Prospects in Forestry and Agriculture

Kerala Forest Research Institute
KFRI
An institution of Kerala State Council for Science, Technology and Environment

'Prospects in Forestry and Agriculture'
is a compilation of papers presented in
'National Seminar on Forestry and Agriculture'
organized under the auspices of
Kerala Forest Research Institute,
Peechi, India
and Gregor Mendel Foundation,
Department of Botany, University of Calicut,
India at
Kerala Forest Research Institute, Peechi
from 7 to 8 November, 2013.

ISBN 978-81-85041-80-3

Kerala Forest Research Institute
Peechi 680 653. Kerala, India
URL: http://www.kfri.res.in

Prospects in Forestry and Agriculture

Compilation of Papers Presented in
National Seminar on Forestry and Agriculture,
KFRI, Peechi, 7-8 November, 2013

Editors

Mohanan K.V.
Hrideek . T.K.
Raghu A.V.
Amruth M.
Muralidharan E.M.
Radhakrishnan V.V.

Kerala Forest Research Institute
Peechi, Thrissur, Kerala, India
January, 2015

Published by

Kerala Forest Research Institute
Peechi 680 653. Kerala, India
URL: http://www.kfri.res.in

Editors

Mohanan K.V.
Hrideek . T.K.
Raghu A.V.
Amruth M.
Muralidharan E.M.
Radhakrishnan V.V.

First Edition: 500 copies, January 2015

ISBN: 81-85041-80-6
Catalogue in Publication: 630
KFRI Library Cataloguing –in- Publication Data

Prospects in Forestry and Agriculture
1. Forestry 2. Agriculture 3. Biodiversity
(i) Kerala Forest Research Institute (ii) Mohanan K.V. (iii) Hrideek T.K.
(iv) Raghu A.V. (v) Amruth M. . (vi) Muralidharan E.M (vii) Radhakrishnan V.V.

Book design, cover design, layout by Ashokkumar P K, ashokkumarpk@gmail.com

Mohanan *et al.* (Eds.), Prospects in Forestry and Agriculture 263-268 KFRI, 2015.

Participatory research in rice and elephant foot yam: A case study from Wayanad

Rajees P.C., Asiya P., Arun Raj and Girigan Gopi*.
Community Agrobiodiversity Centre, M.S. Swaminathan Research Foundation, Wayanad, Kerala, India.
*girijngopi@yahoo.co.in

ABSTRACT

The popularity of participatory research approaches is largely driven by the expected benefits from bridging the gap between formal agricultural science institutions and local farm families, making agricultural research more relevant and effective. Promotion of scientific cultivation practices and selection of varieties suitable to the locality were carried out under a project being implemented by M.S. Swaminathan Research Foundation in Wayanad district. Experiments related to the varietal selections and yield enhancements were carried out using farmers' methods and improved scientific methods to compare and assess their performance under various management practices. This study was carried out in Rice and Elephant Foot Yam (EFY). Six varieties of Rice and three varieties of Elephant Foot Yam were used in Participatory Varietal Selection (PVS). The research plots were designed in Randomized Block Design (RBD) with six treatments and four replications. Unique approach has been adopted to ensure participation of farmers in research process and farmer research groups have been formed to discuss the process and evaluate the performance of research trials in each stage. Farmers' participation was ensured in identifying the varieties and farmers for involving in research process. Farm days have been conducted to select the best variety according to the criteria set by the farmers. Significant difference was noticed in yield enhancement trials of elephant foot yam (EFY). Farmers selected Sampada as the best variety in rice and Gajendra as the best variety in EFY. As an outcome of the participatory research, more farmers came forward to adopt scientific practices. Our experience shows that creative involvement of farmers in research process is critical to scale up improved farming practices and adoption of improved varieties. Participatory research trials also facilitated vertical and horizontal sharing of views, ideas and preference over traits.

INTRODUCTION

Farmer participatory research is an innovative research approach that encompasses diverse research and research related activities ranging from informal surveys, ensuring the involvement of farmers in research, technology development and dissemination (Freeman, 2001). The development of participatory research and its application came out of the necessity to reach the farmers, whose participation in the research and development process is considered essential to bring about desirable changes in rural livelihoods (Aw-Hassan and Aden, 2008). Yet, there are no defined rules or parameters that determine the nature and extent of participation by different stakeholders in the research. It is also recognized that participatory research is an effective means of educating farmers and bringing desired results (Nina and Mauricio, 2008). This paper describes the process followed in participatory varietal selection and yield enhancement of rice and yams. Promotion of scientific cultivation practices and selection of varieties suitable to the locality were carried out under a project being implemented by M.S. Swaminathan Research Foundation in Wayanad district, Kerala State, India. Experiments related to the varietal selections and yield enhancements were carried out using farmers' methods and improved scientific methods to compare and assess their performance under various management practices.

In Wayanad, rice is the major food crop and it occupies an area of 12,995 ha (2010-11). But the area under cultivation has been shrinking due to various reasons. Elephant Foot Yam (EFY) is a promising tuber crop cultivated on commercial scales mainly for food purpose. Wayanad stands first in terms of area under cultivation in the State with a total area of 1553 hectares, which contribute to 20% of the

total yam cropping area in the State (Farm Information Bureau, 2012). Elephant Foot Yam began to attract the attention of farmers in the light of higher profitability (Srinivas and Ramanathan, 2005) and emerging market for yam in the State. Conducive physical environment for yam cultivation, perceived capacity to mitigate climate changes, short term nature of the crop and availability of seasonal fallow rice fields during summer etc. are other reasons for the entry of more farmers in yam cultivation. Observation and interactions with farmers indicated that they did not follow scientific cultivation practices, which resulted in poor yield and hence low income. So this study was taken up with the following specific objectives.

- To assess the process and results of participatory research in rice and elephant foot yam.
- To assess the strategies followed to communicate the process and results of the research and the steps followed to ensure farmers' participation

METHODOLOGY

The experimental site was situated at an altitude of 750 m above mean sea level. Soil is having sandy clay loam texture and acidic pH (4.5-5.5).

Yield enhancement trials

Yield enhancement trials were carried out to compare between farmer and scientific practices and to expose scientific cultivation practices among farmers. In EFY seven trials were conducted at different locations of the district. The following table illustrates the practices followed in farmers and scientist's plots.

Significant differences are noticed in pit size, quantity of seed material used, spacing and the use of fertilizers. Under farmers' practice, after taking a shallow pit of 10 cm depth, the seed corm is placed along with FYM and a mount is taken above the seed material without any proper mixing of FYM with the top soil. The quantity of fertilizer used is very high in farmers practice (4-5 times) compared to the scientific plot. Fertilizer under scientific

Table 1. Comparison of cultivation practices in EFY.

Sl.No.	Cultivation practices	Farmers' plot	Scientific plot
1	Pit size (cm)	10 x 30 x 50	60 x 60 x 45
2	Quantity of seed material (kg)	1.5-2	0.9-1.2
3	Spacing (m)	1.0-1.3	0.9-1.0
4	Quantity of FYM (kg per pit)	2-2.5	2-2.5
5	Quantity of fertilizer (basal)	150-200 g of factomphos or 18:18:18 (per plant)	11.0 g urea, 27.5 g rajphos & 12.5 g potash (per plant)
6	Quantity of fertilizer (top dressing)	150-200 g of factomphos or 18:18:18 (per plant)	11.0 g urea & 12.5 g potash (per plant)

Table 2. Comparison of cultivation practices in rice

Sl. No.	Cultivation practices	Farmers' plot	Scientific plot
1	Quantity of seed used for 1 hectare	60-85 kg	120-150 kg
2	No. of seedlings per hill (transplanted)	4-7	2-3
3	Quantity of fertilizer (basal) per acre	18:18:18 or Factomphos (Quantity varies)	Urea - 39.1 kg TSP - 39.1 kg MOP - 15 kg
4	Quantity of fertilizer (top dressing) per acre	Factomphos +MOP or 18:18:18 (Quantity varies)	Urea - 39.1 kg MOP - 15 kg

Table 4. Yield data of trials in rice

Variety	Height (cm)	Hills/ m^2	Tillers/ hill	Yield in scientific plot (kg/ ha)	Yield in farmers' plot (kg/ha)
Deepthy	125	25	20	4506	4328
Aiswarya	94	23	22	4205	4019
Kanchana	76	24	24	3516	3502
Athira	105	27	19	4712	4583
Sampada	77	25	25	5136	5013
Uma	76	23	24	4976	4812

practice was given as per the package of practices recommendation ($N:P_2O_5:K_2O$ @ 50:50:75 kg/ha as basal and N and K_2O @ 50:75 kg/ha one month after the first application). Weeding and earthing up were done two times per crop along with fertilizer applications. Since the crop was grown as rainfed, the fertilizer application was done immediately after the summer showers.

In rice, six yield enhancement trials were conducted at different locations. Two adjacent plots having area of about 25 cents is selected. One plot will be allotted for doing farmers practice and the other for scientific practice as recommended in PoP (KAU 2011). The similarities and differences in different cultivation practices are mentioned in Table 2.

Compared to scientific practice, farmers are using more quantity of seeds and fertilizers. Seed quantity used is almost double of the recommended rate and fertilizer used is mixed and complex fertilizers in varying quantities.

Participatory Varietal Selection (PVS)

PVS is one of the potential approaches in research and extension especially in remote areas where farmers face resource constraints and have limited number of crop varieties. Three varieties of EFY (*Sree Padma, Gajendra* and *Wayanad local*) were used for the varietal trial and the plot was designed in Randomized Block Design (RBD) with four replications and six treatments. The treatments include both scientific and farmers practices. *Wayanad local* is a yam variety predominantly cultivated in Wayanad. *Sree Padma* and *Gajendra* were introduced as a part of this trial. *Sree Padma* is released from CTCRI (Central Tuber Crops Research Institute) and *Gajendra* from Andhra Agricultural University.

Six varieties of rice (*Aiswarya, Deepthy, Sampada, Athira, Uma* and *Kanchana*) were used in PVS and the plot was designed in Randomized Block Design (RBD) with four replications and four treatments. *Aiswarya, Deepthy* and *Sampada* were introduced as a part of this trial and the other three varieties were already being cultivated there.

Process followed in ensuring farmers participation

Steps followed to ensure farmers' participation include the formation of Farmer

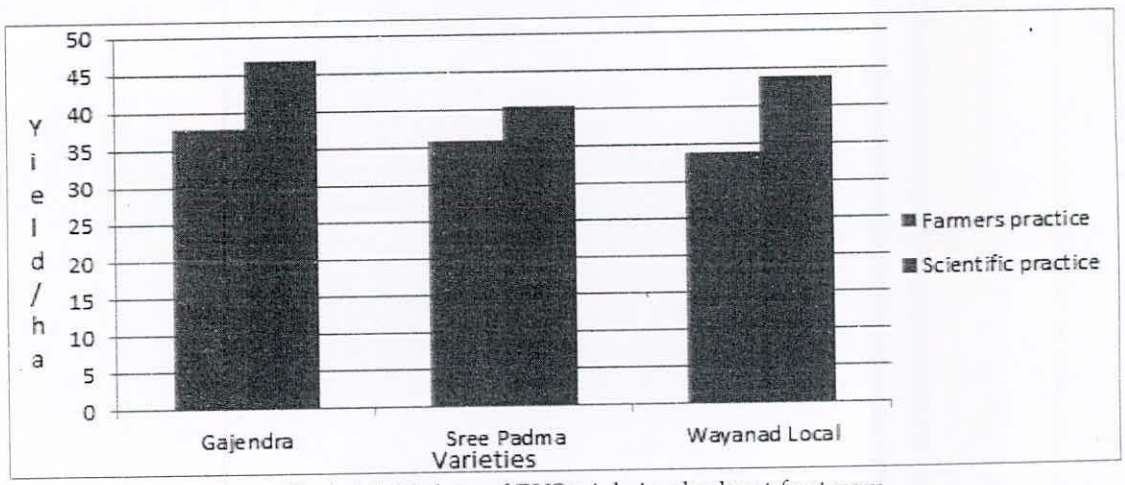

Fig.1. Yield data of PVS trials in elephant foot yam

Table 5. Nutritional parameters of EFY varieties

Sl. No.	Parameters	Result		
		Gajendra	*Wayanad local*	*Sree Padma*
1	Vitamin C (mg/100g)	4.9	4.5	4.7
2	Crude fibre (%)	1.2	0.8	1.0
3	Total sugars (%)	Below 1.0	Below 1.0	1.0
4	Starch (%)	19.5	22.8	20.7
5	Moisture (% by wt.)	62.5	60.0	63.5
6	Protein, % (N X 6.25)	4.1	3.7	3.9

Research Groups (FRG), Farm-walk and Farm-day. Farmer research group formation was done as first step in the two crops. Farm walk and farm day ensured farmer participation right from seed and variety selection to harvest and data collection.

RESULTS AND DISCUSSION

The yield data of the trials in rice and EFY are given in Table 4 & Fig. 1. Farmers selected the best variety according to many criteria. Selection of varieties was done during farm-day conducted on harvesting day.

Sampada recorded the highest grain yield. Straw yield was the highest in *Deepthy*. Maximum number of tillers was observed in *Sampada*. There is only a narrow yield difference between farmer and scientific plots.

The germination percentage was 80% for *Gajendra*, 75% for *Padma* and *Wayanad local* varieties respectively. There was significant increase in yield in the scientific plot over farmers' plot (*Wayanad local* - 29.6%, *Gajendra* – 23.73% and *Sree-Padma* – 12.5%). Based on the observations from both scientific and farmers' plots, *Gajendra* was the best variety in terms of yield. The average yield from farmers plot was 35.79 t/ha and it was 43.61 t/ha from the scientific plot. The results obtained in this study are in conformity with the results of Singh *et al.* (1997), Saravaiya *et al.* (2010) and Ravi *et al.* (2011).

Nutritional analysis of all the three varieties were carried out to assess the parameters like Vitamin C, crude fibre, total sugar, starch, protein and moisture. Vitamin C, crude fibre and protein content were highest in *Gajendra* variety whereas the starch content was maximum in *Wayanad local*. Total sugar and moisture content were high in *Sree Padma* variety.

Farmer research groups

The concept of farmer research group was emerged in 1980s.The idea of farmer research groups was adopted in different forms in different countries. Farmer research group indicates a group of people engaged in development and transfer of technology and knowledge (Elias Zerfu, 2004). We formed farmer research groups mainly for facilitate effective communication between farmers and scientists and among farmers in the adjacent villages. Farmers involved in participatory research played a critical role in communicating the process and results of research trials. Frequent interactions took place between farmer researchers and scientists. Scientists exchanged concepts and practices related to crop specific research, research design, cultivation practices, monitoring the research trials, pest and disease management, data collection, etc. In return farmers shared their knowledge related to resource availability (like soil fertility, crop varieties, irrigation, labour and cooking quality), nature of farming followed by them, and constraints and possible coping mechanisms to overcome the struggles.

Formation of research group was passed through different stages. Initially orientation was given to all the household members about the agronomic trials and expected benefits from it. In the initial phase, through household survey, participatory rural appraisal and focused group discussions, we assessed the problems and prospects of rice and yam cultivation in the study village. After sensitizing farmers about the research trials, we formed farmer research group by ensuring the representation of all caste, class and gender groups. Farmer research group meeting was convened to explain the process involved in trials including research design and nature of participation expected from farmers etc. The meeting also helped the farmers to share their knowledge and concerns, understanding their role in trial, and possible benefits

Table 3. Farmer participation during different stages of research

Research process	Researcher only, no farmer involvement	Researcher and farmer jointly	Farmer only, no researcher involvement
Diagnose current situation		✔	
Identify options	✔		
Planning experiments How	✔	✔	
Where		✔	
Who		✔	
Management of farmer plot (non-intervention)			✔
Conducting experiment		✔	
Assessing results		✔	
Training Plot layout	✔		
Monitoring		✔	
Data collection		✔	
Cooking quality assessment			✔
Nutritional quality assessment	✔		

to the local farming community. There were frequent interactions (formal and informal) between farmer researchers and scientists at every stage of crop production. Farmers in other villages were also keen to observe and learn the process, they interacted with farmer researchers. Farmer researchers thus played a vital role in communicating the process and benefits of research trials. Farmers in the non-intervention areas visited the research plots and interacted with farmer researchers.

The following table shows the participation of farmers at different stages of the experiment.

Eight and four farmer research groups each were formed for undertaking research trials in rice and yam respectively.

Farm-walk

'Farm-walk' is an effective component in the evaluation of agricultural experiments (Joshi and Witcombe, 2002). During each critical stage of crop production/ and intercultural operations, a joint field visit called 'farm-walk' was organized to assess the performance of crop in both farmers' field and scientists field. Critical and open discussions were held to assess the performances. The visit also helped to make joint evaluation and comparison of crop performances across different fields (farmers' field and scientists' field).

Farm-day

Farm-day was organized at the harvest time to select the best variety in terms of preferred traits by farmers. Farm-day helped the researchers to understand the criteria or traits preferred by farmers. This was beneficial for participating farmers in comparing the varieties and cultivation practices when they are in field and an opportunity for researcher to point out the differences. A total of 80 farmers (62 men & 18 women) were participated in farm day of Rice trials and 54 farmers (30 men & 24 women) were participated in farm day of EFY trials.

In Rice, the criteria of selection are grain yield, straw yield, lodging, shattering of grains, pest and disease attack and cooking

quality. Farmers selected *Sampada* as the best variety followed by *Deepthy* and *Athira*. Sampada came first because of its high grain yield. Even though *Uma* variety got a good yield, it was not selected because of high shattering of grains. Deepthy was selected because of its high straw yield and good cooking quality. *Deepthy* tastes like some of the traditional varieties since it was released from Wayanad (RARS, Ambalavayal).

In EFY, the criteria of selection are corm yield, germination percentage, pest and disease attack and cooking quality. Farmers selected *Gajendra* as the best variety followed by *Wayanad local* and *Sree Padma*. Farmers participated in assessing the cooking quality and they selected *Gajendra* as the best variety in terms of cooking quality. *Gajendra* variety was also the best in nutritional point of view.

Farmer participatory research was a two way study process for farmer as well as the researcher. Farmers were taught about the use of seeds and fertilizers in the two crops. Since EFY was grown in the summer paddy fallow fields, it is not necessary to give the pit size as recommended in PoP (60 x 60 x 45 cm) since there may be drainage problems. An increase in varietal diversity of Rice and EFY has been achieved through the PVS program. Farmers in the study site could identify high yielding varieties that were well adapted to their local agro-ecological conditions and suit their needs, both socially and economically.

CONCLUSION

Educational backwardness of the farmers, remoteness and lack of efficient extension systems prevent farmers from accessing results of agricultural research in India. The study reveals that participatory research is an effective tool to communicate results of crop specific research in rural areas. It is also learned that farmers' choice of a variety depends not only in crop yield but also in combination of different traits that help them to maximize multiple uses.

REFERENCES

Aw-Hassan and Aden A., 2008. Strategies for out-scaling participatory research approaches for sustaining agricultural research impacts. *Development in Practice* 18(4): 564-575.

Elias Zerfu, 2004. Participatory research concepts and practices. In: Workshop on Farmer Research Group [FRG]: Concepts and Practices. October 20-21, 2004. Marc, Melkassa. p.147.

Farm Information Bureau, 2012. Farm Guide. Farm Information Bureau, Govt. of Kerala, Trivandrum.

Freeman, H.A., 2001. Comparison of farmer-participatory research methodologies: case studies in Malawi and Zimbabwe. Working paper series no. 10, Nairobi, Kenya: Socioeconomics and Policy Program, International Crops Research Institute for the Semi-Arid Tropics, p.28.

Joshi A. and Witcombe J.R., 2002. Farmer participatory approaches for varietal improvement. *Euphytica* 127: 445-458.

Kerala Agricultural University, 2011. Package of Practices Recommendations: Crops. 14th Edition. Kerala Agricultural University, Thrissur, Kerala, India. p.360.

Nina Lilija and Mauricio Bellon, 2008. Some common questions about participatory research: a review of the literature. *Development in Practice* 18: 4-5.

Ravi V., Ravindran C.S., Suja G., George J., Nedunchezhiyan M., Byju G. and Naskar S.K., 2011. Crop physiology of elephant foot yam (*Amorphophallus paeoniifolius*). *Advances in Hort. Sci.* 25(1): 51-63.

Saravaiya S.N., Chaudhari P.P., Chauhan G.G., Patel N.B., Patel K.A. and Chaudhari J.H,. 2010. Influence of spacing, time of planting and seed corm size on yield of elephant foot yam (*Amorphophallus paeoniifolius*) under south Gujarat conditions. *Asian J. of Hort.* 5(1): 119-120.

Singh S., Singh S.B., Verma R.B. and Singh T., 1997. Growth, yield and quality of elephant foot yam as affected by various levels of nitrogen, potassium and spacing. *Progressive Hort.* 29(2): 41-47.

Srinivas T. and Ramanathan S., 2005. A study on economic analysis of elephant foot yam production in India. *Agricultural Economics Research Review* 18 (2):241-252.