

ANNUAL REPORT

1999-2000



NATIONAL RESEARCH CENTRE FOR WOMEN IN AGRICULTURE
(Indian Council of Agricultural Research)
Bhubaneswar INDIA

ANNUAL REPORT 1999-2000



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This Report includes unprocessed or semi processed data from the ongoing researches, which would form the basis of scientific report/papers in due course.

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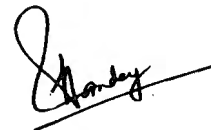
Foreword

National Research Centre for Women in Agriculture (NRCWA), the only Institution of its kind in whole of Asia for developing technologies suitable for farmwomen, for training, research and extension activities for farmwomen has continued its efforts in furthering the research, extension and training activities for developing an economically viable, ecologically sustainable farming system for women involved in the multiple roles of food production, house work and child care.

The Annual Report of the Centre brings out the highlights of its research, training and extension activities carried out during the year 1999-2000 as well as the achievements made towards infrastructural development, faculty development and recruitment of staff. In its efforts towards drudgery reduction for farmwomen, institute has take up important research project on Occupational Health Hazard of Farmwomen.

I would like to express my sincere gratitude to Dr. RS Paroda, Secretary, DARE, Govt. of India & Director-General, ICAR for his strong support and guidance. But for his willing encouragement it would have been very difficult to face the odds and challenges of this up coming institute; I profusely thank, Dr. P. Das, Deputy Director General (AE), Dr. BN Chaudhury, Asstt. Director General (LLP), and Dr. BS Hansra, ADG (Extn) for their consistent guidance.

I wish to compliment my colleagues for braving the super cyclone and the teething problems of the new institute for furthering the cause of women in agriculture. I extend my sincere gratitude to my colleagues in the Centre, Dr SN Pandey, Dr. BN Sadangi for their contribution and for their tireless efforts during the compilation of the report. My appreciations are also for all the scientific, technical and administrative staff for their support and cooperation in developing the Centre & in bringing out this report. Thanks are due to Dr MPS Arya for Hindi translation, Mr. V. Ganesh Kumar for processing the information and to Ms Rina Das for manuscript typing. The consistent support of Dr. G. Singh, Director, CIAE, Bhopal for nurturing the Sub-Centre of NRCWA very effectively is deeply appreciated.



(Hema Pandey)

Director

कार्यकारी सारांश

“विभिन्न कृषि पद्धतियों में कार्यरत महिलाओं के लिए उचित तकनीकी का विकास एवं कृषि तथा संवर्गीय क्रियाओं में लिंगीय भूमिका से संबन्धित विषयों पर कार्यरत शोध एवं विकास विशेषज्ञों की संवेदनशीलता एवं क्षमता में वृद्धि करके विकसित तकनीकी का प्रसार कराना ” कृषि में महिलाओं पर राष्ट्रीय अनुसंधान केन्द्र का एक विस्तृत जिम्मेदाराना कार्य-क्षेत्र है। तदनुसार केन्द्र द्वारा वर्ष १९९९-२००० में कृषि में महिलाओं के लिए अनुसंधान, प्रशिक्षण एवं प्रसार कार्यक्रमों को अपनाया गया। इस वर्ष नौ शोध परियोजनायें बनाई गईं, जिन्हें शोध सलाहकार समिति की स्वीकृति के उपरान्त कार्यान्वित किया गया। नवीनतम परियोजनाओं में शोध एवं प्रतिचयन प्रारूप तथा ऑकलन प्रक्षेत्र के चयन को अंतिम रूप दिया गया।

किसानों के खेतों में इस केन्द्र द्वारा जिन कृषि / फसल पद्धतियों पर शोध आरम्भ किये गये वे इस प्रकार हैं :

(क) उद्यान - मुर्गीपालन (ख) उद्यान - मुर्गीपालन - मूँगफली (ग) उद्यान - मुर्गीपालन - मूँग - उर्द (घ) उद्यान - मूँगफली (च) उद्यान - मूँग - उर्द एवं (छ) उद्यान - मूँगफली - मूँग - उर्द। पिछवाड़ा - मुर्गीपालन परियोजना, जिसमें मुर्गियों के विजातीय विभेदों को घर के कूड़े-करकट के आधार पर विविध वर्गीय महिलाओं द्वारा पालन करने के उपरान्त प्राप्त ऑकड़ों द्वारा अंतिम निष्कर्ष निकाला जा सकता है। वैज्ञानिकों द्वारा फसल - उद्यम - महिलाओं के पारस्परिक प्रतिक्रियाओं का अध्ययन कर निश्चित फसलों, उद्यमों, किस्मों एवं उत्पादन - तकनीकी के लिए महिलाओं की वरीयता पर समीक्षा की गई। महिलाओं के साथ गहन परिचर्चा, प्रेक्षण एवं विवेचना के उपरान्त वैज्ञानिकों ने उनकी वरीयताओं, समाजिक, सांस्कृतिक व तकनीकी प्रतिबन्धों के कारणों का अध्ययन किया। अगस्त, १९९९ में आरम्भ की गई अधिकांश परियोजनाओं को अक्तूबर, १९९९ में आये महा चक्रवात द्वारा ३० से १०० प्रतिशत तक हानि हुई, साथ ही दूसरी परियोजनाओं की प्रगति में भी बाधा उत्पन्न हुई। केन्द्र पर आधारभूत ऑकड़े एकत्र करने के उद्देश्य से वैज्ञानिकों द्वारा विभिन्न स्थानों का तथ्यान्वेषी लक्ष्य के साथ भ्रमण कर सूचनायें एकत्रित की गईं। केन्द्रीय कृषि अभियांत्रिकी संस्थान, भोपाल में स्थित कृषि में महिलाओं पर राष्ट्रीय अनुसंधान केन्द्र का उपकेन्द्र कृषि महिलाओं के लिए मूल्य-सापेक्ष एवं कठिनाई निवारक कृषि-यन्त्रों के विकास में कार्यरत है। हल्की व दांतेदार दराँती (बाँकी) तथा निकाई - गुड़ाई के उन्नत यन्त्रों का विकास, उपकेन्द्र के प्रमुख योगदानों में सम्मिलित हैं। कार्य क्षमता, श्रमशक्ति की बचत व हृदयगति में कमी की दर को ध्यान में रखते हुए कृषि महिलाओं द्वारा इन यन्त्रों के प्रयोग के ऊपर किये गये शोधों से अच्छे परिणाम मिले हैं।

कृ.म.रा.अ. केन्द्र भुवनेश्वर पर चावल उत्पादन एवं कटाई उपरान्त प्रक्रम; पशु आहार के रूप में फसल अवशेषों का समृद्धीकरण; तथा कृषि महिलाओं का प्रेरणात्मक प्रबन्ध; विषयों पर तीन प्रशिक्षक प्रशिक्षण आयोजित किये गये तथा उपकेन्द्र पर २५ प्रशिक्षण आयोजित कर २६४ कृषि महिलाओं को विभिन्न कृषि यन्त्रों के प्रयोग व कृषि उत्पादों के संसाधन के ऊपर प्रशिक्षण दिया गया।

केन्द्र की चारदिवारी बनाना, पुस्तकालय का समृद्धीकरण व शोधकार्यों की कार्य क्षमता में सुधार पर बल दिया गया तथा कर्मचारियों को गोष्ठियों / कार्यशालाओं / प्रशिक्षणों में भाग लेने हेतु भेजा गया। राजभाषा हिन्दी के प्रयोग पर भी बहावा दिया गया।

Executive Summary

National Research Centre for Women in Agriculture (NRCWA) has a broad based mandate of "developing technologies appropriate to farmwomen of different production systems and to disseminate it backed by the increased sensitivity and capability of research and development specialists addressing the issues pertaining to gender implications in agriculture and allied activities". Accordingly, the Centre undertook the work on research, training and extension for women in agriculture during 1999-2000. During the year nine research projects were formulated, approved by Research Advisory Committee and launched. The research design, sampling plan and the area for data collection were finalized in case of the newly launched projects.

The on-farm research was initiated in the following farming / cropping systems: (a) Horti-poultry, (b) Horti-poultry-groundnut, (c) Horti-poultry-mung-urd, (d) Horti-groundnut (e) Horti-mung-urd and (f) Horti-groundnut-mung-urd. The project on backyard poultry farming wherein the exotic strain of birds were reared under scavenging situation involving women of different categories has generated data for drawing tentative conclusions. The scientists studied the outcomes of interactions between crops/ enterprises and women on the aspects of choice or preference of women towards the crop/ enterprise, variety and production technologies. In-depth discussion with women groups, observations and analysis lead the scientists to find out the reasons of their choice and socio-cultural and technological, constraints. The damage to most of the on-farm research projects, launched in the month of August 1999, by the super cyclone in October 1999 ranged from 30 to 100 per cent. The progress in other research projects was also affected.

Visits of scientists to different places with fact-finding mission had brought information for making the database of the Centre. The Sub-Centre of NRCWA at CIAE, Bhopal is engaged in developing drudgery reducing, cost effective agricultural implements for farmwomen. The important achievements of the sub-centre include development of a lightweight serrated sickle & improved weeders. The experiments on use of these equipment by women workers produced excellent results in terms of work output energy saving and lower heart rate.

NRCWA organised three trainers' training programmes viz., rice production and post harvest processing, enrichment of crop residues as animal fodder and motivation management of farmwomen at Bhubaneswar. The Sub-centre of NRCWA at CIAE, Bhopal organised 25 training programmes in which 264 farmwomen were trained on operation of various agricultural tools and implements, processing of agricultural produce.

Other achievements of the year included construction of boundary wall of the Centre, enrichment of library and procurement of important equipment for facilitating the research activities.

Capacity building of the staff members was also given due importance and the staff members were deputed for attending seminars/ workshops/training.

1. THE INSTITUTE

1.1. Brief history

The Working Group in Agricultural Research and Education constituted by the Planning Commission for the formulation of the eighth Five Year Plan (1992-97) in its report recommended to establish a National Research Centre for Women in Agriculture (NRCWA) during the Eighth Five Year Plan. Accordingly, the Indian Council of Agricultural Research established the NRCWA in the month of April 1996 at Bhubaneswar. Since then the NRCWA is functioning in a rented building. The Sub-centre of NRCWA is located at CIAE, Bhopal, which is functioning under the technical and administrative control of Director, CIAE, Bhopal.

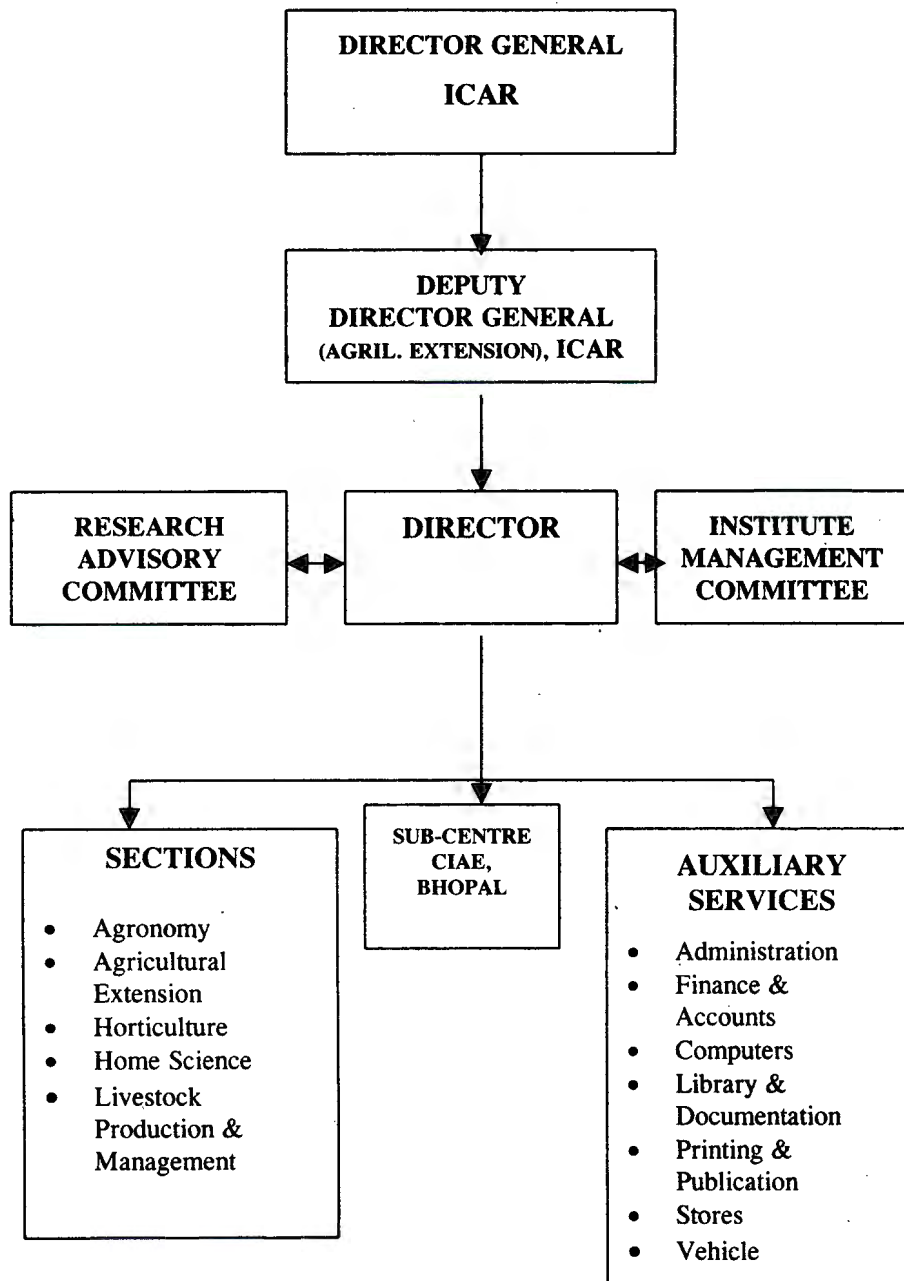
1.2. Mandate

The Mandate of the NRCWA is “to develop technologies appropriate to farmwomen of different production systems and to disseminate it backed by the increased sensitivity and capability of research and development specialists addressing the issues pertaining to gender implications in agriculture and allied activities ”.

The broad objective of the NRCWA is to

- conduct research aiming to strengthen the use of gender analysis in research and technology development;
- conduct training and to develop training modules and manuals for sensitizing gender related issues in research programme and policy development;
- develop and test women-specific extension models for technology transfer;
- collaborate in women-specific research, education and technology assessment and refinement with relevance to national and international organisation;
- act as a repository of information relevant to women in agriculture and provide consultancy services within and outside the country on women-specific research projects and programmes;
- conduct survey to identify and quantify women's roles in various agricultural and allied activities with special reference to agricultural machines, tools and implements;
- create ergonomic database on female workers for use in design of implements/work space;
- identify, assess and refine available agricultural engineering technologies for farmwomen; and
- assess health hazards in some important crop production/processing.

1.3. Organogram



2. TECHNICAL PROGRAMME

Following research projects were approved during 1999-2000:

Sl. No.	Name of the Project	Date of launching	Investigators
1.	Identification and improvement of farming systems suited to farmwomen in Eastern India	August, 99	Dr SN Pandey, Dr KS Risam, Dr BN Sadangi, Dr MPS Arya, Dr Suman Agarwal, Dr PK Sahoo, Shri HK Dash, Mrs Laxmi Priya Sahoo, Mrs Abha Singh
2.	Improvement in backyard poultry farming for farmwomen of different categories	August, 99	Dr KS Risam, Dr PK Dehuri (OUAT)
3.	A gender study on agriculture and household economy of tribals of Orissa	August, 99	Dr BN Sadangi, Shri HK Dash
4.	Development and testing of extension methods for farmwomen in Eastern India	August, 99	Dr BN Sadangi, Dr H Pandey, Dr SN Pandey, Dr KS Risam, Dr MPS Arya, Dr PK Sahoo, Shri HK Dash
5.	Studies on technological empowerment of women in rural aquaculture	August, 99	Dr PK Sahoo, Dr BN Sadangi
6.	Occupational health hazards of farmwomen in coastal Orissa	May, 2000	Dr Hema Pandey, Dr Suman Agarwal, Mrs Abha Singh
7.	Standardization of women specific field practices in rice in Orissa	May, 2000	Dr MPS Arya, Mrs Laxmi Priya Sahoo
8.	Identification and evaluation of interactive learning modules for dissemination of homestead technologies	May, 2000	Dr Suman Agarwal, Dr Hema Pandey, Mrs Abha Singh
9.	Improvement in storage practices of seeds and grains of important crops with women perspective	May, 2000	Mrs Laxmi Priya Sahoo, Dr MPS Arya

3. RESEARCH ACCOMPLISHMENTS

3.1. Identification and improvement of farming systems suited to farmwomen in Eastern India

Since, NRCWA is in its infancy, it will take time to develop its research farm. The research work in this project was, therefore, undertaken in on-farm research mode. The activities, which were undertaken in the project, include:

3.1.1. Selection of Village

(BN Sadangi, SN Pandey, KS Risam, PK Sahoo & HK Dash)

Village Khamang Sasan of Balianta Block in district Khurda of Orissa was selected. The appraisal of the village situation was done by employing Participatory Rural Appraisal (PRA) and survey method which brought out worthwhile information on soil, land use, irrigation, livestock, problems, productivity, opportunities, of the village and data on women in agriculture.



Pic.1: Rapport building with women group

a. Transect analysis of the village

The transect analysis of the village brought out very useful information which is presented in table-1:

Table- I: Transect of village ' Khamang Sasan'

	North 1½ K.M.	2 KM South
	<-----> VILLAGE <----->	
Land type	High	Medium
Soil	Sandy loam	Clay-loam and clay
Land use	Houses, cattle shed, ponds, coconut orchards, vegetables, sugar cane, banana, mango, forest spp.	Rice, pulses, groundnut, til
Irrigation	Ponds, L.I. point, canal	Canal
Trees	Coconut, mango, cassia spp. bamboo, palm, jackfruit	--
Livestock	Cattle, poultry, sheep, goat, duck, fish	--
Problems	Water shortage, diseases and pests in vegetables, infertility in cows, foot and mouth diseases and bloat in cattle, monkey menace	Flood and water logging, disease and pest problem in rice and pulses
Productivity level	High	Average
Opportunity	Mushroom cultivation, api-culture, wheat cultivation, pisci-culture, fodder cultivation, processing of coconut fibres	Integrated rice-fish farming, maize cultivation, mechanized farming

b. Matrix scoring

In order to identify a suitable farming system for women, matrix scoring on a five point scale was conducted with the participation of women on two aspects (i) preference for different vegetables and (ii) preference for livestock enterprises. Table-2 presents the result of matrix scoring for vegetable crops.

Table-2: Matrix scoring of vegetables in Village Khamang Sasan

Criteria decided by women-farmers	Tomato	otato	olicus ean	itter ourd	hindi Okra)	olocasia	hilli	idge ourd	Brinjal	umpkin	ointed ourd	reens Leafy ege- ables)
Taste	4	5	4	1	3	4	1	3	1	4	3	4
Easy to cultivate	5	2	4	3	4	1	2	4	1	4	2	5
Yield	4	5	4	4	4	5	4	2	5	4	4	2
Easy to cook	5	3	4	4	5	3	4	4	5	4	3	5
Market value	2	4	5	4	4	4	3	3	5	3	5	1
Suitable for distribution among relatives	2	5	3	3	4	5	4	4	3	2	3	5
Resistance to diseases	3	3	2	4	3	4	2	4	2	4	2	5
Resistance to pests	4	4	2	2	3	3	4	4	2	3	3	4
Rank for growing	III	I			II	III						I

The matrix scoring done by the women farmers for vegetables clearly shows the relative importance they give to different vegetables. For instance, it can be observed from the matrix that potato and greens got first preference. Potato was rated relatively for its taste, yield, distribution (to satisfy social obligations), market value and resistance to pests. Similarly, greens were preferred because – greens are easy to grow, easy to cook, suitable for distribution, have a relative resistance to diseases and pests and have a good taste.



Pic. 2: PRA in Session, vill.- Khamang Sasan

Table-3 presents the result of matrix scoring for the livestock enterprises. It was observed that women employed seven different attributes in deciding their preference for any livestock enterprise. All together, five

different livestock enterprises were taken for matrix scoring on seven criteria. The matrix revealed that dairy enterprise was perceived as most preferred followed by goat, sheep & poultry and duckery.

Table-3 : Matrix scoring of livestock enterprises

Sl. No.	Criteria decided by women farmers	Dairy	Goat	Sheep	Poultry	Duckery
1	Productivity	5	4	3	2	2
2	Easy to rear	2	3	4	4	5
3	Market value	5	4	4	3	2
4	Meeting domestic needs	5	3	3	4	4
5	Uses of by-products	5	3	3	4	1
6	Resistance to disease	2	3	3	3	5
7	Social and religious values in rearing	5	4	4	3	3
Rank		I	II	II	II	III

The criteria, which were perceived high in case of dairy enterprises, were productivity, market value of milk, meeting domestic needs, uses of by-products and social and religious values in rearing.

The matrix scoring provided useful insight for formulation of on-farm research model.

3.1.2. On-farm research work

The on-farm research was initiated in the following farming systems as given in Table-4.

Table-4 : Details of on-farm farming systems research components

Sl. No	Farming System	Components
1.	Horti-poultry	Poultry RIR Breed, Bottlegourd Varieties (Rajendra Chamatkar & Hybrid Angad)
2.	Horti- groundnut - poultry	Poultry RIR Breed, Bottlegourd (Rajendra Chamatkar & Hybrid Angad), Radish (Pusa Chetki), Carrot (Pusa Kesar), Brinjal (Pusa Uttam & Pusa Hybrid-5), Tomato (Utkal Deepti, Hybrid Pooja), Sweet Potato, Groundnut (Ak 12-24).
3.	Horti-groundnut	Groundnut (Ak 12-24, NFP-101, RB-46, ICGS-44, PBS-8 & Girnar), Brinjal (Pusa Uttam & Pus Hyb-5), Tomato (Utkal Deepti & Hyb-Pooja), Radish (Pusa Chetki & Pusa Rasmi), Carrot (Pusa Meghali), Okra (Arka Anamika)
4.	Horti(Vegetable)-Pulse (mung-urd)	Mung (K 851), Urd (T-9), Bottlegourd (Rajendra Chamatkar & Hybrid Angad), Sweet Potato

Sl. No	Farming System	Components
5.	Horti (Vegeta-ble)-Ground-nut-Pulse (Mung-Urd)	Radish (Pusa Chetki & Pusa Rashmi), Carrot (Pusa Meghali), Brinjal (Pusa Uttam & Pusa Hybrid 5), Tomato (Utkal Deepti, Hybrid Pooja), Okra (Arka Anamika), Groundnut (Ak 12-24), Mung (K-851), Urd. (T-9)
6.	Horti-poultry-pulses (mung & urd)	Poultry RIR Breed, Bottlegourd (Rajendra Chamatkar & Hybrid Angad), Radish (Pusa Chetki), Carrot (Pusa Kesar), Brinjal (Pusa Uttam & Pusa Hybrid-5), Tomato (Utkal Deepti, Hybrid Pooja), Sweet Potato Urd. (T-9), Mung (K-851)

3.1.3.Horti-poultry system

(SN Pandey, KS Risam & LP Sahoo)

a. Comparison of performance of bottle gourd varieties.

Farmwomen raising poultry were supplied with 10 seeds each of Rajendra Chamatkar and Hybrid Angad varieties of bottlegourd to grow on thatches/ in backyard for undertaking research work in this farming system. These new varieties were introduced in the village to compare the performance of the new varieties with a local variety which is round and looked like pumpkin in fruit size and preferred more by farmwomen. So, nine farmwomen grew Rajendra chamtkar variety and four women grew both Rajendra chamatkar and Angad variety. One farmwomen harvested 14 kg of "Angad" and 9 kg of Rajendra chamatkar during the period under report. The total yield potential of these varieties will be reported only next year.

In an organoleptic evaluation of cooked bottlegourd by 16 men and women representing a wide geographical area and socio-economic strata, 'Rajendra Chamatkar' was preliminarily adjudged the best by scoring 6.87 marks for taste out of 10.00 followed by the local type (6.56). However, women-folk from different geographical areas (6.28) as well as those of Orissa state (6.20) liked the local type more than Rajendra Chamatkar (5.57, 4.80). Hybrid 'Angad' scored low for its taste (Table-4).

Table-5 : Organoleptic evaluation of cooked bottlegourd grown in village Khamang Sasan (1999-2000)

Variety	Organoleptic scoring for taste (10 marks) by evaluators				
	Wide geographical areas including Orissa		Orissa State		All men and women folks combined together
	Men	Women	Men	Women	
Local	6.66	6.28	7.10	6.20	6.56
Rajendra Chamatkar	7.77	5.57	7.30	4.80	6.87
Hybrid Angad	5.06	4.28	4.44	4.08	4.72

b. Poultry

Under poultry component four week old (186 Nos.) RIR chicks were introduced for rearing in the backyards of 19 farmwomen belonging to different social castes and land holding categories to study their performance in scavenging conditions. The birds were routinely vaccinated, provided with anthelmintic dosing, vitamin and mineral supplements. The performance of birds was recorded for growth and production traits.

The family wise means for body weight of birds varied from 167.5 ± 11.553 to 227.5 ± 9.645 g at 5 weeks of age; 189.3 ± 21.026 to 334.5 ± 24.251 g at 6 weeks of age; 272.5 ± 15.816 to 457.2 ± 34.892 g at 8 weeks of age; 616.7 ± 108.33 to 1384.4 ± 67.47 g at 20 weeks of age; and 800.0 ± 0.0 to 1775.0 ± 142.45 g at 25 weeks of age. The male birds were heavier at all stages as compared to their female counter parts.

The average survival rate of chicks in the age group of 4-5, 5-6, 6-8, 8-20 and 20-25 weeks was recorded to be 97.85, 95.60, 95.98, 62.28 and 83.65 per cent, respectively. The lowest survivability observed in the age group of 8-20 weeks was mainly due to devastation by super cyclone in the month of October 1999. The growth and production of birds survived after this super cyclone was badly affected. The egg production of hens was being recorded.

3.1.4. Horti-groundnut-poultry system

(SN Pandey, KS Risam, MPS Arya & LP Sahoo)

a. Vegetables crops

Table-6 shows the details of vegetables included under the above mentioned system. Seeds of bottlegourd (Rajendra Chamatkar, Hybrid Angad), radish (Pusa Chetki) and carrot (Pusa Kesar) and seedlings of brinjal (Pusa Uttam Pusa Hybrid 5) and tomato (Utkal Deepti, Hybrid Pooja) and cuttings of sweet potato were provided to four farmwomen who were growing also groundnut and raising poultry for on-farm research in this farming system. The seeds were made available as per their requirement.

Table 6 : Vegetable grown in Horti-groundnut-poultry system (1999-2000)

Sl. No. of farmwomen	Vegetable seeds/seedlings supplied					
	Bottlegourd seeds (No.)		Seedling of tomato (No.)	Seedling of Brinjal (No.)	Seeds of Radish (g)	Seeds of Carrot (g)
	Rajendra Chamatkar	Hybrid Angad	Utkal Deepti	Pusa Uttam	Pusa Chetki	Pusa Kesar
1.	10	10	300	175	40	15
2.	10	10	300	175	40	15
3.	10	10	300	175	40	15
4.	10	10	300	175	40	15

An evaluation of the yield of the vegetables grown under the horti-groundnut-poultry system revealed that during the period under report, only two farmwomen harvested an yield of 50.00 kg tomato (Utkal Deepti), 7.00 kg brinjal (Pusa Uttam) 2 kg bottlegourd (Rajendra Chamatkar) and 3.00 kg sweet potato (Table 7). The full harvest potenti. and suitability of particular varieites in this farming system will thus be reported in the next year.

Table-7: Yield of vegetables in (Kg) Horti-Groundnut-Poultry system (99-2000)

Sl. No. of farmwomen	Tomato (Utkal Deepti)	Brinjal (Pusa Uttam)	Bottlegourd (Rajendra Chamatkar)	Radish	Carrot	Sweet Potato
HGP 2	40.00	2.00	-----	*	*	1.00
HGP 4	10.00	5.00	2.00	*	*	2.00
Total	50.00	7.00	2.00			3.00

* Crop not harvested and left for seed production

b. Poultry production

Under this programme three scheduled caste families were provided with 10 four-week-old RIR chicks each to study their performance under scavenging conditions in horti-groundnut-poultry farming system. Two of the families belonged to marginal land holding categories whereas the third one belongs to landless category. The birds were routinely vaccinated and provided authelmintic dosing and mineral/vitamin supplementation. The family-wise means for weight of birds ranged from 177.5 ± 9.465 to 226.5 ± 11.157 g at 5 weeks of age; 196.1 ± 14.235 to 256.0 ± 13.517 g at 6 weeks of age; 296.4 ± 21.539 to 335.0 ± 25.055 g at 8 weeks of age; 616.7 ± 108.33 to 871.9 ± 61.86 g at 20 weeks of age; and 800.0 ± 0.0 to 1087.5 ± 127.0 g at 25 weeks of age. The males weighed heavier than females at all the stages.

The average survival rate of chicks in the age groups of 4-5, 5-6, 6-8, 8-20 and 20-25 weeks was found to be 100.00, 93.33, 92.86, 65.38 and 94.12 percent, respectively. The lowest survival rate recorded in the age group of 8-20 weeks was mainly due to devastation caused by Super Cyclone. The hens had started laying eggs. The egg production was being recorded by the farmwomen.

3.1.5. Horti-groundnut system

(SN Pandey, MPS Arya & LP Sahoo)

a. Vegetable cultivation

Seven farmwomen were involved in growing vegetables like tomato, brinjal, bottlegourd, sweet potato, chilli, radish and carrot (Table 8). The total harvest of vegetables recorded upto March 31, 2000 was 408 kg (Utkal Deepti) and 63 kg (Hybrid Pooja) of tomato; 98 kg (Pusa Uttam) of brinjal, 34.50 kg (Rajendra Chamatkar) of bottlegourd, 400 kg (Pusa Chetki) of radish and 20 kg (Pusa Kesar) of carrot (Table 8). Pusa Hybrid 5 of brinjal and Hybrid Angad of bottlegourd did not yield any fruits during the period under report.

Table-8 : Vegetables in Horti-groundnut system (1999-2000)

Farm family No.	Number of plant								Land area cover (m ²)	
	Tomato		Brinjal		Bottlegourd		Sweet Potato	Chilli (Sel 240)	Radish (Pusa Chetki)	Carrot (Pusa Kesar)
	Utkal Deepti	Hyb. Pooja	Pusa Uttam	Pusa Hyb. 5	Rajendra Chamatkar	Hyb. Angad				
HG1	196	68	109	-	19	19	-	-	28.00	28.00
HG2	101	53	117	-	-	-	-	-	-	-
HG3	264	-	113	-	-	-	-	-	-	-
HG4	50	37	91	-	-	-	-	10	24.00	-
HG5	35	27	-	-	-	-	-	12	-	-
HG6	35	11	42	19	-	-	60	-	-	-
HG7	25	8	48	13	-	-	-	-	-	-
Total	706	204	520	32	19	19	60	22	52.00	28.00

Table-9 : Yield of vegetable in Horti-Groundnut System (1999-2000)

Farm family No.	Yield (kg) upto 31.3.2000/vegetable (variety)					
	Tomato		Brinjal	Botlegourd	Radish	Carrot
	Utkal Deepti	Hyb. Pooja	Pusa Uttam	Rajendra Chamatkar	Pusa Chetki	Pusa Kesar
HG1	100.00	15.00	10.00	-	*	*
HG 2	50.00	-	25.00	-	50.00	20.00
HG 3	80.00	12.00	28.00	16.00	100.00	*
HG 4	95.00	15.00	-	12.00	*	*
HG 5	13.00	11.00	20.00	-	50.00	-
HG 6	20.00	-	-	6.50	*	*
HG 7	50.00	10.00	15.00	-	200.00	*
Total	408.00	63.00	98.00	34.50	400.00	20.00

* Crop was not harvested and left for seed production.

b. Evaluation of groundnut varieties with women perspective in farming system research

Since, groundnut is an economical source of high protein, efforts were made to fit this crop various farming systems. A field trial to study the response of women on the acceptability and performance of the six varieties of groundnut viz., NFP-101, R.B.46, ICGS-44, Girnar, PBS-8 and AK 12-24 with regard to agronomic characters like competition ability to weeds; easiness in stripping & decortication; and yield & biomass production potential was conducted on the farmer's field in Khamang Sasan

village. The experiment was laid out in randomized block design with three replications. The sowing was done on 01.3.2000 adopting recommended package of the cultivation practices.

Data recorded on germination 15 days after sowing revealed that variety AK 12-24 showed the maximum germination (11.33 seedlings per running metre). This was followed by R.B.-46, Girnar, PBS-8, ICGS-44 and NFP 101 (Table-10). The crops were at flower initiation stage on 31st March 2000.

At flower initiation stage the crop was attacked by the aphid. Different varieties, however, showed differential response to the attack of aphid. The attack was recorded using 0-5 scale, variety AK 12-24 was found the least affected with 0.33 level (Table-10), while NFP 101 and ICGS-44 had the highest level of attack (3.67 level each). Varieties RB-46 (0.67) and PBS8 (0.67) were found to be resistant to the attack of aphid.

Table-10 : Pre-sowing quality assessment, plant stand and level of aphid attack on Groundnut

Variety	Pre-sowing quality assessment				Plant stand inch	Level of aphid attack (0-5 scale)
	No. of seeds/ pod	Shelling quality	Seed size	Colour of Kernel		
NFP-101	2	Hard	Bold	Pinkish white	3.89	3.67
RB-46	2	Medium	Bold	-do-	9.00	0.67
ICGS-44	2	Medium	Medium	-do-	4.33	3.67
PBS-8	2	Hard	Small	-do-	6.33	0.67
Girnar	3	Soft	Medium	-do-	8.56	1.00
AK-12-24	2	Medium	Bold	-do-	11.33	0.33

While making pre-sowing assessment of pod and seed quality with women perspective like shelling quality, marketing acceptance for kernel size and colour besides field assessment from production point of view, it was observed that, variety AK-12-24 recorded all positive traits (Table-10). As per experience of the farmers of the village variety with 2 seeds/pod was the liking of most of the women farmers.

c. Evaluation of groundnut var. AK 12-24 under different farming system

Groundnut variety AK 12-24 was evaluated in the fields of 14 farmwomen under different farming systems. The crop was raised following all the recommended practices and sowing was done in the second fortnight of December, 1999. Crop of one of the farmwomen was completely damaged due to water logging. The number of seedling recorded at germination varied from 6.6 to 10.3/m² (Table 11). Weed population varied from 4.0 to 42.67/m² and pod yield was recorded 6.67 to 33.33 q/ha. Water logging, attack of white ant and weevils and damage by monkeys were the reasons behind lower yields. However, the crop was rated satisfactory in general by the farmwomen.

Table-11 : Germination weed count and yield of groundnut (*Arachis hypogea*) variety AK 12-24 under different farming systems

Sl. No.	Particulars of farming system	No. of plants/ m ²	No. of weeds/ m ²	Yield (q/ha)	Remarks
1.	HG 1	7.0	4.00	16.50	White ant damage
2.	HG 6	10.3	72.00	16.50	White ant damage
3.	HG 2	8.0	38.67	24.75	-----
4.	HGMU 2	8.4	34.67	33.33	-----
5.	HGMU 1	8.0	34.67	6.67	Monkey damage
6.	HG 5	9.6	8.0	19.80	White ant damage
7.	HGP 1	10.3	2.67	26.40	-----
8.	HGP 4	7.6	42.67	24.75	-----
9.	HGP 2	9.6	37.33	23.00	-----
10.	HGP 6	9.0	10.67	13.20	White ant damage
11.	G1	6.6	33.33	19.80	White ant damage
12.	HGP 3	9.0	26.33	11.55	White ant damage
13.	HGP 7	7.0	41.67	9.90	White ant damage

3.1.6 Horti-pulse (green gram & black gram) system

(SN Pandey, MPS Arya & LP Sahoo)

a. Vegetable growing

Twelve farmwomen adopted this system. They were provided with seedlings of tomato (vars. Utkal Deepti, Hybrid Pooja), brinjal (Pusa Uttam, Pusa Hybrid 5) and chilli (Sel.240); seeds of bottlegourd (vars. Rajendra Chamatkar, Hybrid Angada, radish (Pusa Chetki) and carrot (Pusa Kesar) and stem cuttings of sweet potato. The radish and carrot crops were not harvested and left for seed production by farmwomen and all other crops were damaged by monkeys.

b. Evaluation of pulses (green gram and black gram) under horti-pulse farming system

Pulses (*Vigna radiata welczek*) variety K 851 and black gram (*Vigna mung*) variety T-9 were evaluated at the fields of eleven farmwomen under different farming systems. The sowing was done in the last week of December, 1999 to first week of January, 2000. Out of eleven plots six plots were submerged due to sudden flow of canal water. The number of seedlings recorded from the unaffected plots at germination varied from 5.0 to 24.0 in green gram and 8.0 to 16.6 in black gram (Table 12, 13). Similarly, gram yield varied from 1.6 to 12.0 q/ha in green gram and 0.8 to 3.2 q/ha in black gram. Poor germination and damage by monkeys were among the major reasons/problems for poor yield.

Table-12 : Germination and yield of green gram (*Vigna radiata*) variety K-851 under different farming system

Sl. No.	Particulars of farming system	No. of plants/m ²	Yield (q/ha)	Remarks (Damage)
1.	HGMU 2	9.60	1.60	Monkey damage
2.	MU 1	15.60	2.00	Monkey damage
5.	MU 3	24.00	----	Due to canal water logging
8.	HPMU 2	9.70	2.40	Monkey damage
9.	HGMU 1	5.00	12.00	----
10.	HMU 13	17.30	2.00	Monkey damage

Table-13 : Germination and yield of black gram (*V. mung*) variety T-9 under different farming systems

Sl.No.	Particulars of farming system	No. of plants/m ²	Yield (q/ha)	Remarks (Damage)
1.	HGMU 2	11.3	3.20	Monkey damage
2.	MU 1	16.6	1.60	Monkey damage
3.	HPMU 2	9.0	0.80	Monkey damage
4.	HGMU 1	8.0	.80	Monkey damage
5.	HMU 13	10.6	1.60	Monkey damage

3.1.7 Inclusion of family nutritional aspect in the approved research project entitled 'Identification and improvement of farming systems suited to farmwomen in eastern India' (Suman Agrawal, Abha Singh)

Family nutritional aspect, which is very important for family food security, was included in the above-mentioned project in order to assess the nutritional status of families and to provide suitable interventions.

During the period under report the survey schedule for eliciting information on the nutritional status of families was prepared and pre-tested in the village selected for on-farm research.

3.1.8 Evaluation of vegetables (SN Pandey)

Since the research farm of NRCWA has not yet been developed, sets of experiments were undertaken in pots to generate preliminary yet useful information in vegetables like okra, tomato, brinjal and chilli. Some of these experiments have yielded useful results like (i) selection No. 240 in chilli, (ii) improvement in yield in okra cv. A-4

with seed pre-treatment in 1% urea solution, (iii) increased seed germination in okra cv. A-4 with gibberellic acid (100 ppm) plus urea (1%) seed pre-treatment, (v) freedom from root knot nematode in okra cv. A-4 with cow urine plus CPPU (0.1%) seed pre-treatment, (v) better performance of 'Utkal Deepti' tomato than Hybrid Pooja, and (vi) disease resistant wild Vitaceae plant which responded well to the application of gibberellic acid for its berry elongation and was also resistant to damage due to rain at berry ripening. Further, these results will also be tested in on-farm research mode.

a. Evaluation of chilli

Chilli (*Capsicum annuum L.*) cv. 'Utkal Ragini' and selection CHB 75 were evaluated. Seeds were sown in earthen pots (22 cm inner diameter) filled with equal quantity of soil and farm yard manure on March 26, 1999. Neem cake was added @ 150 g per pot to escape damage due to termite. Five seeds of 'Utkal Ragini' were sown in each of 34 pots. Separate sets of 34 plants were grown by transplanting in each of these two types to find out the effect of transplanting on growth, fruiting and fruit quality. Only one plant was retained in each pot of two sets of each chilli type. Keeping in view the possibility of some mortality of seedlings after transplanting, more plants were transplanted, so as to make equal number of plants *in situ* as well as transplantation.



Pic 3: Director, NRCWA viewing the performance of chilli selections

b. Plant variation

In 'Utkal Ragini', 13 out of 68 plants showed variation in plant growth and fruiting. Plants raised from seeds of CHB-75 gave a wide range of variation with only 3 uniform plants i.e. No. 223 (68 cm height), No. 235 (67 cm) and No.250 (60 cm). The segregants of these two types presented useful material for making some improved selections at NRCWA (Table-14).

Table 14 : Chief characteristics of chilli selections with 'Utkal Ragini' as a check variety recorded upto 31.8.1999

Variety/ Selection	Plant height (cm)	No. of branches per plant	No. of fruits/ plant	Yield/ plant (g)	No. of pickings	Organoleptic evaluation (score 10 each)			
						Colour	Appea- rance	Pungency	Overall
Utkal Ragini (Seedling in situ)	44.79	11.07	48.90	38.24	5	-	-	-	-
Utkal Ragini (Transplanted)	46.58	8.37	82.58	40.27	5	7.91	6.88	7.38	7.31
Selection 106	62.00	8.00	205.00	111.81	3	-	-	-	-
Selection 205	63.00	11.00	208.00	220.00	3	-	-	-	-
Selection 209	45.00	11.00	151.00	134.00	2	-	-	-	-
Selection 217	43.00	11.00	161.00	175.00	2	-	-	-	-
Selection 220	48.00	10.00	238.00	177.00	4	-	-	-	-
Selection 240	58.00	9.00	199.00	205.00	2	7.78	8.12	8.62	8.15

c. Plant growth and fruiting

Plant growth recorded 5 months after germination presented interesting results. Transplanted plants of 'Utkal Ragini' showed better growth than those raised *in situ*, as the latter was infested by thrips. Plants of 'Utkal Ragini' *in situ* showed less variation in height (38 – 55 cm) but more in the number of branches (5-15). Transplanted plants of this cultivar exhibited similar variation in height (38-54 cm) but lesser in branching (5 – 11) per plant. The mean plant height *in situ* (44.79 cm) as well as in transplantation (46.58 cm) was almost the same (Table-14).

Plants raised from seeds of CHB-75 showed a great variation in height (23 – 78 cm) but lesser in number of branches (2-8) per plant. These plants could be grouped into 6 categories according to their height. A large variation was also recorded in the time taken to the first picking, number of pickings; number, weight, colour and appearance of chilli and its pungency. These plants also varied greatly in yield from 2 chillies in one picking (plant No. 28) to 205 chillies in 3 pickings (selection 106) upto 31st August, 1999.

d. Number of Pickings

Plant varied greatly in number of pickings (1 to 5) upto August 31, 1999. 'Utkal Ragini' bore early and gave 5 pickings, whereas some promising selections gave 2-4 pickings (Table - 14).

e. Promising chilli selections

On the basis of good plant type, yield and quality scored through organoleptic evaluation, single plant selections were preliminary made from segregating population of CHB-75 (Selection 240) and 'Utkal Ragini' (Selection 205). Some high yielding



Pic-4: Chilli selection- 240 in bearing stage

plants of 'Utkal Ragini' (Selection 209, 217 and 220) were also selected. The chief characteristics of these selections alongwith 'Utkal Ragini' as a check variety are given in Table-13. Some high yielding selections gave 165 (selection 106), 161 (Selection 217) and 146 (Selection 240) chillies in a single picking. Selection 240 was adjudged better in appearance (Score 8.12 out of 10.00) and pungency (8.62) than 'Utkal Ragini' (6.88, 7.38) in organoleptic evaluation.

Hence six improved selections over commercial cv. 'Utkal Ragini' were identified for yield and fruit pungency. These selections were made from 'Utkal Ragini' and CHB-75 seeds.

b. Effect of seed pre-treatment and date of sowing on germination, plant growth, fruiting and fruit quality of okra (*Abelmoschus esculentus*)

Effort was made to try some seed pre-treatments with growth regulators and locally available cheap material like coconut water, cow urine and urea to improve seed germination and yield in okra, so as to fit it into the late harvested rice-based farming system. Pre-treated seeds were sown in pots. This preliminary study started in 1998-99 gave some useful results during the period under report for direct application and also generated new lines for future research. The details of the findings obtained during 1999-2000 are given below.

c. Plant Heights

Seed pre-treatment affected height appreciably in okra cv. A-4. Plant height in the main crop of okra recorded 12 weeks after germination was markedly influenced by different pre-treatments (Table 15). The smallest plant (42.66 cm) was obtained with

CPPU (0.1%), although unsoaked seeds also gave small plants, when sown on 15th January (45.25 cm) and 6th February (53.10 cm). However, water soaked seeds sown on 6 February gave a tall plant (62.22 cm). The treatment with GA3 gave results as with 25 ppm (58.71 cm), 50 ppm (65.25 cm) and 100 ppm gibberellic acid (64.00 cm). The tallest plant (76.00 cm) was obtained from seeds pre-treated with the combined treatment of cow urine and coconut water (25 ml each) and sown on 16th February. The rest treatments gave almost equal plant height (55.57 to 65.85 cm) when seeds were sown on 16th February.

Table 15 : Effect of seed pre-treatments on seed germination, growth and yield on okra (*Abelmoschus esculentus*) var. A-4

Sl No	Treatment (Seed soaking)	Sowing date	Plant height (cm)		No. of fruits per plant			Mean fruit length (cm)	Mean fruit weight (g)	Yield/plant (g)
			Main crop (12 weeks after germination)	Ratoon (12 weeks after Pruning)	Main crop	Ratoon crop	Total			
1	Unsoaking	Jan 15 99	45.25	45.28	9.82	3.40	13.22	11.00	10.09	133.38
2	Unsoaking	Feb 6, 99	53.10	53.00	11.66	5.70	17.36	10.75	9.15	158.84 (+ 19.08)
3	Distilled water	Do	62.22	49.42	10.20	5.44	15.64	10.25	9.16	143.26 (+ 7.40)
4	Distilled water	Do	-	-	-	-	-	-	-	-
5	GA3 (25 ppm)	Do	58.71	45.20	7.55	5.83	13.38	11.04	9.44	126.30 (-5.30)
6	GA3 (50 ppm)	Do	65.25	57.25	10.50	5.30	15.80	11.40	10.58	167.16 (+ 25.32)
7	GA3 (100 ppm)	Do	64.00	50.40	6.00	5.77	11.77	11.38	11.13	131.00 (-1.78)
8	Urea (1%)	Feb 16, 99	65.85	45.83	12.42	5.85	18.27	10.59	9.75	178.13 (+ 33.55)
9	Cow urine + CPPU (0.1%) + coconut water	Do	64.00	42.00	6.75	2.00	8.75	11.12	7.50	65.62 (-50.80)
10.	Coconut water	Do	65.00	38.40	9.12	3.75	12.87	11.52	8.78	112.99 (-15.28)
11.	GA3 (100 ppm) + Urea (1%)	Do	55.57	34.50	8.28	3.83	12.11	11.52	9.01	109.11 (-18.19)
12.	Cow urine + coconut water	Do	76.00	32.50	10.00	4.00	14.00	10.75	9.58	134.12 (+0.55)
13.	Cow urine + CPPU (0.1%)	Do	63.33	40.00	7.50	2.75	10.25	10.95	10.08	103.32 (-22.53)
14.	CPPU (0.1%)	Do	42.66	52.00	9.33	2.60	11.93	11.14	10.00	119.30 (-10.55)

Values in parentheses denote percentage increase (+) and decrease (-) over control sown on 15.1.1999

Table-16: Effect of season on fruit length in okra (*Abelmoschus esculentus*) var. A-4

Sl.No.	Treatment (Seed soaking)	Sowing date	Fruit length (cm)/Month					
			April	May	June	July	August	Mean
1.	Unsoaking	15.1.99	10.86	10.19	10.43	11.75	11.82	11.00
2.	Unsoaking	06.2.99	13.24	10.59	10.26	9.92	9.78	10.75
3.	Soaking in distilled water	06.2.99	14.26	11.38	11.00	9.94	4.71	10.25
4.	Soaking in GA3 (25 ppm)	06.2.99	12.26	11.32	11.59	10.21	9.92	11.04
5.	Soaking in GA3 (50 ppm)	06.2.99	12.38	11.32	11.31	11.32	10.70	11.40
6.	Soaking in GA3 (100 ppm)	06.2.99	10.89	11.17	12.23	12.97	9.65	11.38
7.	Soaking in Urea (1%)	16.2.99	11.24	10.94	12.18	10.23	8.37	10.59
8.	Soaking in Cow Urine + CPPU (1%) + Coconut water	16.2.99	12.53	10.92	8.60	10.58	13.00	11.12
9.	Soaking in coconut water	16.2.99	9.85	11.65	15.34	8.95	11.80	11.52
10.	Soaking in GA3 (100 ppm) + Urea (1%)	16.2.99	11.57	12.08	12.20	12.00	9.75	11.52
11.	Soaking in cow urine + coconut water	16.2.99	10.00	11.05	11.96	11.25	9.50	10.75
12.	Soaking in cow urine + CPPU (0.1%)	16.2.99	10.70	11.50	10.88	10.73	11.00	10.95
13.	Soaking in CPPU (0.1%)	16.2.99	13.06	11.33	10.86	9.20	11.27	11.14

Ratoon was maintained by pruning old unproductive plants on June 16, 1999. In ratoon crop the height of plants recorded 12 weeks after pruning did not give any trend with different pre-treatments, although plants raised from unsoaked seeds sown on 15th January and 6th February attained the same height as that in the main crop. Water soaked seeds sown on 6th February also gave almost the same height (49.42 cm). All other pre-treatments resulted smaller plants in ratoon crop than that in their respective main crop. Plants raised from water soaked seeds sown on 16th February were damaged at early stage and other data, therefore, could not be recorded.

d. Fruit Number

Plants raised from seeds pre-treated with urea (1%) gave the maximum number of fruits (18.27) per plant including the ratoon crop. February sown crop bore more fruits on plants raised from both unsoaked (17.36) as well as water soaked seeds

(15.64) than January sown crop (13.22). GA3 (50 ppm) and cow urine plus coconut water pre-treatment also gave good crop with 15.80 and 14.00 fruits, respectively. CPPU (0.1%) either alone (11.93) or in combination with cow urine (10.25) and cow urine plus coconut water (8.75) reduced bearing markedly.

e. Fruit Length

Fruit length was the least influenced by pre-treatments, which varied from 10.25 cm in water soaking to 11.52 cm in soaking coconut water and GA3 (100 ppm) plus urea (1%). Plants raised from unsoaked seeds sown on 15 January (11.00 cm) and 6 February (10.75 cm) recorded almost the same fruit length. The effect of season on fruit length, however, did not show any pattern.

f. Fruit Weight

Fruit weight was influenced by pre-treatments, which varied from 7.5 g with Combination of cow urine, CPPU and coconut water to 11.13 g with GA3 (100 ppm). Fruits borne on plants raised from unsoaked seeds sown 15th January (10.09 g) and 6th February (9.15 g) and water soaked seeds sown on 6th February (9.16 g) recorded almost the same weight (Table 15, 16). Since picking was done as and when a fruit was ready for harvest, the number of fruits per plant had no effect on the fruit weight.

g. Yield

Urea (1%) pre-treatment gave the maximum yield per plant (178.13 g), which was an increase of 33.55% over January sown control (133.38 g). February sown crop gave higher yields in both unsoaked (158.84 g) and water soaked seeds (143.26 g) recording 19.08% and 7.40% increase respectively over January sown crop. GA3 (50 ppm) pre-treatment recorded 25.32% increase in yield (167.16 g) over control. The lower concentration (25 ppm) of gibberellic acid reduced yield slightly. The CPPU alone (119.3 g) and in combination with cow urine (103.32 g) reduced the yield appreciably while its combination with cow urine and coconut water together gave least yield (65.62 g), although cow urine plus coconut water did not alter the yield (134.12 g).

h. Fruit shelf-life

Fruit shelf-life was recorded during May-August, 1999. Okra fruits stored at room temperatures under Bhubaneswar conditions varied in mean shelf-life narrowly by a day from 2 days in unsoaked January sown crop to 3 days in cow urine plus coconut water pre-treatment. GA3 (100 ppm) plus urea (1%) induced slightly longer shelf-life (2.2 days) than January sown crop (Table 17). Fruits lost the mean fresh weight 12% in January sown crop to 24.79% in that of sown on 6th February, which made fruits loose and unmarketable. Among various pre-treatments, the mean fresh fruit weight loss varied from 12% in the combination of cow urine and CPPU to 30.37% in GA3 (25 ppm).

Table 17 : Mean shelf-life (May to August) of fruits of Okra cv. A-4 at room temperature under Bhubaneswar conditions

Sl. No	Treatment (Seed soaking)	Date of sowing	Fruit weight (g)			% Weight	Shelf life
			Initial	Final	Loss	Loss	(Days)
1.	Unsoaking	15.1.99	125.00	110.00	15.00	12.00	2.00
2.	Unsoaking	06.2.99	50.41	37.91	12.5	24.79	2.5
3.	Soaking in distilled water	06.2.99	53.33	43.55	9.78	18.33	2.6
4.	Soaking in GA3 (25 ppm)	06.2.99	56.27	39.18	17.09	30.37	2.7
5.	Soaking in GA3 (50 ppm)	06.2.99	49.33	40.33	9.00	18.24	2.4
6.	Soaking in GA3 (100 ppm)	06.2.99	44.00	32.20	9.8	22.27	2.3
7.	Soaking in Urea (1%)	16.2.99	42.50	35.00	7.5	17.64	2.1
8.	Soaking in Coconut water	16.2.99	50.00	36.66	13.4	26.68	2.6
9.	Soaking in GA3 (100 ppm) + Urea (1%)	16.2.99	50.00	35.00	15.00	30.00	2.2
10.	Soaking in cow urine + coconut water	16.2.99	50.00	42.5	7.5	15.00	3.00
11.	Soaking in cow urine + CPPU (0.1%)	16.2.99	62.50	55.00	7.5	12.00	2.5
12.	Soaking in CPPU (0.1%)	16.2.99	25.00	20.00	5.00	20.00	2.00

Interestingly, GA3 (100 ppm) plus urea (1%) pretreatment induced fruits to loose more fresh weight (30% in 2.2 days) as against cow urine plus coconut water (15% in 3 days) and cow urine plus CPPU (12% in 2.5 days). All pre-treatments and sowing in February induced longer shelf-life in okra fruits (2.1 to 3 days) except CCPU alone, which maintained the same duration (2 days) as that in January sown crop.

i. Organoleptic quality

Fruits borne on the plants raised from seeds pretreated with GA3 (100 ppm) alone and in combination with urea (1%) were adjudged most acceptable by a panel of judges with high scoring for pulp consistency after cooking (7.41 & 7.00), tastes (8.12 & 7.35), palatability/satisfaction level (7.81 & 7.5) and overall acceptability (7.61 & 7.13) on 10 point score. Incidentally, all pre-treatments scored better than unsoaked control in all respects (Table 18).

Table-18: Effect of seed pre-treatment on organoleptic quality of okra cv. A-4

Sl.No	Treatment (Seed soaking)	Date of sowing	Organoleptic evaluation (10 scores for each)			Overall
			Pulp consistency	Taste	Palatability (Satisfaction level)	
1	Unsoaking	15.1.99	5.60	4.56	4.56	4.63
2	Unsoaking	06.2.99	5.88	5.98	5.96	6.19
3	Soaking in distilled water	06.2.99	6.47	7.12	7.17	6.83
4	Soaking in GA3 (25 ppm)	06.2.99	6.00	6.83	6.83	6.33
5	Soaking in GA3 (50 ppm)	06.2.99	6.58	7.38	7.31	7.08
6	Soaking in GA3 (100 ppm)	06.2.99	7.41	8.12	7.81	7.61
7	Soaking in Urea (1%)	16.2.99	6.37	6.90	6.95	6.68
8	Soaking in Coconut water	16.2.99	6.25	7.16	7.16	7.16
9	Soaking in GA3 (100 ppm) + Urea (1%)	16.2.99	7.00	7.35	7.50	7.13

j. Root growth

GA3 (25 ppm) pre-treatment gave heaviest (70.75 g) root followed by cow urine plus coconut water (62.5 g) and GA3 (100 ppm) with 49.44 g as against unsoaked seeds sown in January (33.33 g) and February (41.66 g). Cow urine plus coconut water gave greatest root elongation (49 cm) as against unsoaked seeds sown in January (38.33 cm) and February (35.50 cm). All other pre-treatments varied in root length from 22 cm in CPPU pretreatment to 37.33 cm in combined treatment of cow urine and CPPU, which produced narrow root system with 8.66 cm breadth as against 12.37 cm in unsoaked seeds sown in January (Table 19). Pre-treatments influenced the number of primary roots appreciably varying from 15 in cow urine plus CPPU to 37 in CPPU as against 30.66 and 27.33 in unsoaked seeds sown in January and February, respectively.

Table 19 : Effect of seed pre-treatment on root growth in okra cv. A-4

Sl. No	Treatment (Seed soaking)	Sowing date	Root fresh weight (g) (Mean)	No. of primary roots (Mean)	Length of main root (cm)	Maximum breadth of root (cm) (Mean)	No. of knots of nematodes (Mean)	Remarks
1.	Unsoaking	15.01.99	33.33	30.66	38.33	12.37	7.00	In one plant, a tuft of very fine roots at bottom, in another plant white roots
2.	Unsoaking	06.2.99	41.66	27.33	35.50	11.16	33.83	In one plant, all roots on one side, other side damaged by insect
3.	Soaking in water	06.2.99	36.25	27.12	27.00	9.80	4.63	
4.	Soaking in GA3 (25 ppm)	06.2.99	70.75	33.20	32.60	12.00	13.50	
5.	Soaking in GA3 (50 ppm)	06.2.99	43.33	29.00	29.00	10.33	4.83	
6.	Soaking in GA3 (100 ppm)	06.2.99	49.44	31.22	30.00	10.77	2.88	In one plant, all primary roots in periphery at the same level
7.	Soaking in Urea (1%)	16.2.99	40.00	29.71	27.28	10.57	2.28	
8.	Soaking in cow urine + CPPU + Coconut water	16.2.99	33.33	23.66	32.00	9.00	0.66	
9.	Soaking in coconut water	16.2.99	56.25	28.50	25.75	10.00	11.75	In one plant, very short primary roots
10.	Soaking in GA3 (100 ppm) + urea (1%)	16.2.99	48.75	26.50	25.00	11.66	6.00	
11.	Soaking in cow urine + coconut water	16.2.99	62.50	16.00	49.00	10.00	13.66	
12.	Soaking in cow urine + CPPU (0.1%)	16.2.99	29.37	15.00	37.33	8.66	----	
13.	Soaking in CPPU (0.1%)	16.2.99	37.00	37.00	22.00	10.00	3.00	

k. Nematode infestation

Okra plants raised from seeds sown on 6 February showed more infestation (33.83 knots/root). Cow urine plus CPPU pre-treatment, however, resulted in plants completely free from nematodes infestation (Table 19). Other pre-treatments showing lesser number of knots per root are cow urine + CPPU + coconut water (0.66), urea

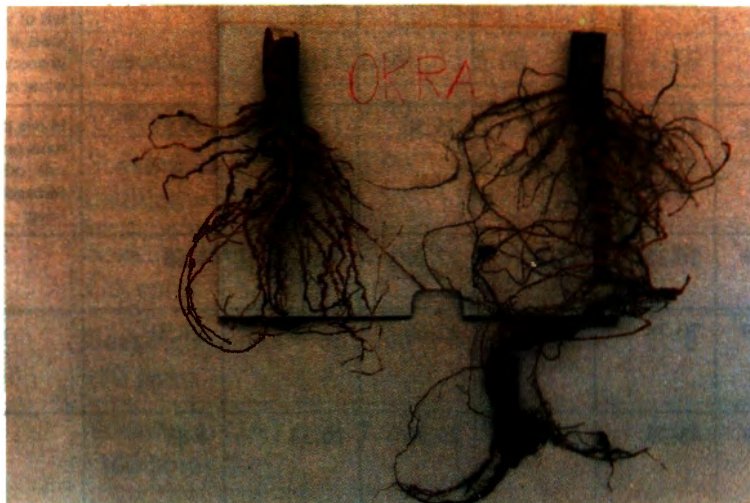


Fig-5: Control of nematode with Cow Urine + CPPU
(L) Symptoms of root knot in controlled conditions (R) Healthy roots after treatment

(2.28), GA3 100 ppm (2.88), CPPU (3.00) and GA3 50 ppm (4.83). Incidentally, water soaked seeds sown in February also showed lesser infestation (4.63). Cow urine plus CPPU pre-treatments appear promising for checking nematodes infestation in okra.

Hence seed pre-treatment of okra cv. A-4 soaking in urea (1%) solution for 24 h before sowing gave the maximum yield. Soaking seeds in gibberellic acid (100 ppm) plus urea (1%) solution for 24 h before sowing gave the maximum seed germination in okra cv. A-4. Soaking seeds in cow urine plus CPPU (0.1% solution for 24 h before sowing produced plants completely free from nematodes.

3.1.9 Evaluation of tomato

Tomato (*Lycopersicon esculentus* L.) vars. 'Utkal Deepti' and Hybrid Pooja were grown in earthen pots (22 cm inner diameter) filled with soil, FYM and neem cake dust on December 5, 1999 and January 10, 2000 to evaluate their performance with different dates of transplanting. In all, 50 plants of 'Utkal Deepti' were transplanted on the earlier date, of which 7 plants were later damaged. The remaining plants bore good crop with total yield of 22.273 kg tomatoes and 26.97 mean number of fruits and 517.98 g mean yield per plant. The harvest lasted for 32 days (Table 20). The mean fruit size (19.205 g) was, however, small. The seeds of Hybrid Pooja was received late, so it could not be transplanted on earlier date. 'Utkal Deepti' recorded good root growth (Table 20).

'Utkal Deepti' and 'Hybrid Pooja' transplanted in 15 pots each at the later date put forth the same plant height (40.83 cm and 41.92 cm) 72 days after transplanting by 22nd March, 2000. Root growth of 'Utkal Deepti' and Hybrid 'Pooja' transplanted at the later date will be presented in the next report because the plants continued bearing and the root growth could thus not be recorded during the period under report.

Table 20 : Growth and fruiting of tomato

Variety	Transplanting		Plant height (cm)		Harvesting duration (No. of days)	Fruit number		Fruit weight (g)	Yield		Root growth				
	Date	No. of plants		2 arch		0 arch	Total		Per plant	Total (kg)	Per plant (g)	Ax. length (cm)	Ax. spread (cm)	Height (g)	Diameter
		Rapidly	Survive												
Utkal Deepthi	12.99	0	3	---	---	72.00 (21.2.00 - 24.3.00)	1160	26.97	19.205	22.273	517.98	28.03	13.41	12.79	fibrous
Utkal Deepthi	0.1.00	5	2	40.83	41.07	*						**			
Hybrid Pooja	0.1.00	5	2	41.92	41.60	*						**			

* Did not take place before 31.3.2000

** Plants continued bearing, so yield and root data will be presented in the next report

3.1.10 Performance of brinjal

Brinjal (*Solanum melongena*) cultivar Pusa Uttam was transplanted in earthen pots (22 cm inner diameter) filled with soil, FYM and neem cake dust on December, 5 and 27, 1999 and January 10, 2000 to find out the effect of transplanting time on the growth and fruiting. 'Pusa Hybrid 5' was transplanted alongwith 'Pusa Uttam' on January 10, 2000 to study the performance of these two varieties. Both varieties exhibited good plant survival (84% to 96 %). 'Pusa Uttam' plants attained good height on 30.3.2000 (46.00 & 52.75 cm) after transplanting on two dates in the previous December. 'Pusa Hybrid 5', however, showed longer height (45 cm) than 'Pusa Uttam' (33.58 cm) on 30.3.2000 when both varieties were transplanted on January 10, 2000. 'Pusa Uttam' transplanted on December 5, 1999 completed its bearing during the period under report. All plants gave a total of 65 fruits and 6.625 kg yield. The per plant yield was small (2.6 fruits, 265 g) with mean fruit weight of 101.92 g. The plants transplanted on two later dates continued bearing during the period under study and the complete yield data could, therefore, not be available during the period under report.

'Pusa Hybrid 5' was found susceptible to root knot nematode. However, the plants grew rapidly. The effect of nematode's infestation on plant growth and fruiting is in progress.

Table 21 : Growth and fruiting of brinjal

Variety	Transplanting		Plant height (cm)		Fruit number (upto 31.3.2000)		Fruit weight (g)	Yield (upto 31.3.2000)	Remark			
	Date	No. of plants		22.3.2000	30.3.2000	Total			Per plant	Total (kg)	Per plant (g)	
		Transplanted	Survived									
Pusa Uttam	5.12.1999	25	24 (96)	42.54	46.00	65.00	2.60	101.92	6.625	265.00		
Pusa Uttam	27.12.1999	20	17 (85)	47.17	52.75	9.00	1.00	69.44	0.625	69.44		
Pusa Uttam	10.1.2000	20	18 (90)	27.72	33.58	-	-	-	-	-		
Pusa Hybrid 5	10.1.2000	25	21 (84)	32.95	45.00	-	-	-	-	-	Susceptible to root knot nematode	

* Figures in parentheses show percentage survival

3.1.11 Evaluation of grape (SN Pandey)

A disease resistant wild type related to grape family vitaceae was collected by exploring thick forests at Khandagiri near Bhubaneswar in July, 1999 when the plants were in flowering and fruiting stages. This appears a useful breeding material for resistance against diseases and sustaining healthy fruit growth and proper ripening even during rainy season. Efforts were made to propagate this material and to undertake some experiment for enlarging berry size.

Stem (cane) cuttings were pretreated with coconut water to facilitate rooting through increased cell division, as coconut water is reported to contain cytokinin. Out of 15 cuttings planted on 15.7.99 only 3 sprouted which attained a height of 46.25 and 10 cm (mean 27 cm) on 22.9.99. The tallest plant also put forth panicles at this stage. Two plants flowered in October. These two plants set 8 fruits from GA3 treated 117 flowers as against 7 fruits from 85 flowers in control. Interestingly, berries responded to gibberellic acid for elongation. Seeds extracted from berries collected from forest on 7.10.1999 did not germinate. Seeds soaked in water gave darker brown leachate than those soaked in coconut water, GA3 (1500 ppm) and their combination. None of pre-treatments induced germination in seeds.

3.2 Improvements in backyard poultry farming for farmwomen of different Categories

(KS Risam)

Village Khamang Sasan of Balipatna block of Khurda district, Orissa was selected for conducting the research.



Fig-6: Director, NRCWA launching the poultry project

3.2.1 Selection of farmwomen for participatory research

Twenty one (21) farmwomen belonging to different castes and land holding categories were identified for participatory (on-farm) research in the project.

3.2.2 Rearing chicks in backyard

In the first phase 4 weeks old chicks of RIR breed were procured from Central Poultry Breeding Farm, Bhubaneswar. The chicks were provided for rearing in the backyards of identified farmwomen under scavenging conditions. In all 206 chicks were reared in the backyards of 21 farmwomen of different categories to evaluate their performance in village/farmers conditions. Simultaneously correspondences and contacts were made to procure the chicks/eggs of different village types/rural poultry strains developed by various institutes/organisations. However, the procurement process was hampered due to paucity of funds, super cyclone and its after effects.

3.2.3 Prophylactic measures undertaken

The chicks were vaccinated against prevalent diseases (viz. RD, Fowl pox) as per routine. The birds were also routinely provided with anthelmintic dosing, vitamin and mineral supplementation.

3.2.4 Performance indicators

Growth : The body weight of chicks recorded at 5,6,8,20 and 25 weeks are given in tables 22,23 & 24. The details are as under:

Five week body weight : The overall mean for body weight of chicks at 5 weeks of age was estimated 203.1 ± 2.943 g. The family wise average five week body weight varied from 167.5 ± 11.553 to 227.5 ± 9.465 g. The individual chick weight ranged from 100 to 300 g. The males had higher weight (247.5 ± 8.036 g) than females (194.8 ± 3.190 g) at this age.

Six week body weight: The average body weight of chicks at six weeks of age was recorded to be 245.5 ± 3.964 g. The family-wise average was observed to vary from 189.3 ± 21.026 to 334.5 ± 24.251 g. the individual chick weight at this age ranged from 125 to 500 g. The male and female chicks weighed 290.0 ± 10.373 and 239.0 ± 4.067 g, respectively.

Eight week body weight: The overall mean body weight of chicks at eight weeks of age was found to be 332.1 ± 5.256 g. The family-wise averages ranged from 272.5 ± 15.186 to 457.2 ± 34.892 g. The individual chick weight at this age varied from 225 to 700 g. The sex-wise average weight was found to be 393.1 ± 13.647 g for males and 319.7 ± 5.798 g for females.

Twenty week body weight: The average body weight of birds at twenty weeks of age was estimated to be 977.8 ± 24.81 g. The group averages varied from 616.7 ± 108.33 to 1384.4 ± 67.47 g. The individual weight ranged from 425 to 1675 g. The weight of males was almost 35 per cent higher than females.

Twenty five week body weight : The mean body weight of birds at twenty five weeks of age was found to be 1214.8 ± 36.55 g. the family wise average 25 week body weight varied from 800.0 ± 0.0 to 1775.0 ± 142.45 g. The individual birds weight ranged from 500 to 2300 g. Cocks weighed higher (1481.3 ± 119.15) than hens (1175.3 ± 36.38 g).

Table 22 : Family-wise means for body weight of RIR Chicks at different ages under backyard

Sl. No	Farmwomen	Body weight (Mean \pm S.E.) in g				
		5 week	6 week	8 week	20 week	25 week
1.	GS 1	167.5 \pm 11.553 (10)	262.8 \pm 15.901 (9)	305.6 \pm 22.169(8)	1085.7 \pm 72.96 (7)	1400.0 \pm 72.37 (7)
2.	GS 2	178.1 \pm 7.376 (8)	256.4 \pm 12.9989 (7)	346.4 \pm 18.443 (7)	991.7 \pm 35.58 (6)	-----
3.	GS 3	226.0 \pm 11.470(10)	270.5 \pm 13.875 (10)	310.5 \pm 17.455 (10)	-----	-----
4.	GM 1	187.0 \pm 13.275 (10)	247.0 \pm 15.389 (10)	388.0 \pm 19.224 (10)	1384.4 \pm 67.47 (8)	1556.3 \pm 101.52(8)
5.	GM 2	210.0 \pm 18.333(10)	334.5 \pm 24.251(10)	457.2 \pm 34.892 (9)	1262.5 \pm 91.57 (4)	1433.3 \pm 176.38(3)
6.	GM 3	199.5 \pm 12.325 (10)	241.0 \pm 11.325 (10)	303.5 \pm 15.493 (10)	785.0 \pm 32.53(10)	1216.7 \pm 87.80 (9)
7.	SCM 1	192.5 \pm 17.292 (10)	232.5 \pm 13.298(10)	327.5 \pm 20.211 (10)	1250.0 \pm 0.0 (1)	1500.0 \pm 0.0 (1)
8.	SCM 2	198.0 \pm 13.626 (10)	256.0 \pm 13.517 (10)	335.0 \pm 25.055 (10)	871.9 \pm 61.86(8)	1087.5 \pm 127.01(8)
9.	SCM 3	217.5 \pm 11.384 (10)	248.5 \pm 4.658 (10)	367.5 \pm 9.167 (10)	970.8 \pm 29.17 (6)	1125.0 \pm 81.14 (6)
10.	SCM 4	200.0 \pm 16.733 (10)	251.0 \pm 20.776 (10)	359.5 \pm 28.795 (10)	916.7 \pm 68.21 (8)	991.7 \pm 76.83 (6)
11.	SCM 5	211.0 \pm 14.754 (10)	206.7 \pm 15.899 (9)	283.3 \pm 13.176 (9)	800.0 \pm 71.44 (4)	925.0 \pm 87.80 (3)
12.	SCM 6	217.5 \pm 15.903 (10)	230.0 \pm 12.803 (10)	318.3 \pm 18.708 (9)	846.4 \pm 36.36 (7)	1015.0 \pm 76.49 (5)
13.	SCM 7	186.1 \pm 12.577 (9)	215.6 \pm 12.031 (9)	288.9 \pm 14.832 (9)	941.7 \pm 120.19 (3)	1000.0 \pm 250.0 (3)
14.	SCM 8	177.5 \pm 9.465 (10)	196.1 \pm 14.235 (9)	296.4 \pm 21.539 (7)	616.7 \pm 108.33 (2)	800.0 \pm 0.0 (1)
15.	SCLL 1	203.3 \pm 8.975 (9)	269.4 \pm 11.590 (9)	357.2 \pm 14.291 (9)	1045.00 \pm 115.36(6)	1290.0 \pm 84.26 (6)
16.	SCLL 2	192.5 \pm 11.211 (10)	236.0 \pm 12.249 (10)	283.3 \pm 16.008 (10)	800.0 \pm 38.19 (3)	1012.5 \pm 7.22 (3)
17.	SCLL 3	226.5 \pm 11.157 (10)	238.9 \pm 10.300 (9)	316.1 \pm 10.334 (9)	81.4 \pm 78.57 (7)	889.3 \pm 107.99 (7)
18.	SCLL 4	227.5 \pm 9.465 (10)	229.5 \pm 11.702 (10)	272.5 \pm 15.816 (10)	875.0 \pm 50.00 (2)	1000.0 \pm 0.0 (1)
19.	SCLL 5	217.5 \pm 11.211 (10)	189.3 \pm 21.026 (7)	290.0 \pm 23.224 (6)	795.0 \pm 94.01 (5)	910.0 \pm 65.95 (5)
20.	SCLL 6	221.0 \pm 12.556 (10)	291.0 \pm 14.061 (10)	339.5 \pm 23.147 (10)	1245.8 \pm 117.69 (6)	1775.0 \pm 142.45(6)
21.	SCLL 7	201.7 \pm 7.149 (6)	270.8 \pm 10.364 (6)	391.0 \pm 23.043 (5)	1260.0 \pm 53.97 (5)	1600.0 \pm 44.72 (5)
Overall mean		203.1 \pm 2.943 (202)	245.5 \pm 3.946 (194)	332.1 \pm 5.256 (187)	977.8 \pm 24.81 (108)	1214.8 \pm 36.55 (93)

GS: General Small // GM: General Marginal //

SCM Scheduled Caste Marginal // SCLL: Scheduled Caste Landless

Table 23 : Category-wise means for body weight of RIR chicken at different ages under backyard conditions

Category of farmwomen		Body weight (Mean+ S.E.) in g.				
Social	Land holding	5 week	6 week	8 week	20 week	25 week
General/Upper caste	Small	191.4 ± 7.800 (28)	264.0 ± 8.176 (26)	330.4 ± 11.404 (25)	1042.3 ± 50.64 (13)	1400.0 ± 72.37 (7)
	Marginal	198.8 ± 8.471 (30)	274.2 ± 12.710 (30)	380.3 ± 17.733 (29)	1089.8 ± 68.90 (22)	1385.0 ± 69.12 (20)
Scheduled Caste	Marginal	200.2 ± 5.048 (79)	230.5 ± 5.275 (77)	324.1 ± 7.611 (74)	861.4 +32.34 (39)	1046.9 ± 45.72 (33)
	Land less	213.7 ± 4.217 (65)	246.6 ± 6.182 (61)	317.7 ± 8.154 (59)	974.6 ± 55.21 (34)	1240.2 ± 71.61 (33)
Overall Mean		203.1 ± 2.943 (202)	245.5 ± 3.946 (194)	332.1 ± 5.256 (187)	977.8 ± 24.81 (108)	1214.8 ± 36.55 (93)

N.B. Figures in parenthesis indicate number of chicks available at a particular age

Table 24 : Sex-wise means for body weight of RIR chicken at different ages under backyard conditions

Age Group	Body weight (mean + S.E.) in g.		
	Male	Female	Pooled
5 weeks	247.5 ± 8.036	194.8 ± 3.190	203.1 ± 2.943
6 weeks	290.0 ± 10.373	239.0 ± 4.067	245.5 ± 3.964
8 weeks	393.1 ± 13.647	319.7 ± 5.798	332.1 ± 5.256
20 weeks	1240.0 ± 61.179	915.0 ± 26.990	977.8 ± 24.814
25 weeks	1481.3 ± 119.15	1175.3 ± 36.38	1214.8 ± 36.55

3.2.5 Survival

The percentage of survival among different age groups and causes of mortality in chicken under backyard rearing conditions are given in tables, 25 & 26, respectively.

The average survival rate of chicks in age groups of 4-5, 5-6, 6-8, 8-20 and 20-25 weeks were observed to be 98.06, 96.04, 96.39, 57.75 and 86.11 per cent, respectively. The lowest survival rate (57.75 percent) observed in age group of 8-20

weeks was mainly due to death of birds by devastation caused during super cyclone. It has shown its after effects on next age group as well.

The sex-wise survival rates were found to be 50.00 and 44.51 per cent for males and females, respectively. The main causes responsible for mortality were observed to be enteritis (15.04%), predation (16.81%) and collapsing of houses during super cyclone (68.14%).

Table-25: Survival rate of RIR chicken under backyard conditions

Age Groups	Male		Female		Total	
	Number	Survival Rate (%)	Number	Survival Rate (%)	Number	Survival Rate (%)
4-5 weeks	24 (24)	100	178 (182)	97.80	202 (206)	98.06
5-6 weeks	23 (24)	95.83	171 (178)	96.07	194 (202)	96.04
6-8 weeks	22 (23)	95.65	165 (171)	96.49	187 (194)	96.39
8-20 weeks	15 (22)	68.18	93 (165)	56.36	108 (187)	57.75
20-25 weeks	12 (15)	80.00	81 (93)	87.10	93 (108)	86.11
Overall	12 (24)	50.00	81 (182)	44.51	93 (206)	45.15

N.B. Figures in parenthesis are number of birds available at the beginning of age group

Table 26 : Causes of mortality in RIR chicken under backyard conditions

Cause	Number	Percentage
Enteritis	17	15.04
Predation	19	16.81
Super Cyclone	77	68.14

3.2.6 Egg production

The hens are in lay. The farmwomen have been provided formatted notebooks for recording egg production. The data will be compiled at 40 weeks and thereafter.

3.3 A gender study on "Agriculture and Household Economy of Tribals of Orissa"

(BN Sadangi & HK Dash)

The research project aims at studying various segments of household economy of tribals, gender role in various agriculture and allied sectors and constraints faced by tribals in general and tribal women in particular in changed circumstance.

During the period under report available statistics of tribals of Orissa was collected, sampling plan was designed. An interview schedule was developed and pre-tested at Kandha dominated villages Kaksabali, Indira Pada, Dadapada, Kirmaha Lipange near G. Udayagiri town of Kandhamal District (Orissa) with the help of an interpreter knowing the dialect of the kandha tribe (called kui) and oriya.

The salient observations made during pre-testing of interview schedule helped in modifying it.

3.4 Development and testing of extension methods for farmwomen in Eastern India

(BN Sadangi & HK Dash)

The World Bank report "Improving Extension Services for Women Farmers" was reviewed. The report on TEWA (Training and Extension for Women in Agriculture), Orissa was studied and discussions with project manager, supervisors and grass-root level workers were held. Based on these exercises an interview schedule has been prepared for undertaking analysis on exposure and preferences of farmwomen for extension methods. Also the blocks for data collection have been finalized.

3.5 Studies on technological empowerment of women in rural aquaculture

(PK Sahoo & B.N. Sadangi)

A survey of the families on resource base for aquaculture was undertaken. Twenty women belonging to different economic groups having small backyard pond were selected. In



Pic-7: Women in pond management

the month of July – August, 1999 a training on "Induce breeding of carps in farmers field" was



Pic-8: Women in aquaculture training

field" was organised.

Subsequently, fries of Indian major carps were distributed among the selected women. The technique of releasing the fries in the pond was demonstrated in order to check the mortality of the

fries. Women were briefed about the systematic aquaculture practices. Due to Super Cyclone fries released into the pond escaped through the over flowing flood water and

all the ponds of the village were badly damaged, water quality was degraded due to decaying of leaves and branches.

Further on 12th February 2000, training was organised on pond preparation and pond management. Topics like soil quality, water quality management, application of lime for pond fertilization and water pH maintenance, weed control, weed fish eradication and artificial feeding were included in the training. Literature on pond management was provided in the local language.

3.6 Occupational health hazards of farmwomen in coastal Orissa

(Hema Pandey, Suman Agarwal & Abha Singh)

Available literature was reviewed for identification of various agricultural operations in different production system in which farmwomen are involved. An interview schedule was prepared, is ready for pre-testing. The areas have been identified for data collection.

3.7 Standardization of women specific field practices in rice for Orissa

(MPS Arya & LP Sahoo)

The available literature was reviewed. The interview schedule was developed and is under pre-testing.

3.8 Identification and evaluation of interactive learning modules for dissemination of home stead technologies

(Suman Agarwal, Hema Pandey & Abha Singh)

The relevant literature was collected for the preparation of the script for module development.

3.9 Improvement in storage practices of seeds and grains of important crops with women perspective

(Mrs Laxmi Priya Sahoo & MPS Arya)

Some indigenous technological knowledge related to seed storage was identified for making studies.

An interview schedule was developed for collecting information regarding women's role in seed management and ITKs used by women for storing seeds.

3.10 Progress of Research Work at Sub-Centre, CIAE, Bhopal

3.10.1 Comparison of improved and local weeding equipments in soybean crop with women workers.

A study was conducted to compare the performance of improved weeding tool (wheel



Pic-9: Weeding in soyabean with CIAE wheel hoe

hoe) and local tool (hand hoe) for weeding & interculture operation in soybean crop with six women subjects using split plot design. With each subject, four replications were carried out. Each trial was of 2 hours duration. Data on heart rate of workers were recorded continuously through out the trial period. Area covered with the tool/weeder and the weeding efficiency was also noted. Mean values of heart rate during work were 101.6 and 126.6 beats/min for hand hoe and wheel hoe, respectively. The corresponding values of AHR (difference between working and resting heart rate) were

21.1 and 40.7 beats/min. The area covered by wheel hoe was about four and half times that of hand hoe i.e. 205.5 m²/h as against 44.7m² /h. The heart rate data indicated high effort requirement per unit time in the operation of wheel hoe. However, as the output is four and half times as that of hand hoe, the energy requirement per m² of area covered would be about 1/3 to that of hand hoe. Therefore, though the wheel hoe has high work capacity and lower effort requirement per unit of area weeded, the effort requirement per unit time is higher which restricts its adoption by the workers on a large scale.

3.10.2 Heart rate responses of women workers during soybean harvesting by using local sickle, improved sickle and self propelled reaper.

A study was conducted to assess the physiological workload involved in operation of local sickle, improved sickle and self-propelled reaper. Trial duration was two hours whereas for reaper it was 15 minutes. Four women workers participated in the experiment and three replications were carried out for each treatment. Data on heart rate were recorded continuously throughout the trial duration with Polar heart rate monitor. Output during the trial period was also noted along with other relevant data. Mean values of heart rate data were 105.4, 108.4, 146.4. beats/min for improved sickle & self propelled reaper respectively. The corresponding value of AHR (increase in heart rate over resting value) was 24.9, 29.8 & 60 beats/min, respectively. The

values of mean area harvested were 184, 207.3 and 3968 m² /h respectively. The values of A 1-1R/ m² of area harvested were 8.2 beats/min for improved sickle as against 8.6 beats/min for local sickle. The study indicated that work with improved sickle had lower heart rate values indicating less physiological workload than that of local sickle. During the operation of self propelled reaper the cardiac cost involved was too high i.e. AHR being 60 beats/min and workers felt discomfort even after 15 minutes of operation while working at a speed of 3.3 km/h. Vibrations of the handle of the reaper was also one of the factors leading to discomfort experienced by women operators during work.

4. TRAININGS ORGANISED

4.1. Trainers' Trainings

The centre has organised the following trainers' training programmes for the scientists/ extension functionaries of the ICAR Institutes/ SAUs/ State Departments of Agriculture, Horticulture, Animal Husbandry and Fishery to sensitize them on the productive roles of women farmers and train them on application of appropriate technologies in agriculture and allied fields.

Sl. No	Title of the Training	Training coordinator	Duration	States covered
1	Technological empowerment of farmwomen in rice production and post harvest processing	MPS Arya	16.9.99 to 18.9.99	Orissa, UP, Maharashtra & AP
2	Enrichment of crop residues for enhancing their nutritive value as animal fodder	KS Risam	7.3.2000 to 9.3.2000	Orissa, MP, Karnataka & WB
3	Motivation Management of Farmwomen	BN Sadangi	22.3.2000 to 25.3.2000	Orissa, Meghalaya, Tamil Nadu, Haryana & WB

4.2. Training for Farm-women

The Sub-Centre of NRCWA at CIAE, Bhopal conducted 25 training programmes during the period under report.

Training Events



Pic-10: Exercises under the supervision of facilitators



Pic-11: Director, NRCWA inaugurates the training



Pic-12: Participants of Motivation Management Training, preparing group report



Pic-13: Farmwomen trying hands on groundnut decorticator

5. MEETINGS

Sl. No.	Date	Name of the Committee	No of Members/ Scientists participated	Outcome
1	8.6.1999	1 st Research Advisory Committee Meeting	9	Five research projects were approved
2	11.1.2000 12.1.2000	Scientific Group Meeting for Project Reviewing	9	Four projects formulated by scientists were reviewed, discussed and modified
3	19.1.2000	Institute Management Committee	11	Several issues falling in the preview of the IMC were discussed and finalised
4	20.1.2000	2 nd Research Advisory Committee Meeting	9	Four research projects were approved



Pic-14: First RAC Meeting in session



Pic-15: Institute Management Committee meeting



Pic-16: Second RAC Meeting in session

6. VISITORS

Sl. No.	Name, Designation & Address	Period
1.	Dr B Panda Former-Director (CARI), Izatnagar	8.6.1999 20.1.2000
2.	Dr BN Chaudhary ADG (LLP), ICAR	8.6.1999
3.	Dr AK Bandopadhyaya Former-Director CARI, Port Blair	26.10.1999
4.	Dr EVV Bhaskar Rao Director NRCC, Puttur	27.10.1999
5.	Dr K Gopakumar DDG (Fy), ICAR	12.11.1999
7.	Mr Samuel Director (Works), ICAR	12.11.1999 17.1.2000
8.	Dr P Das DDG (AE), ICAR	9.12.1999
9.	Dr RS Paroda Director General, ICAR	16.1.2000
11.	Dr (Mrs) Tej Verma, ADG (Home Sc.), ICAR	19.1.2000 & 20.1.2000
12.	Dr I.C. Mohapatra Former-V.C., OUAT, Bhubaneswar	20.1.2000
13.	Dr K.L. Bhowmik, Ex-Dean BCKB, Calcutta	20.1.2000
14.	Dr (Mrs) P. Sundaram former-V.C. Mother Teresa University, Kodaikanal	17.1.2000 to 21.1.2000
15.	Mr Joshi Deputy Director (Hindi), ICAR	21.1.2000

7. PUBLICATIONS

7.1 Research Papers

- Bhat, M.R.; Kirmani, M.A.; Ganai, T.A.S.; Bhat, A.S., Ganai, N.A. and Risam, K.S. (1999) : Factors affecting reproductive traits of Corriedale sheep. *Indian J. Small Ruminants* 5(2): 87-89.
- Mir, M.Y., Risam, K.S., Kirmani, M.A., Bhat, A.S. and Ganai, T.A.S. (1999) : Genetic parameters of post-weaning body weights in a flock of Corriedale sheep. *Proceedings of International Conference on Sustainable Animal Production, Health and Environment : Future challenges held at CCSHAU, Hisar on Nov. 24 - 27, 1999* pp 264.
- Mir, M.Y., Risam, K.S., Kirmani, M.A., Bhat, A.S. and Ganai, T.A.S. (1999) : Post-weaning growth performance of Corriedale sheep maintained under temperate conditions of Kashmir valley. *Proceedings of International Conference on Sustainable Animal Production, Health and Environment : Future challenges held at CCSHAU, Hisar on Nov. 24 - 27, 1999* pp 263.
- Pandey, D., Pandey, S.N. and Varade, P.B. (1999). Physiological and biochemical changes in floral buds of mango (*Mangifera indica* L.) treated with Dormex (Hydrogen Cyanamide). *Indian J. Pl. Physiol.* 4(2) : 137-140.
- Pandey, D. and Pandey, S.N. (1999). Effect of Dormex (Hydrogen Cyanamide) on floral malformation in mango. *Indian J. Hort.* 56 (3) ; 230-232.
- Risam, K.S. and Pandey, H (1999) : Role of women in dairying in Orissa. *Proceeding of International Conference on Sustainable Animal Production, Health and Environment : Future challenges held at CCSHAU, Hisar on Nov. 24 - 27, 1999* pp 239.
- Risam, K.S., Kirmani, M.A., Wani, S.A. and Misgar, G.R. (1999) : Comparative wool quality performance of Kashmir Merino and Stavropol under valley conditions. *Proceedings of International Conference on Sustainable Animal Production, Health and Environment : Future challenges held at CCSHAU, Hisar on November 24-27, 1999* pp 263.
- Risam, K.S., Sandhu, J.S., Brah, G.S. and Chaudhary, M.L. (1999) ; Genetic parameters of visceral organ traits in White Leghorn Chickens. *Proceedings of International Conference on Sustainable Animal Production, Health and Environment : Future challenges held at CCSHAU, Hisar on Nov. 24 - 27, 1999* pp 268.

- Sadangi, B.N. , Sahoo, P.K. and Dash, H.K.(1999) “ Participation of women in Fishery : Case studies around Chilika , Orissa” Fishing chimes, National Fishery Journal of India, 19(5) : 31-33.
- Shyamlal, Sadangi , B.N. and Ghosh, S. (1999) Constraints perceived by coconut growers of coastal Orissa”. Souvenir, Annual Coconut Day.1999, Coconut Development Board, Govt. of India : 7-10.
- Shyamlal, Sadangi , B.N. and Parasar, B(1999) “ Motivational Development of Coconut growers thorough Area Expansion Scheme of Coconut Development Board “ Souvenir, Annual Coconut Day ,1999 Coconut Development Board, Govt. of India, 18-21.
- Singh, R.V. and Arya, M.P.S. (1999). Effect of seed ratio on barnyard millet (*Echinochloa frumentacea*) based mixed cropping system. Indian J. Agronomy 4(1): 51 – 55
- Singh, R.V. and Arya, M.P.S. (1999). Integrated weed management in barnyard millet, Annuals Agric Res. 20(1) : 35 – 38
- Singh, R.V. and Arya, M.P.S. (1999). Nitrogen requirement of finger millet (*Eleusine coracana*) + pulse intercropping, Indian J. Agronomy 4(1): 47 – 50
- Singh R.V. and Arya, M.P.S. (1999). Effect of integrated weed management practices on the yield of ragi under rainfed conditions. B.K.A.P. 14 (3 & 4) : 19-24.
- Singh, R.V. and Arya, M.P.S. (1999). Response of finger millet varieties to nitrogen.B.K.A.P. 14 (1-2) : 57 – 62.

7.2 Popular Article/Technical Bulletin

- Pandey, S.N. (1999). *Angoor* (bulletin in Hindi). Published by U.P. Diversified Agriculture Support Project. Lucknow. pp 24.
- Sadangi , B.N. (1999) “*Mohillanka Pain Krushi Gobesana*”, The Samaja (Oriya Daily), Sunday special, 9th May, 1999 : 5.

7.3 Participation in Seminars/Workshops

- Dr B.N. Sadangi, Principal Scientist (AE) participated in the Brain Storming Session on “Missing Links in Extension at Grass-root Level in Orissa” on 29th May, 1999 at Directorate of Extension, OUAT and spoke on methodology, major themes and sub themes of the Brain Storming Session.
- Dr. (Mrs) Hema Pandey, Director presented paper at XXIII Biennial Conference of Home Science Association of India, held at PAU, Ludhiana from 17-19 Nov., 1999 on “Capacity building in Home Science for Non-formal sector”.

- Dr K.S. Risam, Principal Scientist (LP&M) participated in “International Conference on Sustainable Animal Production, Health and Environment: Future Challenges” held at CCSHAU, Hisar on November 24 - 27, 1999 and presented five papers.
- Dr. (Mrs) Hema Pandey, Director attended a WHO workshop on “Chemicals and Women’s Health” at National Institute of Occupational health, Ahemadabad from 2-4 March, 2000.
- Dr LP Gite and Ku. Nidhi Agarwal attended XXXIV Annual Convention of ISAE held at CCS Haryana Agricultural University, Hissar during December 16-18, 1999.
- Dr LP Gite and Ku. Nidhi Agarwal attended a workshop on “Occupational Health & Safety in Agriculture” at National Institute of Occupational Health, Ahmedabad during February 14-18, 2000.

8. OTHER ACTIVITIES

World Food Day Celebrated

- World Food Day celebration on 16th October 1999 was chaired by Dr.(Mrs) Hema Pandey, Director in the adopted village. The scientists of the Centre, local dignitaries and women farmers of the village and nearby areas participated in the function. "Storage & preservation of grains and seeds & the role of women" was the theme of the function. To mark the occasion, (a) a *mahila goshti* was organised in the adopted village, and (b) a talk on preservation and storage of seed & food grains was delivered and (c) an Oriya bulletin "*Grama Re Kukuda Chuva Pallan*" was distributed among farmwomen. Women farmers raised various issues and put questions from diverse fields of agriculture.
- Mrs. Laxi Priya Sahoo, Scientist (Seed Technology) delivered a radio talk in Oriya on "*Pustikara khadya surakhare mahila*" from All India Radio, Cuttack on the occasion World Food Day, 16th October 1999. The script of this talk was prepared in Hindi by Mrs Geeta Saha, T-4 (Home Science).

Infrastructural development

- The boundary wall construction of NRCWA was started on 18 August 1999.

9. HUMAN RESOURCE DEVELOPMENT

- Dr B.N. Sadangi, Principal Scientist (AE) was deputed to Indonesia by DARE, Ministry of Agriculture, Govt. of India to attend an international course on "Agricultural Extension and Training Methodology " from 18th January to 3 March, 2000.
- Mrs Abha Singh, Scientist (Food and Nutrition) had undergone the 69th Foundation Course for ARS Scientists (FOCARS) from 6th January to 4th May, 2000 at NAARM, Hyderabad.

10. RECOGNITION

- Dr. SN Pandey, Principal Scientist (Hort) was awarded with the best poster paper award for the research paper entitled “Identification and selection of superior clones of mango cv. *Dashehari* for export” by AM Goshwami, SN Pandey, SK Saxena, DS Khurdiya, Charanjit Kaur and GC Srivistava.
- Dr. SN Pandey, Principal Scientist (Hort) has been nominated as a member of the “Site Committee” of the Institute Village Linkage Programme (IVLP) at Central Rice Research Institute, Cuttack.
- Dr. BN Sadangi, Principal Scientist (AE) has been recognized as Ph.D. guide in Sociology by Utkal University, Vani Vihar, Bhubaneswar.

11. OUR NEW COLLEAGUES

Name & Designation	Joined NRCWA on
Dr. Hema Pandey, Director	18.08.1999
Mrs. L.P. Sahoo Scientist (Seed Technology)	04.09.1999
Dr (Miss) Suman Agarwal Principal Scientist (HDRM)	12.10.1999
Mrs. Abha Singh Scientist (Food & Nutrition)	22.11.1999
Sh. M. Radhakrishnan Sr. Clerk	13.12.1999
Sh. V. Ganesh Kumar Personal Assistant	17.01.2000

12. FAREWELL

- Dr. SS Ghosh, Acting Director, relinquished charge on 18.8.99 and the New Director & Staff members offered him a warm farewell.
- Sh. Nagendra Prasad, Senior Clerk of this institute joined back his parent institute, Directorate of Oilseeds Research, Hyderabad on reversion on 14.12.1999.

13. ADMINISTRATION AND FINANCE

13.1 Manpower

Category	Sanctioned	Filled	Vacant
Scientific	19	10	9
Technical	11	3	8
Administrative	8	7	1
Supporting	4	1	3
TOTAL	40	21	20

13.2 Scientific staff

Sl. No	Discipline	Sanctioned			Filled		
		Pr. Sc.	Sr. Sc.	Sc.	Pr. Sc.	Sr. Sc.	Sc.
1	DIRECTOR (RMP)	1			1		
2	Agricultural Economics	-	-	1	-	-	1
3	Agricultural Entomology	-	1	-	-	-	-
4	Agricultural Extension	1	1	-	1	-	-
5	Agronomy	1	-	-	1	-	-
6	ASPE*	1	1	-	-	-	-
7	Farm Machinery and Power	-	1	-	-	-	-
8	Food & Nutrition	-	-	1	-	-	1
9	Child Development	-	1	-	-	-	-
10	Home Dev. Resource Management	1	-	-	1	-	-
11	Livestock Production & Management	1	-	-	1	-	-
12	Dairy Technology	-	1	-	-	-	-
13	Fish Processing Technology	-	1	-	-	1**	-
14	Horticulture	1	1	2	1	-	1
	Total	7	8	4	6	1	3

* Earmarked for sub-Centre, CIAE, Bhopal.

** One scientist (F&F) working against the post of Senior Scientist (Fish Processing Technology)

13.3 Technical staff

Designation	Sanctioned Post	In position as on 31.3.2000
Technical Assistant (T-II-3)	10	2*
Technical (T-1)	2	1

* One Technical Assistant (T-4) joined on transfer against the post of T-II-3 & another T-II-3 for sub-Centre, CIAE, Bhopal.

13.4 Administrative, finance and accounts staff including supporting staff

Designation	Sanctioned post	In position as on 31.3.2000
Asstt. Administrative Officer	1	1
Asstt. Finance & Accounts Officer	1	1
Personal Assistant (Steno Gr-II)	1	1
Sr. Clerk	2	1
Jr. Steno	2	2
Jr. Clerk	1	1
S.S.G.1	4	1
Total	12	8

13.5 Staff in position as on 31.3.2000

Sl. No.	Name	Designation	Date of entry in NRCWA
1	Dr Hema Pandey	Director	18.08.1999
2	Dr S.N. Pandey	Principal Scientist (Horticulture)	15.01.1998
3	Dr K.S. Risam	Principal Scientist (LP&M)	19.02.1998
4	Dr B.N. Sadangi	Principal Scientist (AE)	7.12.1998
5	Dr M.P.S. Arya	Principal Scientist (Agronomy)	11.03.1999
6	Dr Suman Agarwal	Principal Scientist (HDRM)	12.10.1999
7	Dr P.K. Sahoo	Scientist (F&F)	06.08.1996
8	Shri H.K. Dash	Scientist (Agricultural Economics)	03.12.1997
9	Mrs. L.P. Sahoo	Scientist (Seed Technology)	04.9.1999
10	Mrs. Abha Singh	Scientist (Food & Nutrition)	22.11.1999

Sl. No.	Name	Designation	Date of entry in NRCWA
11	Mrs. Geeta Saha	T-4	15.12.1997
12	Shri B.C. Sahu	T-1	1.4.1996
13	Shri D. Kar	Asstt. Administrative Officer	18.3.1998
14	Shri N.V.R.N. Murty	Asstt. Finance & Accounts Officer	14.7.1998
15	Sh. V. Ganesh Kumar	Personal Assistant (Steno Gr-II)	17.1.2000
16	Sh. M. Radha krishnan	Sr. Clerk	13.12.1999
17	Ms Rina Das	Jr. Steno	21.4.1998
18	Mrs Parisima Sen	Jr. Steno	09.11.1998
19	Mrs Bishnupriya Moharana	Jr. Clerk	26.12.1998
20	Mr. Biswanath Biswala	S.S.G.1	27.7.1998

13.6 Budget and Expenditure

Sl. No.	Head of Account	Budget in lakhs	R.E. in lakhs	Expenditure
1.(a)	Estt. Charges including LSP & PF	30.00	35.36	31,64,323.00
	Contractual charges			
(b)	O.T.A.	04.00	---	---
(c)		00.10	---	---
2.	Traveling Allowances	04.90	04.20	4,19,992.00
3.	Other charges including equipments	31.00	19.00	18,99,133.90
4.	Works as per approved EFC			
	Special repairs	---	---	---
	Major works	70.00	18.44	18,44,000.00
Total		140.00	77.00	73,27,448.90

14. RAJBASHA ACTIVITIES

NRC for Women in Agriculture, Bhubaneswar being a newly established centre took initiative for the implementation of Rajbasha programme at the Centre. To begin with a Rajbasha Implementation Committee was constituted and Dr MPS Arya, Pr. Scientist (Agronomy) was given the responsibility for creating Hindi awareness. Steps were taken up for creating awareness of Hindi among the staff members by introducing “*Aaj Ka Shabd*” programme. Other Hindi promotional activities included printing of bilingual letter pads and making available Hindi rubber stamps for all purposes.

