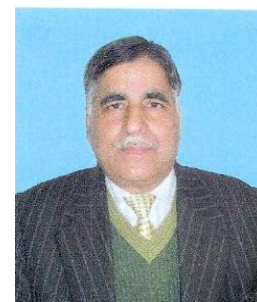


1. Name : Dr. A. Rashid Trag
2. Date of Birth : 27.11.1950
3. Designation : Vice-Chancellor Islamic University of Science & Technology (IUST)
4. Substantive Position : Vice Chancellor
5. Telephone Nos. : 0194-2461103 (office)  
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6. e-mail address : Rashid.trag@islamicuniversity.edu.in  
director.research@rediffmail.com  
rashid.trag@rediffmail.com
7. Research, Teaching & Extension Experience : 30 years & 6 Years



#### 8. Service Particulars

Positions held	Organization	Period		Remarks
		From	To	
Vice Chancellor	IUST	14.02.2011	continuing	Took over the charge of Vice-Chancellor from Prof Siddiq Wahid
Director Research	SKUAST-K	22.7.2005	continuing	Appointed through Selection Committee against clear advertised post in July 2005
Acting Director Resident Instruction-cum-Dean	SKUAST-K	01.10.2010	Continuing	Holding additional charge of Director Resident Instructions
Director Sericulture	Sericulture Development Department, J&K Government	31.3.1997	22.7.2005	Recalled from Central Silk Board, GOI, & appointed on deputation with lien on the post of Professor-cum-Chief Scientist in SKUAST-K

Director Sericulture Research & Trainings, Pampore (Jurisdiction all Sericultural States of North India).	Central Silk Board, Ministry of Textiles, Govt. of India	11.3.1994	31.3.1997	Selected as Director by the Selection Committee against the clear advertised vacancy, but I offered my services on deputation for 03 years initially retaining my lien on the post of Professor & Head, which was extended for further two years by Central Silk Board because of my performance/ contribution in sericulture development in Northern region. But before the completion of 05 years period, I was recalled by State government and appointed as Director Sericulture for revival of silk industry in J&K State
Professor & Head	Division of Sericulture, SKUAST, Mirgund	16.3.1992	10.3.1994	-----
Incharge Division as Associate Professor-cum-Senior Scientist	Division of Sericulture, SKUAST, Mirgund	1986	1992	-----
Associate Professor-cum-Senior Scientist/ Head Silkworm & Breeding Section	Division of Sericulture, SKUAST, Mirgund	1983	1986	-----

Sr. Research Officer	Sericulture Research Centre, J&K Govt.	1980	1983	Appointed by J&K Public Service Commission. Post redesignated as Sr. Scientist-cum-Associate Professor when SKUAST came into existence and Sericulture Research Centre was transferred to it in October, 1983
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**11. Academic Qualification:**

- Ph.D (Entomology)** : Thesis title "Studies on the Life History of *Diachrysia orichalcea (Lepidoptera noctuidae)* and its Control Through Systemic Insecticides, Chemosterilants and Other Chemicals"
- M.Sc. Zoology with specialization in Entomology** : Obtained First Division securing 63.4% marks and stood first in the Entomology batch

**12. Publications**

- : 40 (forty) [Annexure-1]
- During my service period I have emphasized much on transfer of technology to make my services beneficial for farming community and the State rather than concentrating on research & education alone.

**13. Felicitation:**

- : Awarded certificate in acknowledgment of academic wisdom, commendable research activities and outstanding contribution in Zoology by Executive Committee of Zoological Society of India on the occasion of 18<sup>th</sup> All India Congress of Zoology & SCIAZE held at University of Lucknow

**14. Recognition:**

- : On the basis of my experience and contribution in Sericulture, United Nations Development Programme, Geneva had identified me as a Silkworm Breeding Expert. I was also on the FAO roster for an assignment in future as Sericulture Expert.

**15. Experience/Contribution**

- Started Sericulture Research Centre in J&K at Mirgund in May, 1980. Functioned as Incharge/ Head for more than 10 years.
- Under my headship, it was recognized at National level for its research contribution in bivoltine sericulture.
- Guided and Co-ordinated Research in various disciplines of Sericulture.
- Collected 120 Silkworm genotypes in Germplasm Bank from diverse sources for breeding experiments/conservation. Improved their qualitative as well as quantitative traits.
- Evolved 18 high yielding bivoltine silkworm lines (named as SKUAST lines) suitable for temperate climate. Out of them 2 lines ( SKUAST-I & SKUAST-6) and their hybrid were authorized by Central Silk Board for commercial exploitation during 1995.
- Enriched Mulberry Germplasm Bank as well (60 accessions).
- Under extension activities improved rearing technology was demonstrated to the farmers in Lab to Land programme of Indian Council of Agriculture Research (ICAR) from 1986 to 1992. Average yield of 72.110 kgs of cocoons per 100 Dfls was obtained from newly developed SKUAST Silkworm hybrids through improved rearing practices based on 06 years data as against less than 25 kgs of cocoons from the traditional hybrids.
- Introduced and taught Sericulture courses at Faculty of Agriculture Wadoora, SKUAST in 1986.
- Taught Sericulture courses at Ph.D level during 1992-93 .I was one of the advisors for two Ph.D students and one M. Sc. student of Sericulture in SKUAST, who have been awarded degrees.

**16. Contribution made as Director Central Sericultural Research & Training Institute, Central Silk Board:**

- Equipped all laboratories of the institute and its subordinate research stations as its first Director. Provided R & D support in sericulture to Northern States of India. In the capacity of Zonal Co-ordinator of All India Co-ordinated Experiment identified following high yielding silkworm hybrids and mulberry varieties which were authorized by Central Silk Board, Bangalore in 1995 for commercial exploitation in North India.

1. YS<sub>3</sub> X SF<sub>19</sub>

2. SH<sub>6</sub> X KA

} For Spring Season

- 3. SH<sub>6</sub> X NB<sub>4</sub>D<sub>2</sub>
  - 4. CA<sub>2</sub> X NB<sub>4</sub>D<sub>2</sub>
  - 5. Pam<sub>101</sub> X NB<sub>4</sub>D<sub>2</sub>
  - 6. CC<sub>1</sub> X NB<sub>4</sub>D<sub>2</sub>
  - 7. Pam<sub>111</sub> X SF<sub>19</sub>
  - 8. SH<sub>6</sub> X NB<sub>4</sub>D<sub>2</sub>
- } For Autumn Season

**Mulberry varieties** : S146, Chinese White, Mandalay Tr10 and S1635

- A committee was constituted under my chairmanship to suggest models of silkworm rearing - cum-dwelling houses for sericultural states of North India. After thorough exercise and survey, models were suggested for Jammu and Kashmir, Punjab, Himachal Pradesh and U.P. (including present state of Uttrakhand) wherein use of locally available materials was suggested. In such rearing houses good quality cocoons can be produced with minimal mortality.
- After thorough experimentation technology was developed to grow mulberry trees as intercrop with saffron for enhancing returns to farms from saffron fields through twin activities of cocoon and saffron production.
- Technology developed for use of sericultural waste in Vermicomposting in Regional Sericultural Research Station, Sahaspur (Uttrakhand).
- *Glyphodes pyloalis* is a severe pest of mulberry in temperate region and *Mimastra cyanura* in sub-tropics of the state, integrated management practices for both these pests were recommended.
- Organized capsule training courses for field staff of Departments of Sericulture of North Indian States in following areas:
  1. Mulberry cultivation techniques
  2. Nursery raising
  3. Moisture conservation
  4. Silkworm disease management
  5. Disinfection Technology
  6. Chawkei rearing
  7. Intensive biovoltine rearing
  8. Farmers training programme

## 17. Contribution made as Director Sericulture Development, J&K Government:

Cocoon production increased from 650 MT during 1995-96 to 882 MT during 2000-01 registering an increase of 35%. The production would have further increased but for continuous drought and dumping of Chinese silk yarn in Indian markets resulting in the fall of prices of locally produced silk yarn.

- Productivity of cocoons per ounce of silkworm seed reared increased from 25 kgs. during the year 1995-96 to 34 gs during the year 2000-01 thus registering an increase of 36% .In Kashmir Division the productivity increased from 15 kgs per ounce to 33 kgs per ounce during the same period thereby showing an increase of more than 100%.
- Plantation of un-suitable tropical mulberry varieties in Kashmir region was abandoned and temperate varieties through root grafting propagated on large scale. Similarly, propagation of improved varieties popularized in Jammu Division for augmenting quality mulberry leaf production.
- Total replacement of traditional JAM silkworm races (poor silk yielders) with high sericigenous ( more silk producing ) breeds in Jammu Division.
- No of cocoon markets increased from 9 to 24 in J&K State.
- Annually more than 4.87 lacs mandays were generated mostly in the rural areas during various technical operations.
- The No. of functional silk reeling units increased to 26 compared to 6 in 1996-07. Multi-end reeling technology was popularized to produce quality silk yarn.
- Raw silk production in private sector reached all the time high of 22,300 kgs during 2000-01 from about 6,000 Kgs in 1996-97.
- Cocoon Bank and Silk Exchanges were established for which Central Silk Board got convinced on that project proposal for allocation of funds.
- Under Catalytic Development Programme & PM's package of Government of India, Projects were formulated and got approved for financial outlay of about Rs.1356 lacs as against initial allocation of Rs. 1006 lacs based on their relevance and quality. Ministry of Textiles enhanced the outlay to Rs. 1691 lacs after being impressed with the performance in the implementation of Schemes.
- Recurring cost on seed production was reduced by about 40%.
- Two growth centres at the cost of Rs. 53.00 lac were established with 100% assistance from CSB in Govt. Silk Reeling Factory Premises at Srinagar and

Jammu.

#### 18. Other Technical Activities/Assignments:

- Member on various Sericultural Committees of Central Silk Board at National level viz; Research Co-ordination Committee, Research Advisory Committee, Race Authorization Committee, Standing Committee and Board Member.
- Chairman of Regional Research Advisory Committee Regional Sericulture Research Station CSB Jammu.
- Chief Editor of the "Journal of Sericulture "published by Indian Society of Sericultural Sciences.
- Member of Editorial Board of Indian Journal of Sericulture, Mysore.
- Traveled widely in leading Sericulture States of India namely Karnataka, Tamil Nadu and West Bengal and gained sufficient experience about Sericulture development. Visited China to see Sericulture activities.

#### 19. Contribution made as Director of Research, SKUAST-K

SKUAST Act 1982 provides that Director of Research shall be responsible for the direction and co-ordination of research programmes in the university and efficient working of research stations. Accordingly, ever since my appointment as Director of Research in the university, my significant contributions towards the mandatory responsibilities with active cooperation of scientists, supporting staff and under overall guidance and support of Hon'ble Vice-Chancellor are enumerated as under:

- As Member Secretary ensured timely holding of Research Council meetings (twice annually: Rabi & Kharief) as per the schedule under the Chairmanship of Hon'ble Vice-Chancellor.
- 11 Research Council Meetings were held in the last five years in which more than **750** projects were approved. During the said period, more than **500** projects have been concluded. Salient research achievements during 2005-2010) are given in Annexure-2.
- The project formulation for external funding was all time high during the last five years. **Facilitated submission of 230 Research projects** to various

agencies for total financial outlay of **Rs. 13771.33 lakhs**. Out of which:

- **62 projects concluded** at a total financial assistance of **Rs. 1017.78 lakhs**
  - **72 projects are on-going** at total assistance of **Rs. 6160.51 lakhs**; and
  - **96 projects awaiting approval for proposed outlay of Rs. 6593.04 lakhs.**
- Sixty (60) varieties of different crops of food grains, fruits, vegetables, fodder crops and silkworm were released by the university from 1982. Of them 17 varieties of Field, Vegetable and fruit crops (**Mazie:03, Oil Seed [Brown Sarsoon]:01, Oats:01, Totamo hybrids:02, Brinjal hybrids: 02, Capsicum hybrids: 02, Cucumber hybrids: 02, Potato: 02 and Apple: 02**) were released during March 2009.
  - Being location specific, these varieties have been bred exclusively for temperate climatic conditions and for last 05 years university has produced and supplied about 420 q of Breeders Seed, 400 q of Foundation Seed and more than 1500 q of Truthfully Labelled Seed in field crops and about 7.20 q of breeders seed in vegetable crops. The requirement of breeder seed by the indenting agencies particularly the State Department of Agriculture has been fully met for enhancing seed replacement rate and concomitant increase in the area under improved varieties.
  - 164000 Quality planting material of different fruit varieties and mulberry were sold to the farmers.
  - Seven (07) new varieties of field crops (**Wheat:01, Rice:02, Pulses:03 and Maize:01**) are in the process for release during 2010.
  - As Chairman of the Standing Evaluation Committee got timely formulated the Plant Protection Schedule (commonly known as Spray Schedule) for the management of pests and diseases of apple annually and passed on to the Department of Horticulture, J&K for publication and wide circulation for the benefit of farming community in general and horticultural industry of the state in particular.
  - As Chief Editor of SKUAST-K Journal of Research got published 10 issues (05 volumes).
  - Evaluation of agri-chemicals through Directorate of Research has increased manifold over the period of time. 159 products of different companies have been got evaluated at this university enabled to generate revenue of **Rs.**

**0.45 crores approximately for about 20 years. During the last five years alone, revenue to the tune of Rs. 0.25 crores for 48 chemicals has been generated.**

LIST OF PUBLICATIONS

1. Ahmad, D. and Trag, A. Rashid 1979. Observation on the oviposition and hatching of eggs in a laboratory culture of *Diachrysia orichalea* Feb, *Journal of Science*.
2. Trag, A. Rashid and Ahmad Dildar. 1979. Observations on the biology of greasy cut worm, *Agrotis ipsilon* Hufnagel (Lepidoptera: Nectuidae) in laboratory. *Proc. 67<sup>th</sup> Indian Science Congress, Part III*, 178.
3. Ahmad, D. and Trag, A. Rashid. 1981. Studies on the biology of *Plusia orchalcea* Fabricius (Lepidoptera : Noctuidae) in laboratory. *Science and Environment* 3(II) : 103-106.
4. Das, B.C., Trag, A.R., Shaheen, A. and Nabi, G. 1987. New hopes for sericulture in Kashmir. *Indian Silk* XXV(9) : 23-26.
5. Tiku, A.K., Bindroo, B.B., Pandit, R.K. and Trag, A.R. 1987. Feasibility of adopting bush cultivation of mulberry in Kashmir. *Indian Silk* 26(1) : 17-18.
6. Trag, A.R., Shaheen A., Nabi Gh., Ahmad F. and Bindroo, B.B. 1988. Studies on the oviposition rate in fertilized univoltine females of *Bombyx mori*. *International Congress on Tropical Sericulture Practices, Bangalore 18-23 Seridoc* 5(1&2) : 66.
7. Khan, M.A. and Trag, A. Rashid 1989. *Mimastra cvanura* Hope (Coleoptera: Chry-semelidae). An Important pest of Jammu region. *Indian J. Seric.* xxiii(2): 276.

8. Malik, F., Trag, A.R. and Shaheen, A. 1989. On the reproductive behavior of 3 newly evolved strains of silkworms. *Proc. 77<sup>th</sup> Indian Science Congress, Part IV* : 142.
9. Trag, A.R., Afifa S., Nabi, G., Ram, K. and Farooq, M. 1990. Field performance of hybrids of SKUAST Silkworm lines in J&K. *Indian Silk XXVIII(9)* : 19-20.
10. Kamili, A.S., Trag, A.R., Malik, G.N. and Malik, F.A. 1990. Heterosis in silk productivity in hybrids of newly evolved silkworm (*Bombyx mori* L.) lines. *Journal Science & Environment*.
11. Trag, A.R., Malik, M.A., Malik, F. and Afifa, S. 1990. Modernisation of silkworm rearing in J&K. *Dehat Sudhar Magazine of Rural Development Department, J&K*.
12. Shaheen, A., Trag, A.R., Malik, G.N. and Malik, F.. 1990. Heterobeltiesis in F<sub>1</sub> combinations of new bivoltine silkworm (*Bombyx mori*) line. *Journal of Biosciences, Bangalore*.
13. Trag, A.R., Shaheen, A., Malik G.N., and Malik F.A. 1991. Impact of adoption of package of practices in Sericulture for high productivity in Jammu and Kashmir State. *Sericologia* **31**(1): 193-195.
14. Trag A.R. , Kamli A.S., Malik, G.N., and Kuklo, F.A. 1992. Evolution of high yielding bivoltine silkworm (*Bombyx mori* L.) genotypes. *Seriocologia* **32** (2): 321-324.
15. Kamli, A.S, Trag, A.R., Malik G.N. and Kuklo F.A. 1992. Extent of heterosis in crosses among new bivoltine silkworm lines in J&K. *Indian J.Seric.* **31**(2): 155-156.

16. Shaheen, A., **Trag, A.R.**, Nabi, G. and Ahmad, F. 1992. Correlation between female pupal weight and fecundity in bivoltine silkworm *Bombyx mori* L. *Journal Entomon.*17(1&2):109-111.
17. Sofi, A.M., **Trag, A.R.**, Aijaz and Malik F.A. 1992. Crossability studies of four silkworm *Bombyx mori* (Lep : Bombycidae) genotypes. *Journal Zoologica Orientalis* Vol 8.
18. Sofi, A.M., **Trag, A.R.**, Malik, F.A. and Ahmad, A. 1992. Comparative performance of ten Mirgund silkworm races (*Bombyx mori* L., Lep: Bombycidae) under temperate conditions. Accepted for publication in *Journal Zoologica Orientalis* 8/9.
19. Nabi, G., Farooq, M., Shaheen, A. and **Trag, A.R.** 1992. Comparative performance of some F<sub>1</sub> silkworm (*Bombyx mori* L.) hybrids in Kashmir, *Proceedings of the 79<sup>th</sup> Session of Indian Science Congress* Baroda, 1992.
20. Malik, G.N., Kuklee, F.A., Shaheen, A.S. and **Trag A.R.** 1993. Performance of some bivoltine genotypes of *Bombyx mori* in Kashmir. *Entom.* 18(1&2) 39-41.
21. Malik, G.N., **Trag, A.R.**, Malik, F., Tasneem, K. and Singh, T.P. 1993. Single cocoon reeling characteristics of F<sub>1</sub> seed cocoons of new SKUAST silkworm hybrids. *Indian Silk* 32(6) : 51-52.
22. **Trag, A.R.**, Malik, F., Malik, G.N. and Shaheen, A. 1993. Performance of some bivoltine silkworm hybrids under temperate conditions of Kashmir. *80<sup>th</sup> Indian Science Congress* held at Goa in January 1993.

23. Munshi, N.A., Tanki, T.N., Zargar M.A., **Trag, A.R.** and Grover, R.K. 1993. Field evaluation of fungicides against powdery mildew of mulberry in Kashmir. *SERICOLOGIA*.
24. **Trag, A.R.**, Malik, G.N. and Shaheen, A. 1993. Combining ability for 4 quantitative characters in 5 newly evolved SKUAST Silkworm *Bombyx mori* genotypes. *Indian Journal of Agric. Sci.*
25. Bindroo, B.B. Dhar, A. and **Trag, A.R.** 2000. Studies on dormancy and sprouting behaviour of mulberry (*Morus species*) under sub-tropical agroclimate. *Indian Journal of Forestry.*,23(4): 411-414
26. Kamli, A.S, **Trag, A.R.**, and Masoodi, M.A. 2000. Cause and effect relationship of various quantitative traits in Bivoltine silkworm, *Bombyx mori* L. *Sericulture in India* : 575-579.

#### **Books published**

1. Khan, M. A., Dhar, Anil, Zeya, S.B. and **Trag, A.R.** 2004. Pests and Diseases of Mulberry and their Management. Bishen Singh Mahendra Pal Singh, 23-A, New Connaught Place, Dehradun. 68 pp.
2. **Trag, A.R.** 2009. Sericulture - an option for enhancing profitability in hill farming systems. Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar.

## PAPERS PRESENTED IN CONFERENCES/SYMPOSIA/WORKSHOPS

1. **Trag, A.R.** 1989. Status of Sericulture Research in Jammu and Kashmir. Paper presented at a Seminar-cum-Workshop on the Problems and Prospects of Sericultural Development in J&K, organized by Institute of Management and Public Administration on March 2-3, 1989.
2. **Trag, A.R., Malik, G.N., Kamili, A.S., Malik, F. and Kukloo, F.A.** 1992. Effect of female and male parents on the inheritance of traits in the F<sub>1</sub> hybrids of *Bombyx mori*. **In:** National Conference on Mulberry Sericulture Research, Central Silk Board, CSR&TI, Mysore on December 10-11.
3. **Devi, S.P. and Trag, A.R.** 1992. Induction of Proline with viral infection. National conference on mulberry Sericulture Research. Organised by Central Silk Board, Govt. of India on 10-11 Dec.1992.
4. **Trag, A.R., Shaheen, A., Malik, G.N. and Malik, F.** 1993. Heterobeltiesis in F<sub>1</sub> combinations of new bivoltine silkworm (*Bombyx mori* L.) lines. CSRTI, Berhampur for 2<sup>nd</sup> National Conference on Mulberry Sericulture Research.
5. **Trag, A.R., Razdan, J.L., Siddiqui, A.A. and Bali, R.K.** 1995. Bivoltine silkworm breeding in J&K. Paper presented in the Technology seminar on breeding and genetics (silkworm and mulberry), Mysore.
6. **Dhar, A., Bindroo, B.B. and Trag, A.R.** 1995. Management of mulberry powdery mildew. Presented in "Current Technology Seminar on Silkworm Disease Management, Silkworm Rearing Technology and Mulberry Pathology" on 25-26 October 1995 at CSR & TI,

Berhampur, West Bengal.

7. Bindroo, B.B. Dhar, A. and Trag, A.R. 1995. Correlation of Tukra on mulberry under subtropical climate of Jammu. Presented in "Current Technology Seminar on Silkworm Disease Management, Silkworm Rearing Technology and Mulberry Pathology" on 25<sup>th</sup> & 25<sup>th</sup> October 1995 at CSR & TI, Berhampur, West Bengal.
8. Trag, A.R. 2006. Future needs of agriculture research for food security. **In:** One day workshop on Agriculture Renewal in Temperate and Cold Arid Regions of J&K, SKUAST-K, April 13.
9. Trag, A.R., Wani, M.A., Wani, Shafiq. A. and Mattoo, F.A. 2008. Current status and future strategies for sustainable agricultural development in temperate hilly regions of Jammu and Kashmir. **In:** *Food Security and sustainable Agri. Dev.* 24-25 November.
10. Trag, A. R., and Shah Masood 2008. Paper titled "Land Use" presented in Seminar-cum-Workshop on promotion of Peri-Urban Agriculture held at SKUAST-K in the year 2008.
11. Trag, A.R. and Wani, S. A. 2009. Technological interventions for higher agricultural growth to enhance farmers' income in hill and mountains. **In:** *Proceedings of 9<sup>th</sup> Agricultural Science Congress* held at SKUAST-K, Srinagar from June 22-24.
12. Trag, A.R. and Wani, Mushtaq A. 2010. Soil conservation measures for maintaining soil fertility and productivity in temperate valley of Kashmir. p. 177. **In:** *International Conference on Soil Fertility and Soil Productivity*, held at Humboldt-Universitat zu Berlin, Germany from March 17-20.

13. Subash Chand, **Trag, A.R.** George EBERT, Dar, N.A and Badrul Hassan. 2010. Resource conservation technology for sustainable agriculture p. 226. **In:** *International Conference on Soil Fertility and Soil Productivity*, held at Humboldt-Universitat zu Berlin, Germany from March 17-20.
14. Subash Chand, **Trag, A.R.** Tahir Ali and Wani, J.A. 2010. Studies on effect of potassium in association with magnesium on quality of apple (*Malus domestica*) C.V. Red Delicious in temperate valley of Kashmir. p. 108. **In:** *International Conference on Soil Fertility and Soil Productivity*, held at Humboldt-Universitat zu Berlin, Germany from March 17-20.

**SALIENT RESEARCH ACHIEVEMENTS (2005-2010)**

Substantial contribution by providing the leadership in the following areas was made:

- Crop Improvement
- Crop Production
- Crop Protection
- Nutrient Management
- Horticultural crops
- Post Harvest Technology
- Forestry
- Sericulture
- Environmental Sciences
- Agricultural Engineering
- Veterinary Sciences and Animal Husbandry
- Fisheries

**Varieties/hybrids developed**

- Sixty varieties of different crops were released including foodgrains, fruits, vegetables, fodder crops and silkworm. Of them 17 have been released in March, 2009. The chief characteristics of these varieties are:

<b>Crop</b>	<b>Year of release</b>	<b>Variety</b>	<b>Chief characteristics</b>
<i><u>Field crops</u></i>			
Maize	2009	Shalimar Maize Composite-3	Yellow grains yield of average grain 48 q ha <sup>-1</sup> in high altitudes, matures in 135-145 days, moderately resistant to Turcicum blight and tolerance to cold stress at higher elevations.
	2009	Shalimar Maize Composite-4	Flint type orange yellow grains, average grain yield of 63 q ha <sup>-1</sup> in lower altitudes, matures in 100-105 days, resistant to stem borer, aphid and Turcicum leaf blight.

	2009	Shalimar Maize Hybrid-1	The first hybrid maize developed by the University with average grain yield potential of 70 q ha <sup>-1</sup> under irrigated conditions, suitable for higher altitudes, chapattis have the capacity of retaining moisture for longer periods.
Oil Seed (Brown sarson)	2009	Shalimar Brown Sarson-1	Average seed yield potential of 16 q/ha, suitable for cultivation in Kashmir valley, 41.7% oil content, tolerance to Alternaria blight and white rust, suitable for rice-sarson cropping system
Oats	2009	Shalimar Fodder Oats-1	Average fodder yield potential of 380 q ha <sup>-1</sup> , average plant height of 1.6 metres, resistant to loose smut, leaf spot, aphid and army worm, suitable for the whole valley.
<u>Vegetable crops</u>			
Tomato	2009	Shalimar Tomato Hybrid-1	Single cross hybrid, average fresh fruit yield potential of more than 700 q ha <sup>-1</sup> , fruit wall is thick, suitable for transportation to longer distances, first picking after 70-75 days, fairly good vitamin C content (22 mg/100 g). The hybrid shows tolerance to early blight, leaf spot and buckeye rot
	2009	Shalimar Tomato Hybrid-2	Single cross hybrid, average fresh fruit yield potential of 650 q ha <sup>-1</sup> , flesh medium thick, pulpy with good amount of vitamin C (25 mg/100 g). The fruit matures in 67-75 days and the hybrid is tolerant to early blight, leaf spot and fruit rot.
Brinjal	2009	Shalimar Brinjal Hybrid-1	The hybrid with light pink fruit has average fresh fruit yield potential

			of 875 q ha <sup>-1</sup> , early maturity (55-60 days), long fruit bearing period, superior fruit quality, excellent keeping quality and tolerance to wilt, blight and fruit rot.
	2009	Shalimar Brinjal Hybrid-2	The hybrid with purple fruits has average fresh fruit yield potential of 650 q ha <sup>-1</sup> , harvestable in 55-57 days, longer fruiting period, tolerance to wilt, blight and fruit rot. The hybrid is recommended for cultivation in summer season.
Capsicum	2009	Shalimar Capsicum Hybrid-1	The hybrid is characterized by large sized dark green fruits, attain yellow colour at ripeness, yield potential of 450 q ha <sup>-1</sup> , maturity ranging from 55-60 days, longer fruiting period, tolerance to wilt, blight and fruit rot. Average fruit weight of 68.5 g and high vitamin C (135 mg/100 g)
	2009	Shalimar Capsicum Hybrid-2	The hybrid has large sized dark green fruit, average fruit yield of 400 q ha <sup>-1</sup> , matures in 55-65 days with longer fruiting period. The fruits attain red colour on ripeness and show tolerance to wilt, blight and fruit rot.
Cucumber	2009	Shalimar Cucumber Hybrid-1	The hybrid has an average yield potential of 650 q ha <sup>-1</sup> , matures in just 50 days and is tolerant to leaf spot, powdery and downey mildew. Fruits are crisp, vigorous early growth and absence of placental cavity.

	2009	Shalimar Cucumber Hybrid-1	The hybrid has an average yield potential of 610 q ha <sup>-1</sup> , matures in 50 days, available for fairly longer duration, the fruit wall is thick, tolerant to angular leaf spot, powdery and downy mildew. Placental cavity is absent.
Potato	2009	Shalimar Potato-1	White skinned variety with average yield of 300 q ha <sup>-1</sup> , tolerant to early blight, tuber rot and moderately tolerant to late blight, tubers have firm flesh and suitable for making wafers and finger chips. The variety is suitable for high altitude conditions.
	2009	Shalimar Potato-2	Red skinned variety with average yield of 240 q ha <sup>-1</sup> , tolerant to early blight, tuber rot and moderately tolerant to late blight, tubers have firm flesh with good taste and suitable for making chips and French fries.
<u>Fruit crops</u>			
Apple	2009	Shalimar Apple-1	The variety developed from a cross between Sunhari and Prima shows resistance to scab, yields about 95 kg/tree (23.75 t ha <sup>-1</sup> ). The variety belongs to mid season group and has reddish pink, small to medium sized, crisp, juicy and sweet fruits.
	2009	Shalimar Apple-2	The variety developed from a cross between Red Delicious and Ambri has average fruit yield of 106 kg/tree (26.50 t ha <sup>-1</sup> ) at 25 years on seedling rootstock. Moderately tolerant to scab and Alternaria leaf spot, the fruits are roundish, red mottled, juicy, crisp and sweet. The fruit has long shelf-life.

## Development of Improved Technologies

### a) Crop Improvement

- One variety of wheat (Shalimar-Wheat-1) was developed by the University and released at the national level for the northern hill zone. The variety with average yield potential of 35 q ha<sup>-1</sup> is being popularized under Rice-Wheat Cropping System in the farmers' field in Kashmir valley. Double cropping with rice and wheat should enable the state achieve self-sufficiency in food to a considerable extent. At present 5000 kanals (250 ha) have been planted under Front Line Demonstration Programme (FLDs) across the valley.
- Successful efforts have been made in identification of superior aromatic rice cultivars for raising farmers income. Pusa Sugandh-3, with a yield potential of 4.5 to 5 ton/ha has been introduced successfully in low rice belts. At present, 15 ha have been brought under its cultivation in the district Budgam of Kashmir province.
- The University released considerable number of varieties under horticultural crops. Quality planting material of these varieties is being multiplied for making available to Horticulture Department and growers of the valley under Mega Seed Project launched by ICAR. During the last year more than 1,64000 quality planting material of horticulture/mulberry crops were sold to the farmers.
- For diversification of crop husbandry in the region, potential Soyabean genotype (Shalimar Soyabean-1) has been developed to increase the availability of nutritious food and feed.
- Research efforts have enabled establishment of measures required to enhance productivity of saffron and kalazeera, two important commercial crops of the valley. Micro-propagation techniques are being evolved to facilitate horizontal expansion in these cash crops. Similar effort is being made for horticultural crops as well particularly apple, cherry and walnut.
- High quality early seasoned scab resistant apple hybrids (ASP-E-99 and ASP-EE-22) have been developed to ensure early capture of the market.
- Twenty-three genotypes of saffron confirmed significant yield superiority viz. SMD-161 (21.01 kg/ha), SMD-101 (20.71 kg/ha), SMD-87 (20.45 kg/ha), SMD-61 (19.63 kg/ha), SMD-152 (17.93 kg/ha), SMD-133

(17.23 kg/ha), SMD-93 (16.45 kg/ha), SMD-1 (15.56 kg/ha), etc.

### **Crop production and protection**

- Agro-techniques have been developed/upgraded to improve the crop performance of field crops, vegetables, horticultural crops in respect of agronomical practices and integrated disease and pest management. Prominent research findings include the following:
- Maximum grafting success (>80%) has been achieved in walnut under zero energy polyhouse conditions that has helped in large scale multiplication of quality planting material superior to costly electrically heated. The technology has also helped in inducing fruiting within 3-4 years as against 12-13 years. Technology is being popularised among the growers through Krishi Vigyan Kendras.
- Propagation of kiwifruit plant by rooted cuttings under zero energy humidity cellar has been standardized. Introduction of kiwifruit will result in diversifying the fruit cultivation in the valley.
- The University developed spray schedule which proved effective for the control of scab and other diseases and pests in apple and is being widely followed by the growers and the development department.
- Technologies related to storage under zero energy cool chamber have been standardized.
- Raising of four vegetable crops in a season from the same plot through Surface Covered Trench Technology using alkathene film in Ladakh region is a significant achievement. The technology has been transferred to the farmers.
- Potato tubers have been raised through tissue culture and supplied to Departments of Agriculture, Kashmir and Jammu during 2010.
- Control measures for blast disease in rice, pests and diseases in apple, black line viral disease in walnut, potato blight, corm rot of saffron, pine bark beetle etc. were evolved by the University and recommended for transfer to the farmers.
- Package of practices have been developed for raising various forest species and medicinal plants of economic value. Production techniques for

endangered herbs like *Aconitum heterophyllum*, *Inula racemosa*, *Picrohiza kurrooa*, *Podophyllum hexandrum*, *Rheum australe* and *Swertia chirata* have been standardized.

- Agrotechniques have been standardized in *Gladiolus*, *Rosa damascena*, *Chrysanthemum*, *Gomphrena*, *Zinnia* and *Digitalis lanata*.
- Cultivation of tulips under protected conditions in polyhouse has been standardized. One hundred eleven species of landscape plants and medicinal/aromatic plants have been collected and maintained in the germplasm block, out of these 14 species have been evaluated and described for landscape use.
- Two high yielding silkworm hybrids have been developed (SK-31 x SK-13) and SK-31 x SK-6) which are being processed for release.
- The cuttings of temperate mulberry varieties are difficult to root as such through grafting plant production is time consuming and costly. Technology has been developed for the propagation of Goshomerami variety through cuttings under polyhouse.
- Germination has been improved in *Cedrus deodara* by moist chilling at  $4\pm 1^{\circ}\text{C}$  for three Weeks.
- Single bullock-plough developed has been well received by the farmers.
- Improved tools and implements like serrated sickle, tubular maize sheller, power thresher, zero till, seed drill, drum seeder, manual weeder and vertical conveyer, reaper, harvester have been successfully introduced. Rice-wheat rotation has created demand for power threshers.
- Nearly four thousand two hundred fifty farmers and field functionaries were trained in various agricultural activities under Technology Mission in last 5 years.
- Six strains of button mushroom (*Agaricus bisporus*) including 1613, 1650, 1608, 1603, S-11 and S-176 were evaluated on unpasteurized compost. Maximum yield (18.70 kg mushroom  $\text{q}^{-1}$  compost) was recorded in strain S-176.
- Significant impact of inoculation of corms with *Azospirillum* in combination with VAM in enhancing saffron yield from 2.924 to 4.447 kg/ha.

## **Animal Science**

Livestock sector in the state of Jammu and Kashmir contributes about 45% of agricultural GDP, however, this sector is confronted with problems of low productivity, diseases, feed fodder shortage, inadequacies of elite germplasm, infertility, mineral deficiencies as a consequences sector is commercially non-vibrant and state faces shortage of livestock produce especially of meat (66%), chicken(75%) eggs (90%0 even milk during winter season.

Sector wise problems and project conceived, submitted and achievements made during last five years and under R&D of Livestock sector are as under :

### **Meat Sector**

- A project with financial support from DBT to exploit fecundity gene mutation was started by the university. Success has been achieved to introduce the fec.b gene ( gene for higher litter size) in local sheep with twinning in 80% of the F<sub>1</sub> population. . The technology is now ready for transfer to field. The utilization of this technology shall give great boost to meat production industry in state and annual off take percentage shall increase by more than 60% within next four to five years.
- University scientists were geared for augmenting chevon production. Accordingly Boer goat germ plasm has successfully been introduces for goat improvement w.r.t growth rate and early maturity The infusion of exotic inheritance has increased the growth in the crosses with local animals by 30-40%. A body wt. of 27 Kg was recorded in boer cross kids at 6 months of age. The University has already extended this technology to field through Deptt. of Sheep Husbandry
- Van Raja breed as choicest breed for introduction in backyard sector was investigated. After initial trials , Van Raja breed of birds have successfully been introduced in the field as back yard bird with great success Birds have attained a body weight of more than 3.5 kg (with individual record of 6 kg) in a year under backyard farming besides egg laying record of 160 egg/annum .. The results are highly encouraging with tremendous popularity and demand for Van raja chick by the farmers. To meet this demand university has started it own hatchery and breeding farm.

- In order to give boost to production of Pashmina two projects for augmentation of Pashmina productivity and production of quality germplasm were developed and are under implementation in the university with financial assistance of Rs. 12 crore from ICAR. Project envisages increase in the productivity of Pashmina from present average of 250 g to more than 500 g. Pashmina rearing area has also been extended to non-traditional belts in Kargil and Ladakh. For the purpose 900 pashmina goats were distributed among 74 families in the region. Extension in the area will boost production and reduce dependence of the processing industry on import.
- Traditional Charkha has been modified using ball bearings for higher spinning efficiency and reduced drudgery
- Technology for rapid multiplication of elite Pashmina goat germ plasm through cloning has been standardized and further work is under progress and break through is expected shortly.
- Under NAIP (ICAR) funded project, animal scientists of the university are contemplating to identify and develop marker for cold tolerant gene in pashmina goat and double humped camel.

### **Animal Nutrition**

To mitigate the shortage of feeds and fodder and improve the nutritive value of existing resources, following technologies have been developed by the university..

- Technology to incorporate Apple Pomace, a waste from apple juice factories, in the animal feed as a source of energy replacing maize to the extent 15 to 20 percent has been developed. This technology had two prong advantages. On one side the apple pomace and damage fruit (up to 20% of fruit produced in the valley) is an environmental hazard and utilization of this material in feed has increased availability of local ingredients for animal feed besides addressing the environmental concern.
- Technology to densify crop residues/tree leaves and other non traditional feed resources and to prepare complete feed block from locally available resources has been developed. Through this technology losses as left over have been reduced from 30% to almost nil. Further the technology has added advantages of increasing shelf life of the feed ingredients and reduced storage space requirement by 5 times. Technology has been

transferred to the field through demonstrations and trainings of stakeholders.

- As a strategy for future, technology has been developed for mutton production under stall fed conditions on economic basis. Cost/ Kg live weight under stall feeding was Rs. 79 during 2008.
- For improving fodder resources through use of non conventional resources technology has been developed to ensile mulberry leaves and apple pomace in the ration of 2:1 for winter feeding of livestock. Silage so produced is balanced with respect to energy and protein and dry stock can be maintained solely on the silage during scarcity.
- Through wet feeding in poultry 13% improvement in FCR was recorded so was on the cost of production of chicken
- Technology to use Azolla, a water fern choking water bodies and lake, as a protein source in animal feed has been developed. Azolla has been used in the sheep ration the extent of 10% replacing mustered cake with out any deleterious effect on body weight gain of growing sheep. Technology shall go in a long way to improve feed resources availability locally. Trials with other animal species especially poultry are underway in the university.

### **Animal Health**

For prophylactic measures against economically important animal disease studies on identification, isolation and vaccine production were initiated in the university with financial assistance from ICAR/DBT during last five years and major break through achieves in this field.

- Bacteria, *Dichelobacter nodosus*, responsible for foot-rot in sheep was identified, isolated and characterized for virulent gene A potent Vaccine has been developed against the disease and technology is ready for transfer to the field for use. The disease renders the animal unable to walk and results in high morbidity especially among migratory sheep.
- Causative agent for abortions in sheep, *Listeria monocytogenes*, has been identified, isolated and vaccine developed against the organism out of the local strains of bacteria,. The technology of the vaccine production alongwith seed stock of bacteria for vaccine production has been transferred to the Department of Sheep Husbandry.

- Rota virus affecting all livestock species and human beings was first time reported from valley. Virus was characterized for virulent gene which is responsible for economic losses in terms of morbidity.
- Shiga toxin producing *E. coli* was isolated and molecular characterization of the shiga toxin gene has been done. The bacteria are responsible for heavy losses of young stock due to dehydration. These bacteria have also zoonotic importance.
- Virus responsible for Malignant Catarrhal fever in bovines was isolated from cattle. Virus results into more than 50% mortality in cattle and is potential threat to *Hangul*, a unique deer species, of the state, Deptt. of Wildlife has been conveyed about the presence of virus and its preventive measures.
- Assay for anti oxidant activity of edibles developed. Assay system has potential of application.
- . For control of Milk fever, a calcium deficiency syndrome affecting high yielding cow, a prophylactic regime comprising of 1, 25 Dihydroxy Cholicalceferol with ACB modifier has been developed and technology stands transferred to the field. Besides being a successful preventive major, technology is also cost effective.
- For treatment of acute bovine ketosis a simple and feasible at farmers level drug therapy using glucose dranch @ 200g/head has been developed. Technology stands transferred to the fields with very excellent feed back about efficacy of the treatment.
- Survey for prevalence of parasitic disease of sheep, cattle and other livestock species has been conducted through out valley. Survey revealed infection of various Trematodes, Helminths to the extent ranging from 20-60%. Prophylactic regimes have been developed for control of the infestation.
- For control of gout in poultry, a simple drug regime comprising of use of Ammonium Sulphate in drinking water has been developed.

## **Livestock Management and Production**

- Technology developed to wean calves at 2 months of age compared to 3 months recommended earlier thereby net saving of 90liters of milk and Rs. 1000/= as additional farm income/lactating animal.
- Use of Fumaric acid/ascorbic acid in poultry ration has reduced the cost of broiler production by 10%.

## **Fisheries**

- Technology has been developed to breed *Schizothrax niger* artificially. Technology has been extended to the field throughout the valley and Kargil district of Ladakh region through trainings and demonstration in collaboration with Development Department.

**MOUs signed on behalf of SKUAST-K with the following :**

	<b>Organizations</b>	<b>Programme</b>
01.	M/s Jain Irrigation Systems Limited (JISL) Jalgaon, Maharashtra , 05.05.2009	For facilitating collaborative education, research and extension
02.	Indian Council of Agricultural Research (ICAR), New Delhi on 11/2009.	Establishment of Centre of All India Coordinated Research Project on Fodder & Forage Crops
03.	Department of Biotechnology, Ministry of Science & Technology, Government of India, New Delhi on 12.02.2009	Implementation of Research Project on "Screening and Introgression of Fecundity B (Fec B) Gene for augmenting productivity in Kashmir sheep" at an estimated cost of Rs. 72.44 lakhs for five years w.e.f. 12.02.2007
04.	Indian Meteorological Department, Ministry of Earth Science, Govt. of India on 4.02.2009	Setting up Agro-meteorological Field Units for preparation and dissemination of agromet advisories
05.	Indian Council of Agricultural Research (ICAR), New Delhi on 01.12.2008	Implementation of research project on "Serological diversity and molecular characterization of <i>Dichelobacter nodosus</i> and development of vaccine against virulent footrot" under National Agricultural Innovation Project (NAIP).
06.	Indian Council of Agricultural Research (ICAR), New Delhi on 29.01.2009	Implementation of research project on "A value chain on enhanced productivity and profitability of Pashmina fibre" under National Agricultural Innovation Project (NAIP)-2 PCS.
07.	Indian Council of Agricultural Research (ICAR), New Delhi	Implementation of research project on "Sustainable rural livelihood security" under National Agricultural Innovation Project (NAIP)-3 SRLS.
08.	Indian Council of Agricultural Research (ICAR), New Delhi on 29.01.2009	Implementation of research project on " Value chain on Kashmir Saffron" under National Agricultural Innovation Project (NAIP)-2 PCS.
09.	Indian Council of Agricultural Research (ICAR), New Delhi on 13.01.2009	Implementation of research project on " Value chain on Zonafree Cloned Embryos for Quality Animal Production from Elite Buffaloes and Pashmina Goats" under National Agricultural Innovation Project (NAIP)-2 PCS.