

Nepal Agricultural Research Council (NARC)

- ❖ a prime agricultural research organization in Nepal
- ❖ an autonomous organization under " Nepal Agricultural Research council Act – 1991
- ❖ an efficient, effective and dynamic agriculture research system
- ❖ Established to undertake agricultural research activities for increasing agricultural productivity and production by generating appropriate agro-technologies suitable to various agro-ecological zones
- ❖ on diversified crops like cereals, grain legumes, oilseeds, cash/industrial crops, horticulture (fruit and vegetable crops), livestock, swine, avian and fishery etc
- ❖ to uplift the economic level of the people by research activities on agriculture

NARC Mission and Objectives

- ❖ To provide appropriate technologies to the farmers and agro-entrepreneurs and other clients in order to convert the agriculture into a dynamic system
- ❖ To improve the standard of living of Nepalese population
- ❖ To conduct high level studies and researches on various aspects of agriculture
- ❖ To identify the existing problems in agriculture and find out measures to solve
- ❖ To assist Nepal Government in formulation of agricultural policies and strategies

Nepal Agricultural Research network map



14 commodity research programme; 4 Regional Research stations
 14 ARSs based in different agri-ecozones; 19 Technical disciplinary divisions;
 2 Research institutions and 3 Research units

NARC Functions & Responsibilities

- ❖ Conduct high level research work on various fields of agriculture required in line with the national agricultural policies,
 - ❖ Prioritize studies and researches to be conducted,
 - ❖ Provide research and consultancy services to its clients,
 - ❖ Coordinate, monitor and evaluate the agriculture research activities in Nepal,
 - ❖ Document research activities
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NARC Financial Resources

- ❖ Grants from Nepal Government
- ❖ Grants from national and international donor agencies and governments
- ❖ Funds obtained from research or consultancy services

NARC research highlights

- ❖ Most promising crops and vegetable varieties were released with complete package of practices, under the banner of National Seed Board (NSB), Variety Release and Registration Sub-Committee (165 of 30 varieties)
- ❖ Human resource development in collaboration with different institutions
- ❖ The technologies like Chinese Hand Tractors, zero till drill technology were popularized to overcome the late-sowing problems associated with wheat in farmer's fields
- ❖ Relay planted green manures such as rice bean (*Vigna umbellate*) and dhaincha (*Sesbania sp.*) can substitute inorganic fertilizer for rice in intensive cropping areas of the western hills of Nepal.

Agriculture Botany Division (technical sections)



One of the disciplinary divisions, started in 1966 with support of USAID

Crop commodity research programs immersed from here

- ❖ **Crop improvement on rice, wheat, maize and hill crops**
- ❖ **Plant genetic resources**
10735 seed samples
- ❖ **Seed science and technology.**

Biotechnology unit



- Inception of Biotechnology Unit at the Agriculture Botany Division in early 1990s
- Activities were limited to the development of tissue culture protocols in rice and wheat
- Activities expanded to biochemical analysis (isozyme analysis) in 1999
- In collaboration with In-situ Projects (IPGRI and NIAS), the DNA analysis was initiated using RAPD and microsatellite markers esp. in rice and buckwheat.
- Housed and semi-administered from the ABD Division

Working modality

- ❖ **Working for hill of Nepal with the collaboration of existing NARC research stations and District Offices of Department of Agricultural**
- ❖ **Working with local NGO's**
- ❖ **More focus with farmers as participatory approach in research and development**

Major Research Priorities

- **On crops such as potato, sugarcane, banana, citrus, cardamom, tomato and cereals, mandated crop in APP**
- **Tissue culture (breaking breeding barriers and disease free plantlets**
- **MAS**
- **Genetic diversity study with molecular and biochemical markers**

Rice bean crop and FOSRIN project

- ❖ Legume, an important commodity in Nepal with nutritional values
- ❖ Ricebean, a candidate crop grown as an intercrop on residual water after rice on marginal land and also intercropped with maize
- ❖ A neglected crop but potential for production of nutritious fodder, biomass and high quality grains and remarkably drought tolerant
- ❖ No modern plant breeding exist but predominates the landrace diversity
- ❖ 148 accessions from 34 districts of different agro-ecozones with passport data have been collected



Research Activities and NARC Role

- ❖ WP1-WP7 have been identified to fulfill the set objectives
- ❖ NARC recognized for WP3 for molecular diversity and assisted by CAZS-NR
- ❖ Overall activities will be coordinated and integrated among the partners and EU and other NARS by Project coordinator – CAZS-NR

Work package (WP3) – To characterise the germplasm diversity using molecular marker techniques

Objectives: Analysis of diversity with molecular markers

Participants: CAZS-NR and NARC

Description: This work package is led by NARC, who will be assisted in the analysis by CAZS-NR. The work will mainly be conducted in Nepal, assuming that DNA samples of Indian material can be extracted in India and sent to Nepal for analysis. CAZS-NR has already assisted NARC in establishing a functioning molecular marker laboratory in Nepal.

Tasks

- Task 3.1 Extract and assay DNA for hypervariable markers from bulk and individual plant samples of selected accessions [objective 3.1]
- Task 3.1 Assay the selected stratified random sample for the identified polymorphic DNA markers.[objective 3.1]
- Task 3.2 Analyse molecular marker data for diversity [objective 3.1]
- Task 3.2 Compare agromorphological data with molecular marker data and relate the diversity to biophysical and socio-economic variables [objective 2.4]

Work package (WP3) – To characterise the germplasm diversity using molecular marker techniques

Deliverables:

D3.1 A set of useful polymorphic markers identified and published

D3.2 Ricebean diversity in Nepal and India described on the basis of molecular markers and published

D3.3 The value of diversity estimates using agromorphological or molecular markers described in relation to biophysical and socio-economic variables described and published

Milestones and expected result (figures in parentheses are the month of completion):

- Identification of polymorphic molecular markers (12)
- Evaluation of stratified sample with identified markers (24)
- Analysis of molecular marker data (30)
- Comparison of molecular data with agromorphological data (36)

Characterisation and Preliminary evaluation of Ricebean

CROP : **Ricebean** Accessions : **117 from 22 districts**

LOCATION : **Khumaltar**

IRRIGATION : **No**

APPLICATION OF FERTILIZER/ORGANIC MANURE Etc.

Type of fertilizer/manure Rate (kg/ha) Date applied

No fertilization used

PESTICIDES APPLIED

<u>Name of pesticide</u>	<u>Rate</u>	<u>Date applied</u>
Roger plus	1ml/litre of water	20 October, 2006
Diathene	2g/litre of water	20 October, 2006

DATE OF CULTURAL OPERATIONS

Nursery	:Planting	: 4 June, 2006
	Thinning	: 18 June, 2006
	Harvesting	: started from 30 Sept – 23 Oct, 2006

SPACING

Distance between plants	: 40 cm
Distance between rows (cm)	: 50 cm
No. of plants/hill	: 3 seeds

PLOT SIZE

Length of row	: 2 m
No. of rows/plot	: 1 row; 5 hills/plot

DATA COLLECTION

Diversity in ricebean morphologic traits

- ❖ Leaf pubescence
 - sparsely pubescent (50)
 - densely pubescent (66)
- ❖ Petiole colour
 - green (13)
 - green with purple lines (113)
- ❖ Twining tendency
 - none (9)
 - pronounced (107)
- ❖ Flowering Period
 - asynchronous >35 days (84)
 - asynchronous 31-35 days (73)
 - asynchronous 21-25days (9)

Diversity in rice morphologic traits

- ❖ Leaf length
 - Mean - 11.7
 - Range - 7.0-14.4
- ❖ Leaf width
 - Mean - 8.3
 - Range - 4.5-10.4
- ❖ Days to flowering
 - Mean - 87
 - Range - 61-104
- ❖ Pod length
 - Mean - 7.7
 - Range – 5.3-11.6

- ❖ Days to first pod harvest
Sept –Oct



Growth pattern



Determinate (9)

(Humla, Mugu, Baitadi, Bajura)

Indeterminate (107)



Rice bean diseases





Issues and lessons

- ❖ Germplasm flow mechanism and field studies
- ❖ Scaling up and strengthening of the facilities
- ❖ Availability and assess of molecular consumables
- ❖ A knowledge on plant morphology, planting season and field management
- ❖ Variation on plant type among the ecotypes observed
- ❖ A range of diversity in traits, could be of valuable source for breeding and conservation
- ❖ A great scope for crop improvement



Thank you