgate price averaged for the country. Average prices reflect the prices paid for animals intended for meat, transport and draught as well as the generally higher prices paid for female animals for reproductive purposes in the post-drought period. Prices are variable, depending on location, breed and season. For example, the average price of a *watani* (indigenous) milking cow would be US\$300-400 in Kunduz whereas the same animal may fetch US\$500 in the South. Equines are used as transport animals and farm power. Horses and donkeys are the commonest equines, but camels are also used in lowland areas to transport heavy goods. In some locations camels are also slaughtered for meat, but only after the animals have aged. Camels are more commonly kept by Kuchis. The average price of a horse in Kunduz is US\$400. Northern breed horses, especially those used for the traditional 'sport' – buskashi – are most prized and may cost double this amount. Depending on size and breed, a donkey may cost up to US\$45 and a camel about US\$600.

Livestock productivity can be expressed in many ways. One is to express it in terms of births. In this study, births are discounted because many of the coefficients pertaining to reproductive performance of animals are not known. Moreover, the calving interval for

cattle is at least 12 months, which is beyond the coverage of this study. Livestock productivity (i.e. output) is estimated from a static herd structure. Unlike crops where gains can be estimated from annual harvest, output gains from herds take longer time to be realized and are also spread over the life of an animal. The methodology also makes a heroic assumption that future gains can be estimated at the present. A related concern is estimating the net gain in productivity, say milk/cow before and after vaccination/treatment. In the absence of farm-level estimate showing productivity “before” and “after” vaccination, it has been assumed that productivity before and after vaccination/treatment would not be so much different.

To estimate productivity, livestock products are divided into 7 broad categories: 1) milk, 2) meat, 3) hides and skins, 4) eggs, 5) wool and hair, 6) other livestock products, and 7) work. The value of milk is further separated according to the species i.e. milk produced by cattle and sheep and goats. Similarly, meat is divided into mutton and beef. Other livestock by-products considered in the estimations were edibles, bones, blood, guts, horns, fat, dung, heads, trotters, etc. The eggs, meat and milk can be consumed by the family, sold for cash or, in the case of milk, given to young animals, thus increasing their nutritional intake and probably having an effect on their survival. Males can be retained for draught power, breeding stock, sold or kept in the herd as a reserve of cash, or to assist in maintaining a balanced herd.

The production coefficients for milk, meat, and wool are based on estimates reported by Schreuder et. al. (1996) and Ulfat and Iqbal (2000). Animal productivity is generally low compared with other developing countries. The main reasons for this are poor nutrition, low genetic potential, and low technical know-how. It is assumed that milk yield per cow is 850 kg per lactation. About 36 percent of the cattle stock is adult female cows of which 70 percent are in-milk. For milk from sheep and goats, it is assumed that 64 percent of small ruminants are adult females of which 80 percent are in-milk and milk yield is 40 kg per lactation per animal. The lactation period is variable, depending on weaning ages for calves, herd size (the smaller the herd the longer the milking period) and genetic traits. It is assumed that the average lactation length would be 6 months for cows and 3 months for smallstock.

Sheep and goat milk is not sold as such. But value-added products, namely dry yogurt (locally known as qurut) and cheese (paneer) are processed domestically and marketed widely. Hence, the milk output from sheep and goats is converted to dry yogurt and cheese, assuming that 50% of the milk goes to make dry yogurt and the other 50% to make paneer cheese. The conversion ratios are, 9kg of milk = 1kg of cheese; 11kg of milk = 1kg of dry yogurt. The output is then valued using the local price of US\$1,560/Mt for dry yogurt, and US\$2,000/Mt for cheese.

Offtake rates (proportion of animals annually leaving the total herd/flock due to slaughter/sales) is variable, depending on herd/flock dynamics (size, structure and growth), productivity and production constraints. Secondly there is a strong consumer preference for sheep and to some extent for goat meat than for cattle meat in Afghanistan. For beef production, it is assumed that about 12 percent of the cattle are slaughtered per

year and average beef production per cow or oxen is 95 kg. Similarly, for mutton production, it is assumed that 20 percent of small ruminants are slaughtered every year and average meat production per sheep/goat is 16 kg. The negative impact of high offtake rate on smallstock growth and productivity is offset by relatively large ruminant flocks and rapid recovery from the drought.

The output of hides and skins are directly correlated to the animals slaughtered per year. It is believed that consumer prices of livestock products are higher than the prices actually received by producers in rural areas. The difference in urban market prices and producer prices may be significantly high for some livestock products. In order to estimate consumer prices for meat, average retail prices at butchers charged at major markets of Herat, Kabul, Jalalabad and Kandahar are considered. Other output prices also reflect their market value in major urban centers.

By-products like bones and blood are not edible; they are not processed into bone/blood meal for poultry either. Heads, intestines, liver, lung and heart are edibles and valued, and an average retail price of \$7 was assigned for these edibles from cattle and \$4 from smallstock.

Average wool production per sheep is assumed to be 1.5 kg from two sheerings in a year. Average hair production per goat is assumed as 0.5 kg. It is assumed also that 40% of the smallstock are sheered annually. Cashmere production is of special importance as it fetches good price in the international market. Cashmere production is assumed to be 5 percent of the total hair production.

Traction and transport are the two most important values of work animals. Oxen, the group of equines and in some cases camels are the most important species used for work. Traction constitutes a multitude of activities. By convention the major value of animal traction is seen as a general increase in farm capacity. The introduction of a pair of draught oxen is generally believed to increase the cultivation capacity of a family engaged in traditional agriculture by a factor of 2 or 3 (Jahnke, 1989)¹⁸. But there appears no way of deriving from this a generalisable value of animal traction. An indirect method is to value draught power using the average rental rate for farm work. It is believed that much of the 3.5M hectare rainfed land in Afghanistan is ploughed with oxen and the average time of their use as draught animals can be assumed to be 90 days in a year (Ulfat and Iqbal 2000).¹⁹ A pair of oxen could plough one jerib (one-fifth of a hectare) in a day and the average rental rate would be US\$3-5 per day. The productivity gain from oxen saved through vaccination is thus derived by applying a daily rental rate of US\$ 4 to the total number of oxen saved.

¹⁸ Jahnke, H.E. (1989) *Livestock Production Systems and Livestock Development in Tropical Africa*. Kiel, Germany, Wissenschaftsverlag Vauk

¹⁹ This value appears to be higher than what was recorded for certain African countries. Use of draught power in the lowland mixed systems of Sub-Saharan Africa ranges from 12 days/year in Burkina Faso to 55 days in Zimbabwe, 60 days in Tanzania and 62 days in Mozambique (FAO, 2002)

Productivity gains from equines and camels are measured for their transport. Horses and donkeys are sometimes used for draught power in mountainous areas but more commonly as transport animals and the average time of their use as transport is assumed to be 60 days in a year. Information obtained from DCA specialists suggests that the daily rental rate for a cart horse in Kunduz less feed cost is US\$4.5 and for a donkey US\$3. This rate is applied to the number of animals saved to derive at productivity gains from equines covered by the veterinary program. Camels are rarely used for transport, except as beast of burden when Kuchis move from one location to another.

For poultry, it is assumed 5% of the pullets are cocks, 50% are hens laying eggs and each hen lays 150 eggs/year. But because the pullets are young they lay eggs for about eight months, and about 25% of the eggs will be hatched for multiplication of which 95% will survive.

4. Estimated Impact

Gains from the veterinary program are estimated from two sources: (a) the head value of livestock saved, and (b) the productivity (output and work) gains from those animals that are vaccinated/treated. The estimate is that (a) the total number of cattle and smallstock (head count) targeted by DCA is 2M, and of equines and camels 231,243, (b) the total number of animals covered by the DCA vaccination campaign till the end of December 2004 was 1.45M (about 72.5% coverage) while that of treatment to equines and camels was 115,622 (about 50% coverage). A summary of this estimate is shown in Annex 1E disaggregated by province.

In the poultry sector, the project has distributed 56,000 pullets to about 6,000 women and provided over 160,000 vaccinations against Newcastle and other known diseases in three provinces – Parwan, Kunduz and Nangarhar. Through the distribution of pullets, the project has achieved 24% coverage and established 291 producer groups (58% achievement) against planned targets over the “life of the project”. With multiplication, the poultry population has increased by a further 452,000 chicks, enough to benefit 38,000 more women at the current rate of distribution.²⁰

In terms of attribution it has been assumed that 100% of the gains from poultry and 70% from animals vaccinated and treated (less those dying in the post-vaccination/treatment period) may be assigned to RAMP. This is presumed to be a realistic share to RAMP as some NGOs also provide veterinary services in areas covered by DCA (David Sherman, DCA Chief of Party, personal communication). Summing up the values of animals saved and the productivity gains made, intervention in the livestock and poultry sub-sector has resulted in a grand total impact of US\$113M. A summary is given in Table 6. About 94% of this gain comes from productivity, 80% of which is from cattle and smallstock. In terms of species, impact from cattle and smallstock accounts for 85% of the grand total gain, equines and camels for 14% and poultry for about 1%.

²⁰ This assumes that the chicks thus multiplied by the 6,000 women will be sold to other women at the current rate of acquisition, 12 pullets/women.

Table 6. Livestock Impact Summary, 2004

	Cattle and Smallstock			Poultry			Equines and Camels		Total Impact RAMP ²⁰
	Net Gain			Net Gain			Net Gain		
	Head Value	Productivity Gain		Head Value	Productivity Gain		Head Value	Productivity Gain	
Parwan	272,764.4	5,297,350.0		759,163.0	83,907.5		1,181.6	655,411.4	5,201,765.7
Kunduz	402,181.9	6,819,192.0		441,385.0	48,784.7		7,115.1	1,485,793.3	6,590,167.3
Ghazni	236,272.8	3,421,459.1		0.0	0.0		946.3	576,467.6	2,964,602.1
Nangarhar	547,728.3	12,752,738.3		230,850.0	25,515.0		2,162.8	1,012,142.7	10,276,705.5
Rest 20 Provinces	7,098,717.6	100,392,096.8		0.0	0.0		52,340.3	18,463,952.6	88,204,975.1
Total	8,557,665.0	128,682,836.2		1,431,398.0	158,207.2		63,746.1	22,193,767.6	113,238,215.6

[20] 70% attribution from cattle, smallstock, equines and camels; 100% attribution from poultry