

M. S. Subramanian

Center of Excellence in Genomics

Note Book



ICRISAT, Hyderabad

20 February, 2017

Dr David Bergelson, Dg

Dr Rajeev Varshney

5th International Conference

on

Next Generation Genomics and
Integrated breeding for

Crop Improvement

5th International Conference

Sufyan P. Wani

Dileep Kumar Gunteekere

ICT innovation for Agriculture

Soil testing machine

Transfer information to the
Mobile phone

ICT innovations in
Agriculture - So partners

Content, Capacity
development, connectivity
Private - Public

Customer centric
Brand is important

Issue: Finance

Sustainability

Next generation ICT4D approach

Private Registrars Model

Personalized information services

Business Model

Area Pilot



Online Learning Courses
Diseases & Pests

D. Sukas P. Wani

Director, ICRI SAT

Development Center

AVRDC is involved

IFPRI

Inter-center Project

Farming System of Kerala

Tain Irrigation) Participated
Nahudra + Nahudra

CM, AP is coordinated by

himself

Koraput - Watershed management

supply of water

Genomics Lab

Rajiv Varshney

Genomic approach

Rice Genome Project

Pearl Millet genome

New Delhi, Friday, 21st February

World Food Programme Strategy

Zero Hunger Challenge

- ① 100% access to adequate food all year round
Food availability and access
- ② Zero Stunted children less than 2 years
- ③ Sustainable Food Systems
- ④ Enhancing Small holder productivity
- ⑤ Zero loss/waste of food

WFP Strategy

Dr. Torsten Due

Dr. Jan Delbaere

Dr. Pradnya Patilkar

Dr. Ajay Pande

Dr. Venkatesh Adhaya

Food Security & Nutrition

Availability -

Access

Absorption

POS has been a life line

Non-food factors - Drinking
water, Sanitation

IPS

ICDS

MDMA

Right based approach

Pradhan Mantri Krishi Sinchayi
Yojana

State level Action Plans

Soil Health cards

2015 Int. Year of the Soil

2016 Int. Year of Pulses.

~125000 ha to be covered
annually under crops

MSP - PDS If there is no
procurement, production will suffer

Curbing corruption - Use of ICT
tools

Gender dimensions

Women & children

Cash transfer, Pitfalls

Domestic Violence

2. Zero Shunting

life cycle of fruit

with a focus on the 1000 days

Nutrition & Disease

TB, HIV

Goal 3 Sustainable Development

Climate change.

(4) Small holder Productivity

= 85%.

Gap Analysis

Village level Smallholder

Support Centre

(Form School)

Farm Schools

Farm Machinery

Women Farmers - credit -
Cattle to land

Health Approach

Ashas

Community Health Rights

Dr Sasena

Variability has gone
down.

|| Include Fruits & Vegetables
|| in the food intake

Rate of increase in NPP
is low

Main Issue

Brian Patnaik

We have new data

Impact of Trade on Food

Security

Architecture of Governance
of Food & Nutrition.

What are the changes
needed? -

Cost procurement Policy
~~Shantakumar Report~~

40% of people to be covered.

Cost — influenced by
many factors

① Crop Planning - land use

Planning

Punjab + Haryana -

Wheat + rice

② Total Food - Vegetables + fruits

↙ Milk

↘ Pood grains

③ Nutrition Security

Nutric Farms

Manya Sharma

Policy

Implementation Mechanism

Entrepreneurial Development

|| Technologies are available
to fight protein & micronutrient
deficiencies

Focus on Technology

Climate change

Biotechnology

CTA technology

Prayer

Prayer

Raise on class

Crochet

Collection of Farmers

Crochet - human right

Indicators

Food Price Volatility

Mahlah - Steady reduction in
consumption of all foods

Murthy Statistics

Mahlah Severe malnutrition
is not evident

Drinking water)
Sanitation) have improved

Mid day Meal - Awareness,
community education

Nutrition Literacy

Knowledge base
Know how - do, how

Enlarge RUKs

Get macha on Board

Backyard Poultry is
effective

Village Health &
Nutrition Workers

Community Based Rights

Shift subsidies to
small & marginal farmers
to Green Box under WTO

Indira Chakravorty

Hygiene is very important

Food Safety

Bad-day Deal - infection
needs control

Drudgery of Women?

50% Calories are
spent in walking

The Prakash

Priority or Recommendations

Short & long term

Cooperation - Nutrition

coordination committee

Thailand is a good

example

Emphasis on Complementary
feeding

① Security Strategy
Food to Nutrition Security
Hidden Hunger - Poor nutrition

② Food & Non-food factors
Holistic approach
Diverse water, sanitation
Hygiene

③ Crop Planning Rice - Wheat
+ Land use
in the Andamans, Haryana

Enlarging the Food Basket
Import to national food security & price stability

(4) ~~State~~
Nutrition literacy

⑤ Technology - Dredging
Post-harvest management
eg. Minor Millet
Multiple pathway

Imp Remarkable

⑥ Governance : Panchayat- led

Nubritia library -
Community Hages
Rights

⑦ Data collection,
Analysis

Evidence based Policy

Remarkable reduction

in stunting.

Impact of unbarrier

Royal Jordan

Fewer recommendations -
proven.

Tribal malnutrition

Dr Santora

Obesity & over weight

Calorie-deficient

Energy-dense food

Bio-fortification

Coalition for Food + Nutrition

Security

QB Meeting.

CSC. (011) 29955124

① 150 Members 29956110

② Write to Minister

Boston Council Report

Global Advisory Group.
Working Groups.

CSE

Suneta Narain

M.A. Soc Change

Green Rating Project
Coal based power plants

2015 - UN Decade Sustainable Development

- Do Ecology

Voluntary Participation

Good Ecology is good
business

Started in 1998-99

Paper industry 1988 - Farm Foresty
Book

Coal Thermal Power

70% of total fresh water

Sticky coverage

67 Plants

54 G.W

Water use

Environmental footprint

Regulation does is not
support. - Self regulates

VI Five Year Plan -

(1980-85) Environment &
Development

Economic sustainability

Nagpur

5th Floor, P.A.

Habala Kisan Sasthaktana

Parojara

Central Institute for Cotton Research

Dr R.R. Kharthar, Director,

CICR

Women farmer on Jiwamruth

JIWAMRUTH

Dr R. R. Kharthar

December 2011 Funded by

Ministry of Rural Development

215 Women Farmers' Group

60 Villages

3200 Women Members

3265 MKSP Members

398 widows (24 are wives
of farmers who have committed
suicide

No cost extension until
November 2016

Programs

- ① Formation of Management of Groups
+ Federations
- ② Agricultural Technologies
- ③ Grassroots Institution Building
215 Women Farmers' Groups
across 60 villages in the
districts of Wardha + Yavatmal

The Federation will provide
access to credit

34 MKSP Members are
Members of Gram Panchayats

Sustainable Agriculture

Cadre of Community Resource
Persons

Soil Health

Digital Green, NQD

✓ MKSP Phase 2

December 2014 - November 2016

Diversification of income generating
options

Nagpur

Dr Ramesh Thakare

Ms Chhaya Thakare (Wife)

(suffering from Kidney
failure)

Dr Poojanda - Daughter

Dr Shri Swaroop, Director, ICND

Prof Deverda Bhatnagar

Principal, Shri Shivaji College

Rust Top Farming

Monsoon & Market -

Sheetal Amte

Vidha Rupta

Vijay Javandke

PM's new agricultural
plan - implemented

in Wardha district

Banks are trying to cover
100% the women farmers

Rashtriya Jagat, MSRP started

in 2007

20 Villages in Raolgaon of
Yavatmal district

No. of Samikars ~~215~~ 215

No. of Members 3168

1970. illiterates

Federations of Groups

Various improved practices
organic matter content of
the soil

Soil Test based

Nutrient Management

Agricultural Implements

1600 Nurseries have

Kitchen Gardens

Convergence of activities

Tablet, Farming etc

Digital Green - Videos

Challenges (End of 2016)

Sustainability

Credit linkage

Registration of Federations

Looking Forward

① Law: legal entitlements

~~the~~ Policy Makers'

Services

Sustainability

credit linkage

can be solved only

through legal entitlements

⊗ = CSR - Building

Training

Impact of woodruses -

Implementants

Arav

Berseen, Alfalfa,

Stylo santhos

Soil Health Soil organic
matter

Fertilizer use
efficiency,
Weed Management

Need for growing
legumes - Berseem, Lucerne
By products

Malawi has the
lowest return for inputs
largely because of
rainfall behaviour
Economics of cotton
Outlook

Dr Kranti New Cotton variety
(Coarse cloth) released
organic cotton

Financial Inclusion

~ Household

Household - Head - Men

3 Federations

Infrastructure - CSR

Technology

How to go faster?

Beyond MKSP Sustainability

- ① ~~Coop~~ Legislative (Environment)
- ② Panchayat for Mahila
Kisan

~~Chief~~ Chief Minister

Maharashtra

Shri Devendra Fadnis

920 - [unclear]
[unclear]

legues - [unclear]
[unclear]

[unclear]
[unclear]
[unclear]
[unclear]
[unclear]

[unclear]

[unclear]

23 Feb, 2015

CIC R, Nopur.

D. K. R. Kranti, Director

D. Prakash Shetty

Dr. V. P. Singh

Dr. Ajay Parda

Ms. R. V. Dharan

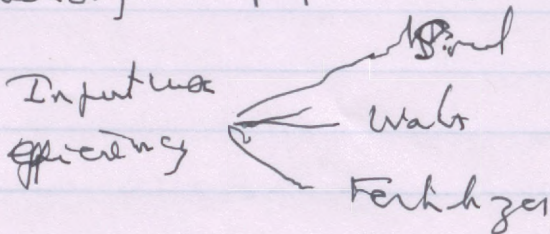
Leveraging agriculture for Nutrition in South Asia (LANS)

Farming System for Nutrition (FSN)

- 1) Under nutrition
- 2) Protein Hunger
- 3) Hidden Hunger

1) Increasing small farm

productivity and profitability



- 1) Soil: Soil Health care
Soil organic matter
Balanced fertilization

- 2) Water: More crop per drop
Water harvesting

Farm Ponds

Equity in distribution of water
is essential for cooperation in
saving water

Drip, Sprinkler, Furrow - row
water saving.

② Protein ~~Harvest~~ Hunger

Pulses - Milk
Eggs

③ Low-nutrient Melonization

Biofortification ← Nature
↳ Plant Based
↳ A No

Fortification - Salt

↳ Wheat flour.

Food Safety

Nutrition Garden

Multinational
Company

Agriculture
Remedy

Monitoring & Assessment

Sandy, (BRT) etc

Partners

I Water: Jain Irrigation

Fertilizer IFDC

Pooled area

Deep Placement

Preventive Ammonia

Volatilization

II Every Farm - a Nutri Farm

Every Farm a Nucleus Farm
Dr. Abdul Shams,

Dr. Dano, VC, ~~PKV~~ PKV

PKV's full support

Creating technologies which
make an impact

Universities are starved
of funds

Enthusiast IIT - Darendra

Radiis - ~~PKV~~ very

supportive

GM crop trials Rice + other

crops have been cleared

Consult Farm Women

Farmer to Farmer learning

Land to Land is wife

PKV issues 75 to 100 technologies
each year

University - Ag. Dept. level
Culture & subsidy

Scientists are the assets for PKV

II

Technology is not reaching
those who need it

Right Technology
Right Place

Appropriate technology ~~at~~ at the
right place

Villages selected in
Vidharbha + Koraput

Persistence of malnutrition

Dr. Surendra Kumar Singh
DIRECTOR NBSS LUP

Offers help in Soil analysis.

Mukherjee Library

Community Hunger Fighter

WARDYANA

Soybean, Tur (Cajana)
Plant Clinic Initiative (CABI)

Abant, Moruga

Sweet Potato

Community Hunger Fighter

Malnutrition is unacceptable

① Nutritional Malady | Agricultural
ICDS, MHP, PDS | Remedy | JF last growth

Food, Fodder, Fuel, Fertilizer

Technology & Public Policy

② Nutrition Literacy

③ Community Hunger Fighters - Community involvement

④ Legumes in the F.S.
Nitrogen fixers

⑤ Nutrition for Animals
= Fertilizer of the Soul

RC Ash - livestock

⑦ Multigrain products

Malnutrition at unacceptable levels is primarily, aspects of ICDS, MHP, PDS etc

Dr V. P. Singh

What are the goals for
next 3 years?

Experience of the
community is important

Productivity & Interventions

Better Feed

Better Agronomy

Interconnection & Diversification
of farming system

Specific interventions for
specific subsector
disorders

Interventions at the
Community level
intervention at the
integrated household level

Policy Instruments

Involve Panchayat
level
Engaging them throughout

Trust is important for
Vothanba

Provides fodder + ~~grass~~
grass.

Animals were maintained
for fertilizer.

Legumes should be
in the

Raman

09444024037

Smita Naran

09810064207

Arjun Seth, Cabinet Secretary

09810012206

ARVIND SUBRAMANIAN

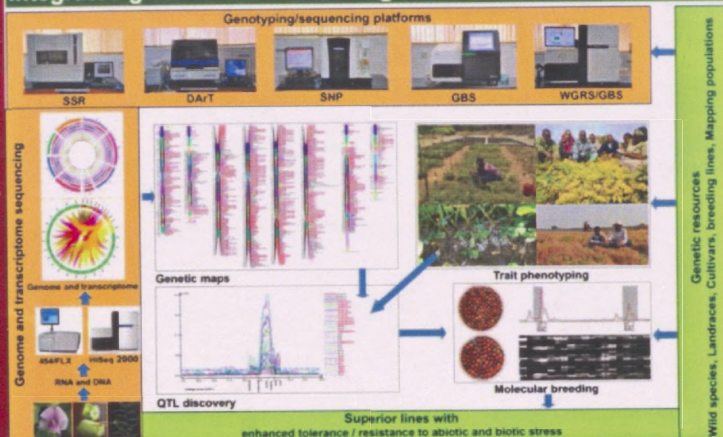
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Iskandar

Darajat

Accelerating Precision and Efficiency of Breeding Programs through Center of Excellence in Genomics (CEG)

Integrated genomics and breeding activities



Genomics

Genome sequences

- ◆ Pigeonpea - 72.7% coverage (*Nature Biotech* 2012, 30: 83-89)
- ◆ Chickpea - 73.8% coverage (*Nature Biotech* 2013, 31: 240-246)
- ◆ Sorghum - 94.5% coverage (available through US-led team)
- ◆ Groundnut (Announced on 2 April 2014)
- ◆ >1000 legume genomes sequenced
- ◆ Pearl millet (in progress)

Marker resources

- ◆ >10,000 SSRs across mandate crops
- ◆ >10,000 SNPs across mandate crops
- ◆ High density DArT arrays in all mandate crops
- ◆ KASPar, Illumina GoldenGate and VeraCode assays for chickpea, pigeonpea and groundnut

Molecular breeding

- ◆ Chickpea - advanced lines for drought tolerance and resistance to Fusarium wilt and Ascochyta blight
- ◆ Groundnut - advanced lines for resistance to rust
- ◆ Sorghum - advanced lines for drought tolerance and resistance to shoot fly and Striga
- ◆ Pearl millet - HHB67 Improved line for downy mildew resistance

Decision support tools

- ◆ IMAS for trait mapping
- ◆ ISMAB for molecular breeding
- ◆ GDMS for data management
- ◆ ISMU for mining SNPs based on NGS
- ◆ Open data

Genotyping

Crops

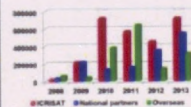
- | | |
|-----------------|------------|
| ◆ Chickpea | ◆ Tomato |
| ◆ Pigeonpea | ◆ Potato |
| ◆ Groundnut | ◆ Onion |
| ◆ Sorghum | ◆ Garlic |
| ◆ Pearl millet | ◆ Cassava |
| ◆ Finger millet | ◆ Tobacco |
| ◆ Rice | ◆ Cotton |
| ◆ Wheat | ◆ Mango |
| ◆ Maize | ◆ Guava |
| ◆ Barley | ◆ Litchi |
| ◆ Oats | ◆ Banana |
| ◆ Sweet potato | ◆ Mulberry |

Projects

- ◆ Fingerprinting of cultivars
- ◆ Genetic diversity analysis
- ◆ Linkage mapping
- ◆ Association mapping
- ◆ QTL mapping
- ◆ Marker-assisted selection
- ◆ Genomic selection

Beneficiaries

- ◆ NARS partners in Africa, Asia, Europe and Latin America
- ◆ Agricultural research institutes
- ◆ Research foundations
- ◆ Universities
- ◆ Small-scale breeding companies



Overview on data generated for SSR, DArT and SNP markers

Capacity building



Students from sub-Saharan Africa and South Asia



Participants in training courses



Inclusive Market Oriented Development (IMOD) – our approach to bringing prosperity in the drylands.



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

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, of whom 644 million are the poorest of the poor. ICRISAT innovations help the dryland poor move from poverty to prosperity by harnessing markets while managing risks – a strategy called Inclusive Market-Oriented Development (IMOD).

ICRISAT is headquartered in Patancheru, Telangana, India, with two regional hubs and six country offices in sub-Saharan Africa. It is a member of the CGIAR Consortium. CGIAR is a global research partnership for a food secure future.

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