



68418 v4

Republic of Tajikistan

Priorities for Sustainable Growth: A Strategy for Agriculture Sector Development in Tajikistan

Technical Annex 3. Livestock Sector Review



Staatssekretariat für Wirtschaft
Secrétariat d'Etat à l'économie
Segretariato di Stato dell'economia
State Secretariat for Economic
Affairs

s e c o

I. Introduction

One of Tajikistan's greatest resources is the 3.3 million hectares of pastures. However, to effectively utilize them, there must be an adequate conservation of fodder for the winters; currently this potential of the pastures is wasted due to insufficient production of winter fodder. It is estimated that the quantity of winter fodder (hay, silage, cottonseed cake, cereal grains and wheat feed) produced per sheep equivalent is less than half of the animal requirements. This is largely due to the restricted nature of arable land use and, therefore, it is not surprising the animals are underfed and underperforming as a result. The current trends of continued increase in the proportion of arable land (and in case of wheat, even former grazing land) for cropping (especially of cotton on irrigated lands), puts further pressure of the livestock sector.

In the summertime, the main problem is that some animals, in particular from the household sector, do not get to summer pastures, and are kept on bare, overgrazed village pastures. In addition, for animals that do make the journey to summer pastures, it can take up to six weeks each way (i.e. 25% of the year is spent on the move), and the availability and quality of pasture while on the move is not well controlled and may be restricted.

As a result, animal productivity in Tajikistan is very low. Milk yield of dairy cows have been reported to be as low as 1-2 kg/day; calving interval is 17-18 months; carcass weights are small, lambs are usually 1.5 years old before they are slaughtered, and the wool industry has virtually disappeared. The picture that emerges is one of a major animal feed deficit, pervasive animal health problems, poor knowledge of husbandry and management practices among farmers, and perhaps most importantly of all, a sector constrained by land availability and tenure. These factors are far bigger constraints to production than the breeds or genetics of the animals. The current animals are capable of much higher levels of production than currently being achieved. The animal production could be considerably increased by correcting these nutritional, disease and management constraints, without a large increase in breeding animal numbers (i.e. female cows and sheep that will produce calves and lambs). For example

- Milk production could increase by 150 - 300%
- Beef production could increase by up to 100%

Improving the breeds will not bring about any improvement in performance until nutritional, disease and management constraints are tackled, which require a considerable reorganization of land resources and a large increase in feed production. The main issues that need to be tackled are listed below. Some of the issues, in particular points 1 and 2, are structural issues, and need government input and action. The other issues require improvements in animal husbandry and farmer skills and knowledge. To achieve this will require a major effort in extension and training, backed up by research that addresses the issues in a local context. These issues are:

1. Land tenure. This is a critical point. The household sector holds most of the animals and has been responsible for most of the growth in animal numbers since the civil war. However, they have very little of the nation's land. The households must be provided with greater access to land for grazing their livestock and growing winter feed. Past experience (as with Presidential Plots) suggests it will be successful. For the larger dehqon farms, land tenure is also a problem, with uncertainty among farmers as to the security and durability of the leases. Until farmers feel a clear sense of ownership of the land they are using there is little incentive for them to make progress. This must be a priority consideration of further privatization of state farms and improving the security of tenure.
2. The crops vs. livestock issue. The country cannot continue to expand both crop acreages and animal numbers. Farmers' desire appears to be to increase animal numbers, which is presumably because they perceive a better return from livestock than cropping (although this could be partly explained by the use of animals to hold wealth and provide financial security).

However in Tajikistan, there is a state encouraged or mandated drive to increase cotton acreage. While this is understandable from the point of view of earning foreign exchange, it is not a good long term strategy; it is preventing the proper use of the large pasture resource of the country. To effectively use this resource, a certain proportion of arable lowland must be devoted to livestock for the winter period. Also, continuous cotton cropping will eventually cause degradation and impoverishment of the soil. Proper rotations need to be established and farmers have got to be left to make their own decisions regarding land use without state interference.

3. Increased quantity and quality of winter fodder. This is a key bottleneck in the livestock system. It is intertwined with points 1 and 2 above, but other factors impinge on it also. This should be one of the key deliverables of any state or donor-funded programs. Farmers need to be educated about the need for sufficient quantity and quality of winter fodder, and then the land constraints outlined above need to be removed to allow them to make sufficient quantities of fodder. Quality should be tackled by education and extension to: a) encourage farmers to cut hay at a more suitable stage of growth; and b) minimize losses in the field, during storage and at feed-out.
4. Increased quantity and quality of pasture in near village pastures. This is a second key bottleneck in the system, particularly for dairy cows that must be kept on or near village pastures while lactating. This is also related to points 1 and 2 above. To address this issue, farmers must be encouraged to send as many animals as possible to summer pastures, and only keep animals such as milking cows on village pastures for the summer. Any impediments to this need to be removed. Alone, this will not be sufficient, and additional grazing pastures near villages will have to be made available if the dairy industry is to expand. Finally, the day to day management of these pastures should be improved to increase output. For instance, there should be periods of rest and re-growth, and perhaps fertilization and reseeded.
5. Controlled breeding in sheep. The control of breeding appears to have broken down with rams running with ewes outside of the optimum breeding season and, as a result, sheep lamb virtually all year round. An education/extension program to improve sheep husbandry should be undertaken to address this issue.
6. Controlled breeding and annual calving in cows. Many cows are kept in very small herds of one to three cows. Such herds will seldom have a bull for breeding, and poor access to bulls or an AI service means that cows often only calve every second year, and often calve outside the optimal time of the spring. Solving this issue of cows not calving every year, in conjunction with concentrating calving in the spring-time, is critical to moving both the dairy and beef industries forward. A program to improve dairy cow husbandry should be undertaken to address these issues.
7. Disease control. There are many serious animal diseases in Tajikistan such as brucellosis, tuberculosis and foot and mouth. From the viewpoint of animal productivity, brucellosis and parasites (internal and external) are probably the most important diseases. Obviously diseases like brucellosis and foot and mouth need urgent attention, but other diseases and parasites also should be addressed, as part of improved cattle and sheep husbandry programs.
8. Improved farmer knowledge and skills. The skill and knowledge level of many farmers on issues of animal husbandry and nutrition, as well as pasture management, needs urgent improvement. An effective extension service would address such issues and should be developed. Allied to this, an education and training service for farmers needs to be established. Both services would be strong drivers of change and improvement in the industry at this stage of its development. However, until issues of land tenure and competing demands

between crops and fodder for land use are sorted, an extension service will be unable to make much progress.

Improved animal productivity is only one aspect (obviously a very important one at the moment) of improving the livestock sector in Tajikistan. There are other issues that should also be addressed: (i) increased access to financial services, (ii) improvements of skills and knowledge in the processing sector, as well as improved quality standards and control in this sector, (iii) market development for livestock products, and (iv) organization of farmer associations and co-operatives. Thus there are many actions that need to be taken to move animal agriculture in Tajikistan from its current chaotic state to where it can contribute effectively to the economy and the well-being of its population.

II. Background

The agricultural area of the country is about 4.3 m ha, of which about 0.9 m are arable. Approximately half of this arable land is irrigated, and the main crops grown are wheat and cotton. Other crops grown include barley, maize for fodder, potatoes, etc. Permanent pastures make up most of the remaining agricultural land area, and these constitute about 3.2 m ha. Within the livestock sector, pasture utilizing animals (sheep, cattle, gorses, goat and yaks) dominate consistent with the pasture-based nature of their production systems. Pig and poultry industries which rely heavily on grain production are small in comparison and have diminished greatly since independence. There is also a significant peri-urban sector where fattening cattle/sheep and dairy cows are kept in household yards. Feeds supplies are sourced locally, and fattened cattle/sheep and milk are sold in local markets.

Livestock numbers declined dramatically up to 1999, and have recovered somewhat since. Most of the country's livestock are held in the household sector (**Table 1**). In 2004, 94% of dairy cows, 87% of beef cattle, 69% of sheep and 82% of goats were in this sector. The household sector has also been responsible for most of the growth in livestock numbers since 1997. This is despite only having a tiny proportion of the country's land. The poor availability of land for most of the animals of the country to graze or for conservation of hay/silage for their winter diets is the root cause of the very poor nutrition of these animals, and the low productivity that results directly from their poor nutrition.

Table 1. Animals holdings by farm categories in 2004

Cows	Sheep	Goats	Horses
Households			
595	1,153	755	52
Dehqon farms			
10	117	30	5
State farms			
301	403	135	16

Source: National Statistical Committee

In general, animal productivity in Tajikistan is very low. Milk yield of dairy cows have been reported to be as low as 1-2 kg/day; calving interval is 17-18 months, beef cattle can be up to four years old before slaughter, and carcass weights are small—lambs are usually 1.5 years old before they are slaughtered. Furthermore, the wool industry has virtually disappeared. The picture that emerges is one of a major animal feed deficit, wide-scale animal health problems, poor knowledge of husbandry and management practices among farmers, and perhaps most importantly of all, a sector constrained by land availability and tenure. Bearing these points in mind, this report

- Examines the feed resources of the country
- Establishes the livestock carrying capacity of the country given the available feed resources
- Examines current animal productivity and addresses the question of whether it more limited by genetics or nutrition/management
- Estimates what the potential productivity is if nutrition and management were improved
- Outlines the steps that need to be taken to move towards this potential productivity.

III. The pasture resources of Tajikistan

Animal production systems in Tajikistan have traditionally been based on transhumance. This is a pastoral system where animals move several times during the year to where feed is available. So, in a region where forage availability is affected by altitude, the following sequence would occur:

- animals would graze at the highest altitudes in summer when pastures at these altitudes were productive,
- they would move to lower altitude pastures in autumn,
- they would be brought down to the valleys for the winter, where they would rely on a mixture of winter pasture (saved from growth during the summer, and crop aftermaths), conserved hay, and their own body fat built up during the summer to get them through the winter
- during the spring they would go to low altitude pastures as grass became available, and then back to the high altitude pastures during the summer.

This system operated in a sustainable manner in Tajikistan for centuries and allowed for good use of the natural resources of the region. However, the system was ended during the Soviet time, which saw a change to a more intensive system based on conserving large quantities of winter fodder, and importing large quantities of grain from the Soviet Union. This meant that more animals were kept in the country than it could sustain from its own resources. This was sustained during the winter by the grain imports, and in the summer, some animals were taken outside of the country for grazing. After independence, the grain imports stopped and the system became unsustainable without them. This combined with the civil war and changes in farm and livestock ownership, brought about large reductions in animal numbers, especially in the sheep flock and beef herd.

The pastures of the country represent a huge national resource for Tajikistan. Their effective utilization is a vital component for the economic success of the country. As much of the country is mountainous, the pastures are usually characterized on the basis of the period of the year when they are used as follows:

- **Summer pasture** – high altitude (500 – 1000m) pastures, with a short growing season, primarily which are grazed during the summer.
- **Spring/Autumn pastures** – lower altitude pastures, with a longer growing season, which are grazed in the spring and autumn. These have suffered from over-grazing in recent years.
- **Winter grazing areas** – grazing areas near villages. These have suffered from over-grazing due to pressure to keep livestock near to villages. These are the most productive pastures. The areas of these pastures are summarized in **Table 2**.

Classification	Area (ha)
Spring/autumn	411,000
Summer	1,535,000
Winter	1,139,000

Source: The State Land Committee

The commencement of grass growth in spring will vary depending on the altitude of the pastures. It will be earlier for lower altitude pastures near villages than more distant higher altitude pastures. In the lower altitude pastures, there will be little growth before April, and good availability of grass at that stage is dependent on restraining animals from at least part of these pastures over the winter to allow accumulation of sufficient quantity of herbage. If this does not happen, but rather all areas are grazed by animals as growth commences in spring, then sufficient quantities of pasture never get a chance to accumulate.

Another problem which has emerged in recent years is that of growing wheat on slopes and flat tops of hills that would previously have been used for grazing. Such cropping benefits from the build-up of soil fertility and organic matter over many years of pasture production, which is released when pasture is ploughed. However, after cropping for a few years, this fertility and organic matter is

depleted, and so yields drop, cropping ceases and moves on to another area.¹ The area now lies fallow and is prone to degradation and erosion. Grasses should be re-established in these areas when cropping ceases to prevent erosion and to allow fertility to build up again. Another problem with this practice is that while an area has been cultivated, it can prevent access by animals to adjoining pastures.

Correcting these two problems will require a multifactor approach, not least of which is giving a sense of ownership of summer pastures use rights to livestock owners and rural communities who might wish to lease them. Providing for the issue of pasture use right allocation is probably the single most important factor for improvement of pasture utilization and productivity, and thus livestock productivity. Other factors important for improving pasture productivity are:

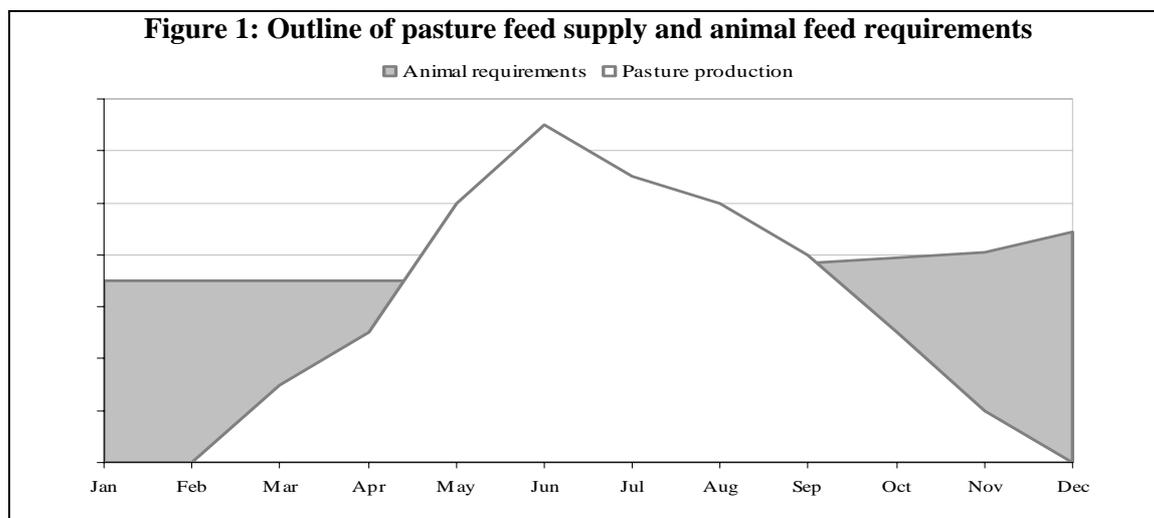
- Improved access to summer pastures (roads, bridges, etc.)
- Improving knowledge of farmers regarding grazing techniques such as rotational grazing
- Encouragement for co-operative hiring of shepherds to look after animals at summer pasture
- Weed control.

There are other issues not listed here such as reseeded, fencing, and fertilization, which all may have important roles to play after the basic issues are sorted. It is also important to note that moving animals to summer pasture can take six weeks each way (i.e. 25% of the year is spent on the move), and that it is not clear who is responsible for these pastures. The availability and quality of pasture while on the move is not well controlled and may be restricted.

IV. Winter feed resources

4.1 Mismatch between pasture production and animal feed requirements

As in other countries where animal production is based on pastures with significant seasonal variation in availability, meeting winter feed requirements is a major issue in Tajikistan. Feed requirements rise in the course of the year, as animals increase in size and weight and consume more feed. On the supply side, pasture output rates fluctuate with seasonal temperature (and rainfall), typically with a surplus in late spring and summer and with deficits in late autumn and winter. Feed supply and animal requirements are therefore poorly matched, as shown in **Figure 1**, and the surplus in the summer needs to be conserved as hay to cover the deficit in the winter.



¹ This is exacerbated by the removal of animal manure for use as a source of fuel for burning.

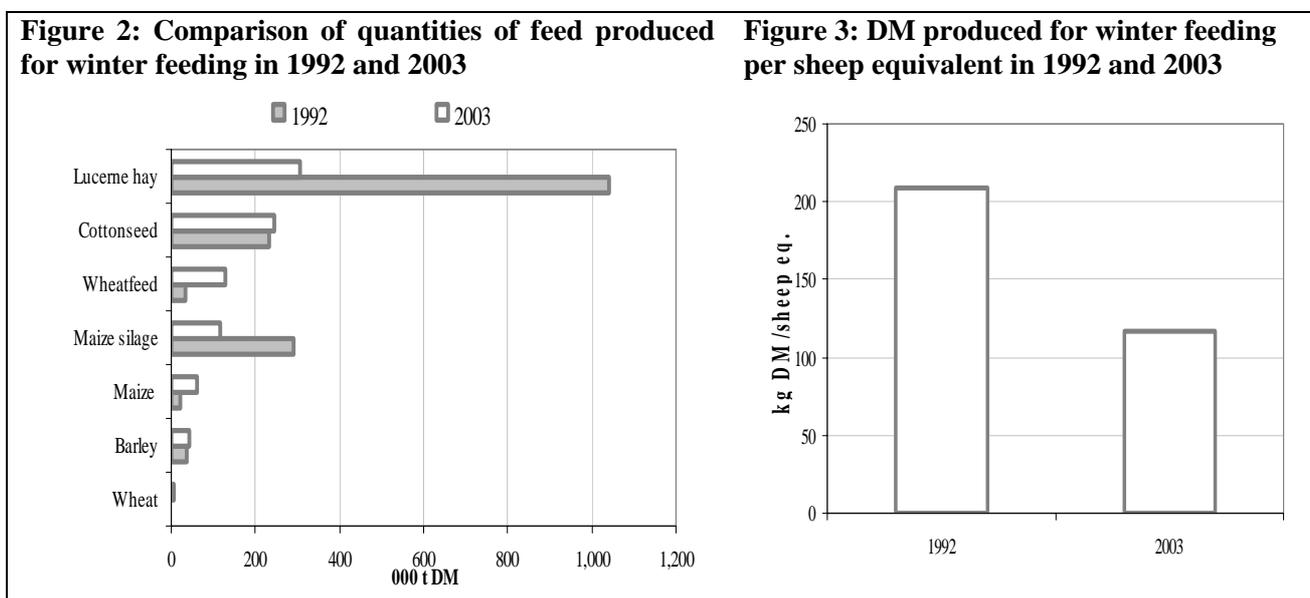
In addition to hay made from meadows, other feeds such as planted forages (lucerne) grown on non-grazing land, concentrates (e.g. barley, wheat, oilseed meal), straw residues from cereals (wheat and barley), and stovers from maize, can all contribute to making up the winter deficit. Winter feed resources in addition to winter pastures are therefore of two main types: **forages** such as hays, straws, stovers and silages, and **concentrates** such as cereal grains, wheat feed, and cottonseed meals (cakes).

4.2 Quantities of forage produced in relation to animal requirements

An attempt has been made to calculate the total animal feed produced for winter feeding in the republic. Several assumptions were made:

- All barley grain produced was used for animal feeding
- Only 1% of wheat grain and 75% of maize grain produced is used for animal feeding
- After oil removal and decortication, as well as waste, 80% of cotton seed is available as cottonseed cake for animal feeding.
- Flour extraction from wheat is 72%, and subsequently there are 20% losses of the wheat feed produced.

The production of the main feeds for winter feeding in 1992 and 2003 is shown in **Figure 2**. Forages make up 47 % of the total calculated feed produced for winter feeding, and thus the critical importance of ensuring good quality forages. In Soviet times, the winter feed availability was much greater, through a combination of imported grain and bigger areas of planted fodder crops (lucerne/maize). The dramatic reductions are obvious. It is very important to note that these data do not include the tonnages of concentrates imported during Soviet times, so the reduction compared to pre-independence data is even more dramatic than it appears.



With the decline in animal numbers since independence, there is a lower requirement for winter fodder, but when production is expressed on a per head basis (sheep equivalents) the deterioration in winter nutrition is stark (**Figure 3**). The picture would look even worse if pre-independence imports of grain were taken into account. The low winter feed production could be sustained if there was a large area of winter grazing, but the feed available from winter pastures has decreased in recent years due to overgrazing and use for cropping. Thus there is obviously a serious shortage of winter feed, which is one of the main problems for livestock production. Given the importance of forage in winter, its quality is highly important. All the evidence suggests that the majority of forage conserved

is poor in quality, and that substantial losses may occur from what is cut in the field to what is eaten by animals. This exacerbates the problem of an already low quantity of winter feed available.

V. Carrying capacity of livestock in Tajikistan

As there are many different types of animals in the country, it is simpler to convert them to a single basis such as sheep equivalents. The conversion all animal numbers results in a number of 7.76 million of sheep equivalents.² Likewise, the estimate of the feed requirement, based on the current mix of animals in the country and assuming moderate levels of production, is 2.27 kg dry matter per day per sheep equivalent, or 829 kg/year.

On the supply side, it is more difficult to estimate the carrying capacity of the country's pastures as information on pasture production is not very reliable. It is assumed that an average pasture dry matter production is 2 t/ha, with the corresponding total national pasture output of 6.6 million tons. Assuming a utilization rate of 50%³, this suggests that animals could consume 3.3 million tons of pasture output. Adding to this the total 0.9 million tons of dry matter of hay, silage and concentrate feeds (e.g. barley, cottonseed cake, wheat feed, etc.) available for animal feeding in 2003, further gives a total of 4.2 million tons. With 7.76 sheep equivalents in the country, this means that each sheep equivalent consumes 540 kg feed per year. This is substantially lower than the calculated requirement of 829 kg/yr, and indicates that only 65% of the estimated feed required is available.

International comparisons of feed availability can be difficult because of differences in feed type and quality, animals and production systems. However, it is useful to benchmark Tajikistan animal intakes against international practices. For example, the average amount of feed consumed by a dairy cow in Ireland is between 4.6 and 4.9 tons DM/year (with approximately 85% of this coming from grazed pasture or grass silage) while only about 2.7 tons DM/year is produced for a cow in Tajikistan. Thus the amount of feed produced per animal in Tajikistan is low by international standards, which obviously contributes to low animal productivity.

However, evidence from the output of animals (i.e. milk production statistics) and the condition of the animals suggests that the situation is much worse than this. There are several readily acceptable explanations for this:

- (i) If significant undergrazing of summer pastures occurs as seems to be the case, then all of the feed assumed to be available for animals is not being used.
- (ii) Pasture output could be significantly lower than the 2 t/ha assumed.
- (iii) Current animal numbers are often considered to be higher than those indicated by the national statistics.

It is clear that to improve individual animal productivity (and sector output), significantly more feed needs to be produced. Thus two scenarios are possible:⁴

- (i) The status quo, where animal numbers are maintained, and feed supply remains the same. This will result in continued low output.

² The following sheep equivalents were used: breeding ewe = 1, growing lamb = 0.5, goat = 0.7, dairy cow = 5, beef animal = 3, horse = 6, yak = 5.

³ Pasture utilization is never 100%—allowance must be made for natural senescence, trampling underfoot, unpalatable pasture which animals avoid, and undergrazing of certain areas

⁴ In theory, the third scenario would be a reduction in the number of animals so that remaining animals can be fed to their requirement. At present, the higher output per animal will more than compensate for the reduction in animal numbers. However, given that a much greater volume of fodder can be produced once the restrictions on arable land use are removed, this option will provide a sub-optimal solution.

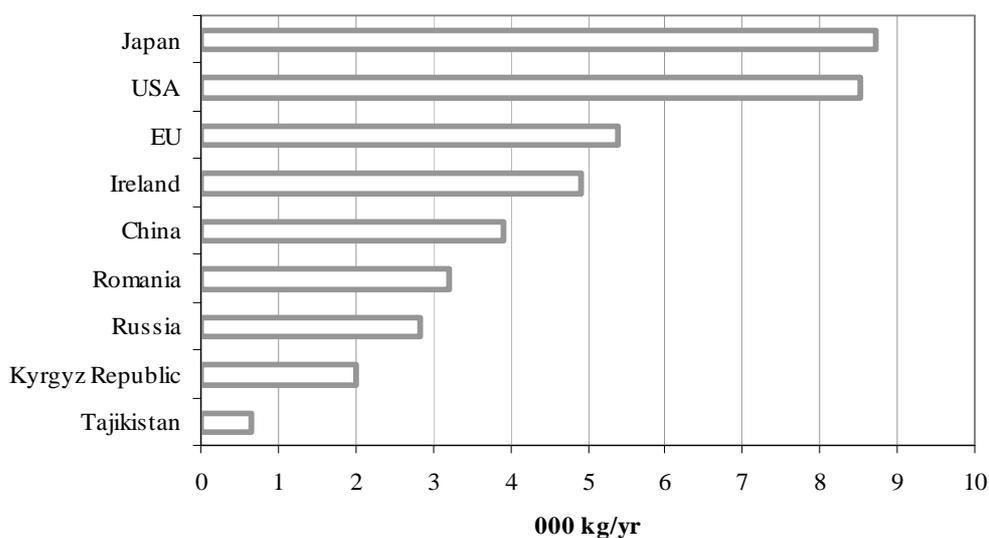
- (ii) Increase the feed supply available to animals. This could be done by (a) firstly ensuring that existing feed production is fully utilized (no undergrazing of summer pastures, reducing losses in hay and silage at conservation and feeding, etc.), (b) reducing the acreage of cotton grown, which is reducing the acreage of winter fodder (it is submitted that cotton production need not necessarily suffer as the improved rotations and/or fertilizer use would compensate—see below), and (c) judicious use of pasture productivity-enhancing investments (e.g. seeding and fertilizers) in selected areas.

VI. Current productivity of cattle and sheep sectors

6.1 Dairy cow production

Dairy cows are mostly kept in small herds of one to three in the household sector with milk being consumed in the household, and any surplus sold in local towns, or local small scale processing units. In the household sector, cows are generally kept on village pastures all year round, sometimes going to nearby summer pastures and being milked there, or sometimes being kept in backyards with feed brought to them. In winter, they are supplemented with some conserved hay and small amounts of concentrates. Due to the small herd sizes, access to bulls can be a problem, and cows often only calve every second year. In the state and dehqon farms, cows tend to be housed for longer periods and fed diets based on silage, cottonseed cake, and wheat feed. Nonetheless, cows held by all categories of farming units suffer from inadequate feed resources, and as a result, animal productivity levels are very low.

Figure 4: International comparisons of annual milk yield per cow per year



Source: FAOSTAT

Milk yield per cow is the most important indicator of productivity in dairy cows. All the indications are that it is very low in Tajikistan. Data on national milk production and number of cows suggests that it dropped dramatically during the civil war, but has recovered somewhat to a level around 700 kg/cow/year in 2004. Other estimates obtained on the field trips show yield per cow at 640 kg/year.⁵ Other estimates have reported very low milk yields of 1-2 kg/day.⁶ The yield per lactation is probably about 50% higher, at around 1,000 kg (which is still very low), because the calving interval is about

⁵ Bravo (2005)

⁶ Nolan (2005)

18 months. Thus, no matter what way one looks at dairy cow productivity, it is extremely low in Tajikistan.

It appears that milk yield per cow is higher for cows in state and dehqon farms than cows in the household sector. Estimates obtained in the field suggest that the milk yield can be as high as 1,186 liters in state/dehqon farms versus 600 liters/year per cow per year in households. This is due to poor access to grazing pastures and poor availability of conserved winter fodder for household cows as compared with cows in state/dehqon farms.

Another important indicator of productivity is the number of calves per cow per year. This is important as it indicates how successful farmers are at getting cows back into calving so that they can start a new lactation, and it is also important as these calves are the raw material for beef production. National statistics (for state farms) report that between 52 and 60 calves are reared per 100 cows with access to a bull in the years 2001 - 2003. This is low by international standards, and an achievable target would be 80 calves reared per 100 cows with access to a bull. As noted above, the calving interval is 18 months as opposed to an industry standard of 12-13 months in countries with well developed agricultural industries. Calving also appears to occur all year round. This is not good practice on farms relying on seasonal pasture production, where calving should be around the start of the grazing season.

6.1.1 Constraints on productivity of dairy cows in Tajikistan—‘breeding or feeding’?

Given that current productivity is low, the question arises as to why. Is it nutrition/management/disease, or is it that the cows are not capable of producing any more milk because of poor genetics? There are several breeds of cows in Tajikistan, with Holsteins in the north and Red Schwitskay and Carpath in the south. There also appears to be large numbers of local breed cows which are smaller in size than the other breeds, and crossbreeds between the various breeds. While the genetic potential of the Holsteins, Red Schwitsky and Carpath for milk production might be lower than found in dairy cows in other countries, field visits indicate that lactation yields can be as high as 9,000 liters for the Holsteins in Tajikistan. An NGO reports that the old Tajik cows in poor condition yielded 7 liters of milk/day when stall fed for 30-40 days. The inescapable conclusion is that the genetics of the cows are not constraining production. Rather, a huge quantum leap in production could be achieved by better feeding of the existing pool of cows. This is not to say that genetic progress should be stopped, but it is futile to make genetic progress when the current pool of cows are so underfed that they cannot even nearly express their genetic potential.

6.1.2 Potential productivity of the Tajik dairy sector

Even taking the best case scenario that average yields are 1,000 kg/cow per year, there is huge potential to increase this by (i) increasing production per lactation and (ii) reducing calving interval. With proper feeding and management, lactation yields could be increased to an average of 2,500 – 3,000 kg/cow, and that the calving interval could be reduced to 12-13 months. This would increase national milk output by 230 to 300%, if cow numbers could be maintained.

6.1.3 Issues that need to be tackled to improve productivity of the dairy sector

The main reasons for this can be summarized as follows:

1. Poor nutrition both during summer when cows are feeding on overgrazed village or nearby pastures and during winter when inadequate quantities and quality of winter feeds are available. As a result, milk yields are very low and lactations are short.
2. Very long calving intervals (18 months) due to an adverse effect of poor nutrition on fertility and unavailability of bull or AI services for many smallholders with resulting long dry periods between lactations. Additionally, calvings are spread throughout the year, rather than being concentrated in spring, around the time that pasture is coming available. This appears

to be the situation also on state and dehqon farms, despite somewhat more organized structures for breeding.

3. Lack of knowledge and husbandry skills among some farmers.
4. Animal diseases, as well as internal and external parasites.
5. Poor quality housing with bad ventilation which can often be worse than no housing in terms of risk of disease.

These constraints must be tackled in an integrated manner, both within the dairy sector and with other livestock sectors.

Undernutrition during the grazing season There are many facets to this. In the household sector where most of the cows are, the cows graze pastures near to villages which are much overgrazed and provide very inadequate amounts of feed for the cows. The situation has deteriorated since independence as households have increased animal numbers and are now grazing more animals on these closer pastures than before. Another major negative factor is the trend to increase cropping areas on former grazing land which reduces the area for grazing, and thus a larger number of animals has even less areas to graze. To reduce the pressure on these areas, beef animals and sheep should be sent to summer pastures, but often the households cannot access for the variety of reasons, which should be the subject of a separate analysis. More land access could be addressed to some extent in the privatization of the remaining state farms. It is logical to target the household sector for distribution of these remaining lands, as this sector has been the main driver of growth in livestock production.

Finally, there is an urgent need for an extension and education program so that management and husbandry practices are improved. This should address the grazing management of the near village pastures.

Winter nutrition The problems here are inadequate quantity of hay and silage, and the poor nutritional value of the material that is made. According to the national statistics, the acreage of arable land used for winter fodder has declined from 75,000 ha pre-independence to 14-15,000 ha in the 2000s. At the same time, yields per ha are less than half that pertaining pre-independence, due most likely to lack of fertilizer use, removal of animal manure for burning, poor seed quality, and weed infestations. The desperate shortage of winter fodder is evident. The continued expansion of cotton and wheat acreages is strangling the livestock sector, and as discussed below, this conflict needs to be addressed. In terms of forage quality, fodder conservation needs to be improved by cutting crops at the correct stage, avoidance of in-field losses, good storage, and good management practices at feed-out. Due to constraints on cereal and other concentrate production, the dairy industry in Tajikistan cannot become a grain-based system, but nevertheless, improved availability of grain by improved yields would benefit the dairy sector. There are reports that in some instances, the yield of barley crops is not much greater than the quantity of seed sown. Thus there is potential to increase the supply of grain for animal feeding without further encroachment on pasture areas. It is obvious that the livestock sector cannot be treated in isolation from the crops sector when considering the development of agriculture in Tajikistan.

The conflict between the desire to increase cotton acreages and increase livestock output must be resolved. Continued expansion of crop areas will cause continued deterioration of the livestock sector. In the medium-long term, continued crop expansion will also lead to reduced crop output because inappropriate rotations will decrease soil fertility and soil organic matter contents and lead to impoverished and eroded soils. Expert estimates suggest that if cotton acreages were reduced by 70,000 ha and replaced with lucerne, there would be no drop in overall cotton production (yields would increase due to improved soil fertility), and the extra lucerne would improve the nutritional status of the animals to a great extent.

Non-seasonal calving In a pasture based system as in Tajikistan, farmers should aim to minimize the nutrient requirements of the cows in the winter period when feed is scarcest and most expensive. This is achieved by calving cows in springtime, around the time when grass growth is recommencing. This

is practiced in other pasture based countries such as New Zealand and Ireland, where about 90% of cows calve in the spring. This is not happening in Tajikistan; instead, calving occurs all year round. The main reasons for this are probably poor availability of a bull or AI services, leading farmers little option but to get cows inseminated whenever the chance arises, and poor appreciation among farmers and other stakeholders of the importance of and benefits from seasonal calving. There is the additional problem of uncontrolled breeding leading to inferior bulls having access to breeding females, some of which have not reached the proper age or size for breeding. Putting heifers into calving for the first time when they are too small impairs their long term production potential.

Animal diseases While there are many diseases that affect dairy cows in Tajikistan (e.g. foot and mouth, TB, hydatids), the ones most likely to affect productivity are brucellosis and parasites (internal and external). The importance of controlling brucellosis has been dealt with in many other reports. Parasites can affect animals indoors and outdoors (spread of external parasites is much more rapid indoors, while internal parasites can be spread all year round), and are an important cause of reduced productivity. Any diseases or poor nutrition that causes poor milk production, or poor quality of the first milk called colostrum (calves are born without immunity from disease and must get the necessary anti-bodies to provide immunity in early life from the cows' colostrum) will cause increased mortality in calves.

Other constraints Further constraints, such as poor animal housing or poor farmer technical knowledge, are issues that need to be improved through technology transfer, via an effective advisory service, or some form of self-help and training.

6.2 Beef cattle production

The beef industry is based on calves produced by dairy cows and they are generally sent to pastures for the summer. During the winter, they may be kept on village pastures, or yarded if facilities are available. Winter diet is winter pastures, supplemented with some hay. If cattle is yarded, diets consist mostly of hay/straw, with some concentrates (cottonseed cake, wheat feed) if they are being fattened. In the peri-urban regions, there is a system of buying cattle, and feeding them in backyards for two to three months and then selling them in local markets for slaughter. Some cattle are sold or slaughtered at young ages as household income dictates, but others are two to four years old at slaughter. Weights are low for their age because of under nutrition in the winter period resulting in weight loss.

The vast majority of beef animals are in the household sector, with only small numbers in state and dehqon farms. As could be expected, there is not a uniform production system. Cattle are slaughtered at 2.5 – 3 years old (and at 350 – 400 kg liveweight) and also being slaughtered at 1.5 – 2 years old (and at 400 – 500 kg liveweight). Beef cattle productivity at farm level is usually measured by some index of growth rate, such as average daily weight gain, or carcass weight at slaughter. These data are not reliably available for Tajikistan and the expert estimates vary. The general picture that emerges is of (i) animals being brought to summer pastures in the summer, or remaining on overgrazed near village pastures if the farmer cannot afford the costs, (ii) grazing winter pastures during the winter, and (iii) a period of stall feeding (cottonseed cake and wheat feed) before slaughter.

6.2.1 Potential productivity of the Tajikistan beef sector

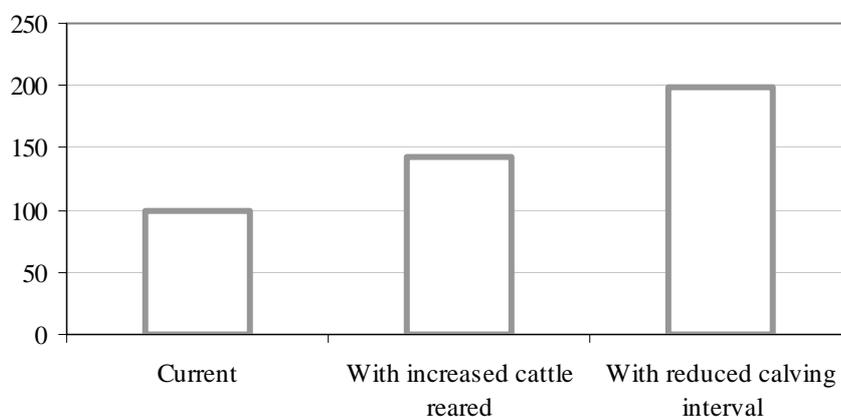
Estimates of feed availability show that there is not a huge scope to increase the livestock numbers in Tajikistan, but even with the existing number of dairy cows, a big increase in beef cattle numbers is possible if the number of calves born and reared per 100 cows per year was improved. Available estimates⁷ suggest that only 52-60 cattle are reared per 100 cows with access to a bull; a target of 80 could be realistic. As noted earlier, information gathered during the field visits indicates that the calving interval is about 18 months, whereas a realistic target could be 13 months. Both increases can

⁷ For state farms only

be attained simultaneously leading to an overall increase in beef output of up to 98%, as shown in **Figure 5**. The number of calves reared could be increased from the current 300,000 to about 750,000. This would not be of any benefit, of course, unless management and husbandry practices were changed so that the increased number of animals had adequate food.

The field work suggests that carcass weights (beef output per animal) are 200 kg or less, which is small. This is not surprising, as animals are likely to lose a large proportion of their bodyweight each winter due to underfeeding. As with dairy cows, the conclusion is that nutrition and management are sub-optimal. The current breeds available are not expressing their potential. Again, it seems logical that nutrition and management be corrected first, so that the current stock can produce to their potential before any substantial effort is put into improving the genetics of the animals. Better nutrition should allow a higher beef output per animal (i.e. bigger carcass weight), in addition to potential gains from more calves being produced by dairy cows as outlined above.

Figure 5: Effect of increasing the number of beef cattle reared per 100 cows mated and reducing the calving interval on national beef output relative to current output



6.2.2 Constraints on beef productivity and issues that need to be tackled

Beef production could be increased either by an increase in the number of animals or an increase in output per animal. Possible reasons why this is not the case are:

1. Poor nutrition both during summer when cattle are feeding on overgrazed village or nearby pastures and during winter when inadequate quantities and quality of winter feeds are available. As a result, growth rates can be low in summer when they should be excellent if animals were moved to summer pastures, and in winter growth rates can be negative, with animals' losing a large proportion of their body weight.
2. A low number of calves reared per 100 cows, compounded by a long calving interval.
3. Animal diseases, as well as internal and external parasites.
4. Lack of knowledge and husbandry skills among some farmers.
5. Poor quality housing with bad ventilation, which can often be worse than no housing in terms of risk of disease.

Poor nutrition The imbalance in grazing (undergrazing of summer pastures with overgrazing of winter and village pastures) must be corrected. Animals need to be moved to summer pastures where there is a plentiful supply of feed to support excellent growth rates. As long as cattle are grazing

over-grazed near pastures during the summer, animal growth rates will be poor. Therefore, all impediments (structural, logistical, leasing, etc.) to cattle using summer pastures need to be removed.

In regards to winter nutrition, there needs to be improvements in the quantity and quality of winter fodder, as outlined for dairy cows. With beef cattle, it is not essential to have high growth rates over the winter period (unless animals are being prepared for winter slaughter). If beef cattle have a period of moderate /poor nutrition followed by a period of good nutrition, growth rates will be poor in the first period, but this is recovered to a large extent in the second period. The cattle make up most of the lost ground; this phenomenon is known as *compensatory growth*. While this phenomenon is used in many cattle rearing systems, the heavy weight loss experienced by cattle during Tajikistan winters is too extreme. Thus winter nutrition does need to be improved.

Low number of calves reared per 100 cows. To tackle this, many issues need to be addressed:

- Poor fertility in cows leading to long dry periods and calving intervals of 18 months. Poor nutrition and management are the root cause of this.
- Abortions brought about by diseases such as brucellosis and poor nutrition.
- High mortality rates in calves due to disease and nutrition/management problems.

Animal diseases While there are many diseases that affect cattle in Tajikistan (e.g. foot and mouth, TB, hydatids), the ones most likely to affect productivity are calf diseases (scour, pneumonia, and joint ill and parasites (internal and external). Poor hygiene and housing conditions contribute to calf diseases, as does poor nutrition of the cows. Any diseases or poor nutrition that causes poor milk production, or poor quality of the first milk called colostrum (calves are born without immunity from disease and must get the necessary anti-bodies to provide immunity in early life from the cows' colostrum) will cause increased mortality in calves. Parasites can affect animals indoors and outdoors (spread of external parasites is much more rapid indoors, while internal parasites can be spread all year round), and are an important cause of reduced productivity.

Other constraints Further constraints, such as poor animal housing or poor farmer technical knowledge, are issues that need to be improved through technology transfer, via an effective advisory service, or some form of self-help and training.

6.3 Sheep and goats

Most sheep and goats are kept in small flocks on household farms. Breeds of sheep are mainly fat tailed breeds suited to meat production. Controlled or planned breeding is only practiced in the larger flocks, with the result that sheep lamb all year round. (The discussion of the negative impact of this is presented below). Sheep and goats generally go to summer pastures for the summer, returning to village pastures for the winter period, except in some cases where the owners cannot afford the costs of shepherding. In these situations, the animals are kept on overgrazed village pastures all year round.

The sheep industry in Tajikistan has declined significantly since 1991 with a drop in sheep numbers from 2.4 m in 1991 to 1.7 m in 2004. Goat numbers have actually increased since independence. Most sheep and goats are in the household sector, with little in the dehqon farms, but significant numbers (e.g. 24% of sheep) are in state farms. Output from the sheep sector at farm level is best measured by an index such as number of lambs sold per 100 ewes put to the ram, and lamb growth rate. The results of a small field survey showed that the number of lambs reared per 100 ewes mated varies between 62 and 89 (125-130 for goats). These are low figures by international standards. Available estimates of the growth rates from birth to slaughter are about 69g/day for lambs and 65-78g/day for goat kids. Again, these are very low by international standards.

To a large extent in Tajikistan, planned breeding of sheep appears to have broken down, and lambing takes place all year round. Flocks are often not segregated, so ram lambs which may be of poor

genetic quality may breed with ewes, giving poor quality progeny. In addition, ewe lambs are often mated when too young and small, and this impairs their subsequent growth and development, and ability to rear lambs. Thus uncontrolled breeding is detrimental to performance and makes management very difficult, and it should be rectified by separating rams from the rest of the flock until the farmer wants mating to commence. In a production system based on pasture as in Tajikistan, sheep should lamb around the time that spring grass is coming available. This is because the two weeks before lambing and the first four to six weeks after lambing are the period of highest energy and protein requirement of the ewe for the latter stages of pregnancy and then early lactation. Good nutrition in this period is essential so that (i) lambs are strong and healthy at birth and (ii) ewe milk yield is sufficient to ensure good survival of young lambs and good lamb growth rates. The easiest way to achieve good nutrition around lambing in a low input pastoral system is to synchronize lambing and grass availability.

6.3.1 Potential productivity of the Tajikistan sheep and goat sector

According to the national statistics, the average output of lambs reared per 100 ewes put to the ram is 70. This is low, but not disastrously low. However, there is no reason that Tajik sheep cannot produce 100+ number of lambs (150+ goat kids per 100 goats available for mating). The conclusion is that nutrition and management are sub-optimal and should be corrected before substantial effort is put into improving the genetics of the animals.

As the carrying capacity of the country is already exceeded, there is no scope for increasing output by increasing sheep or goat numbers (unless pasture output is dramatically increased). Rather, an increase in productivity will be far more readily obtained by increasing the growth rate of lambs or goat kids which is very low at 69 or 72 g/day on average, respectively. Most lambs are slaughtered at about 1.5 years old. This is a result of the following pattern of growth:

- Low-moderate growth rate after birth during their first grazing season
- Very low or even negative growth rate during the winter
- Low-moderate growth rate during their second grazing season until slaughter

It would greatly help the overall fodder situation in the country if some of the lambs could be slaughtered at an earlier age, thereby reducing the number of lambs being carried at any time. In hill sheep production systems in Ireland, the earlier born lambs are usually sold at the end of the first grazing season. This would require these lambs to be separated from the rest of the flock towards the end of the grazing season so that they could be maintained on a better diet, and they might require some supplementary concentrates. The benefit is that the rest of the flock has greater pasture availability the following year.

Increasing wool output is mainly a function of increasing sheep or goat numbers. Additionally, increasing the quality and value of the wool is a function of handling and storage, segregation of different wool grades, and marketing. As indicated above, the scope for large increases in sheep or goat numbers is limited. Given that international wool markets have been poor for some time, there is not much scope to increase the financial wellbeing of the agricultural sector through wool/hair production, but any efforts in this area should be directed at improving the quality and marketing of the wool rather than increasing the volume of wool/hair production.

6.3.2 Constraints on sheep and goat productivity

The biggest problems which constrain sheep productivity can be summarized as follows:

- Poor availability of fodder
- Low numbers of lambs/kids sold per 100 ewes/goats put to the ram
- Lambs/kids too old when fit to slaughter

Poor availability of fodder This is the most critical problem for the livestock sector in Tajikistan, and the issues are the same as outlined for dairy cows. During the winter period, there is simply not sufficient fodder for the animals. The solution must come from a combination of educating farmers about the needs of animals for fodder, the steps that need to be taken to provide it, and from a re-appraisal of the policy of planting more pasture areas with crops. During the summer, there should be sufficient fodder in summer pastures, but if sheep and goats are not sent to these pastures because householders cannot afford the costs involved in moving them and shepherding, then they remain on severely overgrazed pastures, which results in low growth rates. For animals that do go to summer pastures, the treks are long, with up to six weeks spent traveling each way. It is important to ensure adequate forage availability on the treks, as these periods of movement constitute a quarter of the year.

Low numbers of lambs/kids sold This is due to a combination of a low number of lambs/kids born and high mortality. The number of lambs born could be increased by better husbandry: breeding at the correct time and better feeding at critical times. Sheep are seasonal breeders to some extent, although they can go in lamb throughout the year; fertility and lambing rates are best during the natural breeding season which is when day length is declining in autumn. Out of season breeding is the first issue to tackle—rams need to be kept away from ewes, except when they should be mating with ewes in late autumn/early winter. Diseases also need to be tackled, in particular brucellosis, which causes direct lamb losses through abortion, and internal/external parasites. The biggest cause of lamb mortality around birth is inadequate colostrum and milk supply from the ewe, which is related to poor ewe nutrition. Nutrition in late pregnancy and early lactation needs to be improved. The best way to improve early lactation nutrition is to plan to lamb at a time when grass will be available in early lactation. Thus winter lambing should be avoided, as supplementing with concentrates at this time is cost prohibitive. Other factors are bad weather, predators, and diseases. Well-fed lambs have much greater resistance to bad weather and diseases, and diseases can be further avoided by good hygiene at lambing time (e.g. navel dipping in an iodine solution). In lambs born in spring, movement to summer pastures with good pasture supply is the best way to ensure good lamb growth rates. The same issues are relevant to goat kids.

Lambs/goat kids too old when fit to slaughter

One of the consequences of poor availability of fodder is that growth rates are so slow that lambs/goat kids are not fit for slaughter until they are about 1.5 years old. A lamb that reaches the target liveweight for slaughter at nine months old will, over the course of his life, only eat about two thirds of the feed of a lamb who reaches the same liveweight at 18 months. (The two lambs require the same amount of feed for growth, but the older lambs require a lot more feed for maintenance. Maintenance feed requirement is the amount of feed needed when the lamb is neither gaining nor losing weight). Moving the slaughter age from 18 to 9 months will present a challenge to the husbandry and management skills of the farmers, and lighter slaughter weights will probably have to be accepted, but the younger lambs should give meat which is more valuable. Perhaps one way to achieve the technology transfer required could be demonstrated on the pilot farms.

Diseases As with dairy cows, many serious diseases affect sheep and goats in Tajakistan, such as brucellosis and foot and mouth. Brucellosis and parasites are the diseases that will have the greatest effect on productivity.

Other constraints Other constraints, such as poor farmer knowledge of good husbandry practices, need to be tackled through technology transfer, via an effective advisory service or some form of self-help and training.

VII. Conclusions

The animal sector is in a chaotic state with many serious problems.

- There are wholly inadequate quantities of feed for livestock, with current animal numbers exceeding the current carrying capacity of the country.
- Animal numbers are increasing at a time when feed supply is stagnant and may even be diminishing due to expansion in cropping, thus making a bad situation worse for animal enterprises.
- There is a very low animal productivity, with feeding and management being the main constraint rather than genetics.
- A very serious animal health situation exists, with many serious diseases occurring, and little capacity to deal effectively with them.
- There are a set of new private farmers and households, many of whom have little knowledge of animal husbandry and farm management skills, and only a very limited extension service to up-skill them.
- There is a very fragmented production system, which increases the challenges for processing and marketing of agricultural products.

Livestock enterprises are competing with crops (cotton and wheat mainly) for available land, and because of the current cotton sector policies it appears as if the crops are winning. This conflict in the use of land resources needs to be resolved. At the moment, the livestock industry is losing, and animal productivity is far below what could be expected. Cotton acreages are expanding, but in the short to medium term, crop yield will suffer as soil fertility declines, and organic soil matter contents reduce. The present trends will further impact negatively on the livestock sector, and eventually the crop sector will decline also. Thus the country is heading for a lose-lose situation. A possible win-win situation is to encourage more sustainable crop rotation systems by promoting farmers' free choice over planting decisions.

The land tenure system discourages the development of the sustainable livestock management systems. Despite holding only about 4% of the land, the household sector contains most of the animals of the country (94% of dairy cows, 87% of beef cattle, 69% of sheep and 82% of goats in 2004), and it has been responsible for most of the growth in animal numbers since the end of the civil war in 1997. Yet, they have very little of the nation's land. The households must be provided with greater access to land for grazing their livestock and growing winter feed. Past experience (as with Presidential Plots) suggests it will be successful. For the larger dehqon farms, land tenure is also a problem, with uncertainty among farmers as to the security and durability of the leases. Until farmers feel a clear sense of ownership of the land they are using there is little incentive for them to make progress.