Report on ICARDA Project

"Community Action in Integrated and Market Oriented Feed-Livestock Production in Central and South Asia."

Activities # 11, 14 and 15

The basis for decentralized and participatory breeding plans for farmers to access improved animals in Kyrgyzstan and Tajikistan

Submitted by

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Executive summary

Three small ruminant community based breeding plans were developed and implemented. (1) meat sheep in Kyrgyzstan, (2) dairy sheep in Kyrgyzstan and (3) Mohair goats in Tajikistan. The development procedure involved basically three steps: discussion of options amongst technical teams, a workshop with farmers to select an option, and a formal agreement on a calendar of activities for the 2007/2008 breeding cycle. In each case a specific genetic structure was designed and selection criteria based on records of visual assessment and objective information defined. In all cases smallholders of isolated communities are involved and initially strong technical support is needed and will be provided by local NARS. However provisions are made to ensure that breeding plans are sustainable beyond the period of the ICARDA project.

(1) A group of ten members of the Akbeket community (Kemin District, Kyrgyzstan) with a total of 200 ewes agreed on a breeding plan based on the initial purchase of Aikol rams which will be mated to selected ewes of each participant. Male lambs, born to superior ewes, will be performance tested by recording successive life weights until decision is taken to keep or cull/sell them. Controlled pen mating will allow crossing with superior performance tested young sires. Ewes will be selected on own reproductive performance and growth of its progeny. Eventually all necessary sires are produced within the group and surplus sires can be sold to other farmers.

(2) The breeding plan is based on further upgrading of an existing Awassi graded flock (near Tokmok, Kyrgyzstan) through the introduction of new Awassi rams. Five neighbor smallholders also interested in diversifying their production will select ewes having outstanding reproduction features and receive rams from the Awassi graded flock to produce Awassi graded females for milking. In a second year new females will be selected and mated to Awassi rams, progressively building dairy flocks. The process is slow but allows gradual adjustment of management, milk collection, milk processing and marketing issues. Eventually the breeding plan can develop into a selection plan as participating farmers, animals and milk recording conditions develop.

(3) A group of 8 farmers from 2 villages (near Kudzhand, Tajikistan) agreed on following a breeding plan based on the initial inspection of available breeding females and identification of accepted does. Selection will be based on visually assessed body and mohair traits and mating will be to best bucks available. Progeny from these does will be identified and at first shearing fleece weight and fleece sample will be taken for analysis in a regional wool lab. Before mating and based on visual assessment, fleece weight and sample analyses results, superior female and male candidates will replace culled does and bucks. The scheme is a variant of a dispersed open nucleus system where each participant keeps best females but shares top male progeny. The scheme is open because, at least in the first years, it allows young replacement females to be selected amongst non-nucleus born animals. The plan involves recording and controlled mating but can be managed in the future by the participants with minor technical help.

The basis for a decentralized and participatory breeding plan for farmers to access improved animals in Kyrgyzstan and Tajikistan

Kyrgyzstan

Akbeket Meat Sheep Breeding Plan (*Activity 11*)

Summary
A group of ten members of the Akbeket community with a total of 200 ewes agreed on a breeding plan based on the initial purchase of Aikol rams which will be mated to selected ewes of each participant. Male lambs, born to superior ewes, will be performance tested by recording successive life weights until decision is taken to keep or cull/sell them. Controlled pen mating will allow crossing with superior performance tested young sires. Ewes will be selected on own reproductive performance and growth of its progeny. Eventually all necessary sires are produced within the group and surplus sires can be sold to other farmers.

Salient features of the plan

- The plan was formally agreed on with participants. This involves commitment in following an activity calendar and accepting emerging responsibilities.
- Breeding objective and selection criteria were discussed, ranked and agreed by farmers and scientists prior to the definition of the plan.
- Participant farmers took part in the selection of foundation sires at Aikol Pedigree Farm.
- Selection will be based on visual assessment and measured records.
- The plan was formulated as a strategy that requires only minimal adjustments to present management procedures and available resources.
- The plan requires initial monitoring and strong technical advice. Provided that farmers will benefit from it, the plan is expected to be sustainable beyond the end of the project with minimal technical support.

Plan development
Two target communities were considered, the Donarek and the Akbeket community, the latter community in the Kemin District was chosen as being more appropriate and better suited for the experience, based on successful previous work. Three breeding plan options were identified and discussed with farmers and researchers (1) continuous incorporation of rams from a suitable supplier, (2) a community based centralized open nucleus group breeding system and (3) a decentralized open nucleus group breeding system. It was decided to discuss all options with the community. In a workshop with farmers, agreement was reached on a particular combination of breeding plan options (1) and (2). Farmers were interested in the initial introduction of rams from the Aikol Pedigree Breeding Farm and progressively produce their own rams by performance testing candidate rams born to best ewes in the flocks.

For the constitution of the community nucleus a document signed by the community farmers and researches documenting the foundation steps and defining the responsibilities to be listed below will be written as part of the documentation process and as a reference for following up.

Furthermore an activity calendar for the first year (starting October 2007) was agreed. In addition to the breeding plan calendar the technical team is also expected to implement an improved health (and feeding) calendar adjusted to the needs of the community. If this is not planned in the project, its implementation, as a complement by other project activities, is urgently recommended.

Plan details

1. Identification of the nucleus foundation ewes

The breeding plan will start with classing existing ewes in each flock into 3 categories: superior ewes, average ewes and inferior ewes. Selection will be based on historical account on former performance. Superior ewes will be those having weaned at least one strong lamb in the previous parity. Average ewes will be those having failed to wean a strong lamb in the previous parity but are acceptable or promising (in case of young replacement ewes). Inferior ewes are very old, very weak or sick ewes and those which frequently fail to wean a lamb. Only superior and average ewes will be ear-tagged. If possible all inferior ewes will be culled and replaced with young promising ewes. Ewe classing results may be recorded as shown in Table 1 of the attached Excel file (Akbeket.xls).

2. Nucleus foundation rams

Two Aikol rams will be purchased at the Aikol Pedigree Breeding Farm on the basis of their performance record and appearance. In addition the "best" local ram will also be used. The technical team together with the participants will select the 3 foundation rams.

3. Mating

All superior and average ewes will be mated to the three rams. Mating will be controlled in pens and start November 1. Ewes on heat, detected by a teaser ram (wearing an apron), will be separated on a daily basis and taken to a pen with one of the rams. Rams will be used in alternating days. Effective mating date will be recorded so that progeny's sire and dam can be identified. Mating results may be recorded as shown in Table 2 of the attached Excel file (Akbeket.xls).

4. Identification of candidate lambs for selection

At lambing, all female lambs born to superior and average ewes, and all male lambs born to superior ewes will be identified with ear-tags and their birth dates and birth weights recorded (see Table 3 in Akbeket.xls) by farmers and these records will be checked by scientists in periodical visits.

5. Selection of male lambs

(i) First selection of lambs: At marking, say May 30, all male lambs born to superior ewes (that is, all male lambs with ear-tags) will be weighed and adjusted 45-day weight will be calculated (see Tables 4 and 5 in Akbeket.xls). Based on this weight, about 20 male lambs will be pre-selected. Other male lambs will be castrated or sold.
(ii) Second selection of lambs: By October 15, when the flocks return from the rotational range remote grazing, male lambs will be weighed again and adjusted 6-month weight will be calculated and used as selection criterion (see Tables 4 and 5 in Akbeket.xls). The best 10 of these male lambs will be retained for winter feeding. Other males will be castrated or sold. During winter, selected males will be managed together

in one flock agreed by the community in order to assess comparative growth rates under a single management environment.
(iii) Third and final selection of lambs: By April 15, young rams will be weighed and the best of them selected on a final 12-month adjusted body weight (Tables 4 and 5 in Akbeket.xls).

6. Selection of female lambs
Female lambs born to superior or average ewes will follow the same weighing schedule as male lambs, that is: weighing on May 30, October 15 and April 15. Weight adjustments will be similar to those for males and final selection will be based on adjusted 12-month weight (as in Tables 4 and 5 in Akbeket.xls).

7. Future ram replacement in the nucleus under selection
For the November 2009 mating, young males born in the system become ram replacement candidates. At that stage we will have progeny tested the 3 rams used for mating in 2007. The progeny test of these rams will be based on their male and mainly on their female progeny, since many more female lambs provide body weight records than male lambs (see Table 7 in Akbeket.xls). Based on this progeny test results if one of the sires (Aikol or local) is clearly outperformed it will be replaced by a new one. This new ram can be a new selected Aikol ram purchased at the Aikol Pedigree Breeding Farm or can be an outstanding young performance tested ram born in the Akbeket nucleus. The decision should be based on a careful analyses of data and visual inspection discussed amongst farmers and technical team.

8. Future nucleus ewe replacement selection
Once formal lambing records are available for ewes, classing of ewes can be based on breeding values taking into account lifetime reproductive performance (see Table 6 in Akbeket.xls).

Relevant issues
The first aspect to consider is that the proposed breeding plan assumes that Aikol rams are improvers of production for the Akbeket community flock. During the visit to the Kyzyl-Oktybar village, farmers and technical team had the opportunity to inspect a small group of sheep from one household, as all other sheep from the community were at the summer pastures. The observed sheep were of good size, frame and condition, suggesting that any rams to be introduced in this kind of flocks will need to be selected carefully in order to further improve the quality of the local flocks. For this reason it was agreed that farmers and technical team will together select the rams at the Aikol Farm.

A second aspect is related to recording requirements. The premise is to minimize recording needs given the restricted conditions of the community, establishing only a discipline that farmers could follow on a sustainable manner after the project. However the technical team clearly is prepared and interested to take additional measurement to what is essential, by taking for example extra weights, body structure measurements and fat tail measurements. If necessary, birth weighing can be avoided as well as weaning weighing, considering that lambing occurs over several days (perhaps weeks) and weighing at birth would necessarily be a task of the farmers. Similarly, weaning will be in the summer pastures and access of the technical team will be more difficult. On the

other side weighing at marking[1] is essential since at that point male lamb candidates are selected, others castrated. However at the early age of marking (average 45 days) it will be very important to have birth dates to adjust marking weight for age of lamb. In the usual management system October weighing (at about 6 months of age) becomes more important than weaning weighing because at that stage male candidates are retained for winter feeding. Body structure measurements and fat tail measurements may be of interest but could be replaced with visual assessment. Minimum recording will become important when the pilot system is to be replicated without the extensive technical support provided to Akbeket.

A third aspect is inbreeding rate. Clearly the breeding plan is based on very few animals, very much in the limit of acceptable effective population size. Considering random mating and 1 ram and 40 ewes replaced every year, effective population size (Ne) is only about 14 (1/Ne=1/4ML+1/4FL, M and F being new males and females and L is the generation interval, here 3.5 years) and yearly increase of inbreeding is 1% (1/2NeL). In the future, unless the system evolves into another direction, there would be a need of some periodic introduction of males to delay accumulation of inbreeding. If pedigree recording is effective and extensive then mating could be arranged in order to keep inbreeding rate at a minimum.

Time will tell if performance and pedigree recording will be sufficient and reliable, if this is the case, additional improvement is possible using more sophisticated analyses procedures. In any case this would require extra expertise from the technical team supporting farmers.

Activity Calendar for first year (Oct 2007 - Oct 2008)

Date	Id	Activity	Responsible
Oct 2007	1	*Sire selection:* Participants travel to Aikol and select foundation sires. Note: if there is a good sire in the community he could be used together with the Aikol sires allowing a comparison of the progeny from local and Aikol genotypes.	Participants and technical team
Oct 2007	2	*Ewe classing:* Upon return of ewes from summer grazing good ewes are identified and ear-tagged. Inferior ewes are culled if replacements are sufficient. Ewe classing will be based on criteria discussed between participants and technical team (an example of such criteria is given in Table 1 of an attached Excel spreadsheet).	Participants and technical team
Nov 2007	3	*Mating:* All ewes are pen-mated to Aikol sires giving priority to best ewes. Sire-ewe mates and corresponding mating dates are recorded (Table 2) to enable pedigree recording of progeny.	Participants, monitored by technical team
Apr 2008	4	*Lambing:* Birth date, birth type and birth weight is recorded and lambs are ear-tagged (Table 3).	Participants monitored by technical team

[1] Marking is an activity occurring at the end of lambing, about 45 to 60 days after the first lamb is born, when lambs are usually "marked" in their ears for matters of ownership, at this time tails are cut and male lambs not to be used in the flock are castrated.

May 2008	5	*Marking:* At marking all lambs are weighed (Table 4) and weights are analyzed (Table 5). About 20 male lambs with high growth rate born from superior ewes are not castrated and are candidates for future sire replacement. Decisions are made here on the basis of the data results.	Technical team with opinion of participants
May 2008	6	All animals go to summer pastures.	Participants
Aug 2008	7	*Weaning:* Weaning takes place in summer pastures. Weaning weights of ear-tagged lambs are taken (Table 4).	Participants
Oct 2008	8	All animals return from summer pastures and ear-tagged lambs are weighed (Table 4).	Technical team
Oct 2008	9	Weights are analyzed and about 10 male lambs are selected on growth rate and visual quality for final performance testing (as in Table 5).	Technical team with opinion of participants
Oct 2008	10	*Performance testing:* Selected male lambs are managed together during the winter in a single flock (will get their final weight in May 2009).	Participants
Oct 2008	11	*Ewe selection:* Select young replacement females and re-class adult ewes (Table 1 and 6). Put ear-tags on new ewes (using new numbers). Young replacement females will be selected and adult ewes will be reclassified. The first 2 years this will be done on the basis of the ewes' own performance.	Participants with opinion of technical team
Oct 2008	12	*Sire selection:* After one year, the adaptation of Aikol rams to the Akbeket production condition and the performance of their progeny can be assessed. Results of this assessment may indicate the necessity of the replacement of one or both sires (Table 7).	Participants with opinion of technical team

Recording

An Excel spreadsheet template was developed including the 7 tables mentioned in the Activity Calendar which the technical team can fill with field records. The tables include some built-in functions for appropriate adjustment of data and estimation of breeding values. The built-in functions are meant for the researchers as they do not need at this stage to be explained to farmers. However the farmers should be aware of the most important recording times: ewe fertility, lamb birth dates, marking dates, 6-month weight and 1-year weight.

Project monitoring

May and October are key monitoring months. In May marking takes place and initial selection of male lambs for performance testing is performed on adjusted 45 day weight. The activity requires strong involvement of the technical team and participants. After this event all animals proceed to summer pastures. The other key month is October upon return from summer pastures. In October several key selection decisions take place including a new cycle of selection and mating.

Tokmok Dairy Sheep Breeding Plan (Activity 14)

Summary of plan

The breeding plan is based on further upgrading of an existing Awassi graded flock through the introduction of new Awassi rams. Neighbor smallholders also interested in diversifying their production will select ewes on reproduction features and receive rams from the Awassi graded flock for producing Awassi graded females for milking. In a second year new females will be selected and mated to Awassi rams, progressively building dairy flocks. The process is slow but allows gradual adjustment of management, milk collection, milk processing and marketing issues. As the flocks improve it will be necessary to introduce further Awassi rams but also home-grown grade young Awassi rams can be detected and used. It is recommended not to go further than 7/8 Awassi. Eventually the breeding plan can develop into a selection plan as participating farmers, animals and milk recording conditions develop. Careful attention of the Awassi rams to be introduced should be taken into account because it is very likely they are already inbred. If data are available showing that the rams are unrelated it would be ideal. The flock of pure Awassi was introduced into Central Asia around 1997 and was kept closed thereafter.

Salient features of the plan

- This is a small scale and incipient breeding plan with the merit of being the first diversified sheep dairy initiative in the region.
- The plan is formally agreed on with participants. This involves commitment in following an activity calendar and accepting emerging responsibilities.
- Breeding objective and selection criteria have been previously discussed.
- The project will succeed as far as there is a strong training in the processing of milk into products with market possibilities.

Plan development

The plan is based on a flock of Awassi graded ewes (most probably having 50% Awassi breeding) that belong to Mr Nurgan who collected information on meat and milk production of the flock and is about to present his PhD thesis with results of the comparison of the different genotypes. Mr Nurgan acknowledges very good milking performance of the crossbred ewes. In a discussion with Mr Nurgan, he supported the proposal of not only expanding his own flock but extending the diversification process through dissemination of his Awassi grade rams to interested neighbors, eventually helping them in processing and marketing their dairy products. A participatory workshop was held a few days later with 5 interested farmers, Mr Nurgan included. Implementation options were discussed and it was agreed to start the breeding plan by allotting a portion of ewes from each farmer to Awassi graded rams provided by Mr Nurgan in the next mating season. New Awassi rams will be introduced shortly from Kazakhstan.

Plan details

The nucleus consists of about 200 females in which about 50% are Awassi graded ewes. Only one ram has been used for about 5 years. This ram came from Kazakhstan. In this season two new rams will be brought from the same origin, however in the future other Awassi ram sources need to be considered to avoid inbreeding. Currently the farm milks about 30 ewes, a number that could be expanded in view of the grazing and feeding

facilities, particularly due to the establishment of a lucern/barley production component in the farm.

Initially a group of five smallholders are interested in the breeding plan. They have 200, 200, 40, 30 and 20 coarse wool meat ewes, respectively. These farmers have proposed to select 55 strong and fertile ewes having lambed and weaned at least healthy twins (which indicates much about their good mother and milking ability). Selected females of the five participants will be taken to two or three strategically located farms for mating. Mr Nurgan will provide his purebred Awassi ram and one or two 3/4 Awassi rams for mating. The rams will be transported to each mating site and mating will start 15 November 2007. 3/8 and 1/2 Awassi female lambs will be born in April 2008 and milked in 2009. In a second cycle additional females will be selected in similar manner and mated to Awassi rams. In a third cycle female progeny of Awassi rams will be used to increase the dairy flock. In the first years, male progeny will be castrated or sold. This process, that will observe a gradual progression, will require due adjustment of management, milk collection, as well as targeted milk processing and marketing issues. Concurrent analysis of the production would give place to define an upgrading ceiling. All participants insisted on the importance in training in milk processing for market outlook.

As the flocks improve it will be necessary to introduce further Awassi rams but also grade young Awassi rams can be selected and used. Candidate male lambs are those born to high grade Awassi and ewes with outstanding milk production. Eventually the breeding plan can develop into a selection plan as participating farmers, animals and milk recording conditions develop. Recording will most probably start soon in the nucleus flock enabling objective evaluation of sires.

Relevant issues

- The first aspect to consider it that only in the nucleus there is an incipient experience in milking. Development of additional skills for other farmers will be urgently required, though at this stage this is not a crucial issue as the farmers are not milking yet.
- A second aspect is the dependence of the breeding plan from the nucleus. Participants and technical team are very confident in that there are no risks as there is mutual interest in a successful breeding plan. As the project design addresses the opportunities to capitalize on positive interactions among production systems, this plan fits well into this design. Animal health risks will be kept at minimum with adequate health monitoring. Inbreeding risks will also be avoided by preventing sire-daughter matings and introduction of new Awassi sires, provided these are unrelated.

Activity Calendar for first year (Oct 2007 - Oct 2008)

Date	Id	Activity	Responsible
Oct 2007	1	New Awassi rams from Kazakhstan are introduced into the nucleus.	Nucleus
Oct 2007	2	Participants agree on Awassi rams to be used in their flocks.	Participants
Oct 2007	3	Participants select appropriate ewes for mating with Awassi rams.	Participants
Nov	4	Mating in nucleus and participating flocks	Participants

2007			
Apr 2008	5	Lambing. F1 Awassi lambs are identified and ear tagged.	Participants and technical team
May 2008	6	Milking starts in the nucleus.	Nucleus
May 2008	6	An initial training in milk processing is planned at this time to be held in Tokmok (Muhi El Dine, from ICARDA, in following g already standard plans in this regard)	Participants, nucleus and technical team
Oct 2008	8	A new cycle of mating with Awassi rams takes place with further ewes included in the plan by participants	Participants

Tajikistan

Kudzhand Angora Goat Breeding Plan (Activity 15)

Summary of plan
A group of 8 farmers from 2 villages agreed on following a breeding plan based on the initial inspection of available breeding females and identification of accepted does for mating in October 2007. Selection will be based on visually assessed body and mohair traits and mating will be to best bucks available. Progeny from these does will be identified and, at their first shearing, fleece weight and fleece sample will be taken for analysis in a regional wool lab. Before mating and based on visual assessment and results of fleece weight and sample analyses, superior female and male candidates will replace culled does and bucks. The scheme is a variant of a dispersed open nucleus system where each participant keeps best females but shares top male progeny. The scheme is open because, at least in the first years, it allows young replacement females to be selected amongst non-nucleus born animals. The plan involves recording and controlled mating but can be managed in the future by the participants with minor technical help.

Salient features of the plan
- The plan was formally agreed on with participants. This involves commitment in following an activity calendar and accepting emerging responsibilities.
- Breeding objective and selection criteria were discussed in detail.
- Selection will be based on visual and measured assessment and on individuals that contribute to effective breeding improvement.
- The plan links directly with Activity 16 (“Value added local processing of goat fibers”) as superfine fleeces can be detected in a systematic way and breeding objective will progressively focus on international standards.
- The plan gradually will be simplified in order to make it sustainable beyond the end of the project requiring at that stage minimal technical support.

Plan development
Options were discussed with research counterpart Matazim Kosimov. He identified two groups of farmers, one of 18 conservative farmers and another group of 8 farmers willing to participate in an Angora goat breeding plan. Members of this group, which he

called the “integrated group”, are located in the villages of Karadzhingil, Takli, Uyas and Gulobod some 70 km north of Kudzhand. Several farmers of this group were visited and their flocks inspected (some farmers were with their flocks still in the summer pastures) and with two of them, Turgunboi Kilichev and Abdumalik Khoji, breeding issues were discussed and breeding plan options evaluated in more detail.

Plan details
The 8 participating farmers have small flocks (20-50 breeding females, last fall), 3 are basically white Mohair producing and the others produce colored or mixed color Mohair. In spite of the fact that colored Mohair is appreciated in some specific market niches, the international bulk Mohair market is for white color and in the long run Tajik Mohair will have to be white to compete in that market. Apart from color, breeding objective is to improve fleece weights and to improve mohair quality without loosing body weight and fitness. Improvement of Mohair quality refers to increasing staple length, reducing contamination (medullated fibers and kemp) and improving style, character and luster.

1. Selection of nucleus foundation does and bucks
It was decided to start the breeding program this year, even though little time is left for comprehensive selection of females. It also became clear that initially two mating groups will be arranged, one of white and one of colored females with about 100 white and about 50 colored females, respectively. Selection will be based on visual assessment of available females classed within color group into two categories: nucleus and non-nucleus does. Assessment will consider previous reproductive performance, body size and Mohair quantity and quality. Similarly bucks will be assessed visually based on quality of known progeny and own size and Mohair quantity and quality.

2. Mating and kidding
Mating starts October 20 and kidding by mid April 2008. Promising male kids (visually superior and born from best females) will be kept un-castrated. These males and the female kids will be ear tagged. In fact as many male-kids as possible will be kept un-castrated in order to increase selection pressure.

3. Shearing
At shearing in May 2008, fleece weights and fleece samples will be taken from nucleus females, bucks and 2007-born progeny. Fleece weights will be recorded by weighing the whole fleece using scales with at least 0.05 kg accuracy. Sampling site is the region of the middle of third last rib. At least 20 grams from each animal should be removed by shearing at skin level. The fleece sample will be sent to the Alrun Wool Lab in Almaty, or another suitable wool lab, for analyses. Average fiber diameter, its Coefficient of Variation (CV) and Standard Deviation (SD), comfort factor (percent of fibers below 30 microns) and medullation will be determined. At this stage coordination with Dr Liba Brent will be important since some of the best and finest fleeces from this first shearing may be purchased by the women involved in the Mohair yarn and knitting project activity 16.

4. Selection of replacement does and bucks
Before mating in October 2008, young (2007-born) females and males as well as all adult does and bucks of the nucleus established in 2007 will be evaluated on measured and visual performance. Thus, four age-sex categories of animals will be evaluated

independently within each of the two color groups: 2007-born males, 2007-born females, adult bucks and adult does.

By October 2008 the following measured performance records will be available for each category of animals:

List of measured traits considered in Mohair goat selection

Trait	Details
• Body weight taken at the end of summer grazing in October 2008	Similar scales should be distributed to avoid large variations in weight
• Fleece weight taken at shearing in May 2008	Scales should be at least 0.05 kg capacity and should be the same for all participant farmers
• Analysis of fleece sample taken at shearing in May 2008	• Mean fiber diameter • CV and SD of fiber diameter • Comfort factor • Medulated fiber and kemp content

Animals within each color group and age-sex category will be ranked and those with high body weight, high fleece weight and those with low average fiber diameter, CV, SD, Comfort Factor and Medullation will be identified as "superior" in overall measured traits. Conversely, bad performing animals in all these traits will be identified as "inferior" and others will be identified as "average". There is no pre-conceived weighing factor for each measured trait and the classer will have to apply his own criterion and knowledge to reach the overall measurement class. Typically 25% of animals should be classed as superior, 50% as average and 25% as inferior in overall measurement. This is why it would be highly recommendable to begin the training of an identified person who speaks English.

Similarly animals within each color group and age-sex category will be thoroughly inspected considering the following visual traits:

List of visually assessed traits considered in Mohair goat selection.

Trait	Details
• Basic faults	• Testicles, udder, prognatism, etc.
• Reproductive performance	• Knowledge of kidding performance in adult females or sire performance in adult males
• Visual inspection of body traits	• Size • Head / Horns • Feet • Conformation
• Visual inspection of Mohair traits	• Visual fineness (in Counts) • Visual medullation and kemp content • Visual staple length • Luster, Style and Character • Evenness, Softness, Cover • Black pigment (only for white animals)

Note: Find further explanation of visual traits in ANNEX.

Visual inspection ends with an overall visual class of each animal, based on weighted consideration of all visually assessed traits. Again three classes are possible: Superior animals, Average animals and Inferior animals. A similar 25:50:25 proportion of classes is also suggested.

Final selection will be based on both measured performance and visual performance, the decision depending on sex and number of candidates in each class. The following Table shows typical requirements for male and female replacements in the nucleus:

Male and female replacement requirements to enter the nucleus.

	Measured Performance	**Visual Performance**
Male replacement	Superior	Superior
Female replacement	Superior or Average	Superior or Average

It is suggested to hold a training workshop on the issue of Mohair selection procedures using measurements and visual assessment. This can be done in two sessions, the first including theoretical aspects aimed at the technical team and a second largely practical and aimed at farmers.

Relevant issues
Breeding objective. In the international mohair market fiber diameter differences account for most variation in Mohair price, the finer the average fiber diameter the higher the price. Price for fine Mohair (say 25 mic) may double the price of coarser Mohair (say 30 mic) (McGregor 2007). However the present Tajik market has a preference for rather coarse Mohair, and price of coarse mohair is somewhat higher than fine Mohair for reasons clearly explained by Brent (2007). At present most Mohair is destined to the Russian market as opposed to the regular international market. In Russia Mohair is used for winter clothing and fabrics are not readily used on the skin, therefore the prickle sensation due to coarse fibers is not perceived. If this market orientation persists and is sustainable then breeding for coarse Mohair would be sensible but if progressively the demand in Russia changes toward more fashion oriented end-use, or coarse Mohair clothes are replaced with cheaper synthetics clothes then Tajik Mohair should find its way to other more profitable markets. In fact Activity 16 of the project is already opening a market for Tajik superfine Mohair (Brent 2007) and some participating farmers are aware of this emerging demand. This is why some of these farmers are proposing to contribute some of their finer females to be mated to fine mohair males to produce finer Mohair.

Importation of breeding stock. Introduction of males or their frozen semen can improve a particular segment of the Mohair producing flocks that is: the white and fine Mohair flocks. Other mohair types cannot be improved with foreign breeding stock as the best colored and coarse mohair is found in the region. In addition, import and use of frozen semen needs special logistics as there is no regional expertise for laparoscopic AI in goats.

It is recommended that ICARDA should first support and if possible consolidate the organization of the breeding plan to then carefully assess the need for an introduction of imported genotypes which often involves the introduction of non adapted material. At this stage priority should be given to the organization of farmers around a collective and realistic breeding objective and learn how to target the market this way. Then a test for

the adaptation of a new genotype could be conducted if the analysis indicates the need to do so. It is recommended that this test should follow a good design, i.e. the comprehensive progeny test proposed by McGregor (2005). To reach this stage enough white fine fiber females must be available and the conditions for a progeny test are needed to be in place in addition to having surmounted the rather difficult health regulations for importing animals and semen; such a progeny test requires a proper design and organization. In the meantime Tajik health regulations for import of goats and semen need to be investigated.

Recording effort

As written above, the breeding plan requires body weight, fleece weight and fleece sample analyses as well as visual assessment of all animals in the nucleus, that is, records from approximately 250 animals. In the future this recording effort may be reduced substantially by concentrating only on young replacement candidates, that is, from approximately 100 animals. In addition, in the future, it is also possible that fleece sample analyses can be avoided altogether. The potential loss of information and consequent loss of genetic progress due to these simplifications can be evaluated with the information generated during the first two years of the breeding plan (during the ICARDA project). The local technical team with support of ICARDA will be able to calculate the relation between measured and visual performance records as well as the relation between young and adult performance. Such information will help to decide on this important issue.

Activity Calendar for first year (Oct 2007 - Oct 2008).

Date	Id	Activity
Oct 2007	1	*Grazing.* All animals returned from summer pastures
Oct 2007	2	*Selection.* Young and adult females are selected and ear-tagged for establishment of the nucleus.
Oct 2007	3	*Mating* starts October 20 and finishes after about 45 days. Wherever possible sire-dam mates are recorded.
Nov-Apr 2007	4	Winter feeding
March 2008	5	*Kidding* starts about 15th March. Kids are ear-tagged and dams of kids are identified
May 2008	6	At *marking* (and/or castration) promising male kids are kept un-castrated.
May 2008	7	*Shearing.* All adults and 2007 born kids are shorn. For all nucleus animals fleece weights are taken and fleece samples sent to Wool Lab.
May – Sep 2008	8	*Grazing* in summer pastures.
Oct 2008	8	Goats return from summer grazing.
Oct 2008	9	Results of Mohair sample analyses are returned from Wool Lab and are now available to substantiate selection of animals.
Oct 2008	10	A workshop on Mohair selection is recommended.
Oct 2008	11	*Visual assessment* of all animals in the nucleus including 2007 born male (un-castrated) and female kids. Staple length will be assessed with a ruler at the mid-side sampling site.
Oct 2008	12	*Selection.* Based on visual assessment and measured performance nucleus females and replacements are selected (or re-selected) and

		ear-tagged.
Oct 2008	13	*Mating.* Best bucks and selected females are mated in the two color groups.

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ANEX: Terms of Reference

- Discuss with the Principal Investigator (PI) the general frameworks of this project.
- Work and layout the details of the implementation of this project with the scientists involved from Kyrgyzstan and Tajikistan, defining the strategies to be followed this year, with due visits to the communities of farmers to be benefited and the development of a participatory workshop with these farmers in each site to discuss the basis of the plan and identify breeding goals.
- Plan a careful survey for the characterization of the target population to be improved focusing on the main traits to be improved, and identify the needs for sampling and analyses.
- Agree with the scientists involved in CA on a realistic timetable to be followed in the year towards to secure the implementation of the plan.
- Prepare a draft report on above and on the basis of a structure agreed with the PI and submit this report to the PI for iterative editions and changes.

ANEX: General Itinerary Field work 17/09/07 - 04/10/07

1. In Bishkek the general nature and context of the eventual breeding plans were discussed with the PI of the project (Luis Iñiguez). These plans focus on smallholders with difficulties of access to improved rams. Suitable breeding plans need to be developed taking into consideration the particularities of each case. The general approach being the use of participatory methods leading to schemes which can be handled by the community with the due assistance of researchers.

2. At the Kyrgyz Research Institute of Livestock, Veterinary and Pastures (from now on the "Livestock Institute") in Bishkek the implementation of Activities 11 and 14 was discussed with senior staff of the Institute including its director Nurgaziev Zaryldykovich, deputy director Kudaibergen Abdykerimov and Asambek Ajibekov. Regarding Activity 11 target communities and breeding plan options were analyzed. Regarding Activity 14 ways for increased participation of smallholders were discussed.

3. A participatory workshop was held with most of the Akbeket community farmers in the village of Kyzyl-Oktybar in order to discuss and agree on a suitable meat sheep breeding plan.

4. In Bishkek general principles underlying breeding plans for small ruminants were presented to staff scientists of the Livestock Institute and for Activity 11 a detailed work calendar was outlined with the technical team of the Livestock Institute.

5. Near the city of Tokmok a possible dairy sheep breeding plan was discussed with Mr Nurgan who initiated a dairy enterprise. In order to join Activity 14 the importance of extending and fostering such diversification process to smallholders was emphasized.

6. A participatory workshop with candidate farmers was held a few days later on the farm of Mr Nurgan some 50 km from Tokmok in the foothills of the Tien Shan Mountain Chain. Animals were inspected and breeding plan and initial activities discussed.

7. In Khujand Activity 15 was discussed with Matazim Kosimov from the Sughd Branch of the Tajik Livestock Research Institute and the National Coordinator of the project in Tajikistan Amir Karakulov and staff. Also the local Mohair market was visited.

8. In the villages of Takli, Karadzhingil, Ujas and Gulobod various farmers were visited and flocks inspected. Several discussions were held on Angora goat breeding options for farmers of these villages.

9. In Tashkent collected information was processed and a draft report prepared for discussion with technical teams in both countries and the PI of the project.

10. Discussions in relation to the report contents were followed up with Luis Iñiguez after Leaving Central Asia.

ANNEX. Visual assessment of Angoras

The following Table explains traits for visual assessment. The table is taken from Ferguson and McGregor (2005) with scoring adapted, simplified and clarified. An animal may be scored as positive, normal or negative for the different traits. A final overall class determines the destination of the animal.

Trait	Scoring	Explanation
Size	Negative = small 0 = normal Positive = large frame	The animals can be assessed for their general size including length, barrel and frame. Negative is an animal that is small and narrow, positive is an animal that is considered to be long with a good barrel and well grown
Head / Horns	Negative = poor structure 0 = normal Positive = excellent	The head and horns can be assessed together with horn shape, muzzle width and head cover taken into account. A negative score is given to an animal displaying weak or poorly shaped horns and a narrow muzzle; a positive score is given to an animal with well-shaped horns and good muzzle.
Feet	Negative = poor hoof shape 0 = normal Positive = excellent hoof shape	Hoof shape is an important characteristic of interest to commercial growers, animals with poorly shaped hooves are more likely to develop feet problems and require trimming more often. A negative score can be given to an animal that has poor hoof shape. A positive score is given to an animal that had excellent hoof shape that would seldom require trimming.
Conformation	Negative = serious faults 0 = normal Positive = free from faults	Negative is an animal with an obvious and serious structural fault that would limit the ability of the animal to survive and thrive eg serious hockiness. A positive score is given to an animal that is free from structural faults.
Visual fineness	In Counts	Spinning count grade is recorded as observed by the inspector. Spinning count grade 58s for example refers to average fiber diameter in the range 24.95 to 26.39 microns.
Visual medulation and kemp	Negative = no visible medulation and kemp 0 = normal Positive = excessive medulation and kemp	Occurrence of kemps. If on the fleece there are no visible medulated fibers and kemps the animal receives a negative score. If medulated fibers and kemps are readily seen, the animal receives a positive score (Note this is the only case in which a negative score is actually a positive feature of the animal).
Visual Staple length	Negative = short staples 0 = Normal Positive = long staples (or in cm)	Typically Mohair grows 2 cm per month and staples less than 20 cm are of negative staple length and staples of more then 28 cm are positive. However this rule has to be checked in Tajikistan. A ruler may be used for more precise staple length estimation, measurement site is the midside used also for sampling mohair for the wool lab.
Luster	Negative = dull 0 = normal Positive = very lustrous	Luster, the degree to which the fiber reflects light, is one of mohair's best-known qualities. A negative score is given if the fiber is dull; a positive score is given to fibers that are bright and highly lustrous.
Style and character	Negative = none 0 = normal Positive = very good	Style (the degree to which the fiber twists or spirals) and character (the degree to which the fiber crimps or waves) can be assessed as one trait taking into consideration an appropriate balance. A negative animal would be one where the fiber exhibits very little or no style and character, a positive animal where the fiber displays an excellent balance of style and character.
Evenness	Negative = uneven 0 = normal Positive = very even	The evenness of the fleece is explained as the similarity of staple structure, staple length and fiber diameter, from the front of the animal to the back. A negative score is given if there are large differences in fiber across the fleece; a positive score is given if the fiber is very similar across the whole fleece.
Softness	Negative = harsh 0 = normal	Softness can be assessed looking at the type of fiber present on the animals face in particular on the ears and around the eyes and

	Positive = soft	the softness of the fleece itself. A negative score is given if chalky white fibers were dominant on the face and the fleece was harsh to handle; a positive score is given if the fiber is fine, soft and silky and the fleece is soft.
Cover	Negative = minimum cover 0 = normal Positive = well covered	Cover is defined as the amount of mohair on the head, legs and tails of the animals. A negative score is given to an animal that has little mohair on its head; legs and tail, a positive score is given to an animal with much mohair on its head, legs and tail.
Black pigment	Negative = excessive 0 = normal Positive = no pigment	For white Angoras only. The nose, eye and ears should be assessed for the presence of black pigmented skin and the presence of black hair growing from the pigmented areas. A negative animal is one with excessive pigmentation on the stated areas; a positive animal is totally free of pigment on these areas. Any animal that has a black fiber growing from the pigmented areas is automatically negative for this trait.
Overall class	Inferior = cull Average = accepted for flock Superior = accepted for nucleus	The inspector also places animals into one of three pseudo groups: those to be culled; those to go into a commercial or general flock and those to go into a stud flock or nucleus (that is with male breeding animals).