

Introduction and Expansion of Improved Pigeonpea
(Arhar) Production Technology in Rainfed Upland
Ecosystems of Odisha

'Technological Empowerment and Sustainable Livelihood'



2011 Accomplishment Report
(June 2011 - May 2012)
2012 Targets and Revised Project Proposal

**Introduction and Expansion of Improved Pigeonpea (Arhar) Production
Technology in Rainfed Upland Ecosystems of Odisha**

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(June 2011 - May 2012)

2012 Targets and Revised Project Proposal

Submitted to: **The Director of Agriculture & Food Production,
Bhubaneswar, Odisha, (RKVY sub-scheme)**



Department of Agriculture and Food Production
Bhubaneswar, Odisha



**International Crops Research Institute
for the Semi-Arid Tropics**

Patancheru 502 324, Andhra Pradesh, India

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11 June 2012

Dr RS Gopalan

Director, Department of Agriculture and Food Production
Bhubaneswar, Odisha
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Subject: 2011-2012 Physical and Financial Accomplishment Report, 2012 Physical Targets, and Revised Project Proposal under the RKVY funded project 'Introduction and Expansion of Improved Pigeonpea (arhar) Production Technology in Rainfed Upland Ecosystems of Odisha'

Dear Dr Gopalan,

We are pleased to submit a three-section report covering the 2011-2012 Physical and Financial Accomplishment, 2012 Physical Targets, and the Revised Project Proposal under the RKVY funded project 'Introduction and Expansion of Improved Pigeonpea (Arhar) Production Technology in Rainfed Upland Ecosystems of Odisha'.

The 2011 cropping season was full of challenges. This was because of a tight schedule to meet the deadline for project implementation; need to identify farmer beneficiaries and corresponding areas of cultivation; and the hiring of NGOs without any background information on their ability to implement the project. Moreover, the project experienced prolonged drought and hailstorm that affected the growth and development of pigeonpea. However, under these very harsh environmental conditions, the newly introduced pigeonpea varieties have produced a much better yield in Nauparha (891 kg/ha) than the local cultivars (300 kg/ha). The promotion and cultivation of high yielding pigeonpea varieties in marginal soils was implemented across 3,000 hectares in 10 blocks of the three districts (Nauparha, Kalahandi and Rayagada) under the improved pigeonpea production technology (IPPT). Of this, 1,000 hectares were utilized for seed multiplication of varieties Asha and Maruti. Aside from providing the certified seeds, a total of 200 kg of Breeder seeds (100 kg Asha and 100 kg Maruti) were provided by ICRISAT for multiplication into Foundation seeds by the KVK - Umarkote. To realize the required cycle of the seeds system of the project, ICRISAT has produced a total of 3,905 kg of Nucleus/Breeder seeds of varieties (Asha, Maruti, ICP 7035 and ICPL 88039), and parental lines and hybrids (ICPH 2671 and 2740).

The conduct of the 2012 project orientation and planning workshop on 26 April at Bhawanipatna, Kalahandi was to plan out activities intended for IPPT, seed production of Foundation and Certified seeds, and the conduct of farmer participatory varietal trials (FPVTs). The main objective was to schedule activities such as delivery of seeds and fertilizers on time before cropping season starts on 15 June. The project has provided 48,000 kg seeds for the conduct of IPPT to cover 4,000 hectares in five districts (Rayagada, Kalahandi, Nauparha, Boudh and Bolinger). In addition, ICRISAT has purchased a total of 9,830 kg of Breeder, Foundation and Hybrid seeds to cover 1,226 hectares under the seed production component of the project. Aside from this, under the FPVT, a total of 42 hectares will be utilized to demonstrate high yielding varieties and hybrids in comparison with the existing local varieties.

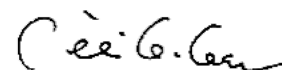
The revised project proposal depicts the adjustment of budget to accommodate the purchase of fertilizers to be used for the seed production program as agreed upon during the 19 April

meeting at the Directorate of Agriculture and Food Production, Bhubaneswar, Odisha. The revised total budget was estimated at Rs 1028.81 lakhs, an increase of Rs 3.54 lakhs from the original approved budget of Rs 1025.27 lakhs.

Against the funds received of Rs 20,058,000 for 2011-2012 cropping season, the expenditure incurred was Rs 23,122,698. We have already pre-financed and released Rs 3,064,698 to NGOs towards procurement of seeds for the 2012-2013 cropping season. ICRISAT has already booked and purchased the required seeds and in this regard, we would appreciate the immediate release of the budget for 2012-2013 cropping season, in the amount of Rs 24,417,950, to meet our commitments by paying and delivering on time the Breeder, Foundation, Certified and Hybrid seeds together with the purchase of fertilizers; and among others, the conduct of capacity building for farmers and technicians; and hiring of 15 Field Assistants.

Thank you and looking forward to your continued support to the project.

With warm regards,



William D Dar
Director General

Cc: **Saroj Das**, Director for Pulses, Odisha
CLL Gowda, Director for Grain legume;
KB Saxena, Project Coordinator;
Suresh Pande; MG Mula of ICRISAT

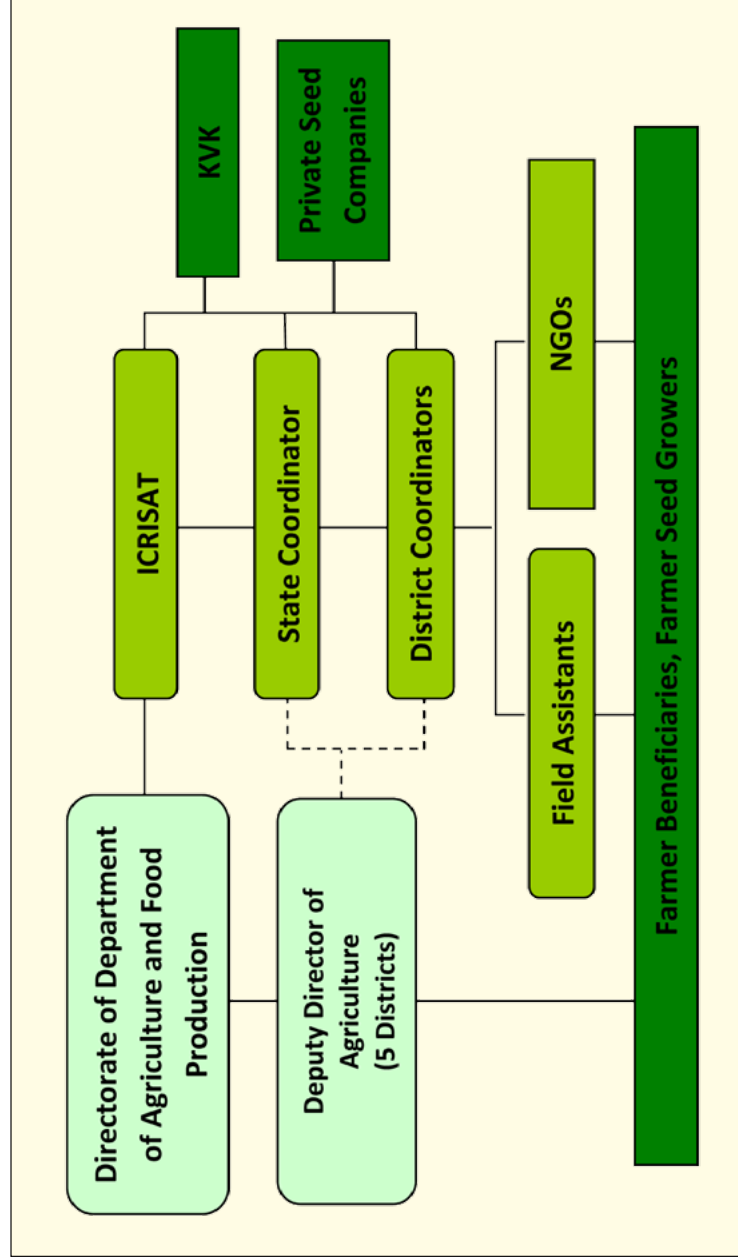
Section 1:

2011 Accomplishment and Financial Report

List of Partner Agencies and Staff

Agency	Name of Staff	Designation
Department of Agriculture and Food Production, Odisha	Dr RS Gopalan	Director
	Dr SK Das	Assistant Director (Pulses)
	Mr PK Patra	DDA – Nauparha
	Mr KC Ojha	DDA – Rayagada
	Mr A Mishra	DA – Kalahandi
ICRISAT	Dr WD Dar	Director General
	Dr CLL Gowda	Director – Grain Legumes
	Dr KB Saxena	Principal Scientist/Project Coor.
	Dr S Pande	Principal Scientist/Co-Proj. Coor.
	Dr MG Mula	Scientist/Project Leader
	Mr RV Kumar	Manager, Field Research Operations
	Mr S Tripathy	State Coordinator
	Mr B Sahoo	District Coordinator (Kalahandi)
	Mr Y Naik	District Coordinator (Nauparha)
Mr S Mohanty	District Coordinator (Rayagada)	
Sahabhazi Vikash Abhiyan (SVA) NGO	Mr J Pradhan	President Director Nauparha, Bhawanipatna and Narla, Kalahandi
LOKSEBAK NGO	Mr AP Mosanty	Secretary Kesinga, Kalahandi and Kaysinghpur, Rayagada
Juba Jyoti Jubak Sangha (JJJS) NGO	Mr CJ Singh	Secretary Kesinga, Kalahandi and Kaysinghpur, Rayagada
Juba Jyoti Jubak Sangha (JJJS) NGO	Mr CJ Singh	Secretary Lanjigarh, Kalahandi
Orissa Professional Development Service Consultants (OPDSC) NGO	Mr P Das	Secretary Rayagada and Kulnara, Rayagada
Krishi Vigyan Kendra	Dr SR Das	Programme Coordinator Nabarangpur

Project's Institutional Organizational Flow Chart



2011 Accomplishment Report

(June 2011 to May 2012)

Executive Summary

The project entitled '**Introduction and Expansion of Improved Pigeonpea (Arhar) Production Technology in Rainfed Upland Ecosystems of Odisha**' was funded by the Government of Odisha under the RKVY sub-scheme. This was approved on 23 May 2011 for a period of 4 years with a total budget of Rs 10.253 crores (US\$2.29 million). The project was officially launched on 9 August at ICRISAT Headquarters, Patancheru. Following its approval, a series of meetings-cum-workshops and trainings were conducted for the concerned staff of the Department of Agriculture (DoA), NGOs and for farmer beneficiaries. To fast track project implementation, ICRISAT purchased a total of 59.8 tons of Certified seeds of Asha and Maruti varieties from the Maharashtra State Seeds Corporation (MSSC), National Seed Corporation (NSC) and Aakruti Seed Company (ASC) for the conduct of improved pigeonpea production technology (IPPT) research cum demonstration.

The promotion and cultivation of high yielding pigeonpea varieties in marginal soils was implemented covering a total of 3,102 hectares (102 hectares more than the planned 3,000 hectares) in 10 blocks of the three districts (Nauparha, Kalahandi and Rayagada) under the IPPT. However, 1,000 hectares were utilized for seed production of Asha and Maruti. Around 260 kg of improved varieties and hybrids (3 varieties and 2 hybrids) were tested in 30 locations (12 hectares) at 1 acre/location under the Farmer Participatory Varietal Trials (FPVT) to evaluate and identify newly developed high yielding disease resistant varieties and hybrids of pigeonpea. Aside from providing the Certified seeds, a total of 200 kg of Breeder seeds (100 kg Asha and 100 kg Maruti) were provided by ICRISAT for multiplication into Foundation seeds by the KVK - Umakote. To realize the required cycle of the seeds system of the project, ICRISAT has produced a total of 3,905 kg of Nucleus/Breeder seeds of varieties (Asha, Maruti, ICP 7035 and ICPL 88039), and parent line and hybrid of ICPH 2671 and 2740.

The 2011-2012 cropping season was not as good as expected for pigeonpea in Odisha. The prolonged moisture stress (drought) affected the pod development of pigeonpea during the months of November and December due to very low rainfall received (550 mm) as against the normal annual rainfall of 1,451 mm. Furthermore, abrupt drop in temperature (8-10°C) in December adversely affected the fertilization of flowers and consequently flower drop was observed. A similar situation was witnessed in the local variety even when sown one and a half month earlier. Also, at Kalahandi district, a hailstorm during the month of December, affected the yield of pigeonpea affecting pod development. However, spite of this very harsh environmental conditions, the newly introduced pigeonpea varieties have yielded much better, with an average of 363 kg/ha, than the local cultivars (231 kg/ha). Nauparha district showed better productivity among the two districts with an average of 712 kg/ha as compared to the local variety (300 kg/ha), which surpasses the State and National productivity average of 412 kg/ha and 700 kg/ha, respectively.

To facilitate efficient seed production, the project has established linkages with the Odisha State Seed and Organic Product Certification Agency (OSSOPCA). With the total 1,000 hectares registered for seed certification, 350 hectares of Asha and Maruti passed the final inspection by the seed certification officers of OSSOPCA. The reason for rejecting other seed production areas was the non-compliance of the required isolation distance of 300 meters, aside from the constraints identified earlier.

A total of 1,883 participants (including 86 women) attended various capacity building sessions, including orientation meeting, seminar workshops and trainings. Twenty seven participants from NGOs, ICRISAT staff members, Agricultural Officers and technicians of the Department of Agriculture from the state government and three districts were provided with a highly scientific course on pigeonpea seed production and management. A total of 195 farmer seed growers (including 11 women) attended the specialized training on integrated disease management and integrated pest management. A farmers' field day was also organized with the participation of 1,248 farmers (including 56 women).

The cultural management practices of pigeonpea and the integrated disease and pest management booklets were published in Oriya and distributed to 3,700 farmers and extension officials during the farmers training and at the time of farmer field days. Electronic and print media were effectively utilized for dissemination of the two newly introduced pigeonpea varieties and crop management technologies.

In support of marketing and value addition of pigeonpea, the project supplied four dal mill machines (including polisher and generator), approved the construction of 3 godowns with storage capacity of 25 tons, and provided 6 spiral seed cleaners for ease in cleaning pigeonpea seeds by farmers.

1 Background Information

The state of Odisha has a total agricultural area of about 8.7 million hectares and 70% of it is rainfed. While 70% of the population lives in the rainfed upland ecosystem of Odisha, around 85% of the workforce depends on agriculture. Of the total agricultural area, production of pulses has been reduced to 56.4% in the last 10 years. Rayagada, Kalahandi and Nauparha districts were identified by the project because of their dry and rainfed ecology. The total tillable area of these three districts is 39,860 hectares, which is suitable to new high yielding pigeonpea cultivars.

Pigeonpea is mainly grown on rainfed upland areas and is one of the most important pulse crops of Odisha. It is an affordable source of protein (22-24%) and contains carbohydrates, minerals and vitamins. Pigeonpea, which is a good source of essential amino acids, carbohydrates and minerals, can be an excellent crop to promote food and nutritional security in Odisha. However, its productivity is at 415 kg/ha compared to the national average of 700 kg/ha and with very low seed replacement ratio of 2-3%. A large section of farmers in the rainfed upland ecosystems of Odisha have remained isolated from improved varieties and management practices of pigeonpea for various reasons. There is ample scope for the expansion of high yielding short and medium duration pigeonpea varieties in the rainfed areas for the development of sustainable livelihoods. Thus, this proposal was conceived. This proposal intends to introduce and expand the production of high yielding pigeonpea by the initiation, selection and promotion of pigeonpea through a farmer participatory mode. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), in partnership with Department of Agriculture, Odisha;

Odisha University of Agriculture and Technology, Bhubaneswar; farmers and self-help groups (FSHG) sought funding support from Department of Agriculture, Government of Odisha for the promotion of improved pigeonpea production technology (IPPT) in three districts of Odisha (Kalahandi, Rayagada, and Nauparha) from 2011 to 2015.

2 Project Approval

On 23 May 2011, the project was approved by the Government of Odisha under the RKVY sub-scheme 353 No. 15(03)/19/2011 for four years (2011-2015) with a total budget allocation of Rs 1025.27 lakh. For the first year of operation (2011-2012 cropping season), the budget allocated was Rs 210.36 lakh.

3 Project Implementation

3.1 Improved Pigeonpea Production Technology (IPPT)

Improved pigeonpea production technology (IPPT) intends to introduce and expand high yielding pigeonpea varieties that would benefit farmers in terms of productivity in comparison with their existing local varieties grown in upland rainfed areas of Odisha. Importantly, improved technology, for instance, line sowing in ridges, spacing, and other cultural management practices such as integrated disease and pest management are introduced to farmers.

The project through ICRIASAT procured 59.8 tons of Certified seeds (Asha and Maruti) from MSSC, NSC and ASC, which was delivered on 24 June 2011 at DDA Kalahandi. A total of 2,102 hectares for IPPT were sown benefitting around 5,718 farmers (Table 1).

In Rayagada, the very low productivity observed by farmers at an average of 78 kg/ha (Table 1) was due to the following circumstances: a) Late sowing of the crop (from 21 July to the first week of August) due to late implementation of the project; b) Abnormal distribution of rainfall, which caused the unexpected crop losses. Rainfall received was low (550 mm) as compared to the normal rainfall (1,451 mm) of the district; and c) Abrupt drop in temperature (8-10°C) during the month of December, which adversely affected the fertilization of the flowers and consequently flower drop was observed. The same situation was observed in their local variety, which was sown one and a half month earlier.

At Kalahandi, the average productivity obtained from Asha and Maruti was higher (300 kg/ha) than their local variety (275 kg/ha) (Table 1). In addition to drought, hailstorm affected the podding stage of pigeonpea during the month of December. However, this did not deter the performance of these new varieties as against the farmers' local variety.

In Nauparha, the performance of Asha and Maruti exceeded the local variety. As shown in Table 1, the average yield obtained from the two new varieties was 712 kg/ha (above the average state productivity of 412 kg/ha and the national productivity level of 700 kg/ha) as compared to the local variety at 300 kg/ha even at harsh environmental (drought) conditions. The other reason for a successful production was a slightly better distribution of rainfall and the cooperativeness of the beneficiaries in following the protocol of the IPPT and seed production guidelines.

Table 1. Status of improved pigeonpea production technology in three districts.

District	Block	Variety	Farmers (no.)	Area (ha)	Total Production (kg)	Ave. Yield (kg/ha)	Local Variety (kg/ha)
Rayagada	Rayagada	Maruti	642	354	28,320	80	100
	Kulnara	Asha	731	347	24,290	70	100
	Kalyansinghpur	Maruti	580	294	24,990	85	150
	Sub-total		1,953	995	77,600	78	117
Kalahandi	Bhawanipatna	Asha	943	333	166,500	500	200
	Lanjigarh	Maruti	662	200	20,000	100	350
	Kesinga	Maruti	129	188	75,200	400	200
	Narla	Maruti	586	123	24,600	200	350
	Sub-total		2,320	842	286,300	300	275
Nauparha	Komna	Asha	658	164	146,124	891	300
	Khariar	Maruti	407	89	53,934	606	250
	Sinapali	Maruti	380	12	7,668	639	350
	Sub-total		1,445	265	207,726	712	300
Total		5,718	2,102	571,626	363	231	

Most farmers practice saving their pigeonpea seeds for food and as seed source by allowing 50% for annual home consumption and a required 20 kg/acre as seeds for the next cropping season. The remaining 50% of the produce is sold to commercial traders at the rate of Rs 40-45 per kg.

In our interview with farmer seed growers in Nauparha and Kalahandi, the farmers are very satisfied with the outcome/performance of the new varieties introduced in their area. Aside from the yield difference that the new varieties have shown, the taste of the new varieties is better than their local varieties, and they have better milling quality.

3.2 Farmer Participatory Varietal Trial Selection (FPVTS)

To showcase the different high yielding cultivars using improved production practices, the project provided five high yielding cultivars (3 varieties and 2 hybrids) to compare this with the existing local varieties grown in the project sites. Per district, a total of 10 acres (1 acre/site) was established (Table 6). All-in-all, 12 hectares under FPVTS was planted. Aside from the seeds, fertilizer at the rate of 100 kg/ha of DAP and insecticide were supplied from the project. The straight line method of planting was observed for all the FPVTS. A total of 260 kg of Breeder seeds (ICP 7035, ICPL 87119 and ICP 8863) and hybrids (ICPH 2740 and ICPH 2671) were supplied by ICRISAT.

The overall performance of this component was not overwhelming due to severe moisture stress. Nevertheless, ICP 7035 (due to its bold seeds and less insect infestation) and ICPH 2671 and 2740 showed promising results and the farmers recommended a repeat of the trial.

3.3 Seed Systems

In Odisha, there is a need to strengthen the formal and informal seed sectors. The approach of 'one variety one village' concept should be popularized because the formal seed sector cannot lead in supplying a huge quantity of quality seeds. The seed village concept will solve the problem of the lack of quality seeds to sustain the requirements of the farmers. The benefit of partnering with the formal seed sector (OSSOPCA) has necessitated the strengthening and formalizing of the informal seed production system of the project. Seed production in Kalahandi, Nauparha and Rayagada districts was offered for certification by OSSOPCA, thereby, informal seed production was formalized.

a. Seed Certification. Seed certification was initiated by the DoA – Odisha. Specific project sites where the Certified pigeonpea seeds were grown were determined in order to sustain the quality of seeds purchased for the project. A total of 1,000 hectares planted with Certified pigeonpea seeds (Asha and Maruti) was evaluated and documented by the OSSOPCA for seed certification into C1 to C2. The breakdown of area by districts is as follows: Rayagada (600 ha); Kalahandi (180 ha) and Nauparha (120 ha). The project allotted a fee of Rs 250 per hectare to OSSOPCA for monitoring and certification. Aside from the Certified seeds, 200 kg Breeder seeds (Asha and Maruti) were given to KVK, Nawarangapur for multiplication into Foundation seeds, which is also included for certification by the OSSOPCA.

b. Seed Production of Certified Seeds. A total of 1,000 hectares benefitting 1,667 farmers were sown with Asha and Maruti for seed multiplication (Table 2). The fields were monitored and frequently inspected by the OSSOPCA. Due to prolonged moisture stress (drought), the average yield for the three districts was listed at 374 kg/ha. Seed grower farmers were satisfied with the outcome of their produce.

b.1 Rayagada. Seed production in the three blocks of Rayagada was too low (Table 2). The reasons behind this failure were late sowing and prolonged moisture stress (drought) during the months of November and December. Rainfall distribution was limited (550 mm) during the year as against the normal annual rainfall of 1,451 mm. Another limitation was the abrupt drop in temperature (8-10°C) in December, which adversely affected the fertilization of the flowers and consequently flower drop was observed. Most of the produce was not sold by the farmers; instead, they will use a part of this as seed for the next cropping season and a part for food.

b.2 Kalahandi. Farmers engaged in seed production in Kalahandi had mixed experiences. There was better yield in Bhawanipatna (500 kg/ha) than in the other blocks (Table 2). The reasons for low yield in Lanjigarh, Narla and Kesinga were the hailstorm during the month of December, abrupt drop in temperature (8-10 degrees Celsius) and continuous rainfall observed during the month of January. Most farmers in this district keep their produce as food (40-50%) and a portion (20 kg/acre) as seed for the next cropping season. The remaining are given either as gift or sold to commercial traders at the rate of Rs 40-45/kg.

b.3 Nauparha. Seed production in the three blocks of Nauparha was better than in the other two districts (Table 2). The average yield was figured at 745 kg/ha, higher than the state average of 415 kg/ha and also higher than the national average of 700 kg/ha. The reasons for the success were: following the protocol of seed production (line sowing, ridges) and providing inputs such as fertilizers and chemicals against pests and diseases.

Table 2. Status of seed production of Certified seeds by district.

District	Block	Variety	Farmers (no.)	Area (ha)	Ave. Yield (kg/ha)	Total Production (kg)
Rayagada	Rayagada	Maruti	306	146	79	11,534
	Kulnara	Asha	281	148	70	10,360
	Kalyansinghpur	Maruti	464	206	86	17,716
	Sub-total		1,051	500	78	39,610
Kalahandi	Bhawanipatna	Asha	240	67	500	33,500
	Lanjigarh	Maruti	50	50	100	5,000
	Kesinga	Maruti	275	121	400	48,400
	Narla	Maruti	11	27	200	5,400
	Sub-total		576	265	300	92,300
Nauparha	Komna	Asha	11	36	694	24,984
	Khariar	Maruti	7	61	672	40,992
	Sinapali	Maruti	22	138	870	120,060
	Sub-total		40	235	745	186,036
Total		1,667	1,000	374	317,946	

c. Foundation Seed Production. A total of 200 kg of Breeder seeds (100 kg – Asha and 100 kg – Maruti) were supplied by ICRISAT to the project for seed multiplication into Foundation seeds by KVK-Umarkote. About 10 hectares were sown for this purpose. Due to late sowing and prolonged moisture stress (drought) with no irrigation facility in the KVK station, yield of Maruti and Asha was too low at 70 kg/ha (Table 3) with a total production of 700 kg only.

Table 3. Foundation seed production at KVK-Umarkote.

Breeder Seeds	Area (ha)	Yield (kg/ha)	Foundation seed (kg)
Maruti	5	70	350
Asha	5	70	350
Total	10	70	700

d. Seed Production Model. The concept of ‘one village-one variety’ was initiated in the project (Figure 1). The project started by identifying villages and providing them with one variety suited to the type of soil. ICRISAT provided the Breeder seeds to ARS/KVK-Umarkote for the production of Foundation seeds. Upon certification by the certifying agency, the Foundation seeds will be distributed to farmer seed growers, through the NGOs, for the multiplication of Certified seeds. For seed multiplication of Certified seeds during the initial project implementation, the project provided Certified seeds (C1) procured from MSSC (Maharashtra), NSC and ASC (Andhra Pradesh). The seeds were distributed to selected

farmer seed growers to produce the Truthfully Labelled (TL) seeds (product of C1 seeds). An isolation distance of 300 m between varieties was initiated and followed by some farmer seed growers. This is the reason why the 1,000 hectares under the seed production program of Asha and Maruti was reduced to 350.4 hectare after the final inspection by the seed certification officers of OSSOPCA (Table 4). The reasons for rejecting other seed production areas are the following: a) did not follow the required isolation distance of 300 meters from other pigeonpea growing areas; and b) very poor growth due to severe moisture stress.

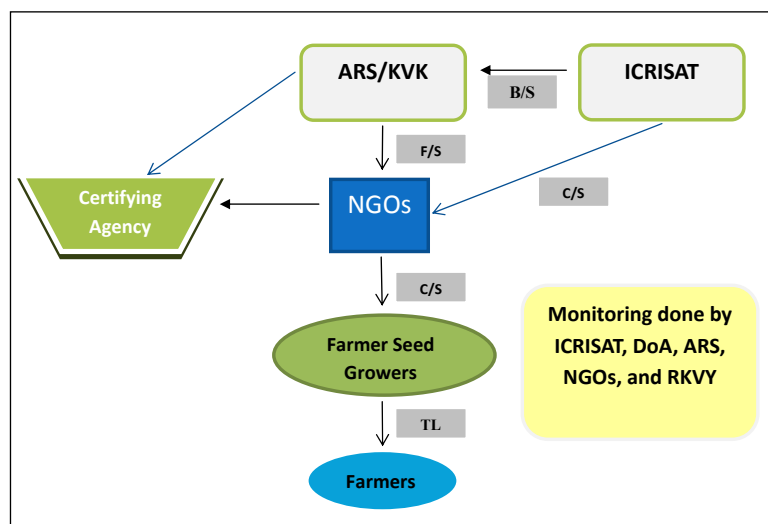


Figure 1. Formal and Informal Seed Production Model.

Table 4. Status of area allocated for seed production of Asha and Maruti in three districts.

District	Blocks (no.)	Registered Area (ha)	Rejected Area (ha)	Final Area (ha)
Nauparha	3	235	136	99
Kalahandi	4	265	92.6	172.4
Rayagada	3	500	421	79
Total	10	1000	649.6	350.4

To effectively sustain and maintain seed production of pure seeds (from Breeder to Foundation to Certified seeds), the project has proposed a seed system model that would start in 2012 cropping season as revealed in Figure 2. A continuous delivery of pure seeds to farmers will enhance seed production and quality of seeds. ICRIASAT will continuously supply Breeder seeds to KVKs, Progressive Farmer Seed Growers, and NGOs to multiply into Foundation seeds. The Foundation seeds will then be distributed to selected Farmer Seed Growers for seed multiplication of Certified seeds. All of the seed production process will be under the watchful eye of OSSOPCA for monitoring and certification.

e. Seed Procurement. Seed procurement started in February by identifying good quality seeds from farmer seed growers. A total of 55,567 kg of Certified seeds were procured by the project and the Odisha Seed Corporation (Table 5). A total of 348 farmer seed growers were benefitted by this program. Around 50,200 kg of TL seeds were procured from Nauparha and Kalahandi districts of which 48,000 kg will be utilized during the 2012-2013 cropping season

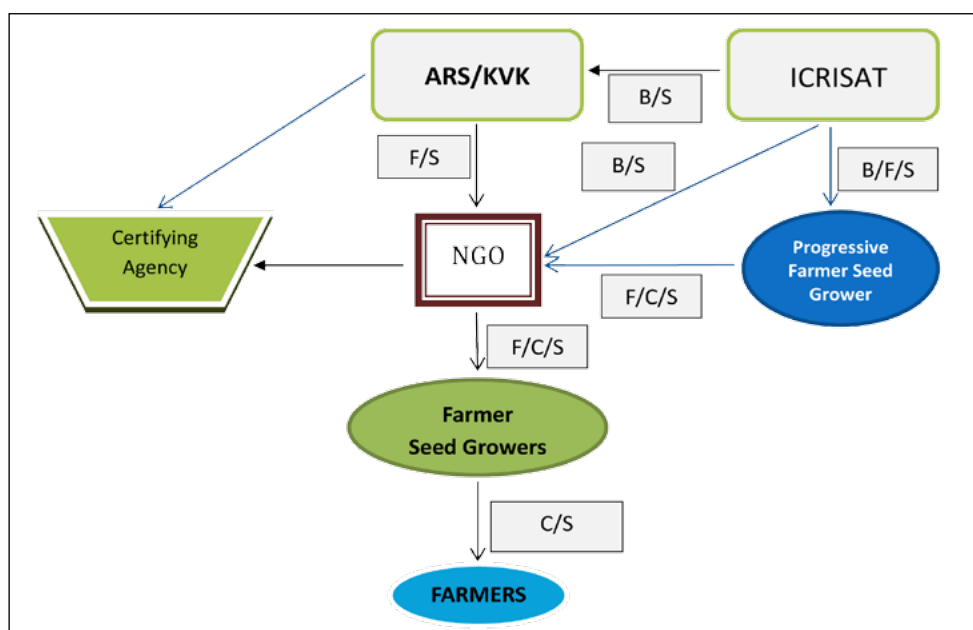


Figure 2. The Proposed Formal and Informal Seed System Model for 2012.

(under the IPPT program), while the remaining 2,200 kg will be procured by the Odisha Seed Corporation. In addition, for Rayagada district, seeds produced at more than 5,000 kg will likewise be procured by the said seed corporation.

Table 5. Seed procurement of Asha and Maruti in three districts.

District	Block	Variety	Farmers (no.)	Quantity (kg)	Remarks
Nauparha	Komna	Asha	11	3,500	Purchased by the Project
	Khariar	Maruti	7	5,500	
	Sinapali	Maruti	22	13,200	
Sub-total			40	22,200	
Kalahandi	Bhawanipatnam	Asha	105	12,500	Purchased by the Project
	Kesinga	Maruti	98	14,500	
	Narla	Maruti	4	1,000	
Sub-total			207	28,000	
Rayagada	Rayagada	Maruti	3	712	Purchased by Odisha Seed Corporation
	Kalyangsinghpur	Maruti	87	3,920	
	Kulnara	Asha	11	735	
Sub-total			101	5,367	
Total			348	55,567	

f. Variety and Hybrid Seed Production and Reconstitution. To maintain the purity of the improved new varieties and hybrids for the project, ICRISAT continuously conducted seed production and seed reconstitution of the Nucleus and Breeder seeds of Asha, Maruti, ICP 7035 and ICPL 88039 (Table 6). Likewise, seed production was also done for A-, B-line, and hybrid of ICPH 2671 and ICPH 2740. Also, seed reconstitution of farmer preferred varieties and screening of farmer preferred varieties and hybrids against pests and diseases are ongoing at ICRISAT.

Table 6. Summary of Breeder seed, Parent line and Hybrid seed production at ICRISAT.

Cultivars	Type of Seeds	Area (ha)	Quantity (kg)	Yield (kg/ha)
Asha	Breeder seeds	0.64	786	1,228
Maruti	Breeder seeds	0.55	603	1,096
ICP 7035	Breeder seeds	0.10	80	800
ICPL 88039	Breeder seeds	1.00	600	600
ICPA 2043	Parent line	0.89	430	483
ICPB 2043	Parent line	0.45	250	556
ICPA 2047	Parent line	0.33	190	576
ICPB 2047	Parent line	0.17	56	329
ICPH 2671	Hybrid	0.30	500	1,667
ICPH 2740	Hybrid	1.00	410	410
Total		5.43	3,905	

3.4 Capacity Building

Overall, 1,883 participants including 86 women (farmers, DA Officers and Technicians, NGOs, and ICRISAT staff members) attended the orientation meetings, seminars, trainings, and farmers' field days (Table 9). The breakdown of participants is as follows:

Table 7. Capacity building conducted and attended.

Particular	District (no.)	Participant (no.)	Women (no.)	Remarks
Project Meeting cum Workshop		25	-	OUAT, DoA, NGOs, ICRISAT staff
Project Presentation Meeting		60	5	DoA Officers and Technicians, ICRISAT staff
Project Orientation cum Training		50	3	NGOs, ICRISAT staff, and DA Officers and Technicians
Project Launching cum Training Workshop	3	16	1	NGOs, ICRISAT staff, and DA Officers and Technicians
Project Orientation Meeting Seminar	4	278	10	DA Officers and Technicians, NGOs, Farmers (Kalahandi, Rayagada and Nauparha)
First International training Course on Pigeonpea Seed Production and Management	3	11	-	ICRISAT staff, DA Officers and technicians
Farmers' training program	3	195	11	IPM and IDM
Farmers' Field Days	2	1,248	56	Farmers (Kalahandi and Nauparha)
Total		1,883	86	

- a. **Project Meeting cum Workshop.** On 30 May 2011, the first meeting with the DoA headed by Dr SK Das and scientists of the Odisha University of Agriculture and Technology (OUAT) was held at IMAGE, Bhubaneswar, Odisha to plan for the project activities for the 2011-2012 cropping season. It was at this juncture that the targeted 3,000 hectares for the project was allocated to three districts covering 10 blocks. Likewise, it was also during this meeting that the NGO partners for the project were identified.
- b. **Project Presentation Meeting.** On 5 June 2011, the results of the meeting held 30 May 2011 were presented in the 'Pre-seasonal Orientation Training for Extension Officers' at IMAGE, Bhubaneswar, Odisha. The workplan of the project was presented and acknowledged by Mr RL Jamuda, IAS (Principal Secretary of Agriculture) and Mr RS Gopalan, IAS (Director, Agriculture and Food Production).
- c. **Project Orientation cum Training.** On 30 June 2011, an Orientation cum Training of the project was conducted at DDA Kalahandi for 50 participants that included extension workers of the Department of Agriculture, NGOs, coordinators and farmer leaders. Alongside the orientation, there was also an inspection of the 59.8 tons of Certified seeds of Asha and Maruti delivered at the DoA, Kalahandi.

Table 8. Distribution of area by district and by blocks.

District	Block	NGO Partner	Target area (ha)	Variety Selected
Rayagada	Rayagada	Odisha Professional Development Service Consultants (OPDSC)	500	Maruti
	Kulnara	Odisha Professional Development Service Consultants (OPDSC)	500	Asha
	Kalyansinghpur	LOKSEBAK	500	Maruti
Kalahandi	Bhawanipatna	Sahabhagi Vikash Abhiyan (SVA)	400	Asha
	Langigarh	Juba Jyoti Jubak Sangha (JJJS)	250	Maruti
	Kesinga	LOKSEBAK	200	Maruti
	Narla	Sahabhagi Vikash Abhiyan (SVA)	150	Maruti
Nauparha	Komana	Sahabhagi Vikash Abhiyan (SVA)	200	Asha
	Khariar	Sahabhagi Vikash Abhiyan (SVA)	150	Maruti
	Sinapali	Sahabhagi Vikash Abhiyan (SVA)	150	Maruti
Total			3000	

- d. **Project Launching cum Training-Workshop.** The project was formally launched at ICRISAT on 9-10 August 2011. Dr William Dar (Director General, ICRISAT), Dr CLL Gowda (Director for Grain Legumes), Dr KB Saxena (Project Coordinator), Dr MG Mula (Project Leader), together with Dr SK Das (Director for Pulses, Odisha) and Mr K Sahu (Deputy Director for Pulses, Odisha) graced the occasion. Director General William Dar, in his

inaugural address, highlighted the importance of partnership in research-for-development. “Synergies and convergence of efforts and resources will have to happen to achieve greater heights”, he said. He also emphasized that apart from enhancing the food and nutritional security and income generation of underprivileged farmers in Odisha, the project would seek to mitigate the adverse effects of climate variability on production and livelihoods in the State through improved varieties and hybrids dovetailed with hands-on training in crop production and management. Mr Das appreciated ICRISAT’s initiative considering it was the first time Odisha was having a project of this nature. He reiterated the importance of strengthening local capacity including NGO participation, procurement of local seed from the ongoing project, and purchase of village-level dhal processing machines.

Present during the activity were local partners from the Office of the Deputy Director of Agriculture, namely, A Mishra (Kalahandi), SC Biswal (Naurparha) and KC Ojha (Rayagada); representatives from four NGOs (Sahabhagi Vikash Abhiyan, Odisha Professional Development Service Consultants, Loksebak and Juba Jyoti Jubak Sangha); and three District Coordinators and a State Coordinator.

This was followed by a training workshop to map out the specific activities for the entire 4-year project duration. Another highlight of the launching was a field exposure at ICRISAT showcasing the various aspects of pigeonpea seed production.

- e. **Project Orientation Meeting Seminar.** This activity was spearheaded by the three District Coordinators in their respective areas of assignment. A total of 278 farmer participants (including 10 women) attended the orientation meeting.
- f. **Specialized Training Course.** A total of 11 participants (Department of Agriculture - 7, District Coordinators - 3 and a State Coordinator) attended the 1st international training course on pigeonpea seed production and management on 7-12 November 2011 at ICRISAT, Hyderabad. The course was aimed at improving the production of pure seeds of pigeonpea varieties and hybrids, and management systems, with emphasis on effective practices such as proper collection and characterization of materials; suitable screening for pests, diseases, drought, waterlogging and salinity tolerance; cytoplasmic male sterility (CMS) breeding techniques; and improved agronomic and postharvest practices. The training program concluded with a field visit to pigeonpea growing areas in Medak district and a private seed company engaged in pigeonpea seed production.
- g. **Farmers’ Specialized Training Program.** Specialized training on Integrated Disease Management (IDM) and Integrated Pest Management (IPM) was conducted for farmer seed growers in the three districts. A total of 195 farmer participants (including 11 women) attended the training.
- h. **Farmers’ Field Day Demonstration.** During the month of December, 7 farmers’ field day demonstrations were conducted in two districts (Kalahandi and Nauparha). A total of 1,248 farmer beneficiaries (including 56 women) attended the one day event. Project staff involved in the program demonstrated ways to conduct roguing of off-type plants, maintenance of isolation distance, control measures of pests and diseases.

3.5 Farmer Awareness Activities through Print and Electronic Media

- a. **Cultural Management Practices of Pigeonpea booklet in vernacular form.** The project has prepared 2,000 copies of the booklet on Cultural Management Practices in Oriya. The said booklets were distributed to 1,400 farmers (including 100 women) during the farmers’ field days (Table 9).

- b. **Integrated Disease and Pest Management booklet in vernacular form.** During the specialized farmers training program and farmers' field days, 3,000 copies of the booklet on integrated disease and pest management in Oriya dialect were distributed to 2,300 farmers (including 85 women) as shown in Table 9.

Table 9. Farmer friendly literatures.

Particular	Topic	Copy (no.)	Farmers (no.)	Women (no.)
Booklet	Cultural Management Practices of Pigeonpea	2,000	1,400	100
Booklet	Integrated Pest and Disease Management	3,000	2,300	85

- c. **Local print and electronic media.** The training programs and farmers' field days were covered by local radio stations and two local TV stations for wider circulation of the project activities and gains among the farmers (Table 10). The local TV stations telecast information on the two newly introduced pigeonpea varieties and crop management technologies. In addition, the local newspaper (Grama Swaraj Abhiyan) in Nauparha published the importance of pigeonpea as a resilient crop in drought prone areas of the district.

Table 10. Enhancing local-level awareness through local print and electronic media.

Electronic Mode	Location	Date	Topic
Radio	Kalahandi	5 September 2011	Production Technology and benefits of HYV and Hybrids
TV	Kalahandi	27 October 2011	Commercial production of pigeonpea and its marketing aspects and benefits in Odisha
TV	Nauparha	14 December 2011	Farmers' Field day activity
Grama Swaraj Abhiyan (Local Newspaper)	Nauparha	December 2011	Drought prone - Change in cropping pattern for protection from drought
Grama Swaraj Abhiyan (Local Newspaper)	Nauparha	February 2012	Golden Crop - Golden crop for highlands

3.6 Post Harvest Facility

In support of value addition and an inclusive market oriented development for farmer beneficiaries, the project provided 3 godown seed storages with a capacity of 25 t (Table 11). These godowns will also house the 3 dal mills, which farmers can utilize to process their pigeonpea into dal. In addition, 6 spiral seed cleaners were purchased to be used by farmers for ease of cleaning the pigeonpea seeds.

The cost and estimates of the godowns have already been approved by both parties (ICRISAT and DoA) and the funding has already been forwarded to the concerned agency of the Department of Agriculture in Odisha, who has been tasked with constructing the said godowns.

Table 11. Postharvest facility and equipment.

Particulars	Unit (No.)	Remarks
Dal Mill	4	Mini dal mill (including polisher and generator)
Godown	3	25 t capacity
Spiral seed cleaner	6	2 each per district

3.7 Appointment of Coordinators and NGOs

To facilitate the smooth implementation of the project, ICRISAT hired three District Coordinators, one State Coordinator and also engaged the services of four local NGOs (Table 12).

The engagement of NGOs was to serve as a backstop in project implementation and provide assistance to the District Coordinators in the conduct of farmer meetings and trainings. However, most of the NGOs hired were not capable enough to do the intended job. Hence, the management decided to replace non-performing NGOs with other capable NGOs who specialize in agriculture and who have a good rapport with the farmers.

Table 12. Names of coordinators and NGOs engaged by the project.

Name	Designation	Date engaged	Area of coverage
Basudev Sahoo	District Coordinator	1 July 2011	Kalahandi
Sourav Ranjan Nayak	District Coordinator	1 July 2011 to 12 February 2012	Rayagada
Santosh Mohanty	District Coordinator	20 February 2012	Rayagada
Gyandip Pandia	District Coordinator	15 July to 31 December 2011	Nauparha
Yashobanta Naik	District Coordinator	10 December 2011	Nauparha
Sarat Kumar Tripathy	State Coordinator	10 August 2011	3 Districts
LOKSEBAK c/o Ajit Prasad Mosanty	Secretary	1 July 2011	Kesinga, Kalahandi & Kalyansingapuram, Rayagada
Juba Jyoti Jubak Sangha (JJJS) c/o C Jaya Singh	President	1 July 2011	Langigarh, Kalahandi
Sahabhazi Vikash Abhiyan (SVA) c/o Jagadish Pradhan	President	1 July 2011	Naurparha; Bhawanipatna & Narla, Kalahandi
Odisha Professional Development Service Consultants (OPDSC) c/o Pramod Das	Secretary	1 July 2011	Rayagada & Kulnara, Rayagada

4.0 Constraints and Limitations in Project Implementation

The 2011 cropping season was a year of adversities and challenges. Adversities because of factors affecting project implementation and the environmental constraints that affected the growth and development of pigeonpea. Challenges because of a tight schedule to meet the deadline of project implementation vis-a-vis the sowing of pigeonpea; identifying farmer beneficiaries and their corresponding areas of cultivation; the hiring of NGOs without any background information on their ability to implement the project; and fast turnover of ICRISAT staff members.

Table 13 presents the constraints and possible solutions to improve project implementation. With our humble mitigating measures towards the identified constraints, the year 2 of the project will have a smooth ground operation. Specifically, to avoid moisture stress during flower initiation and pod development of pigeonpea, the project intends to distribute the seeds on time (during the month of May 2012) for immediate sowing on mid-June. This will enable the crop to flower in the month of October, thus avoiding the months of November and December where less rainfall was observed. For areas where late sowing will be observed, the early duration variety (ICPL 88039) will be introduced. In addition, in areas where the rice-fallow cropping system is observed, the project will demonstrate to farmers a technology using an early pigeonpea variety (ICPL 88039) that would be sown during the fallow period immediately after the harvest of rice in zero tillage.

Table 13. Constraints in project implementation.

Constraints	Solution
Prolonged moisture stress (drought) affected pod development during the months of November and December due to low rainfall received (550 mm) as against the usual annual rainfall forecast of 1,451 mm.	Sowing must start during the onset of rainy season (15 June). Introduction of early duration variety (ICPL 88039) during late sowing and in areas where rice-fallow cropping system is observed.
Abrupt drop of temperature (8-10°C) in December adversely affected the fertilization of pigeonpea flower and consequently flower drop was observed.	To avoid the drop in temperature, introduction of early duration variety (ICPL 88039) will allow farmers to harvest during the month of December.
Unusual hailstorm (December) affected the yield of pigeonpea in Kalahandi.	Introduction of early duration variety (ICPL 88039).
Non-commitment and lack of knowledge of some NGOs in agriculture.	NGO must be replaced with committed and agriculture-based NGOs.
Poor monitoring of activities	The need to hire Field Assistants to improve monitoring and provide backstopping activities.
Non-compliance of technology by other farmers.	Farmer selection must be given strict importance.
Seed production certification of Certified seeds from C1 to TL is not recommended.	Adopt a seed system concept by institutionalizing the continuous production of Breeder, Foundation and Certified seeds in the project area. The 'one village, one variety' model must be put in place to improve/maintain purity of seeds to enhance productivity of farmer beneficiaries.

5.0 Project Organizational Flow Chart

Figure 1 shows the organizational setup of the projects' relationships and procedures in such a way that partners can obtain the best results from their efforts. The chart illustrates the structure of the project in terms of relationships among personnel or departments as well as distinctively showing the lines of authority and responsibility within the project.

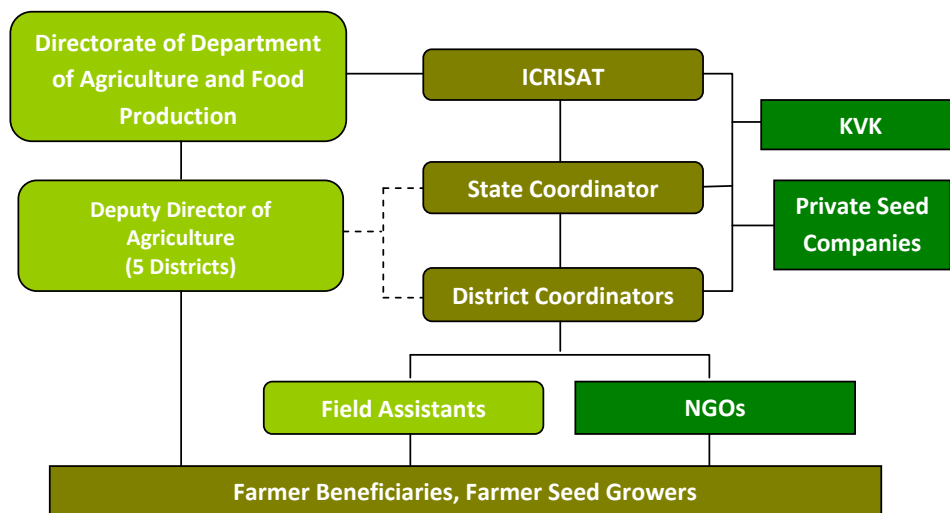


Figure 1. Projects' Institutional Organizational Flow Chart.

Financial Report ***2011-2012***

Mr R S Gopalan
Director of Agriculture and Food Production
Government of Orissa
Bhubaneswar – 751 001

20 March 2012

Dear Mr Gopalan,

**Sub: Introduction and Expansion of Improved Pigeonpea (Arhar)
Production Technology (IPPT) in Rainfed Upland Ecosystems
of Orissa.**

Please find attached the Utilisation Certificate (OGFR-19) for 1 May 2011 to 19 March 2012 for the above project.

Against the funds received of Rs. 2,00,58,000/- for 2011-12, the expenditure incurred is Rs. 2,31,22,698 and the receivable amount is Rs. 30,64,698 as at 19 March 2012. We have already pre-financed and released Rs. 30,64,698 to NGOs towards procurement of seed for 2012-13.

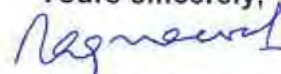
In view of the above, kindly arrange to remit the second year funds for 2012-2013 of Rs.2,40,64,000 immediately as per the bank details below.

Name of the Account : ICRISAT
Account Number : 908102000000037
Type of Account : Current
Name of the Bank : IDBI Bank, ICRISAT, Patancheru
Hyderabad 502 324, A.P.
IFSC Code : IBKL0000908
Branch Code : 908
MICR Code : 500259006

With regards,

Encl: a.a.

Yours sincerely,



Rajesh Agrawal
Director, Finance

Copy: Drs K B Saxena / Peter Ninnas (ICRISAT)

Headquarters: Patancheru 502 324, Andhra Pradesh, India

Tel +91 40 30713071 Fax +91 40 30713074 +91 40 30713075 Email icrisat@cgiar.org

Liaison Office: CG Centers Block, NASC Complex, Dev Prakash Shastri Marg, New Delhi 110 012, India

Tel +91 11 32472306 to 08 Fax +91 11 25841294

ICRISAT-Nairobi
(Regional hub ESA)
P.O. Box 30653, Nairobi
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Tel +254 20 7224551
Fax +254 20 7224001
Email icrisat-nairobi@cgiar.org

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(Regional hub WCA)
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Causa Postal 1906
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Fax +258 21 481581
Email icrisatmoz@cgiar.org

UTILISATION CERTIFICATE

(OGFR-19)

RASTRIYA KRUSHI VIKASH YOJANA (RKVY)

Sl.No.	Letter No. And Date	Amount Sanctioned
1	498 dated 17 June 2011	1,00,00,000
2	2M (03) /24/2011	1,00,58,000
	Total	2,00,58,000

1. Certified that out of Rs. 2,00,58,000 (Rupees Two Crores and Fifty Eight Thousand only) of grant in aid sanctioned during the year 2011-12 in favour of Director General, ICRISAT, Patancheru, AP by the Director of Agriculture & Food Production, Government of Orissa, Bhubaneswar under RKVY vide letter No. in the margin, a sum of Rs. 2,31,22,698 (Rupees Two Crores Thirty One Lakhs Twenty Two Thousand Six Hundred Ninety Eight only) has been utilised and the receivable is Rs. 30,64,698 as of 19 March 2012.

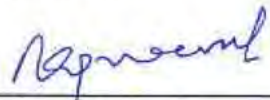
2. We have met the project targets on time.

3. Certified that I have satisfied that the condition on which the grant in aid was sanctioned have been duly fulfilled and that I have exercised the following checks to see that the money was actually spent for the purpose for which it was sanctioned.

Kinds of checks exercised:

1. The Financial management of the project has been done thru Financial Services, ICRISAT.
2. Procurements have been made thru centralized Purchase and Supplies Division, ICRISAT.
3. Expenditures have been verified and approved by the Project Manager.
4. ICRISAT maintains its accounting records as per CGIAR-Guidelines.

Signature-


Rajesh Agrawal

Designation: Director, Finance

Date: 19 March 2012

(Seal)

Rajesh Agrawal
Director, Finance
I C R I S A T
Patancheru 502 324
Andhra Pradesh, India

ICRISAT
Statement of Account
For the period May 1, 2011 to March 19, 2012 and cumulative to March 19, 2012

- Project Title : Introduction and Expansion of Improved Pigeonpea (Arhar) Production Technology (IPPT) in Rainfed Upland Ecosystems of Orissa
Donor : Agriculture Department, Government of Orissa
Classification : Temporarily Restricted
Currency : USD
Duration : May 1, 2011 to April 30, 2015

Item	Budget (Year 1) (May 1, 2011 to March 31, 2012)		Expenditure May 1, 2011 to March 19, 2012		Balance as at March 19, 2012	
	INR	US\$	INR	US\$	INR	US\$
A. Recurring						
1. Personnel	5,061,000	108,204	4,744,601	102,263	316,399	5,941
2. Production Program	5,000,000	114,351	7,598,959	163,149	(2,598,959)	(48,798)
a. Seed Cost (IPPT)	760,000	16,642	756,792	16,582	3,208	60
b. FPVT operations	990,000	20,584	753,250	16,139	236,750	4,445
c. NGO support	800,000	25,504	400,000	17,994	400,000	7,510
d. @ KVK (seed production)	930,000	26,076	1,752,605	41,521	(822,605)	(15,445)
e. @ ICRISAT (seed production)	870,000	19,732	870,000	19,732	-	-
3. Capacity Building (Trainings, Seminars, Workshops) and Publications	881,000	19,064	848,691	18,457	32,309	607
4. Travel	200,000	4,388	170,288	3,830	29,712	558
5. Contingencies	15,492,000	354,545	17,895,186	399,667	(2,403,186)	(45,122)
Sub-Total						
B. Non-recurring						
1. Equipment & accessories	2,800,000	56,238	2,211,508	45,189	588,492	11,049
Sub-Total						
					588,492	11,049
C. Institutional Overheads						
	2,744,000	61,621	3,016,004	66,728	(272,004)	(5,107)
Grand Total	21,036,000	472,404	23,122,698	511,584	(2,086,698)	(39,180)

Funds Status:

Balance available as at May 1, 2011

Add: Amount received during the period

Total funds available

Less: Expenditure during the period

Balance receivable as at March 19, 2012

-

20,058,000

-

20,058,000

23,122,698

-

3,064,698

-

449,440

449,440

511,584

-

62,144

Notes:

- Total budget and line item classifications are as specified by the donor at project inception.
- Currency conversions (INR/US\$) are at average exchange rates as applicable.

Rajesh Agrawal
Director, Finance

Photo Documentation

Improved Pigeonpea Production Technology (IPPT)



a. Seed distribution at districts Rayagada, Nauparha and Kalahandi.



b. Seed sowing started on 21 July 2011.



c. Cotton intercrop with pigeonpea at Nauparha.



d. IPPT in Kalahandi.



e. IPPT in Rayagada.

Farmer Participatory Varietal Trial Selection (FPVTS)



ICP 7035.

Seed System

a. Seed certification



Inspection of seed production plots at Nauparha by the Seed Certifying Officers.

b. Seed Production of Certified seeds of Asha and Maruti



Seed Production plot at Nauparha.



Seed Production plot at Kalahandi.



Seed Production plot at Rayagada.

c. Foundation seed production of Asha and Maruti at KVK - Umarkote



d. Seed procurement Asha and Maruti (March 2012)



Seeds procured from farmers at Nauparha.

Procured seeds are cleaned through the spiral seed cleaner.



Procured seeds are processed for cleaning, grading and certification at Nauparha plant.



Seeds procured from farmer seed growers at Kalahandi.



Seeds are delivered for cleaning, grading and certification at Bhawanipatna plant.

e. Breeder and Foundation seeds procured for 2012 cropping season (April 2012)



Breeder and Foundation seeds packed in a 4 kg bag at ICRISAT.

f. Variety and hybrid seed production and reconstitution at ICRISAT



Asha.



ICP 7035.



Maruti.



ICPL 88039.



ICPA 2043.



ICPA 2047.



ICPH 2740.



ICPH 2671.

Capacity Building

1. Project Meeting cum Workshop



ICRISAT scientist Dr KB Saxena (Principal Investigator) spearheaded the meeting on 30 May 2011 at IMAGE, Bhubaneswar, Odisha. With him are Drs S Pande and MG Mula.

2. Project Presentation Meeting



Presentation of the Pigeonpea Odisha Project by ICRISAT team (MG Mula and S Pande) to the Principal Secretary of Agriculture, Mr RL Jamuda and to Director of Agriculture and Food Production, Mr RS Gopalan on 5 June 2011 at IMAGE, Bhubaneswar, Odisha.

3. Project Orientation cum Training



Deputy Director Mr S Das together with ICRISAT staff members (RV Kumar, S Pande, MG Mula) and host Mr KC Behra of DDA Kalahandi lead the project orientation cum training on 30 June 2011.

4. Project Launching cum Training Workshop



(From left) K Sahu, W Dar, CLL Gowda, S Das and KB Saxena during the launching of the project on 9 August 2011.



Participants visit the pigeonpea demonstration site.

5. Project Orientation Meeting for IPPT beneficiaries



One of the farmers' orientation meetings conducted at Nauparha.

6. Attendance at Specialized Training Courses



7. Farmers' Specialized Training Program



Farmers' training on IPM and IDM at SVA, Nauparha.



Farmers' training on IDM and IPM at DoA office, Kalahandi.



Farmers' training on IDM and IPM at DoA office, Rayagada.

8. Farmers' Specialized Training Program



Dr KB Saxena with other officials during the Farmers' Field Day at Sinapali, Nauparha.



Farmers' Field Day at Kesinga, Kalahandi.

Farmer Awareness through print and electronic media

ICRISAT
Science with a human face

ବିକାଶ ଉପଯୋଗୀ ବିକାଶ ଅନୁଗତ
Inclusive Market Oriented Development (IMOD)
ନୂଆ ବିଚ୍ଛିନ୍ନ, ବଢ଼ ଓ ସମୃଦ୍ଧ ହୁଅ
(Innovate, Grow & Prosper)

“ଉତ୍କଳରେ ବର୍ଷା ଆଧାରତ ଉଚ୍ଚ ଜମିରେ ଉନ୍ନତ ସରଳ ଉତ୍ପାଦନ କୌଶଳର ପ୍ରଚାରଣ ଓ ପ୍ରସାରଣ”
(Introduction & Expansion of improved pigeon pea production technology in rainfed up land eco system of Odisha)

ହରଡ଼ ଚାଷର ପରିଚାଳନା ପଦ୍ଧତି
(CULTURAL MANAGEMENT PRACTICES OF PIGEON PEA)

ଆର୍ଥିକ ସହାୟତା :
ରାଷ୍ଟ୍ରୀୟ କୃଷି ବିକାଶ ଯୋଜନା, ଓଡ଼ିଶା ସରକାର
(Support: RKVY, Govt. of Odisha)

ହରଡ଼ ଫସଲର ସମନ୍ୱିତ ରୋଗ ପୋକ ପରିଚାଳନା
(IPM / IDM in Pigeon Pea)

ବିଶ୍ୱ ମହତୀୟ ଚର୍ଚ୍ଚା ଆଣିବ ଶୁଭାଞ୍ଚନ **ICRISAT**
ପାଇଁ ଆଗାଧିକାରୀ ଫସଲ ଉଦ୍ଦେଶ୍ୟ ଆନୁଷ୍ଠାନ
ପାଟାଲଚେରୁ, ଆନ୍ଧ୍ରପ୍ରଦେଶ-୫୦୨ ୩୨୪

Financial Support: RKVY, Govt. Of Odisha
for the Project
“Introduction & Expansion of Improved Pigeonpea
Production Technology in Rainfed Ecosystem of Odisha”

ଦିପ ଜମିରେ ସୁନାର ଫସଲ

ଦିପ ଜମିରେ ହରଡ଼ ଉଷ୍ଣ କରି ମରୁଡ଼ି ସବୁ ଖଜର ପ୍ରତି ୮ କିଣ୍ଡାଲ ପର୍ଯ୍ୟନ୍ତ ଥିବା କରାଯାଇପାରିବି । ଧାନ ଉଷ୍ଣ କରି ଖଜରକୁ ଲାଭ ୨୦୦୦ଟଙ୍କା ହିଁ ହେଉନାହିଁ କିନ୍ତୁ ହରଡ଼ ଉଷ୍ଣରେ ଲାଭ ୨୦ରୁ ୨୫ ହଜାର ଟଙ୍କା । ଉନ୍ନତ ପ୍ରଣାଳୀରେ ଉଷ୍ଣ କଲେ ଗରିବ ଗଢ଼ିବା କାହିଁକି ? (ଚିତ୍ରରେ ସୁଶେନ ପଦର କିନ୍ତୁ ନୂଆପଡ଼ାର ସଫଳ ଉଷ୍ଣ ଶ୍ରୀମତୀ ଦେବମତୀ ମାଝା । ଚିତ୍ର : ବିଜେଡ଼ କୁମାର ଧରୁଆ)

Grama Swaraj Abhiyan - Feb. 2012.

ମରୁଡ଼ିରୁ ଋଷା ପାଇଁ ଫସଲ ପ୍ରଣାଳୀରେ ପରିବର୍ତ୍ତନ

ଅଶକଳସେବିତ ଦିପ ଓ ମଝିଆଳି ଜମିମାନଙ୍କରେ ଧାନ ଉଷ୍ଣ ହାଡ଼ିବାକୁ ହେବ । ଏପରି ଜମିରେ ଅଧିକ ଅମନଜମ ହରଡ଼, ମକା, ବପା ଇତ୍ୟାଦି ଫସଲ ଉଷ୍ଣ କଲେ ମରୁଡ଼ିରୁ ଆଉ ଭୟ ରହିବ ନାହିଁ । ପୁଣି ଧାନଋଷ ଅପେକ୍ଷା ଭାବ ଅନେକ ଅଧିକ । (ଚିତ୍ରରେ ନୂଆପଡ଼ା କିନ୍ତୁ ହରଡ଼ର ଶାଁର ଶ୍ରୀ ବଳା ସାହୁଙ୍କ କପା ଓ ହରଡ଼ ଉଷ୍ଣ କରିବେ ଚା. ୧୫, ୧୦, ୨୦ ୧୧ ଦିନ ଉଷ୍ଣିତର, ହରଡ଼ବାଦର ବୈଜ୍ଞାନିକ ଆର. ବିକାଶକୁମାର, ରାମେଶ୍ୱର ରାଓ, ଓଡ଼ିଶା ରାଜ୍ୟ ସଂଯୋଜକ (ଗାଣି ଉତ୍ପାଦ ଫସଲ) ଶରତକୁମାର ତ୍ରିପାଠୀ ଏବଂ ଅନ୍ୟ ସହଯୋଗ । (ଚିତ୍ର: ପରମାନନ୍ଦ ପ୍ରଧାନ)

Grama Swaraj Abhiyan, Dec - 2011

Grama Swaraj Abhiyan (Local Newspaper).



Dal mill machine, polisher and generator.



Spiral Seed Cleaner.

Project Monitoring



Seed inspection of 59.8 tons pigeonpea Certified seeds by ICRISAT staff members S Pande, RV Kumar and MG Mula at DoA Kalahandi storage on 30 June 2011.



Field monitoring by ICRISAT and NGO staff members at Nauparha.





Field monitoring by ICRISAT staff members and DDA Mishra at Kalahandi.



Field monitoring by ICRISAT staff members at Rayagada.



Field monitoring by NGO (LOKSEBAK) and ICRISAT staff members at Rayagada.



Field monitoring by RKVY staff members at Nauparha.



Seed inspection of procured seeds by NGO (LOKSEBAK) staff members at Bhawanipatna Seed Processing Plant.



Seed inspection of procured seeds by NGO (SVA) staff members at Nauparha Seed Processing Plant.



Seed inspection of procured seeds by NGO (SVA) staff members at Nauparha Seed Processing Plant.



65 project implementers including four DDAs of Kalahandi, Nauparha, Rayagada and Bolinger with their Agricultural Officers, KVK Nauparha, NGOs (LOKSEBAK and SVA), OSSOPCA (Central Seed Certification Officer and staff members), 15 newly hired Field Assistants, District Coordinators, State Coordinator, and ICRISAT Scientists at the Orientation training cum workshop.

Section 2: *2012 Physical Targets*

2012 Physical Targets

Introduction

The highlights of year 2012 are the purchase of TL seeds and other types of seeds (Breeder, Foundation and Hybrid) for the conduct of IPPT and the establishment of a workable and sustainable seed system of the project. An 'Orientation and Planning Workshop' was conducted on 26 April 2012 at Bhawanipatna, Odisha participated in by 65 project implementers and involving four DDAs of Kalahandi, Nauparha, Rayagada and Bolinger with their Agricultural Officers, KVK Nauparha, NGOs (LOKSEBAK and SVA), OSSOPCA (Central Seed Certification Officer and staff members), newly hired 15 Field Assistants, District Coordinators, State Coordinator and ICRISAT scientists. The main output of the workshop was to schedule the delivery of the seeds to the project sites covering 15 blocks in five districts (Nauparha, Kalahandi, Rayagada, Bolinger and Boudh) for the sowing of 4,000 hectares as part of the improved pigeonpea production technology (IPPT) project; 1,000 hectares for Certified seed production; 186 hectares for Foundation seed production; 40 hectares for Hybrid seed production; and 42 hectares for farmer participatory varietal trials (FPVT). The workshop also came up with specific schedules for the purchase and delivery of seeds and fertilizers in order to meet the scheduled sowing before 15 June. Fertilizers will be subsidized by the project only under the seed production and FPVT component of the project.

- a. **Improved Pigeonpea Production Technology (IPPT).** The original target based on the approved project document was to cover at least 6,000 hectares under this component. However, during the meeting on 19 April at the Office of Director RS Gopalan and Deputy Director SK Das of the Directorate of Agriculture and Food Production at Bhubaneswar, Odisha, it was strongly suggested by the Director to streamline the IPPT area from 6,000 hectares to 4,000 hectares. The reason for the reduction was to utilize the budget for the purchase of fertilizers under the seed production program. Therefore, it was also recommended that the 1,500 hectares intended for Rayagada will be reduced to 500 hectares and the remaining area will be distributed to the new districts of Boudh and Bolinger at 500 hectares each. A total of 48,000 kg of seeds will be required, which will be sown in 5 districts covering 15 blocks. The planning workshop has finalized the specific targets for the distribution of seeds as shown in Table 1.
- b. **Seed Production.** The project has considered sustaining the supply of pure quality seeds to farmers in Odisha by setting up and/or strengthening the seed delivery system of pigeonpea. Time and again, it has always been a practice by this state to procure seeds from neighboring states like Andhra Pradesh and Maharashtra. Nucleus/Breeder, Foundation and Certified seeds, including Hybrid seeds will be procured and will be instituted by partner research institutions, progressive farmer seed growers, private seed company, and NGOs who have the capability of engaging in this business. All-in-all, there will be a total of 1,226 hectares and an estimated required seed of 9,830 kg. The proposed seed delivery system model has been discussed in the accomplishment report.

b.1 Nucleus/Breeder seeds. For Nucleus and Breeder seed production of farmer preferred varieties (Maruti, Asha, ICPL 88039 and ICP 7035), it will always be the mandate of ICRISAT to supply the seeds.

b.2 Foundation seeds. The multiplication of Foundation seeds of farmer preferred varieties will be designated to KVK-Umarkote, progressive farmer seed growers, designated private seed company and NGOs. A total of 186 hectares will be sown with

Table 1. Seed distribution for IPPT by district and by block.

District	Block	Variety	Farmers (no.)	Area (ha)	Quantity
Rayagada	Rayagada	Maruti	300	150	1,800
	Kulnara	Asha	450	200	2,400
	Kalyansinghpur	Maruti	300	150	1,800
	Sub-Total		1,050	500	6,000
Kalahandi	Bhawanipatna	Asha/Maruti	500	300/200	6,000
	Kesinga	Maruti	400	400	4,800
	Narla	Asha	100	100	1,200
	Lanjigarh	Maruti	100	100	1,200
	Dharmagarh	Maruti	100	100	1,200
	Golamunda	Maruti	300	300	1,800
	Sub-Total		1,500	1,500	18,000
Nauparha	Komna	Asha/Maruti	350/350	150/150	3,600
	Khariar	Maruti	300	150	1,800
	Sinapali	Asha/Maruti	350/400	200/200	4,800
	Boden	Asha/Maruti	130/170	67/83	1,800
	Sub-Total		2,050	1,000	12,000
Boudh	Kantamal	Asha/Maruti	250/350	125/375	6,000
	Sub-Total		600	500	6,000
Bolinger	Bangomunda	Asha/Maruti	450/750	125/375	6,000
	Sub-Total		1,200	500	6,000
	Total		6,400	4,000	48,000

an estimated supply of 1,590 kg Breeder seeds of four high yielding varieties (Table 2). In Nauparha district, a total 780 kg of Breeder seeds will be multiplied into Foundation seeds covering 91 hectares. In Kalahandi, 80 hectares will be sown with a total of 770 kg of Breeder seeds while KVK-Umarkote will only cultivate a total of 5 hectares with Asha and Maruti variety.

Table 2. Seed production of Foundation seeds.

District	Block	Variety	Seed Grower	Area (ha)	Quantity (kg)
Nauparha	Khariar	Asha	NGO SVA	12.5	100
		Maruti	4 Progressive Farmers	20	160
	Komna	Asha	4 Progressive Farmers	20	160
	Sinapali	Maruti	4 Progressive Farmers	20	160
		ICPL 88039	1 Progressive Farmer	2.5	50
	Boden	Asha	2 Progressive Farmers	10	80
		ICP 7035	2 Progressive Farmers	6	70
	Sub-Total				91
Kalahandi	Narla	Asha	Progressive Farmers	10	80
	Kesinga	Maruti	Progressive Farmers	30	240
	Lanjigarh	Asha	Progressive Farmers	5	40
		Maruti	Progressive Farmers	5	40
	Bhawanipatna	Asha	Progressive Farmers	10	80
		ICP 7035	LOKSEBAK NGO	5	60
		ICPL 88039	LOKSEBAK NGO	2.5	50
	Golamunda	Asha	Progressive Farmers	15	120
		Maruti	Progressive Farmers	5	40
	Charbanal	Asha	Amulya Seeds (P) Ltd	2.5	20
Sub-Total	90	770			
Nawarangpur	Umarkote	Asha	KVK	2.5	20
		Maruti	KVK	2.5	20
	Sub-Total				5
Total				186	1,590

b.3 **Certified seeds.** The multiplication of Certified seed will be established in 1,000 hectares of the three districts (Nauparha, Kalahandi and Rayagada) with a total requirement of 8,000 kg Foundation seeds (Table 3).

Table 3. Certified seed production.

District	Block	Variety	Seed Grower	Area (ha)	Quantity (8kg/ha)
Nauparha	Komna	Asha/Maruti	40 Progressive Farmers	75/75	1,200
	Khariar	Asha/Maruti	10 Progressive Farmers	25/25	400
	Sinapali	Asha/Maruti	40 Progressive Farmers	75/75	1,200
	Boden	Asha/Maruti	10 Progressive Farmers	25/25	400
		Sub-Total	100	400	3,200
Rayagada	Rayagada	Asha	50 Progressive Farmers	50	400
	Kolnara	Asha	50 Progressive Farmers	50	400
	Kalyansin-ghpur	Maruti	100 Progressive Farmers	100	800
		Sub-Total	200	200	1,600
Kalahandi	Bhawani-patna	Asha	100 Progressive Farmers	100	800
	Kesinga	Maruti	100 Progressive Farmers	100	800
	Larjigarh	Asha	50 Progressive Farmers	50	400
	Narla	Asha	50 Progressive Farmers	50	400
	Charbanal	Maruti	Amulya Seed (P) Ltd	100	800
		Sub-Total	301	400	3,200
		Total	601	1,000	8,000

b.4 **Hybrid seeds.** Hybrid seed production will be a new venture under this project. Two promising hybrids (ICPH 2671 and ICPH 2740) will be sown in 40 hectares compact patches in Asha fields (Table 4) with a required 360 kg seeds of parental lines.

Table 4. Hybrid seed production.

District	Block	Parent line	Seed Grower	Area (ha)	Quantity (kg)
Kalahandi	Bhawanipatna	ICPA 2043	LOKSEBAK NGO	10	60
		ICPR 2671			30
	LOKSEBAK NGO	ICPA 2047	LOKSEBAK NGO	10	60
		ICPR 2740			30
		Sub-Total		20	180
Nauparha	Boden	ICPA 2043	4 Progressive Farmers	10	60
		ICPR 2671			30
	Komna	ICPA 2047	4 Progressive Farmers	10	60
		ICPR 2740			30
		Sub-Total	8	20	180
		Total	9	40	360

c. **Farmer Participatory Varietal Trial (FPVT).** FPVT will continue to demonstrate the different high yielding cultivars in comparison with farmers' existing varieties. A total of 105 sites will be laid-out in 42 hectares at 1 acre per site in the five districts (Table 5).

Table 5. Conduct of FPVT by district and by block.

District	Block	No. of Sites	No. of Farmers	Area (ha)	Quantity (kg)	Remarks
Nauparha	Komna	7	7	2.8	17.5	Asha, Maruti, ICP 7035, ICPH 2671, ICPH 2740, and local variety provided by farmer beneficiary
	Khariar	7	7	2.8	17.5	
	Sinapali	7	7	2.8	17.5	
	Boden	7	7	2.8	17.5	
	Sub-Total	28	28	11.2	70	
Kalahandi	Bhawanipatna	10	10	4	25	
	Kesinga	10	10	4	25	
	Lanjigarh	5	5	2	12.5	
	Narla	7	7	2.8	17.5	
	Dharmagarh	3	3	1.2	7.5	
	Golamunda	7	7	2.8	17.5	
	Sub-Total	42	42	16.8	105	
Rayagada	Rayagada	7	7	2.8	17.5	
	Kolnara	7	7	2.8	17.5	
	Kalyansinghpur	7	7	2.8	17.5	
	Sub-Total	21	21	8.4	52.5	
Boudh	Kantamal	7	7	2.8	17.5	
	Sub-Total	7	7	2.8	17.5	
Bolinger	Bangomunda	7	7	2.8	17.5	
	Sub-Total	7	7	2.8	17.5	
Total		105	105	42	262.5	

Schedule of Activities Prior to Sowing

In order to achieve on time sowing of pigeonpea, the participants were grouped as per their assigned district (Group 1 – Rayagada and Boudh; Group 2 – Kalahandi; Group 3 – Nauparha and Bolinger). Table 6 presents the timeline of specific activities that the participants have approved prior to sowing of pigeonpea.

Table 6. Schedule of activities prior to sowing of pigeonpea.

Activity	Time Line
Seed Processing of C2 seeds	27 April – 5 May
Seed sampling, testing, tagging and bagging of C2 seeds	5 May – 20 May
Seed procurement and re-bagging of Breeder, Foundation, Hybrid and FPVT seeds	17 April – 30 April
Seed delivery of Breeder, Foundation, Hybrid and FPVT seeds to project locations	1 May – 7 May
Site and beneficiary selection for IPPT, seed production and FPVT	28 April – 20 May
Seed distribution to farmer beneficiaries	25 May – 30 May
Farmer orientation	25 May – 10 June
Sowing of pigeonpea under IPPT, seed production and FPVT	On or before 15 June

2012 Budgetary Requirement.

The 2012 physical targets were presented during our meeting with Dir RS Gopalan and DD SK Das at the Office of the Directorate of Agriculture and Food Production, Bhubaneswar, Odisha on 19 April. The following were recommended: a) reduce cultivated pigeonpea areas for IPPT from 6,000 ha to 4,000 ha; b) reduce cultivated areas in Rayagada and the need to include Boudh and Bolangir districts to the project; c) include fertilizer subsidy on our seed production component of the project with the understanding of allocating additional funds of Rs 353,950.00 for the purchase of fertilizers (in addition to the existing budget allocated for 2012) to cover 1,226 hectares for seed multiplication of Foundation, Certified and Hybrid seeds; d) replace non-performing NGOs with agriculture-based NGOs; and e) hire 15 Field Assistants to backstop and effectively implement the project. The total approved budget allocated for 2012 was Rs 24,064,000 and the revised budget will entail around Rs 24,417,950.00 (Table 7).

Table 7. Revised Budgetary Requirement for 2012.

Activity	Original Target	Agreed Adjustment	Seed Required	Budget Cost (Rs)
IPPT	6,000 ha	4,000 ha	48,000 kg	4,800,000
Foundation seed production*		185 ha	1,510 kg	1,045,000
Certified seed production*		1,000 ha	8,000 kg	2,960,000
Hybrid seed production*		40 ha	100 kg	120,000
FPVT trials	42 ha		263 kg	760,000
Seed Certification		1,225 ha		306,250
Support to NGO		5,267 ha		1,316,750
Field operation - KVK	1 KVK	2 KVK		800,000
Field operation - ICRISAT				930,000
Capacity building				900,000
Travel				536,000
Personnel		hire 15 field assistants		5,744,000
Non-recurring expenses	1 godown, 2 dal mills	1 godown, 2 dal mills, 1 laptop and 1 camera		715,000
Contingency				300,000
Institutional overhead (15%)				3,184,950
Total 2012 Budget				24,417,950

* include provision of fertilizers (100 kg DAP/ha) @ Rs2000/ha.

Section 3:

Revised Project Proposal

***A Revised Proposal on Pilot Project for Technological Empowerment
and Sustainable Livelihood***

Introduction and Expansion of Improved Pigeonpea (Arhar) Production Technology in Rainfed Upland Ecosystems of Odisha

**Submitted to: The Director of Agriculture & Food Production, Odisha,
Bhubaneswar under RKVY sub scheme**

Name and Designation of the Proposer

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Project Duration: 4 years (2011- 2015);

Project Funding: Rs 10.253 Crores;

Project Start: May 2011 (Kharif)

Project Completion: April 2015

Participating Institutions/Collaborators

- Dr SK Das, Asst. Director Pulses, Directorate of Agriculture and Horticulture, Ministry of Agriculture, Government of Odisha, India
- Dr PD Pradhan, Odisha University of Agriculture and Technology (OUAT), Bhubaneswar, Odisha, India
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- International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, 502 324, Andhra Pradesh, India
- NGO and Farmer Self Help Groups (FSHG)

Title: Introduction and *Expansion of Improved Pigeonpea (Arhar) Production Technology in Rainfed Upland Ecosystems of Odisha*

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4. Background Information

Odisha, (17.49´N to 22.34´N and 81.27´E to 87.29´E), is located in the eastern coast of India. The total agricultural land area of Odisha is about 8.7 million hectares of which 1.9 million hectares is irrigated. About 70% of the population lives in villages and 85% of the total workforce depends on agriculture. However, out of a total cropped area of 6.1 million hectares during the kharif, about 94% is rainfed. About 70% of the cultivated area in Odisha has acidic soils. These soils are major impediments to crop production due to nutrient imbalances such as:

- Deficiencies of calcium and magnesium in light textured acidic soils
- Low availability of phosphorus and molybdenum and fixation of applied phosphate
- Low nitrogen fixation by symbiotic and non-symbiotic bacteria
- Aluminium and manganese toxicity in upland situation

Odisha is one of the states most affected by climate change. Its ecology and weather have undergone a noticeable change. The last few years have been prone to extreme weather conditions where the pattern of droughts and floods is becoming a recurring scenario, affecting 11 million people in 25 out of 30 districts. This has already shown impact on agriculture in the state. In the last 10 years, there has been a decrease in production of paddy rice (6.8%), pulses (56.4%), oilseeds (44%), potato (20.7%), onion (14.4%) and other vegetables (24.8%).

Odisha has a tropical monsoon climate. There are three main seasons in the state: summer (March to June), rainy (July to October) and winter (September-February). The annual rainfall varies from 1140 mm to 1716 mm, and the rainfall increases from west to east. Maximum temperatures during the year range from 24°C to 45°C; minimum temperatures during the year range from 17°C to 22°C. Rainfall during the kharif season varies from 804 mm to 1324 mm.

Introduction

Pulses in Odisha: Pigeonpea, chickpea and black gram are the major pulses grown in Odisha covering 10.9% (0.953 million hectares) of the total agricultural land area with very low seed replacement ratio of 2-3%. Productivity is only 415 kg/ha, which is well below the national average of 700 kg/ha. Irrigated tracts like the Mahanadi Delta, the Rushikulya plains and Hirakud and Badimula regions are the prominent pulse growing areas. Production of pulses is concentrated in districts like Cuttack, Puri, Kalahandi, Koraput Dhenkanal, Bolangir, Rayagarh, Nauparha and Sambalpur. However, pigeonpea is an ideal crop for the rainfed upland ecosystem of Odisha.

Pigeonpea in Odisha: Pigeonpea is one of the most important pulse crops of Odisha. It is an affordable source of protein (22-24%) and contains carbohydrates, minerals and vitamins. Pigeonpea, which is a good source of essential amino acids, carbohydrates and minerals, can be an excellent crop to promote food and nutritional security in Odisha. ICRISAT scientists have developed new short (for example ICPL 88039), and medium duration (Asha) pigeonpea varieties that can fit into various cropping systems and diverse agro-ecological systems without disturbing traditional agriculture in the rainfed upland ecosystems of Odisha.

Aside from the benefits derived from the food, 15-20 tons/ha of fuel wood from pigeonpea plants can provide energy @ 4,000 Kcal/kg wood; pigeonpea can fix nitrogen of about 40 kg/ha; and, it can effectively protect the soil from erosion. Pigeonpea can withstand drought, requires minimal inputs, and can be utilized as quality fodder for cattle and goats. Pigeonpea, therefore, has several qualities, which can fulfil various social, nutritional and economic needs of Odisha farmers. It is expected that the integration of its production along with soil and nutrient conservation will pave the way for agricultural prosperity of rainfed upland ecosystems in Odisha.

6. Pigeonpea Project: Introduction and expansion of IPPT

A large section of farmers in the rainfed upland ecosystems of Odisha have remained isolated from improved varieties and management practices of pigeonpea for various reasons. There is ample scope for the expansion of high yielding short and medium duration pigeonpea varieties in the rainfed areas for the development of sustainable livelihoods.

Recently, high yielding, short and medium duration pest and drought tolerant varieties and hybrids in pigeonpea have been developed by ICAR, SAUs and ICRISAT. The interventions for pigeonpea promotion in rainfed upland ecosystems in Odisha are given below:

Constraints identified for promotion of pigeonpea in Odisha

- Seed
- Crop establishment
- Diseases
- Insect pests (Pod-borer)
- Fertilizers
- Micronutrients
- Weeds
- Seed systems

The proposal intends to introduce and expand high yielding pigeonpea. To begin with, selection and promotion of pigeonpea will be initiated in a farmer participatory mode. ICRISAT, in partnership with Department of Agriculture, Odisha; Odisha University of Agriculture and Technology, Bhubaneswar; farmers and self help groups (FSHG) seeks funding support from Agriculture Department, Government of Odisha for promotion of IPPT in five districts in Odisha (Kalahandi, Rayagada, Nauparha, Boudh, and Bolangir) for the period 2011 to 2015.

7. Goal

The overall goal of this project is to enhance food and nutritional security and income generation for the underprivileged farmers of rainfed areas of Odisha.

8. Objectives

- To evaluate and identify newly developed high yielding disease resistant varieties and hybrids of pigeonpea for further introduction and expansion.
- To promote cultivation of high yielding pigeonpea varieties in the marginal soils.
- To develop village-level seed systems to achieve self-sufficiency in seed of farmer-preferred improved varieties of pigeonpea.
- To build capacity of farmers, NGOs and Self Help Groups in sustainable pigeonpea production technology components.
- To enhance profitability by linking production with *dal* processing and marketing.
- To provide research backstopping for refinement and research on pigeonpea and IPPT components as identified by researchers and farmers in the target area.

9. Target Areas

ICRISAT, in collaboration with the State Agricultural University and Department of Agriculture has identified three potential districts (**Kalahandi, Rayagada, Nauparha**) for introduction and promotion of IPPT (Table 1) in Odisha. **Blocks (10 villages in each block)** will be selected. Selection of blocks, villages and farmers will be done in collaboration with partners and finalized during workplan meetings for each project year. In year 2, 3 and 4, the project will expand its operation by including two more districts (Boudh and Bolangir). The total target area will be the original target of 25,000 hectares.

Table 1. Details of the project area to be covered in Odisha.

Districts	Total area (ha)	Total villages (no.)	Total block (no.)	Target area (ha)				
				Year 1	Year 2	Year 3	Year 4	Total
Rayagada	20,800	2,667	11	1,500	708	1,000	2,500	5,708
Kalahandi	13,190	2,236	13	1,000	2,026	2,238	3,000	8,264
Nauparha	5,870	663	5	500	1,522	2,000	2,500	6,522
Boudh	4,410	1,186	3		503	750	1,000	2,253
Bolangir	9,080	1,794	14		503	750	1,000	2,253
Total	53,350	7,546	46	3,000	5,262	6,738	10,000	25,000

10. Strategy and Approach

Harnessing the potential of rainfed upland ecosystem calls for a science-led farmer centric approach. This proposal highlights an example of identifying a niche for introducing and expanding pigeonpea cultivation to increase and sustain its production in Odisha. In addition, this will minimize land degradation and increase incomes of large numbers of subsistence farmers in the rainfed upland ecosystems of Odisha.

The project will be farmer-driven, farmer-implemented and farmer-owned. The researchers and extensionists will play a catalytic and guiding role by providing available technical options to farmers and helping them to make appropriate choices. Scientists will also provide technical backstopping needed for further on-station and on-farm research. The research and development process will aim to integrate locally adapted improved cultivars of pigeonpea, improved crop production technologies and crop management practices.

10.1 Methodology

Main elements and activities of the strategy and approach will be as follows:

- We have selected five districts (Kalahandi, Rayagada, Nauparha, Boudh and Bolangir) in the state of Odisha for interventions in each district during 2011 to 2015. In each district, a certain number of village blocks will be selected for interventions.
- In each village, 10-15 farmers will be chosen every year to establish demonstration cum sites of learning and transfer of technology.
- Participatory monitoring of trials will be organized to share the lessons from the farmers with non-participating farmers.
- The progressive farmers will also be trained as seed producers, and village seed banks will be established to ensure supply of quality seeds for further expansion of pigeonpea production.
- Working together with Department of Agriculture and NGOs will help the state for necessary policy reforms to increase pigeonpea production as well as farmers' incomes, improve household nutrition and protect the environment.

11. Project Implementation

The project will be managed and implemented by ICRISAT in collaboration with DoA, the University, and some prominent NGOs. A work plan for each year will be prepared before the sowing season. Local staff will organize aspects related to field supervision, seed distribution to identified growers, monitoring of crop and dissemination of information. Appropriate sites and cultivars will be selected for evaluation in consultation with local farming communities using a participatory approach. Training and awareness activities in pigeonpea production and utilization technologies will also be organized. In the first year, the seed for the target area will be purchased and distributed to farmers. The project coordinator will be responsible for implementing various activities and preparing project reports. ICRISAT has the necessary infrastructure, facilities and seed materials to provide training and logistical support for pigeonpea research and development. Facilities of the DoA will be utilized for executing the project activities.

11.1 Major Activities

- Organize stakeholder workshop to identify interventions for promoting pigeonpea.
- Identify pigeonpea growing areas in consultation with local authorities and farmers.
- Identify new pigeonpea cultivars for different agro-ecological zones.
- Promote pigeonpea seed production at the local level through selected farmers.
- Organize farmers' field days during the crop season.
- Organize annual planning and review meetings, training programs for field staff and farmers.
- Prepare appropriate pigeonpea literature/audio-visual aids for technology transfer.

11.2 Time schedule of activities.

Activities by objectives	Time schedule (Year and months)							
	Year 1		Year 2		Year 3		Year 4	
	May-Dec	May-Dec	May-Dec	May-Dec	May-Dec	May-Dec	May-Dec	May-Dec
Objective 1: To evaluate and identify newly developed high yielding disease resistant varieties and hybrids of pigeonpea for further introduction and expansion.								
• Selection of sites and farmers in target districts for PVS	√		√		√		√	
• Location specific 5-7 improved pigeonpea cultivars selection evaluated and identified.	√		√		√		√	
• Data collection, analysis and report writing.	√	√	√	√	√	√	√	√
Objective 2: Promote cultivation of high yielding pigeonpea varieties in the marginal soils.								
• New farmers in three districts in Odisha state every year, ie, year 1, year II, year III and year IV, will be selected for demonstrations of pigeonpea.	√		√		√		√	
• Soil samples and base line data from the target districts collected and analyzed for macro/ micronutrient deficiency.	√		√		√		√	
• Demonstrations initiated using locally available implements as per farmer practice.	√		√		√		√	
• Data collection, analysis and report writing.	√	√	√	√	√	√	√	√
Objective 3: To develop village-level seed systems to achieve self-sufficiency in seed of farmer-preferred improved varieties of pigeonpea.								
• Farmers identified to initiate village level seed production systems of the improved and farmer preferred cultivars of pigeonpea.	√	√		√		√		√
• Seed multiplication at village level at a few farmers' fields initiated in Year 1 and enhanced in Year II, III and IV.	√		√		√		√	
• Periodical training programs of farmer groups and farmer organizations on seed production and storage.	√	√	√	√	√	√	√	√
• Data collection, analysis and report writing.	√	√	√	√	√	√	√	√
Objective 4: Capacity building of farmers, NGOs and Self Help Groups in sustainable pigeonpea production technology components.								
• Periodical hands on training in identification of biotic/abiotic constraints of pigeonpea to selected farmers/technical staff of the partner institutes.	√		√		√		√	
• Specialized courses and training on to participating farmers.	√	√	√	√	√	√	√	√
• Training of individual farmers/farmer groups/self help groups on seed production and storage at household/village/block/district level.		√		√		√		√
• Prepare farmer friendly training and extension manuals in local language.	√	√	√	√	√	√	√	√

Continued

11.2 Time schedule of activities <i>continued</i> .								
Activities by objectives	Time schedule (Year and months)							
	Year 1	Year 2	Year 3	Year 4				
	May-Dec	May-Dec	May-Dec	May-Dec	May-Dec	May-Dec	May-Dec	
Objective 5: Enhance profitability by linking production with <i>dal</i> processing and marketing.								
• Small scale <i>dal</i> processing machines purchased.		√	√	√	√	√	√	
• <i>Dal</i> processing demonstrated.		√	√	√	√	√	√	
Objective 6: To provide research backstopping for refinement and research on pigeonpea and IPPT components as identified by researchers and farmers in the target area.								
• Constraints both biotic and abiotic to pigeonpea production in rainfed upland environments identified and prioritized for finding solutions	√		√		√		√	
• Preliminary investigations initiated under precision environments on the identified diseases - biology of the pathogen, etiology of the disease and genetic improvement.	√	√	√	√	√	√	√	√
• Depending upon the problem identified, detailed experiments started, data analyzed, published and shared with researchers and end users	√	√	√	√	√	√	√	√

12. Expected Outputs and Outcomes

- Areas under improved pigeonpea cultivars enhanced
- New pigeonpea varieties/hybrids suitable for cultivation in Odisha identified
- Suitable crop management package for grain production developed
- On-farm demonstrations with farmers' participation conducted
- Income of farmers enhanced by marketing value-added products
- Information on production and marketing constraints identified and solutions found
- Extension staff and farmers trained in pigeonpea production and processing technology
- Protein requirements of Odisha farmers fulfilled with the locally produced pigeonpea *dal*.

13. Expected Impact on Livelihoods and Poverty Alleviation

- Farmers start generating more income from their land through pigeonpea production.
- A sound self-sustaining seed production system in operation.
- Farmers start consuming and marketing locally produced pigeonpea *dal*.

14. Monitoring and Evaluation

Monitoring of project implementation will be performed jointly by ICRISAT and partners. Local technicians will also be trained in monitoring and addressing production constraints and implementation issues. Periodical reports as required by the donor will be submitted.

15. Partnership and Linkages/Collaborators

The project will build on the above mentioned strategy in collaboration with Department of Agriculture, Odisha; Odisha University of Agriculture and Technology, Bhubaneswar in the targeted districts and ICRISAT staff members associated with pigeonpea production-research and extension.

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- Dr P D Pradhan, Odisha University of Agriculture and Technology, Bhubaneswar- 751003, Odisha, India
- OUAT/KVK Nawarangapur, Odisha
- District/Block Agricultural offices (DAO) in the target districts of the project
- NGOs

16. Estimated Budget (Rs 1028.81 Lacs)

Particulars	Budget (in lac rupees)				
	2011-12	2012-13	2013-14	2014-15	Total
A. Recurring					
1. Personnel	50.61	57.44	66.06	67.57	241.68
2. Production Program					
a. Seed Cost (IPPT)	50.00	48.00	50.50	61.85	210.35
b. Foundation seed production		10.45	11.00	11.00	32.45
c. Certified seed production		29.60	30.00	30.00	89.60
d. Hybrid seed production		1.20	3.00	5.00	9.20
e. Seed certification		3.0625	4.00	5.00	12.0625
f. FPVT operations	7.60	7.60	7.60	7.60	30.40
g. NGO support	9.90	13.1675	19.90	27.40	70.2675
h. @ KVK (seed production)	8.00	8.00	8.50	8.50	33.00
i. @ ICRISAT (seed production)	9.30	9.30	9.80	9.80	38.20
3. Capacity Building (trainings, seminars, workshops) and Publications	8.70	9.00	10.00	12.70	40.40
4. Travel	8.81	5.36	5.53	5.72	24.42
5. Contingencies	2.00	3.00	4.00	5.00	14.00
Sub-total	154.92	205.18	229.89	257.14	847.13
B. Non-recurring					
1. Equipment & accessories	28.00	7.15	6.16	6.17	47.48
Sub-total	28.00	7.15	6.16	6.17	47.48
C. Institutional Overhead (15%)	27.44	31.8495	35.41	39.50	134.20
Grand-total	210.36	244.1795	271.46	302.81	1028.81

Justifications and breakdown of budgetary requirements

A. Personnel

Particulars	Budget (in lac rupees)				
	2011-12	2012-13	2013-14	2014-15	Total
Scientist (20% time)	10.94	15.31	16.07	16.88	59.20
Scientific Officer (50%)	5.47	7.66	8.04	8.44	29.61
District Coordinator (3)	9.00	9.00	10.8	10.8	39.6
Field Assistants (28)	19.8	19.8	25.2	25.2	90.00
State Coordinator (1) (based at Kalahandi)	5.40	5.67	5.95	6.25	23.27
Sub-total	50.61	57.44	66.06	67.57	241.68

Justifications: The personnel includes 20% salary of Scientist, 50% Scientific Officer, District Coordinators, Field Assistants and State Coordinator working at target districts, who will be responsible for coordinating, planning, conducting, implementing, developing preferred seed system(s), monitoring and executing the project work; responsible for conducting and guiding research on identified issues for backstopping R&D; enhancing capacity of the local partners and creating awareness of farmer-preferred improved varieties among farmers in the targeted districts; responsible for organizing the trainings, seminars, workshops and review meetings; responsible for collecting and analyzing the data and writing the project reports, preparing brochures and flyers in the local language and for other publications.

B. Field Operations in Farmers' Fields.

Particulars	Budget (in lac rupees)				
	2011-12	2012-13	2013-14	2014-15	Total
A. Seed cost (15 kg/ha @ Rs90/kg) for IPPT in 3 districts	50.00	48.00	50.50	61.85	210.35
B. Foundation seed production	-	10.45	11.00	11.00	32.45
C. Certified seed production	-	29.60	30.00	30.00	89.60
D. Hybrid seed production	-	1.20	3.00	5.00	9.20
E. Seed certification		3.0625	4.00	5.00	12.0625
F. FPVT cost @ 2000/acre	7.60	7.60	7.60	7.60	30.40
G. Support to NGO @ 250/ha					
• IPPT	7.50	10.00	17.50	25.00	60
• FPVT – 100 sites @ 1 acre/site/district	2.40	0.105	2.40	2.40	7.305
• Seed production sites		3.0625			3.0625
Sub-total	67.5	113.08	126	147.85	454.43

Justifications:

A. Includes on-farm technology development and demonstration costs for seed generation and purchasing at target districts, including transport cost to project sites.

B,C, and D. This will include seeds and the provision of fertilizers in the seed production area.

E. This will be the monitoring expenses provided to OSSOPCA for seed certification of pigeonpea seeds.

F. This will include seeds and other chemicals (insecticides, fungicides) and fertilizers for on-farm farmer preferred varietal trials to cover 100 sites per year, including transport cost to project sites.

G. This will include support to NGOs to cover the target areas under the IPPT and FPVT, and areas for Foundation, Certified and Hybrid seed production.

Justification: This includes on-station technology development and demonstration costs for Breeder and Foundation seed multiplication and purchasing integrated disease management (IDM), integrated pest management (IPM), integrated nutrient management (INM), etc, at target districts. This will include consumables such as glassware and other chemicals (insecticides, fungicides, bio-pesticides) and fertilizers.

C. Field Operation at OUAT/KVK Nawarangapur.

Particulars	Budget (in lac rupees)				
	2011-12	2012-13	2013-14	2014-15	Total
Breeder and foundation seed multiplication (20 ha @ 30,000/ha)	6.00	6.00	6.50	6.50	25.00
Supplies (20 ha @ Rs 5,000/ha)	1	1	1	1	4
Labor cost (20 ha @ Rs 5,000/ha)	1	1	1	1	4
Sub-total	8.00	8.00	8.50	8.50	33.00

D. Field Operation at ICRISAT – Breeder seed production and reconstitution.

Particulars	Budget (in lac rupees)				
	2011-12	2012-13	2013-14	2014-15	Total
Breeder and Foundation seed generation, reconstitution and multiplication (2 ha @ Rs 225,000/ha)	4.50	4.50	4.50	4.50	18.00
Supplies	0.90	0.90	0.90	0.90	3.60
Back-up research (biotic and abiotic constraints)	1.50	1.50	2.00	2.00	7.00
Labor cost (2 ha @ Rs 75,000/ha)	1.50	1.50	1.50	1.50	6.00
Transport and Miscellaneous (2 ha @ Rs 22,500/ha)	0.90	0.90	0.90	0.90	3.60
Sub-total	9.30	9.30	9.80	9.80	38.20

Justification: This includes on-station technology development and demonstration cost for seed generation, reconstitution, multiplication and purchasing IDM, IPM, INM, etc. This will include back-up research (biotic and abiotic constraints) as well as consumables such as glassware and other chemicals (insecticides, fungicides) and fertilizers.

E. Capacity Building and Publications.

Particulars	Budget (in lac rupees)				
	2011-12	2012-13	2013-14	2014-15	Total
Review and planning meeting	1.50	1.50	1.50	2.00	6.50
Staff orientation and training	3.20	2.00	2.00	3.20	10.40
Farmer orientation and training (@500farmers/district)	3.00	3.75	4.50	5.00	16.25
Publications	1.00	1.75	2.00	2.50	7.25
Sub-total	8.70	9.00	10.00	12.70	40.40

Justification: This includes farmer and staff training, seminars, workshops, meetings, etc, and publication of integrated cultural management (ICM) manuals, pamphlet and flyers during the project life.

F. Travel.

Particulars	Budget (in lac rupees)				
	2011-12	2012-13	2013-14	2014-15	Total
Scientist	5.00	2.10	2.20	2.30	11.60
Scientific Officer	2.13	1.58	1.65	1.74	6.10
State Coordinator @ 5,000/mo	0.60	0.60	0.60	0.60	2.40
District Coordinator @ 3,000/mo	1.08	1.08	1.08	1.08	4.32
Sub-total	8.81	5.36	5.53	5.72	24.42

Justification: This includes on-station and out-station travel of the Scientist and Scientific Officer for ground work in the selected village sites, distribution of inputs, planning, conduct of capacity building, and day to day maintenance and monitoring at farmers' field in the target districts. These visits are planned to strengthen the establishment of pilot-scale preferred seed system(s) more effectively and efficiently.

G. Non-Recurring (equipment outlay).

Particulars	Budget (in lac rupees)				
	2011-12	2012-13	2013-14	2014-15	Total
Seed storage facility at district level	14.00	4.00	3.00	3.00	24.00
Dal mill processing at village level	10.00	2.20	3.16	3.17	18.53
Computer, printer and camera (1 set/district; and a set for each State Coordinator, Scientist and Scientific Officer)	4.00	0.95	-	-	4.95
Sub-total	28.00	7.15	6.16	6.17	47.48

Justification: This includes the costs for establishing infrastructure for seed storage and required maintenance for the operation and acquisition of dal processing machine including transport cost for the delivery of dal machine. This also includes purchase of computer sets for State and District Coordinators, Scientist and Scientific Officer.

H. Contingencies.

Particulars	Budget (in lac rupees)				
	Year 1	Year 2	Year 3	Year 4	Total
Recurring	2.00	3.00	4.00	5.00	14.00
Sub-total	2.00	3.00	4.00	5.00	14.00

Justification: This includes expenditures due to conduct of research, unforeseen crop failures and emergencies.

17. Project Summary.

Title	Introduction and Expansion of Improved Pigeonpea (Arhar) Production Technology in Rainfed Upland Ecosystems of Odisha.
Target Area	Rainfed upland ecosystem in the state of Odisha in India.
Goal	The overall goal of this project is to enhance food and nutritional security and income generation for the under-privileged farmers of rainfed areas of Odisha.
Objectives	To evaluate and identify newly developed high yielding disease resistant varieties and hybrids of pigeonpea for further introduction and expansion. Promote cultivation of high yielding pigeonpea varieties in the marginal soils. To develop village-level seed systems to achieve self-sufficiency in seed of farmer-preferred improved varieties of pigeonpea. To build capacity of farmers, NGOs, and Self Help Groups in sustainable pigeonpea production technology components. To enhance profitability by linking production with <i>dal</i> processing and marketing. To provide research backstopping for refinement and research on pigeonpea components as identified by researchers and farmers in the target area.
Implementing Institutions / Organizations	ICRISAT, Patancheru Agriculture Department, Government of Odisha Odisha University of Agriculture and Technology, Bhubaneswar- 751003, Odisha District/Block Agricultural Offices (DAO) in the target districts of the project NGOs
Duration	4 years (2011 – 2015)
Crop	Pigeonpea
Districts/ Blocks/ Villages	5 districts (Kalahandi, Rayagada, Nauparha, Boudh and Bolinger), 28 blocks in each district and 10 villages in each block. Villages and farmers in each district will be selected in consultation with partners
Budget	Rs 10.2881 Crores

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