SAFFRON HERITAGE SITE OF KASHMIR IN INDIA
GIAHS Saffron Site Report (Part-2)
31st May, 2012

Revival of Kashmir Saffron Heritage System

Saffron production is confined to a limited geographical area in the State. Saffron has traditionally been associated with the famous Kashmiri cuisine, its medicinal values and the rich cultural heritage of Kashmir. Its role in enriching the local cuisine, its medicinal value and its use in important religious rituals is well known. However, Saffron production is currently suffering on several counts, especially those relating to productivity as well as post harvest management. This has resulted in lower production and poor quality. There have been cases of several farmers abandoning Saffron cultivation in favour of other crops. The GIAHS pilot project study has assessed the situation and main reasons responsible for this trend are indicated below:

- Senile fields with inadequate plant population (2-3 lakh/ha instead of 5 lakh/ha)
- Moisture stress (rainfed cultivation)
- Inadequate availability of disease free Saffron corms
- Nutrient depletion in Saffron fields
- Longer planting cycle of Saffron corms (>15 years as against 4-5 years)
- Higher incidence of pests and diseases
- Delayed stigma separation, lowering Saffron recovery to 22 g/kg of fresh flowers (optimum recovery 30g/kg)
- Quality deterioration due to traditional practices: (sun drying lowers colouring strength from 16 to 8 per cent)
- Inadequate Quality Control / Certification / Branding system
- Poor price discovery and lower farm gate price (Involvement of intermediaries), and
- Issues of adulteration and admixture

1. Background Information

2.1. Present Scenario of Saffron Cultivation

Saffron cultivation in Kashmir has been under threat of extinction. This is evident from its dwindling share in global production. Area under Saffron cultivation has declined from about 5707 ha in 1996 to just 3715 ha in the recent past (viz., 2010-2011). Productivity has also declined from 3.13 kg/ha to 2.50 kg/ha in the last few years. (Annexure-1)

District Pulwama, commonly known as Saffron bowl of Kashmir, is the main contributor to Saffron production followed by Budgam, Srinagar and Kishtiwar districts. Saffron is cultivated by more than 16,000 families located in 226 villages, the majority (61 per cent) of whom (Annexure-2) have holdings of less than 0.5 ha.

2.2. Production Practices

1.2.1 The production system currently followed in Kashmir is responsible for the lower productivity of Saffron. In Iran and Spain, farmers use the pluriannual method of cultivation, under which Saffron plants are left in the soil for two consecutive years, after which corms are removed from the field for fresh plantation. Graded corms weighing 8 gm and above are preferred for new plantations. Corms are irrigated during the months of September and October using sprinkler technology which ensures timely corm sprouting and good flower yields. Saffron is dried using toasters / electrical dryers/vacuum dryers, which enhances the quality of Saffron.

1.2.2 In J&K, farmers have traditionally adopted longer planting cycles (> 15 years). Unsorted corms of different grades are used for fresh plantation. The corms are not uprooted except when new planting is done to use the daughter corms as seed material. Water is a critical factor for productivity since Saffron

is a rainfed crop of Karewas (highlands) where irrigation sources are generally not available.

1.2.3 A large number of Saffron fields have become senile on account of low plant population. Scientific studies have established that biotic stress on account of longer planting cycle is the main cause of low productivity. The major biotic stress faced by Saffron for several years is 'corm rot fungal infection'. However, farmers do not adopt any systematic control measures to prevent this infection. Rodents and field rats also pose a serious problem.

1.2.4 After plucking of flowers, the stigmas are separated by family labour and sun dried. This results in sharp degeneration in quality, leading to non-standard products. The fundamental reasons for poor quality are (i) poor post harvest handling practices (ii) lack of proper infrastructural facilities, such as pack houses, (iii) packing of dried product in poly bags which are stored under room temperature by the farmers. Saffron remains in such packing till the product is sold to the wholesale traders, which may take between one to six months, and sometimes even year after drying and packing.

1.2.5 Marketing of Saffron is unorganized. It is largely in the hands of brokers, with a long chain of intermediaries linking the grower to the consumer. The main marketing channels are brokers, local traders, agents, cooperative societies, government agencies and companies. Since the broker is the mainstay of the marketing channel, there is rampant exploitation of farmers mainly due to ignorance regarding the prices prevailing in major trading centers.

1.2.6 During the last decade, Saffron prices have witnessed wide fluctuations. During 1999 to 2006, prices generally hovered in the range of Rs.30,000 to Rs.47,000 per kg. However, prices now are higher. During 2008-09 and later, the average domestic price was Rs.2.70 lakh/kg.

1.2.7 Even though domestic production is not sufficient to meet demand, India does export saffron in small quantities. During 2009-10, India exported around 1.5 tonnes of Saffron. As a result of strong domestic demand, domestic prices went up from Rs 0.30 lakh/kg to Rs 2.70 lakh/kg (current price), which has

discouraged export of Saffron. The quantity imported is merely 0.3 tonnes (Rs 480 lakh). It is believed that a substantial quantity of foreign Saffron enters the country clandestinely, and is mixed with the local produce and sold as Kashmiri Saffron. (Annexures-3,4,5).

1.2.8 Strong domestic demand and high domestic prices are supporting factors to revitalize Saffron cultivation in Kashmir. As per trade estimates, domestic demand is in the range of 20 MT per annum, while current domestic production is in the range of only 10-15 MT. Hence, it is desirable to focus on productivity enhancement, improvement of post harvest processing and transparent marketing channels for the overall growth in the Saffron economy, and enhance income of Saffron family farmers.

2.3. Critical Inputs for Dynamically Conserved Saffron Production

In order to address issues relating to decline in Saffron production, productivity and quality, the GIAHS pilot project primarily through the Sher-e-Kashmir University of Agricultural Science & Technology - Kashmir (SKUAST-K) has developed relevant production, protection and post harvest technologies to achieve productivity level of around 5 kg/ha, compared to the prevailing productivity of around 2.5 kg/ha The recommended interventions are as follows and have been explained in detail in the subsequent paragraphs:

2.3.1 Initial corm treatment with fungicides (Carbendizime @ 0.1% in combination with Mancozeb @ 0.3 %) to control corm rot disease

2.3.2 Plantation of graded corms (> 8 g) at a seed rate of 50 q/ha on raised beds with a planting geometry of 20x10 cm (5 lakh corms/ha) under a shorter planting cycle of 4-5 years.

2.3.3 Seven weekly pre-flowering irrigations to be applied in September/October when there are no rains, followed by 3 weekly post flowering irrigations (November), to ensure yield gain by 40%.

2.3.4 Integrated Nutrient Management using manure (FYM 30 MT/ha), fertilizers (N90:P60:K50kg/ha) and vermicompost (0.25 MT/ha) to increase yield by improving soil health.

2.3.5 Picking of 2 days old flowers in early morning hours (5 a.m to 7 a.m) and separation of stigma within 4-5 hrs of picking.

2.3.6 Traditional sun drying to be replaced by drying in Solar/Hot Air dryers, which can lead to increase in Saffron recovery from 22g to 37g and improvement in quality by 60%.

2.3.7 Establishment of quality testing labs / grading centre / spice parks/ pack houses/ warehouses for quality control and certification, packaging, branding and development of a pan India electronic spot market for Saffron enabling the farmers to sell directly to the processors and end users. This will reduce cost of intermediation, improve marketing efficiency, promote grading and standardization at farm gate, promote electronic trading in graded and branded Saffron and also establish “Brand Kashmir.”

3. Scope & Strategies for Development

3.1. Scope

In order to tackle all issues related to Saffron production and marketing, it is essential to adopt a holistic approach in a Mission-Mode, covering all aspects of production and marketing. The outcome of such initiative will be the dynamic conservation of the saffron heritage site through substantial enhancement in farmers' income, besides the establishment of Kashmir Saffron as a global brand.

3.2. Strategies

The strategies to achieve the desired objective are as follows:

- Increasing productivity and quality in the area under Saffron crop through replanting of existing Saffron fields and supply of quality inputs,
- Expanding the area under cultivation,
- Creation of reliable and efficient irrigation sources,
- Multiplication of quality seed corms in public sector farms,
- Improving post harvest handling practices by continuing the awareness campaign launched by the GIAHS pilot project along with Skuast-K among the farmers about the benefits of picking flowers at the right stage and separating stigma and style in shortest possible time,
- Popularizing solar dryers for ensuring optimum moisture content to preserve quality during storage,
- Promotion of grading, quality testing and packaging at farm gate, establishing an electronic marketing channel for graded and quality certified Saffron, supporting Saffron growers' societies and Self Help Groups for promoting cluster farming and collective marketing, and

- Transfer of improved technologies by continuing to undertake testing, training and demonstration on farmers' fields and using all established extension methods to connect with each and every farmer growing Saffron.

4. Activities Proposed through the Follow-up Action Plan

The follow-up Action Plan as a programme for the dynamic conservation, adaptation and revival of J&K Saffron Systems should be implemented in a mission mode, for which a National Saffron Mission has been prepared and approved recently by the Government after due site stock-taking, consultations and awareness raising. The Plan has the following components to ensure that interventions are timely and have identifiable parameters of performance for the dynamic conservation of saffron cultivation in Kashmir. The components of the said Mission are adumbrated below:

- Rejuvenation/replanting of existing Saffron area for improving productivity,
- Improving soil health by INM,IPM and IDM practices,
- Standardization of quality corm production in public nurseries,
- Strengthening and improving the irrigation system,
- Enhancing product quality through improved post harvest handling,
- Appropriate Mechanization support while harnessing traditional cultivation practices,
- Establishment of weather stations and coping with weather vagaries,
- Infrastructure development ,
- Appropriate selection and transfer of production, rejuvenation and conservation technologies,
- Quality control, testing and marketing,
- Enhancement of research and extension capabilities,
- Delineation of package of practices for the traditional Saffron system sustainability,
- Dissemination of weather forecasts, market alerts, and on-ground risks and opportunities through SMS,
- Market intervention through e-trading and establishment of Electronic Auction Centre, and

- Grading, packaging and branding for quality control and eco-labeling.

4.1 Component-1: Rejuvenation/Replanting of Existing Saffron Area for Improving Productivity

Physical & Financial targets of collection, sorting and relaying of corms

S.No	Year	Area (ha)	Collection, sorting and relaying of Corms (@ 5 MT /ha)	Financial requirements (Rs in lakh) @6.75 lakh/ha	*Govt. of India share (Rs in lakh)
1	2011	-	--	--	--
2	2012	1520	7600	10260	7695.0
3	2013	1150	5750	7762.5	5821.87
4	2014	1045	5225	7053.75	5290.31
	Total	**3715**	**18575**	**25076.25**	**18807.18**

**As per follow-up Saffron Mission, the Govt. of India share is 75% of the total cost involved for collection, sorting and relaying of 18575 MT corms in 3715 ha and has been agreed to be provided on the basis of actual costs.*

Note: *- 700 skilled man days will be needed for collection of corms, 378 skilled man days for sorting and 850 skilled man days for relaying of corms per ha. cost of skilled manpower has been computed – Rs.350 / day.*

- Area under cultivation: 3715 ha
- Average productivity level: 2.5 kg/ha
- Potential productivity level: 5 kg/ha
- Reason for low productivity: inadequate plant population of 2.5-3 lakh plants /ha
- Target: to replant 5 lakh corms/ha in the first year; that would produce over 15 lakh corms/ha after 4 years.

Replanting shall be carried out over a time frame of four years. The first year will be used for preparatory work, including the GIAHS pilot project support. It is proposed to cover 41 per cent of the actual area (1520 ha) in the second year, followed by 31 % (1150 ha) in 3rd and 28% in the 4th Year (1045 ha). Seventy five percent of the cost of digging, sorting and relaying of corms @ Rs 6.75 lakh/ha shall be borne by the Mission follow-up of the project. Maximum area under rejuvenation shall be targeted in district Pulwama followed by Budgam (300 ha), Srinagar (165 ha) and Kishtwar (50 ha). SKUAST (K) has recommended adoption of

seed rate of 5 lakh corms weighing more than 8 gm each) per ha. Production is expected to commence within 3 to 4 years of planting. Farmers will also receive support for nutrient management, disease management and water management, so as to help achieve productivity of around 5 kg/ha.

a) Corm requirement

Corm requirement for rejuvenation will be met from the harvest of corms from this very area after digging out old corms. This is estimated to yield 7-8 MT per ha with 70% of graded corms,

Scheme for corm availability under rejuvenation and corm production

Year	**Target (ha)**	**Requirement (MT)**	**Availability @7.5 MT/ha**		
			Graded (70%)	**Under sized (30%)**	**Total**
2011	--	--	-	-	-
2012	1520	7600	7980	3420	11400
2013	1150	5750	6038	2587	8625
2014	1045	5225	5486	2351	7837
Total	**3715**	**18575**	**19504**	**8358**	**27862**

4.2 Component-2: Improving Soil Health by INM, IPM and IDM Practices

Hand used for Saffron cultivation has become increasingly difficult and under-productive over the years. A package of practices for dynamicalaly evolving Saffron cultivation are being developed, which can enhance productivity per unit area. Use of manure, inorganic fertilizers, vermicompost, and fungicides for control of corm rot and pesticides for rodent management are critical inputs for enhancing Saffron productivity. The major components of the integrated management program for improvement of soil health are:

i) Balanced nutrition through fertilizer application, vermicomposting and organic manure, and

ii) Need based plant protection measures preferably with botanicals and biopesticides.

Physical & Financial targets of INM/IPM & IDM

S.No	Year	Area (ha)	Critical Inputs @ 10.88 MT/ha	Total Project cost (Rs.in lakh) @0.50 lakh/ha	Govt of India share (Rs. in lakh)
1	2011	--	--	--	--
2	2012	1520	16537.6	760	570
3	2013	1150	12512.0	575	431.25
4	2014	1045	11369.6	522.5	391.87
	Total	**3715**	**40419.2**	**1857.5**	**1393.12**

**Govt of India support share is committed at 75% of the total cost of inputs*

4.3 Component-3: Standardization of Quality Corm production in Public Nurseries

Year Wise Physical & Financial targets for setting up public sector nurseries for corm production

Year	Location	Area	Physical Requirement @5 MT/ha @ 10.88 MT/ha		*Total Project cost (Rs in lakh) @6.75 lakh/ha @0.50 lakh/ha		
			Corms (MT)	Inputs (MT)	Corms	Inputs	Total
2011	Allapora	19	95	207	128.25	9.5	137.75
	Beerwar	5	25	54	33.75	2.5	36.25
	KD/SRSS Konibal	4	20	44	27.00	2.0	29.0
	Total	**28**	**140**	**305**	**189.0**	**14.0**	**203.0**
2012	Allapora	19	95	207	128.25	9.5	137.75
	Beerwar	5	25	54	33.75	2.5	36.25
	KD/SRSS Konibal	4	20	44	27.00	2.0	29.0
	Total	**28**	**140**	**305**	**189.00**	**14.0**	**203.0**
2013	Allapora	17	85	184	114.75	8.5	123.25
	Beerwar	5	25	54	33.75	2.5	36.25
	KD/SRSS Konibal	4	20	44	27.00	2.0	29.0
	Total	**26**	**130**	**282**	**175.50**	**13**	**188.50**
	G. Total	**82**	**410**	**892**	**553.50**	**41.0**	**594.50**

** Govt of India has agreed to meet the full cost of procurement of 410 MT of corms and 892 MT inputs*

Increased availability of quality corms is necessary for area expansion & rejuvenation. Therefore, corm multiplication program, (through establishment of public and private sector nurseries) is essential to make available quality corms to the growers at reasonable rates. This will also

lead to horizontal expansion. In order to achieve targets under area expansion, the proposed approach is as follows:

- The Department of Agriculture, Kashmir has a State Seed Farm at Allowpora in Pulwama district, with an area of 63 ha. Out of this, about 55 ha can be brought under cultivation after land development. The farm is presently used for seed production, including seed corm production in 2 ha. and in 55 ha area under the farm needs to be developed and irrigation facilities provided to make it fit for seed corm production.
- GIAHS pilot project collaborator SKUAST (K) has a research farm, called 'KD Farm' near the old airport in Srinagar, which is in the neighborhood of CITH. This farm is currently used for field trials inter-alia for Saffron. It is also used for production of seeds and planting material of major crops on a limited scale. About 12 ha area would be available from this farm for saffron seed corm multiplication.
- In Kishtwar district, the State Department has a 15 ha Saffron Development Farm in Berwar, which will be used for seed corm production.

Thus, nurseries for the production and multiplication of corms shall be established in an area of 82 ha. on public sector farms. The annual corm production from these nurseries is estimated to be 410 MT, which will be sufficient to replant 246 ha under area expansion from 2014.

Input Requirement

In order to maintain soil health and to achieve high corm multiplication ratio, about 892 tonnes of critical inputs like FYM, vermicompost, inorganic fertilizers, fungicides and pesticides will be required over a period of 3 years. The entire cost of inputs shall be borne under the follow-up project.

4.4 Component-4: Strengthening the Irrigation System

Year wise Physical Targets for strengthening of irrigation system

S.No	Year	Targets	
		No of Tube Wells	No of Sprinkler Sets
1	2011	53	1548
2	2012	40	1178
3	2013	35	1071
4	2014	---	---
	Total	**128**	**3797**

Year wise financial requirements for strengthening of irrigation system

S. No	Year	Total cost (Rs. in lakh)			Govt of India share (Rs.in lakh)			
		Tube Wells	Sprinklers (50% cost)	Total	Tube Wells	*Sprinklers (100% cost)	Sprinklers (50% cost)	Total
1	2011	1060	774.0	1834	1060	14.0	380.00	**1454**
2	2012	800	589.0	1389	800	14.0	287.50	**1101.5**
3	2013	700	535.5	1235.5	700	13.0	261.25	974.25
4	2014	--	--	---	--	-	--	
	Total	**2560**	**1898.5**	**4458.5**	**2560**	**41.00**	**928.75**	**3529.75**

**for public sector nurseries*

N.B.- Assistance will be available as per actual costs subject to the indicated ceiling and stipulated pattern of assistance. GIAHS pilot project in 2011 has been appropriately helpful.

Lack of irrigation facilities is one of the main reasons for low productivity. There is need to establish 128 tube wells with 100 per cent project assistance in the targeted area to be brought under rejuvenation with complete net work of sprinklers. Each tube-well will be able to irrigate 30 ha of Saffron area. However, efforts shall also be made to create permanent water source for Saffron areas adjacent to river Jhelum near Patal and Lathipora, by strengthening Lathipora Lift Irrigation Scheme. This scheme will irrigate the area under Saffron in Pulwama covering Hatiwara, Lethpora and Ladho. Chatlam Sar (a perennial water body) is another option to irrigate Konibal karewas. Digging of tube wells will be

synchronized with the area under re-plantation every year. 3715 sprinkler sets with distribution system costing Rs 5000 per set shall be made available to the farmers with 50% subsidy, whereas 82 sets shall be installed on Govt farms with 100% project share.

4.5 Component-5: Enhancing Product Quality through Improved Post Harvest Handling

Physical Targets for distribution of dryers

S.No	Year	Physical Targets (Hot Air Dryers)	Total Cost (Rs in lakh)	*Govt. of India Share @ 50% subsidy (Rs in lakh)
1	**2011**	1400	210	105
2	**2012**	2200	330	165
3	**2013**	2200	330	165
4	**2014**	2200	330	165
	Total	**8000**	**1200**	**600**

**Govt. of India share @ 50% subsidy*
**Assistance will be admissible as per actual cost*
**GIAHS pilot project has been helpful during 2011.*

Kashmiri Saffron is known for its high quality, but suffers from poor post harvest handling. The traditional method of sun drying reduces Saffron quality due to degradation of colouring alongwith odour and bitterness imparted by pigments like rocin, saffranal and picrocrocin. Scientific drying method using Solar/Hot Air dryers designed by SKUAST-K ensures high product quality, due to reduction in drying time from 27-54 hours to 3-4 hours. Popularization of such dryers among the farmers will ensure high product quality. Dryers with an initial cost of Rs 15000 shall be made available at 50 % subsidy. It is proposed to fabricate such dryers at Government workshops. Further, it is proposed to provide 1 dryer for every two families.

4.6 Component-6: Appropriate Technology Mechanization

Physical Targets under mechanization

S.No	Year	Mechanization of Public Farms (100 % Govt of India share)				Mechanization of Private Farms @ 50% subsidy
		Planters/ Diggers (Indigenous)	Planters /Diggers (Imported)	Tractors	Weeders	Weeders
1	**2011**	4	-	4	7	125
2	**2012**	-	1	-	-	125
3	**2013**	-	-	-	-	125
4	**2014**	-	-	-	-	125
	Total	**4**	**1**	**4**	**7**	**500**

Financial Targets under mechanization

S.No	Year	Planters/ Diggers (Indigenous) @ 10 lakh/ unit	Planter/ Digger (Imported) @ 30 lakh/ unit	Project cost (Rs in lakh)			*Govt of India share (Rs in Lakh)
				Weeders	Tractors	Total	
1	2011	40	30	132	28.0	230	167.5
2	2012	-	-	125		125	62.5
3	2013	-	-	125	-	125	62.5
4	2014	-	-	125	-	125	62.5
	Total	**40**	**30**	**507**	**28.0**	**605**	**355.0**

** Govt of India share includes 100 % cost of planters/diggers/tractors & 7 weeders besides 50% subsidy on 500 weeders*

**Assistance admissible will be as per actual cost*

** GIAHS pilot project has been helpful in testing, training and demonstration during 2011*

Saffron is a labour intensive crop. The majority of field work is done by women. Hoeing of Saffron fields to facilitate soil aeration and emergence of sprouts is labour intensive requiring 80 man days per ha. Introduction of weeders will facilitate quick weeding and hoeing. Five hundred weeders @Rs 1.0 Lakh per weeder are proposed with 50% subsidy support. Besides, 7 weeders are proposed with 100% assistance for public farms.

Corm planting and corm collection are important components of field operations in Saffron. Saffron planters/diggers with 100 per cent project assistance will reduce the time and labour requirement to around 147 man days. Four planters and 4 tractors shall be used for establishment of public nurseries at Government farms and for custom hiring for farmers fields in Pulwama, Budgam and Kishtwar districts. This will facilitate timely plantation. One imported planter/digger may be used for further demonstrations and development of improved indigenous prototype.

4.7 Component-7: Weather Station Development

Target: Creation of 5 weather stations (Govt. Of India Share: 100%)

Knowledge of weather is critical to implementation of effective package of practices for enhanced productivity and efficient input utilization. Establishment of weather stations in the growing areas would ensure that local weather data is utilized to provide weather forecasts and crop advisory messages to the farmers through SMSs. The cost involved for installation of weather stations and requisite software, hardware, etc. for reading and interpreting data will be Rs.40 lakh.

4.8 Component-8: Infrastructure Development

Physical and Financial Targets under creation of facilities (Govt of India Share)

S.No	Year	Vermicompost Units		Corm handling & storage units for public		*Total cost (Govt of India share)
		Physical (No)	Financial (Rs.in lakh)	Physical (No)	Financial (Rs.in lakh) @5 lakh	
1	2011	114	34.2	3	915	49.2
2	2012	190	57.0	-	-	57.0
3	2013	190	57.0	-	-	57.0
4	2014	264	79.2	-	-	79.2
	Total	**758**	**227.4**	**3**	**915**	**232.4**

** Govt of India share includes cost vermicompost Rs 30,000/unit. Activity was launched in 2011 with due guidance and support of GIAHS pilot project experts.*

Development of vermicompost units will facilitate adequate supply of organic manure at cheap rates. It is proposed to establish 758 vermicompost units over the next four years to meet the requirement of Saffron sector.

It is also necessary to provide facilities for processing and storage of seed corms at all the three farms (Allapora, Beerwar and KD/SRSS Konibal).

4.9 Component-9: Transfer of Technologies

Physical Targets under transfer of technologies

Component	2011	2012	2013	2014	Total
Demonstrations	50	50	50	50	200
Literature/ Farmers' Day etc	4	4	4	4	16
Training of staff	100	100	50	50	300
Training of farmers	150	150	100	100	500
Study tours abroad for experts/ farmers		2	2	-	4
		8	8	-	16
Seminars/ workshops	1	1	1	1	4

Financial Targets under transfer of technologies (Rs in lakh)- (100% Govt. of India share)

Components	2011	2012	2013	2014	Total
Demonstrations @30,000/Demonstration 250 m^2	15.0	15.0	15.0	15.0	**60.0**
Literature/ Farmers' Day etc	3.0	3.25	2.0	2.0	**10.25**
Training of staff	0.75	0.35	0.35	**2.20**	
Training of farmers	1.12	1.12	0.75	0.75	**3.74**
Study tour abroad Experts	6.00	--	--	**12.0**	
Farmers	24.00	24.00	--	--	**48.0**
Seminars/ workshops		TBC	5.0 (International)	2.0 (National)	**7.0**
	49.87	**50.12**	**23.10**	**20.10**	**143.19**

The impact of improved technologies emanating from research institutions depends on the effectiveness of the 'transfer of technology' to the field staff of the Department of Agriculture. Extension programmes

for Saffron have been quite weak; training, testing and demonstration during the GAIHS pilot project have been intensive and useful for requisite awareness raising, also involving on-site seminars and workshops. Massive efforts are required for making the farmers aware of the improved technologies through continued demonstrations. Arrangements will have to be made for 'hands-on' training of farmers, besides timely supply of inputs. Human resource development for handling all operations involved in management of a sensitive and costly crop like Saffron would form an essential component of the proposed follow-up project and related Mission.

To begin with, training would be imparted to farmers to help them update and dynamically evolve age-old practices, and make them aware of the improved appropriate technologies, quality grades and marketing. The project would also provide for training of scientists in the new advancements made in Saffron and use of advanced lab techniques. The Government staff would also be exposed to improved management and marketing systems, while the Extension Agents would receive training in traditional farmer-friendly technologies, PRA techniques and Impact analysis.

The follow-up project would also fund a study tour of experts and officials, including the Project staff and scientists for studying global practices regarding cultivation, processing and marketing of Saffron to identify appropriate systems and policies which can be adopted for dynamic conservation and modernization of Saffron production and for compatibilty with global markets.

The Agriculture Department and SKUAST-K would arrange for publishing extension material including package of practices in consultation with CITH for distribution among the farmers, production of video films and setting up a call centre to respond to queries from the stakeholders and general public. The Agricultural Extension Officers (AEOs) would be responsible for organizing distribution of inputs, overseeing functioning of the Extension Agents and identifying farmers for training.

The SKUAST would also make the Departmental staff, including AEO, fully aware about the evolving technologies. The University, in collaboration with the department, would lay out OFTs and front line demonstrations (FLDs) to assess the suitability of any new technology before its full scale transfer. Extension Agents would also be deployed in the Universities for the purpose.

Package of practices based on GAP shall be devised by SKUAST-K and CITH, Srinagar within next six months and disseminated amongst the farmers with the assistance of Directorate of Agriculture.

An international seminar on Saffron will be organized in 2012. It is also proposed to organize one National seminar every year.

4.10 Component – 10: Quality Testing and Marketing

It is a well known fact that good quality Saffron, characterized by high crocin and safranal contents, fetches the best price in the international market. Kashmir Saffron suffers severely on quality considerations because of poor post harvest handling practices. At present, there is no mechanism to enforce adoption of quality standards and fix the price based on quality grades at farm gate level. There is no state owned quality evaluation laboratory to carry out regular evaluation and certification of Saffron.

It is now an accepted fact that good price for a high value crop like Saffron can be ensured only by fixing quality standards, enforcing them across the board, and fixing prices as per grades. The menace of spurious Saffron needs to be tackled on a war footing to send a strong message to the Saffron traders in particular and consumers in general. The same approach is needed for fighting the practice of adulteration. Until Saffron is freed from this menace, investment in Saffron project will be infructuous. Quality control is very much needed to establish brand "Kashmir Saffron".

A quality control lab with ISO certification is proposed to be established at Pampore for which Government of J&K will provide a ten acres of land The Government of J&K has agreed to this, in principle. A preliminary proposal in this regard has also been received from the Spices Board, which is going forward with a Saffron Spice Park at the GIAHS pilot site at Pampore.

Spice Board Proposal:

(Rs.in lakh)

Sl.	Component		Amount
1.	**Setting up of Quality Lab**		**891.00**
	Equipment	3.10	
	Building	2.50	
	Staff (Recurring for five years)	2.31	
	Training	1.00	
2.	**Export Promotion activity**		**200.00**
3.	**Saffron Park**		**1300.00**
	Building	4.50	
	Water supply, Electricity, road	2.00	
	Stigma handling	2.00	
	Common solar drier	1.50	
	Common packing machine	2.00	
	Pre-operation expense	1.00	
4.	**E-auction centre**		**53.00**
	Total =		**2444.00**

Apart from the Spices Board for implementing this activity, it is proposed that NHB be entrusted with this responsibility. NHB will be directed to select a 'service provider' to operate the electronic auction platform in a Spot Exchange Mode by enrolling members from the community of growers, traders, exporters and institutional buyers.

4.11 Component-11: Enhancement of Research and Extension Capabilities (100% Govt of India share)

Institution: SKUAST-K CITH

Targets:

1. Devising package of practice based on GAP for Saffron.

2. Studies on irrigation scheduling and development of appropriate formulations of biofertilizers / biocontrol agents /organic nutrients suitable for organic Saffron.

3. Investigation of the role of micronutrients under high density plantation.

4. *In vitro* screening of elite germplasm against *Fusarium* for identification of genotypes resistant to corm rot

5. Saffron improvement through introduction of exotic germplasm from Iran, Spain, Greece, Turkey, Morocco, Italy, Azerbaijan and utilizing indigenous germplasm resources of SKUAST-K/CITH.

6. Biosynthesis of carotenoids and gene expression in Saffron

7. Development of morphological, molecular and biochemical markers for identification and conservation of genes of interest in available germplasm

8. Standardization of cost effective in vitro protocols for corm production

9. Development of protected structures with controlled temperature and atmospheric conditions with growth chambers and irrigation controls for developing protocol for corm production

10. Validation and refinement of identified technologies for extension of Saffron in non-traditional areas of Jammu & Kashmir

11. Post Harvest Management and Value Addition of Saffron

12. Extending shelf life of fresh stigmas and styles to inhibit or delay degeneration of crocin and safranal

13. Feasibility of Saffron mechanization through up-gradation and refinement of existing prototypes of corm planters / corm graders / corm diggers /weeders / stigma separators / dryers).

Physical Targets under R&D

		Physical Targets			
S.No	Year	Corms		Inputs (MT)	Saffron flowers (Qtl.)
		Saffron corms for lay out of 100 OFT over an area of 2.5 ha	Saffron corms for layout of Research Trials over 0.5 ha under high density		
1	2010-11		12	76	1.5
2	2011-12	12.5	-	76	1.5
3	2012-13		-	76	1.5
4	2013-14	-	-	76	-
	Total	**12.5**	**12**	**304**	**4.5**

Financial requirements under R&D

	SKUAST-K	CITH	Total
Recurring			
T.A	6.00	2.0	8.0
Contractual	37.35	14.76	52.11
Operational cost	128.91	34.45	163.36
Non-recurring			
Equipment	13.00	1.0	14.0
Protected structures	150.0	25.0	175.0
Furniture	1.25	0.5	1.75
Books/ Journals	1.50	1.0	2.50
Total	**338.01**	**78.71**	**416.72**

Year wise Financial Requirement of SKUAST –K under R&D

Type of Expenditure	Budget Head	Rs in Lakh				
SKUAST-K		**2010-11**	**2011-12**	**2012-13**	**2013-14**	**Total**
Recurring	**T.A (National Level)**	**1.50**	**1.50**	**1.50**	**1.50**	**6.00**
	Contractual Services					
	Tech Associate (3) @Rs 25000/Month	6.75	9.00	9.00	9.00	33.75
	Office Assistant 1 @ Rs 8000/Month	0.72	0.96	0.96	0.96	03.60
	Sub Total Contractual Services	**7.47**	**9.96**	**9.96**	**9.96**	**37.35**
	Operational Expenses					
	Purchase of Saffron corms for lay out of 100 OFT	-	16.86	-	-	16.86
	Purchase of corms for research trials (10 MT)	13.5	-	-	-	13.5
	Purchase of manure, bio fertilizers, pesticides, fungicides, etc for research & OFT Plots, Nursery	3.0	3.0	3.0	3.0	12.0
	Field operations, lay out tillage, management of OFT, harvesting, processing, etc @ 1) Rs.5000/month for skilled labour. 2) Rs.3410/month for semi-skilled labour. 3) Rs.3000month for un-skilled labour.	5.00	3.00	3.00	3.00	14..00
	Chemical &Glass ware	4.00	4.00	4.00	3.00	15.0
	O.E, Stationery, Training material/ /postage/Xerox/ Internet/phone/communi cation	0.50	0.75	0.75	0.75	2.75

	T.E/Hiring of vehicle/POL/	2.00	3.00	3.00	3.00	11.00
	Development of prototypes for mechanization	5.0	5.0	2.0	2.0	14.0
	Sub Total Operational Cost	**39.60**	**52.21**	**22.35**	**14.75**	**128.91**
Non-Recurring	Equipment	-		-	-	50
	Colour spectrophotometer		12.0	--	-	12.00
	Computer with accessories	1.00	--	--		1.00
	Atmospheric controlled Protected Structures	-	150.0	-	-	150.0
	Furniture	--	1.25	--	--	1.25
	Books/Journals	0.50	0.50	0.50	--	1.50
	Total	**1.50**	**163.75**	**0.50**	**-**	**165.75**
	Total (SKAUST-K)	**48.57**	**225.92**	**32.81**	**24.71**	**332.01**

Year wise Financial Requirement of CITH under R&D

Type of Expenditure	**Budget Head**	**Rs in Lakh**				
CITH		**2010-11**	**2011-12**	**2012-13**	**2013-14**	**Total**
Recurring	**T.A (National Level)**	**0.5**	**0.5**	**0.5**	**0.5**	**2.0**
	Contractual Services					
	Tech Associate (1) @Rs 25000/Month	2.25	2.97	2.97	2.97	11.16
	Office Assistant 1 @ Rs 8000/Month	0.72	0.96	0.96	0.96	03.60
	Sub Total Contractual Services	**2.97**	**3.93**	**3.93**	**3.93**	**14.76**
	Operational Expenses					
	Purchase of corms (2T)	2.7				2.7
	Purchase of manure, bio fertilizers, pesticides, fungicides, etc for Research & OFT Plots,	0.5	0.5	0.5	0.5	2.0

	Nursery					
	Field operations, lay out tillage, management of research trials, flower picking, processing of samples in pack house @ 1) Rs.5000/month for skilled labour. 2) Rs.3410/month for semi-skilled labour. 3) Rs.3000month for un-skilled labour.	0.5	0.5	0.5	0.5	2.0
	Purchase of Flowers	3.0	3.0	3.0	-	9.0
	Chemical & Glass ware	4.00	4.00	4.00	3.00	15.0
	O.E, Stationery, Training material/ postage/ Xerox/ Internet/phone/ communication	0.50	0.75	0.75	0.75	2.75
	T.E/Hiring of vehicle/POL/	0.25	0.25	0.25	0.25	1.00
	Sub Total Operational Cost	**11.45**	**9.0**	**9.00**	**5.00**	**34.45**
Non-Recurring	Equipment	-		-	-	
	Computer with accessories	1.00	--	--		1.00
	Hi-tech green house	25.0				25.0
	Furniture	--	0.50	--	--	0.50
	Books/Journals	0.25	0.25	0.25	0.25	1.00
	Total	**26.25**	**0.75**	**0.25**	**0.25**	**27.50**
	Total (CITH)	**40.67**	**13.68**	**13.18**	**9.18**	**76.71**

5. Overall Financial Requirements (Rs in Lakh)

		Rs in Lakh	
Component	**Target**	**Govt of India Share**	**Total project Cost**
Replanting/ Rejuvenation	**3715 ha**	--	**--**
Corms **(A)**		**18807.18**	**25076.25**
IINM/IDM/IPM **(B)**		**1393.12**	**1857.5**
Quality Corm Production under Public sector	82 ha		
Corms	-	553.50	553.50
Inputs	-	41.0	41.0
Total (C)	**-**	**594.50**	**594.50**
Strengthening of Irrigation system			
Tube Wells	128 Nos	2560.00	2560
Sprinkler sets	3792 Nos	969.75	1898.5
Total(D)		**3529.75**	**4458.5**
Enhancing Product quality			
Dryers(E)	**8000 Nos**	**600**	**1200**
Saffron Mechanization			
Weeders	507 Nos	257	507
Planters/Diggers	04 Nos(Indg) 01 No (Imp)	40 30	40 30
Tractors	04 Nos	28	28
Total (F)		**355**	**605**
Weather station	**5 Nos**	**200**	**200**
Infrastructure			
Vermicompost Units	758 Nos	227.4	227.4
Bio-fertilizer units	2 Nos	20.00	20.00
Corm handling and storage units	3 Nos	30.00	30.00
Total (G)		**277.40**	**277.40**
Transfer of Technologies			
Demonstrations	200 Nos	60	60
Farmers Days	16 Nos	10.25	10.25

Training(staff)	300 Nos	2.20	2.20
Training(Farmers)	500 Nos	3.74	3.74
Tour(Abroad			
Staff	4 Nos	12	12
Farmers	16 Nos	48	48
Seminars	2	7	7
Total (H)		**143.19**	**143.19**
Quality testing & marketing(I)		**2206.0**	**2206.0**
Research & Development (J)			
SKUAST-K	-	338.01	324.01
CITH		78.71	113.67
Total (I)		**416.72**	**416.72**
Project Monitoring @ 1 % of project cost **(K)**		**283.22**	**283.22**
Grand Total		**28806.08**	**37218.28**

6. Partner Wise Financial Break up (Government of India Share)

	Financial Implication (Rs in lakh)					
Component	**DAK**	**DAJ**	**SKUASTK**	**CITH**	**Spice Board/ NSEL**	**TOTAL**
Replanting/ Rejuvenation (A)	**18554.06**	**253.12**	-	-		**18807.18**
IINM/IDM/IPM **(B)**	**1374.37**	**18.75**	-	-		**1393.12**
Quality Corm Production under Public sector						
Corms	371.25	101.25	81.0	-		553.5
Inputs	27.5	7.5	6.0	-		41.00
Total (C)	**398.75**	**108.75**	**87.0**			**594.5**
Strengthening of Irrigation system						

Tube Wells	2460	80	20	-		2560
Sprinkler sets	951.25	12.5	6	-		969.75
Total(D)	**3411.25**	**92.5**	**26**			**3529.75**
Enhancing Product quality						
Dryers(E)	**525**	**75**	**-**	**-**		**600**
Saffron Mechanization						
Weeders	227	27	2	1		257
Planters/Diggers	20	10	40	--		40 30
Tractors	14	7	7	-		28
Total (F)	**261**	**44**	**49**	**1**		**355**
Infrastructure						
Vermicompost Units	180.3	45	1.5	0.6		227.4
Corm handling and storage units	10	10	10			30.0
Total (G)	**200.30**	**55**	**21.5**	**0.6**		**257.40**
Establishment of weather station					**200**	**200**
Transfer of Technologies						
Demonstrations	45	15				60.0
Farmers Days/Literature	5.75	1.0	3.5			10.25
Training(Staff)		2.20				2.20
Training(Farmers)		3.74				3.74
Tour(Abroad)						
Staff	6	6				12.0
Farmers	33	15				48
Seminars			7			7
Total (H)	**89.75**	**42.94**	**10.5**	**-**		**143.19**
Quality testing & marketing(I)					**2206.0**	**2206.0**
Research & Development (J)			338.01	78.71	-	**416.72**
Project Monitoring @ 1 % of project cost	**283.22**					**283.22**
Grand Total	**25097.7**	**690.06**	**532.01**	**80.31**	**2306.0**	**2880F6.08**

7. Year wise Financial Requirement (Rs. in lakh)

Component	Inputs	2011	2012	2013	2014	Total
Replanting/ Rejuvenation (A)	**Digging & relaying cost**	**--**	**7695.0**	**5821.87**	**5290.31**	**18807.18**
IINM/IDM/IPM **(B)**		**--**	**570.0**	**431.25**	**391.87**	**1393.12**
Quality Corm Production under Public Sector	**Corm / other inputs**	**203.0**	**203.0**	**188.50**	**--**	**594.50**
Strengthening of Irrigation system	**Tube well/ sprinklers**	**1454.0**	**1101.5**	**974.25**	**--**	**3529.75**
Enhancing Product quality	**Dryers**	**105.0**	**165.0**	**165.0**	**165.0**	**600.00**
Saffron Mechanization	**Planters / weeders etc.**	**167.50**	**62.50**	**62.50**	**62.50**	**355.00**
Infrastructure						
Vermicompost Units		**34.20**	**57**	**57**	**79.2**	**227.4**
Biofertilizer units		**20.0**	**--**	**--**	**--**	**20.00**
Corm handling and storage units		**30.0**	**--**	**--**	**--**	**30.00**
Transfer of Technologies		**49.87**	**50.12**	**23.10**	**20.10**	**143.19**
Establishment of Weather Stations		**100.00**	**100.00**	**-**	**-**	**200.00**
Quality Testing & Marketing(I)		**1651.0**	**185.0**	**185.0**	**185.0**	**2206.00**
Research & Development (J)		**91.24**	**241.60**	**47.99**	**35.89**	**416.72**
Project Monitoring @ 1 % of project cost		**38.06**	**103.30**	**79.56**	**62.30**	**283.22**
Grand Total		**3943.87**	**10434.02**	**8036.02**	**6292.17**	**28806.08**

8. Expected outcome

PRODUCTIVITY ENHANCEMENT

- At present, productivity level of Saffron is 2.50 kg/ha, with a total production of 9.46 MT in J&K State from an area of 3785 ha. After implementation of the Mission, productivity level is expected to increase to 5 kg/ha, thus enhancing production to about 18.5 MT from the same area.

PUBLIC SECTOR NURSERIES

- Establishment of public sector nurseries to cover an area of 82 ha is expected to produce 1230 MT quality corms for further use in area expansion in the State.

SAFFRON RECOVERY

- Quality Saffron drying and efficient post harvest processing will improve Saffron recovery by 27%, thereby, improving Saffron production by further 5 MT.

PRICE DISCOVERY THROUGH TRANSPARENT TRANSACTIONS

- Well organized marketing system will reduce cost of intermediation, improve marketing efficiency, enhance farmers' price realization, promote grading and standardization at farm gate level and make better quality certified Saffron available to the consumers.

9. Implementation and Monitoring

The follow-up Action Plan Mission will have well defined components to address all the issues related to the dynamic conservation and sustainable development of the traditional heritage Saffron cultivation in the State. The departments involved in administering and implementation of the activities under different components are given below:

S.No	Activity	Implementing Agency	Monitoring
C-1	Rejuvenation/Replanting of Existing Saffron Area for Improving Productivity	Deptt of Agriculture	SLSC HC SKUAST-K
C-2	Improving Soil Health by INM,IPM and IDM Practices	Deptt of Agriculture	HC CITH SKUAST-K
C-3	Production of Planting Material in Public Sector Nurseries	Deptt of Agriculture	SLSC HC SKUAST-K
C-4	Strengthening of Irrigation System	Deptt of Agriculture	SLSC HC SKUAST-K
C-5	Enhancing Product Quality Through Improved Post Harvest Handling	Deptt of Agriculture	SLSC HC CITH SKUAST-K
C-6	Saffron Mechanization	Deptt of Agriculture	SLSC HC CITH SKUAST-K
C-7	Weather Stations	National Horticulture Board	JS (NHM)
C-8	Infrastructure Development	Deptt of Agriculture	SLSC HC CITH SKUAST-K
Ct-9	Transfer of Technologies	Deptt of Agriculture	SLSC HC CITH SKUAST-K
C-10	Quality Testing and Marketing	National Horticulture Board	JS (NHM)
C-11	Enhancement of Research and Extension Capabilities	SKUAST-K CITH	DDG (Hort.) HC

10. Sanctions and Strategic Review

During dialogue for the mission mode action plan with various national and state level authorities, it has been agreed that:

- AAP (Annual Action Plan) will be sanctioned by the SLSC of RKVY under the chairmanship of Chief Secretary, J&K .
- Half-yearly review by the SLSC of RKVY
- Bi-monthly monitoring of implementation of scheme by APC/Agri. Secretary, J&K.
- Half-yearly monitoring by Committee under DAC in which Chief Secretary, J&K and members from ICAR and Planning Commission would be represented.
- Annual allocation/release on the basis of performance.

The follow-up action plan has now been launched accordingly and is underway with oversight role and responsibility of SKUAST-K collaborators for ensuring that the GIAHS pilot site is safeguarded sustainably, scientifically and technically with due participation of and support to saffron family famers.

Annexure-1

Trends in area, production and productivity of Saffron in J&K

Year	Area (ha)	Production (MT)	Yield (kg/ha)
1996-97	5707	15.95	2.80
1998-99	4116	12.88	3.13
1999-00	3997	7.65	1.89
2000-01	2831	3.59	1.27
2001-02	2713	0.30	0.095
2002-03	2825	6.50	2.28
2003-04	2742	5.15	1.88
2004-05	3143	6.86	2.23
2006-07	3010	6.50	2.15
2007-08*	3280	8.20	2.50
2008-09	3280	7.70	2.34
2009-10	3785	9.462	2.50

**Source: Directorate of Agriculture Jammu & Kashmir*

Annexure-2

District-wise area under Saffron in J&K(2009-10)

S.No	District	Area (ha)
1	Pulwama	3200
2	Budgam	300
3	Srinagar	165
4	Kishtiwar	120

Source: Directorate of Agriculture Jammu & Kashmir

Annexure-3

Export of Saffron from India

Year	Quantity MT	Value (Rs. in Lakh)
2005-06	6.08	201.16
2006-07	7.18	389.10
2007-08	2.03	164.38
2008-09(E)	4.06	372.78
2009-10(E)	1.59	342.71

(*Source: Spice Board of India)*

Annexure-4

Import of Saffron into India

Year	Quantity (MT)	Value (Rs. in Lakh)
2006-07	3.3	664.8
2007-08	2.3	1254.9
2008-09(E)	0.4	377.2
2009-10(E)	0.3	480

(*Source: Spice Board of India)*

Annexure-5

Average Domestic Price of Saffron in India

Year	Avg. Price (Rs. in Lakh/kg)
2005-06	0.298
2006-07	0.438
2007-08	1.123
2008-09	1.891
2009-10	2.701
2010-11	1.745 (Avg over 2 months April/May

(*Source: Spice Board of India)*