



INTERNATIONAL SOCIETY FOR HORTICULTURAL SCIENCE

Section Tropical and Subtropical Fruits

Newsletter No 15 July 2016

Dear Colleagues,

The Section Tropical and Subtropical Fruits has successfully organized V International Symposium on Lychee, Longan and other Sapindaceae Fruits from May 31-June 3, 2016 at Sabour, Bihar, India. In 2016 (between July and December), the Section is organizing VI International Symposium on Tropical and Subtropical Fruits at Kafr El-Sheikh, Egypt from September 26-28, 2016, VI International Symposium on Persimmon at Valencia, Spain from October 16-20, 2016, IV International Symposium on Guava and other Myrtaceae and I International Symposium on Tropical Plantation Crops at Cairns, Australia from November 20-25, 2016. We have many more events in the coming year (please see forthcoming events). We like to invite you to attend the symposia scheduled in the coming months.

We have received two articles for this e-Newsletter and we will be pleased to receive your contributions for the next issue to be circulated in January 2017.

We also welcome comments and suggestions for improving its utility.

With regards,

H. Jaenicke
Vice-Chair

S.K. Mitra
Chair

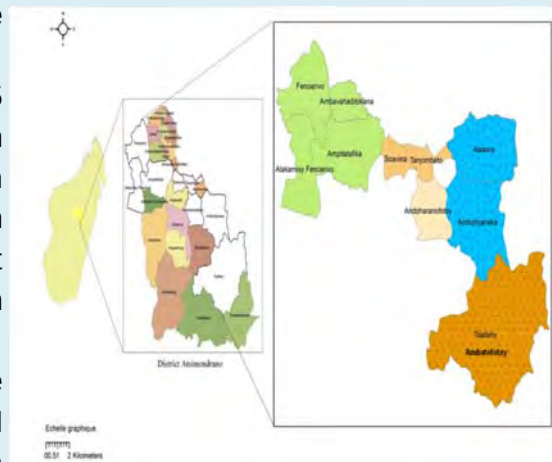
Section Tropical and Subtropical Fruits



Importance of Fruits and Vegetables on Agricultural Activities in the Atsimondrano District, Analamanga Region of Madagascar

The effectiveness of development strategies in the agricultural sector depends on the efficiency of the agricultural information system. The peri-urban areas of *Atsimondrano* district, is located close to the proximity to urban employment markets, technology which is considered as a constraint or competitor against agricultural activities. The public policy ignores the dynamic roles of urban agriculture for Atsimondrano's development. If the actors' dynamics are not considered, the ineffectiveness of political support by the contradiction between the convergence of local objectives and the prescribed acts, or by the constatation of the gap between public objectives and local dynamics are highlighted (Soulard et al. 2011). The objective of this article is to show the dynamics between areas within the district and explain their differences in order to propose specific development strategies in each area.

A study was conducted in the *Analamanga* region *Atsimondrano* District, with ten (10) municipalities, grouped in 5 classes by the geographical position: in the center *Andoharanofotsy*, in the north *Tanjombato* and *Soavina*, in the South *Tsiafahy Ambatofotsy*, in the east *Ambohijanaka* and *Alasora*, and finally in the West *Ampitatafika*, *Fenoarivo*, *Alakamisy*, *Ambavahaditokana*. The geographical coordinates of the capital city in the north and the extreme south are respectively between 47°26'/18°55'58 and 47°33'/ 19° 04' (Map 1).



Map 1: Area study

In terms of farming, farmers in the district currently suffer constraints of urbanization and market. In terms of adaptation, some municipalities are specialized in fruit and vegetables or in other activities systems that remain unidentified.

To classify the municipalities, the study links their activities systems in order to identify the common activities creating links between them interface, and specifics to each zone. Thus, 60 farmers per group have been surveyed. For agriculture and livestock, the variables are respectively constituted by: (i) economic surfaces of the crop types and (ii) livestock number per year. For fruit trees, the number of feet is considered. Variables are centered and reduced in the analysis. Since we have continuous quantitative data, a synoptic chart by Principal Component Analysis (PCA) has been used.

The classification of the results has been mapped with Arc Gis, by mobilizing the database "BD500" according to Laborde projection with the WGS 1984 UTM 38 South Reference Coordinate System. This mapping allowed the visualization of spatial dynamics of the systems.

Classification according to municipalities' types of priority activities

The F1F2 axes represent 55% of the initial information for the municipalities' classification by types of prioritized activities. The two axes are highly correlated with fruit and vegetables; that means that these types of activities are discriminating (Figure 1).

There are 3 groups: group 1 Tsiafahy, in Star position, very strong in fruits and vegetables. Then Alasora, Ambohijanaka and Andoharanofotsy in Question Marks position, strong enough in vegetables. Finally, Fenoarivo, Ampitatafika and Tanjombato, constitute group 3, in Dogs position, less strong in fruits and vegetables. Among the groups 2 and 3, Andoharanofotsy Tanjombato gives more importance to rice (Figure 1).

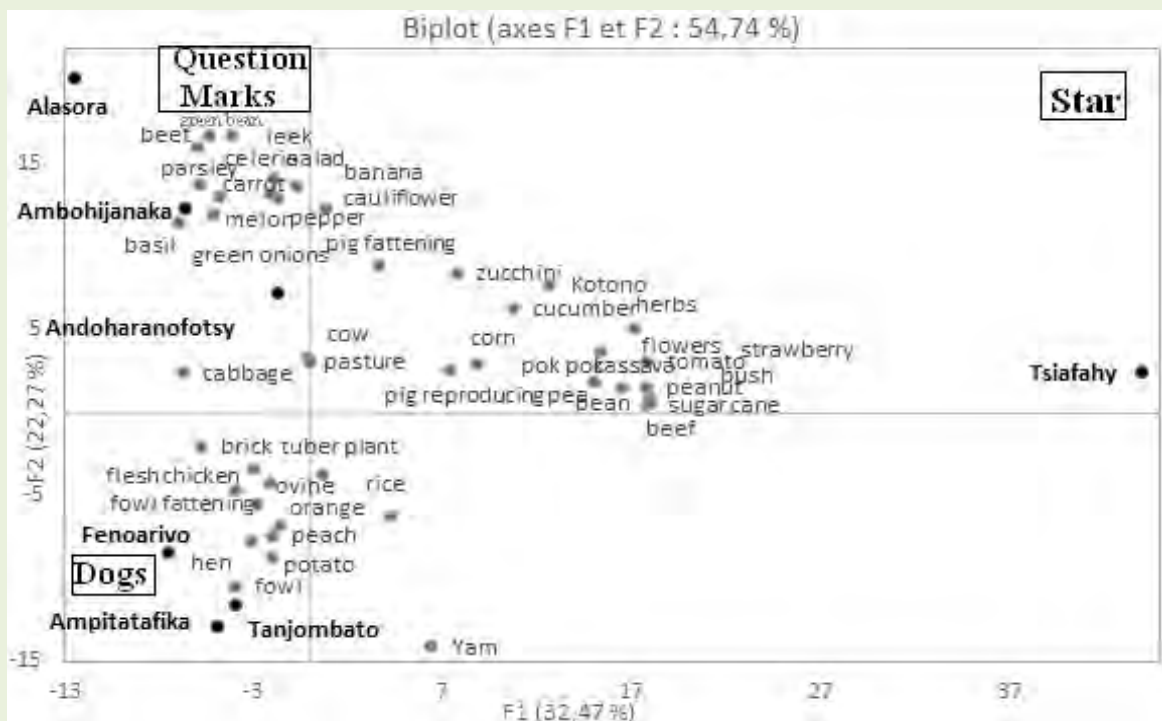


Figure 1: classification of municipalities according fruits and vegetables

By analogy with fruit and vegetable, there is a heterogeneous of activities systems at the Atsimondrano district and the dominance of rice is not total. However, from the west to the south, there is a sudden change in the types of activities at Tanjombato and Andoharanofotsy, hence the appellation "interface area"; they belong to the municipalities having the same types of priority activities but they diversify their farm activities without any specialization. Contrary to the interface area, tubers, cattle and orange are priority activities in the west. The East zone opts for vegetable crops while prioritizing rice and the brickyard. Finally for the Southern zone, vegetables remain priority; however, the farmers are also interested in farrow swine speculation, dairy cattle and producing fruit such as strawberry, pok pok (Figure 2).

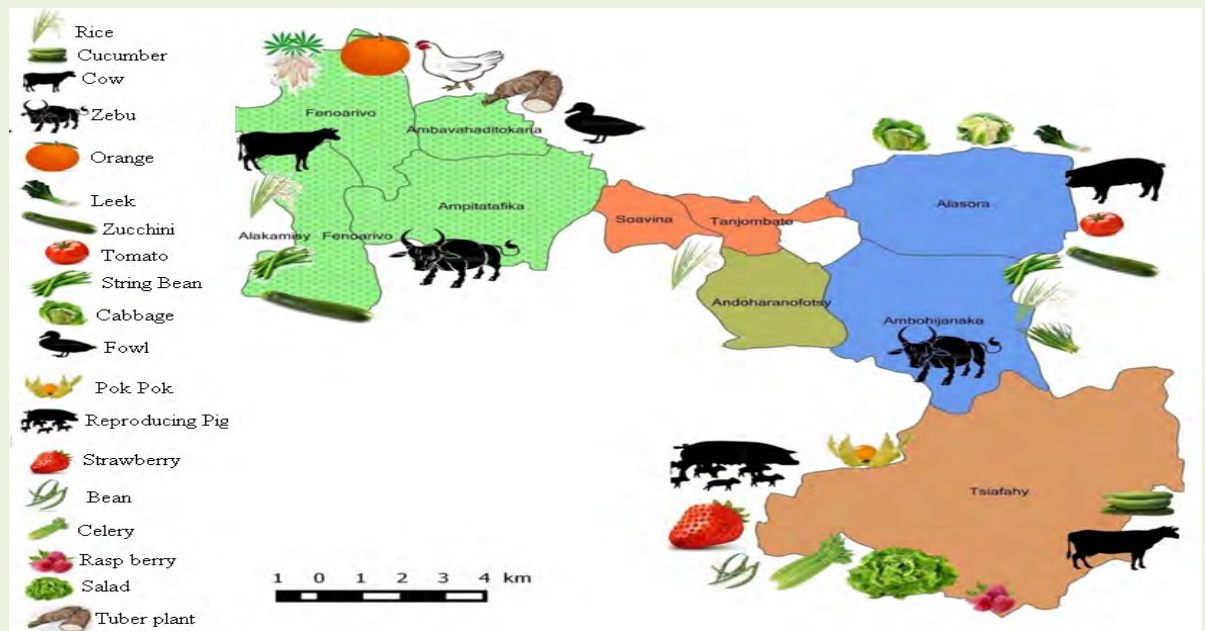


Figure2: Spatial dynamics of the activities system

Heterogeneity of the types of activities

Influence of access to inputs.

The practices inside the interface zone are explained primarily by access to factors of production, which in turn influences the utilization of resources. Indeed, the 2 municipalities suffer land pressures, manifested by a competition between agriculture and habitation. On one side, the demographic pressure weighs, with a very dense population (10 000hab / km² for Tanjombato) against 3 000hab/km² for the area study and 345hab / km² at national level) (Figure 3). On the other hand, industrialization is progressing and is impacting factors "land and manpower". Indeed, between 1996 and 2003, there was a 7% increase in newly constructed houses and a 12% decrease in cultivated land. The agricultural population in this zone, has become minority, with respectively 7% and 5% for rice producers and vegetable farmers.

Facing the land pressure, there is less culture in the *tanety*¹ for the market gardening; this incites farmers to intensify more on the irrigated rice or on the off-season crops. Additionally, Moustier et al. in 1996 have already stated that in case of peri-urban areas, vegetable crops are not durable because of the population density problem.

Despite the importance of the land pressure in social and local political dynamics, the commercial components have the greatest impact on farmers. Thus, they react less to this pressure due to their high capacity for adaptation and flexibility in relation to changing contexts.

2. Influence of urban environments

The proximity of the city plays an important role. If it promotes the flow of goods, it exerts on the other hand a land pressure on agriculture and leads to competition for access to the workforce. This peri-urban agriculture is often part of farmer's activities, including agricultural production, farming, fishing or fish farming, product development activities or exploitation of resources and activities outside agriculture. These activities outside agricultural production are closely linked to the city: direct sale of certain products on markets more or less formal, brick

making for urban construction, small business, wage in industry and services, craft activities related to construction such as joinery, carpentry,... or to craftwork .

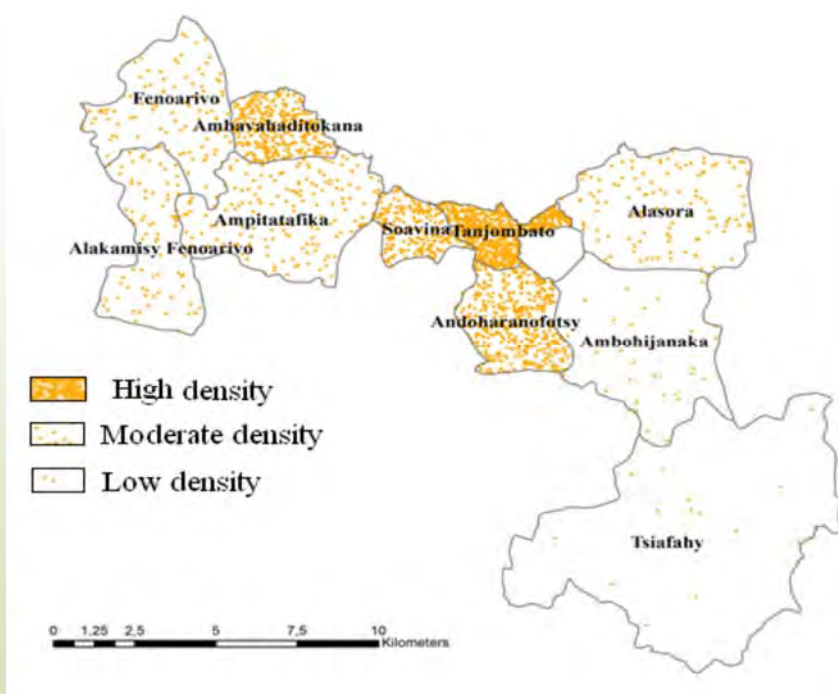


Figure 2: Map of density of population

3. Other distinguishing factors

The other factors of dynamism are very different but they are linked with the types of activities adopted by farm households.

In the east zone, market gardening occupies the *tanety* or *baiboho*¹; they are off-season crop on the rice lowland. This is because of the land pressure on the alluvial soils accompanied by the demographic and urban growth. Moreover, the impacts of economic crises push farmers to supplement incomes. However, practice in off-season is less profitable because of the expensive inputs. In this East zone, there is less of land pressure than interface area. The intensification of market gardening is justified in seeking additional incomes because of the economic crises which cause the loss of jobs in free-zone.

For West zone, rice growing is important, accompanied by fattened fowl and sweet potato. The farmers are also specialized in orange. From the results, farmers do the diversification and intensification at once. Over one quarter of the population are market gardeners. As feature, the west zone is less populated compared to the study area (2 500 hab/km² against 3000 hab / km²). Thus, with reduced land pressure, farmers have fewer constraints for the allocation of resources.

Finally for Tsiafahy in the south, almost all (99%) of the population is rice farmer while only a quarter of the market gardeners. According to the results, Tsiafahy is in Star position on fruits and vegetables and specializes in strawberry. Up to now, this zone is not sensitive nor by demographic pressure (232hab / km²) nor by a pressures of urbanization and industrialization. This South Zone is similar to the West in the combination of diversification in food crop and market gardening, and the specialization on fruit.

¹ Hillsides

² Flood recession cropping



RECOMMENDATIONS AND CONCLUSION

The recommendations focus on the specification of support and the reorientation of agricultural policy. The municipalities were classified according to the real needs of farmers taking into account their economic and technical capacity. Thus, for the West zone formed by Alakamisy, Fenoarivo, Ampitatafika, the supports must focus on cassava, orange, milk cow. Then in the case of the East Zone, coaching should focus on the market gardening. Finally, the culture of strawberry is very easy to identify as specific to the South zone. Several programs and public or private projects have identified this priority and have provided support on the technical and commercial like the SAHA program, Commune Urbaine d'Antananarivo (CUA), etc. ; they brought supports as diverse as versatile: introduction of mulching, variety trials, market research, inputs, establishment of business infrastructure, strengthening of producer responsibility. Not only the strawberries but corn, beans, dairy cow should be considered like priorities in the south area.

This study aims to show a spatial dynamic between zones and explain their differences in order to propose specific development strategies in each area. Therefore, it was necessary to verify that the "priority" activities are different from one area to another. Once the support of public policy are consistent with the farmers' expectations, an efficient politic is expected and real.

Further reading references

Losch, B. (2002) La multifonctionnalité face aux défis de l'agriculture des Suds : une perspective de refondation des politiques publiques ? Communication au colloque SFER « Multifonctionnalités de l'activité agricole et sa reconnaissance par les politiques publiques », 21-22 mars 2002, Paris INA P-G, 23.

Ministère de l'Agriculture, de l'Elevage et de la Pêche (MAEP). (2007). programme régional du développement rural Analamanga. P.105

Ramanankantsoina, J. (2006). Agriculture urbaine et péri-urbaine: vers une meilleure compréhension des organisations de producteurs à bas revenus.

Rasolomanana, L., R., Ralaimaro, Rakoto. (2011). Problèmes de pollution des ressources en eaux posés par les déchets industriels et ménagers dans la ville d'Antananarivo et de ses environs. p2, 10

Soulard, C. T. (2011). Cultiver les milieux habités. Quelle agronomie en zone urbaine? La revue de l'association française d'agronomie.

L. RAKOTOARISOA.¹, H.F. RANAIVOARISOA^{1,2}, J. RAZAFIARIJAONA.^{1,2}, S. RAMANANARIVO ^{1,2}, and R. RAMANANARIVO.^{1,2},

(1)Ecole Supérieure des Sciences Agronomiques Madagascar

(2)Ecole Supérieure de Management et d'Informatique Appliquée

***Prunus nepalensis* Ser. (Steud) : A Potential Underutilized Fruit of North Eastern Himalayan Region of India**

The North Eastern Himalayan Region of India, one of the mega biodiversity hotspot in the world, is a treasure trove of many underutilized horticultural species. The region is known for more than 4500 indigenous germplasm of various crops. More than 81 species belonging to 40 genera of wild relatives of different crops are found in this region. Of this, 10 genera covering 28 species belong to wild relatives of various fruit plants. Most of these underutilized fruit crops are important part of the traditional diet and serve as important sources of nutrients to the local tribal people. In addition, many underutilized fruit crops are highly rich in bioactive properties and contributed significantly to the local food basket of the ethnic hill communities. *Prunus nepalensis* Ser. (Steud), a member of Rosaceae family, is one of the important underutilized fruit crops of North Eastern Himalayan region of India, especially in Indian state of Manipur (Senapati and Ukhrul district), Meghalaya (East Khasi Hills, West Khasi Hills and Jaintia Hills) and some parts of Nagaland at altitude ranging from 1400 to 2000 m above MSL. In Meghalaya the fruit is known as '*Sohiong*' in Khasi dialect while in Manipur it is known as '*Khashi Cherry*' in Pouchi and '*Theikanthei*' in Tangkhul dialect.

Morphology

The tree is evergreen medium size 15-20 m height, upright with dark brown or greyish white colored bark and open branches. Leaves oblong, lanceolate, caudate, acuminate, and glabrous with average length and breadth of 8-15 cm and 4-6 cm, respectively. Flowers are white in colour arranged in terminal racemes or axillary. It starts fruiting after about seven to eight years of planting. Fruits are drupe, fleshy, globose, green to pinkish in colour at early stage and later on becomes dark purple at ripening. Fruit surface is smooth. The fruits are usually round in shape and resemble black grapes or jamun. Stone is hard, round in shape with smooth surface but rough in few genotypes. Bloom period varies from November to March and fruit ripens during July to early October depending on the agro-climate and altitude. Genotypes having rough stone surface start maturing March onwards.

Table 1. Physical characters of *Prunus nepalensis* fruits

Parameters	Range
Fruit weight (g)	3.75 - 10.40
Fruit volume (ml)	4.00 - 8.73
Polar diameter (cm)	1.57 - 2.53
Equatorial diameter (cm)	1.71 - 2.50
Stone weight (g)	1.10 - 3.00
Stone length (mm)	12.48 - 15.94
Stone diameter (mm)	11.50 - 15.08
Pulp recovery (%)	47.30 - 76.18
Pulp : Stone ratio	1.40 - 2.97

There is no distinct cultivar available for *Prunus nepalensis* in the region but variability exist in terms of size of fruits.

Composition and Uses

The fruits are consumed as fresh by the local people. Fruit juice and pulp are also used for preparation of processed products. The fruits are rich in potassium (7.80 - 16.15 g/kg) and medium in calcium (461.25 mg/kg). The copper, zinc, manganese and iron content in ripe fruits were 1.56 - 1.95, 2.45 - 8.35, 7.56 - 39.35 and 9.60 - 29.23 mg/kg, respectively.

The fruits also contain nitrogen and phosphorus to the tune of 0.77 and 1.15 g/kg, respectively. The fruits are good source of dietary calorie.



The fruits have also been found to be rich in anthocyanin and hence, it holds good potential for extraction of natural edible colour required in food industry.

ICAR Research Complex for NEH Region, Manipur Centre, India has already developed many value added products from *Prunus nepalensis* namely squash, RTS beverages and jam. They also standardized the spray drying technique of microencapsulation of *Prunus nepalensis* juice (ICAR-RC-NEHR, 2011).

Cultivation

Prunus nepalensis is propagated by both seeds and vegetative method. Seed propagation is common practice, however, plants from seedling origin take longer to fruit and give lower yields.

The plant can also be propagated through cuttings. Cuttings (10-15 cm length of 2 cm thickness having 3 nodes) of mature wood of the current year's growth are planted during rainy season (July-August) in poly bag nursery filled with sand, soil and farm yard manure (1:1:1).

Tongue grafting, standardized at ICAR Research Complex for NEH Region, Meghalaya, India, is an easy technique to produce true to type plants. In this method one year old rootstock is used for grafting. Best time of tongue grafting is during October, when stock and scion are in dormant condition. Stock and scion of equal diameter is selected. A smooth slanting cut of 4 -5 cm long is made on the rootstock at about 15-20 cm above the ground level and another downward cut is given starting approximately 2/3rd from the top of the slanting cut and about 2 cm in length. This formed a tongue like structure on the stock. Similar cut is also made on the lower side of the scion exactly matching the cut given on the rootstock. The scion of 20-25 cm length having 2-3 buds of previous season growth is then fitted tightly with the rootstock and tied with polythene strips. The union completed within 30-45 days of grafting and after that polythene strip should be removed.

The plants are usually grown in wild condition in the subtropical rain forest under the hill slope, in homestead and as a subsidiary crop in the orchards of pear (especially in Meghalaya). However, for organized plantation it should be planted during the onset of monsoon in the pits (0.75 m X 0.75 m X 0.75 m) dug at 7 m X 7 m spacing. The pit should be filled with top soil and FYM (15 kg) up to 10-15 cm above the ground level followed by a light irrigation. During seedling stage, the field should be kept free from weeds to ensure good crop growth. In North Eastern Indian Himalayan Region, the crop is grown under rainfed condition without any application of external inputs, as forest soil is rich in organic matter and leaf litter. However, to ensure good vigor adequate amount of organic manure should be applied. Application of nitrogen-fixing and phosphate solubilizing biofertilizers is also beneficial for the crop.

The crop does not require much training and pruning. However, all branches and water sprouts emerged up to 1 m from the ground level should be removed. One clean straight stem

Table 2. Quality Attributes of *Prunus nepalensis* fruits

Parameters	Range
Dry matter (%)	16.00 - 25.33
TSS (%)	15.00 - 24.20
Acidity (%)	0.12 - 0.80
Ascorbic acid (mg/100g)	8.51 - 13.40
Total sugar (%)	3.60 - 10.85
Total anthocyanin (mg/100 ml)	130 - 167
Energy (Kcal/100g)	367 - 374

with a few well-placed branches should be maintained. The dead and diseased branches should be removed periodically.

Insect-pests and diseases are not a major problem in *Prunus nepalensis*. Among the insect-pests leaf eating caterpillars are most common. Leaf blight disease is most widely occurring disease in *Prunus nepalensis* and it can be found in all stages of growth starting from seedling to grown up trees.



***Prunus nepalensis* tree**



***Prunus nepalensis* flowers**



Fruit bearing branches of *Prunus nepalensis*



Ripe fruits of *Prunus nepalensis*

Harvesting of fruit should be done when fruit fully ripe and attain deep purple or blackish colour. Fruits start ripening in the month of August and continue up to early October depending on altitudinal variation. Whole bunches of fruit is harvested with a sharp sterilized knife. Harvesting should be done either in early morning or in the late afternoon. On an average, a 12-13 years old tree produces 110-160 kg fruit/tree/year or 27-30 tonnes/ha/year.



Though *Prunus nepalensis* exhibits a good potential to become a commodity crop, this promising fruit crop is still underutilized in terms of commercial production and processing. The crop is nutritionally rich and adapted to low input agriculture. Hence, dedicated R&D effort is required in terms of morphological and molecular characterization of available genotypes and their genetic cataloguing, conservation of genetic resources, crop improvement and standardization of location specific production package. Strategies need to be worked out particularly at national and regional levels to develop and make available promising selections and overcoming constraints of mass multiplication of good planting material to boost production and meet the demand of local market. Establishment of small scale processing units at community level, promotion of processed products and providing market access are urgently required to ensure better economic returns and also to provide employment opportunities to rural folk. As the crop has been found to be rich in bioactive properties, research needs to be geared up in the field of bioprospecting for its commercial utilization and to improve the quality of life.

References:

- ICAR-RE-NEHR. 2011. Standardization of spray technology for *Prunus nepalensis*. Annual Report 2010-11. *ICAR Research Complex for NEH Region, Meghalaya, India*. pp 135.
- ICAR-RC-NEHR. 2012. Evaluation of the stability of sohiong squash. *Annual Report 2011-12. ICAR Research Complex for NEH Region, Meghalaya, India*. pp 90.

S. S. Roy¹, R. K. Patel², M. Preema³, , N. Prakash¹ and S. V. Ngachan⁴

¹ICAR Research Complex for NEH Region, Manipur Centre, Imphal, India

²National Research Centre on Litchi, Muzaffarpur, Bihar, India

³Faculty of Horticulture, Uttar Banga Krishi Viswavidyalaya, Cooch Behar, West Bengal, India

⁴ICAR Research Complex for NEH Region, Umiam, Meghalaya, India

FORTHCOMING EVENTS

Forthcoming Events

