FOURTH NATIONAL HORTICULTURE SEMINAR ON HORTICULTURE FOR FOOD SECURITY, EMPLOYMENT GENERATION AND ECONOMIC OPPORTUN

January 18 -19, 2007 (Magh 4-5, 2063)
Kirtipur, Kathmandu
Nepal

NEPAL

Proceeding of the Fourth National Horticulture Seminar on Horticulture for Food Security, Employment Generation and Economic Opportunity

January 18-19, 2007

Kathmandu.

Editors of the Proceeding*

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Nepal Horticulture Society

* The editorial board or the editors are not responsible for the expressions by different authors in this publication.

Fourth National Horticulture Seminar

Theme: Horticulture for Food Security, Employment Generation and Economic Opportunity

Venue: Central Horticulture Centre, Kirtipur, Kathmandu, Nepal

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- CEAPRED

Table of Contents

Fourth National Horticulture Seminar
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Mr. Hari Prasad Gurung

Program Schedule of Fourth National Horticulture Seminar

January 18-19, 2007

Venue: Central Horticulture Centre, Kirtipur, Kathmandu

Date & Time Jan. 18, 2007	Program	Remarks
09.00-10.00	Registration of the participants	Mr. Hari Prasad Gurung Mr. Narayan Bhandari
Technical Session I		
	Chairman: Mr. Shiva Bahadur Nepali	
Rapporteures: Dr. Deepak Mani Pokharel and Dr. Raju Raj Pandey		
Master of Ceremony Dr. Gajendra Sen Niroula		
10.00- 12.00	1. Present status of huanglongbing in some western districts of Nepal	Dr. Chiranjivi Regmi and Mr. Bishwanath Pd. Yadav
	2. CEAPRED`S experiences in fresh vegetable and vegetable seed production	Mr. Indra Raj Panday
	3. Evaluation of satsuma mandarin (*Citrus unshiu*) varieties for early season production	Dr. K. P. Paudyal and Mr. Basant Chalise
	4. Prospect of coffee commodity to improve the livelihood of middle mountain farmers in Nepal	Mr. Prachanda Man Shrestha
	5. Nepal SIMI approach on high value horticulture product	Dr. Luke A. Colavito
	Chairman's Remarks	Mr. Shiva B. Nepali Pradhan
Inaugural Session		
Chief Guest, Mr. Mahantha Thakur **Hon`bl Minister, Ministry of Agriculture and Coopratives**		
	Chairman: Dr. Krishna B. Shrestha	President, NHS
12.00 -12.15.	Welcome of chief guest and other invitees.	Dr. K.B. Shrestha President NHS
12.15- 12.10	Welcome address	Mr. Ganesh K. Shrestha General Secretary, NHS
12.10 –12. 25	Vision on Horticulture Development in Nepal	Mr. Gopal P.Shrestha Mr. Fuleshwor Singh Dr. Gajendra Sen Niroula
12.25-12.30	Recognition of Senior Horticulturists	Honorable Minister for Agriculture &Cooperatives
12.30-1.00	**Few Words:**	
	1. Mr. Shiva B. Nepali (With message from President IHS)	Life Member, NHS & Convenor of Hort. Seminar
	2. Mr. Dr. Harikrishna Upadhyay	President, Nepal Agriculture Federation
	3. Mr. Bhairab Raj Kaini	Officiating Secretary, MoAC
	4. Inaugural address by chief guest	Honorable Minister for Agriculture &Cooperatives
	5. Vote of thanks	Mr. Hari Parsad Gurung
	6. Chairman's remarks	Dr. K.B. Shrestha, President, NHS
1.00-2.00	**Tea Break**	

	Technical Session II	
	Chairman: Mr. Bhairab Raj Kaini	
	Rapporteures: Dr. Deepak Mani Pokharel Mr. Dharma Parsad Devkota	
2.00- 6.00	1. Experiences on International Horticulture Congress 2. Fruit fly attractants 3. APPSP's support in Horticulture development for poverty reduction 4. Enhancing apple productivity through using pollination services of honeybees: a case study from Himachal Pradesh, India	Mr. Shiva Bd. Nepali Pradhan Dr. Raju Raj Pandey Mrs. Sangita Khadga Ms. Uma Pratap
Chairman's Remarks		
6.00-8.00	Dinner	

Second day

Date & Time **Jan. 19, 2007**	**Program**	**Remarks**
	Technical Session III	
	Chairman: Mr. Bhairab Raj kaini	
	Rapporteures: Dr. Deepak Mani Pokharel Mr. Dharma Prasad Devkota	
	Tea break	
09-12.00	1. Fruit development in Nepal: Success cases 2. Year round fresh vegetable production from an organic kitchen garden: Twelve years' experience of ARS, Pakhribas 3. TPS technology in Nepal	Mr. Bhairab Raj Kaini Mr. P. P. Khatiwada Mr. Shyam Prasad Dhakal
Chairman's Remarks		
12.00-1.00	**Lunch Break**	
General assembly of NHS		
Chairman: Dr. K. B. Shrestha, President, NHS		
2.00-2.30	Presentation of general report Presentation of financial report	Mr. G. K. Shrestha, General Secretary Mr. G. P. Shrestha, Treasurer
	Discussion for new executive committee formation (Open flower)	
2.30-3.30	Formation of a new executive committee of the NHS.	
Closing Session		

Inaugural Session

Honorable Minister for the Ministry of Agriculture and Cooperative Mr. Mahantha Thakur inaugurated the fourth horticultural seminar by lighting *panas* amidst the participants' clapping. The 2-days seminar, given a theme of *'horticulture for food security, employment generation and economic opportunity'*, was held on 18-19th January 2007 at Central Horticulture Center Kirtipur.

Welcome address by general secretary of the society

The Chairperson Dr. K. B. Shrestha, the president, NH-Society,
Chief-guest, Mr.Mahantha Thakur, the Honorable Minister, MOAC
Distinguished participants
Ladies and Gentlemen

It gives me great pleasure to welcome you all to the fourth Horticulture Seminar jointly organized by Nepal Horticulture .Society and the directorates for fruit and vegetable development. I, on behalf of Nepal Horticulture society and rest of the organizers, take this opportunity to convey warm greetings & good wishes to all of you. The presence of the Honorable Minister in this occasion showed his strong interests & determinations on Nepalese horticultural development, which has boosted our, specifically the horticulturists, morale up. This inspires all of us assembled here to work hard on horticulture development in the country.

'Horticulture for food security, employment generation and economic opportunity' is the theme of the seminar being held, which is participated by about 100 horticulturists from all over the country. Thirteen papers associated with the theme are being presented by the experts from different organizations working for horticulture development in the country.

Lastly, on behalf of the organizers, I would like to thank you all for accepting our invitation. I welcome you and your full participation in the seminar. I wish that your presentation, presence and contribution in the program would be successful and fruitful. I wish all of you an enjoyable and pleasant stay in Kathmandu.

I thank you all again.

Ganesh Kumar Shrestha
General Secretary
Nepal Horticulture Society

Presentation on "Horticulture Development Vision in Nepal" by Gopal Prasad Shrestha

Mr. Gopal Prasad Shrestha, Treasurer of NHS, made presentation on "Horticulture Development Vision in Nepal". The concept of the paper was to meet the internal demand and import promotion of horticultural products by large scale commercial production, product diversification and value addition. He presented strategic vision to be adopted for the horticultural development in Nepal.

Recognition of Senior Horticulturists

The society has a tradition of offering *dosalla as* a symbol of the honor to senior horticulturists and recognition of their contribution to horticultural development in the country. This year, the minister honored senior horticulturists namely Mr. Babukaji Bhomi, Mr. Buddhi Ratna Sherchan and Dr. Ram Krishna Raut . After being honored, Mr. Bhomi on his few words in the session expressed his gratitude to the intuition of the NHS-tradition and wished that the society sustained it.

Few Words by Mr. Shiva B. Nepali including the message from the President, IHS

Nepal Horticulture Society, established in 1990, is platform for the horticulturists and people involved in horticulture production, horticultural industries, horticultural marketing, horticultural services and alike. This platform makes the horticultural industry to grow and move forward and to contribute to the economy of the nation and to help the people to improve the quality of life.

Remote Area Development Board, in 1970-71, gave impetus to grow apple in all districts of Karnali Zone, and Mustang, Manang Districts and in remote mountain districts like Rasuwa, Solukhumbu, and Darchula. In 1975, the first 10 Year Agriculture Plan did visualize the zones for different major agricultural commodities like food grains in Terai, Horticulture in Hills and Livestock in the Mountains. However, such zones did not restrict to develop other commodities in the stated zones. Agricultural Year was observed in 1975 and since that year in case of fruits with predominance in Citrus around 300 nurseries were established. In 1990, Master Plan for Horticultural Development was implemented and paved the way for horticulture development. The institution recommended for the development of horticulture, however, short lived. In 1995, Agricultural Perspective Plan was implemented. This plan has emphasized high value fewer commodities with consorted effort. Like Citrus in the middle hills, Apple in Inner Himalaya, vegetables seasonal and off season in hills, mountains and Terai, and vegetable seed production. Horticulture has been contributing around 14 percent in agricultural GDP and expects to contribute more.

Now the abundance of fruits specially citrus and vegetables, and some apple and mango have shown the economic potentiality of horticulture in day to day life, general health of the people and the quality of life of the people specially of the producers. There is a long way to go. Production is there. But production continues to suffer from insect pests and diseases. There is a need of strong support from research. Production needs the support from post harvest technology. Production needs the support from value addition - processing and prolongation of life of the produce. Production needs the support from . grading, packaging, storage and transportation. Production needs proper chain of marketing - marketing within - domestic and outside - export. Export is the one that should receive attention now. For all these, horticulture institution is paramount one, the Government to give priority.

Like Nepal Horticulture Society in Nepal at the national level, at the world level there is an organization called International Society of Horticultural Science - ISHS. This is the source of information to all the countries of the world for the horticultural development. Annually Symposiums, Workshops, Conferences, Congress, are held in different countries on different topics at different time of the year in conjunction with ISHS. Attending Horticultural Symposiums, Workshops, and Conferences is of great value to the Horticulturists and horticulture development. And its membership at country level and individual level brings tremendous technological inputs in the development of horticulture.

In 2006, IHC was held in Korea. In coming 2010, it will hold in Spain & Portugal, and in 2014, it will hold in Australia. The benefit of attending IHC is tremendous. The ISHS Council Meeting is also held during IHC. IHSH has announced the Global Horticulture Initiative -GHI, the Paris Accord that aims to address the poverty through horticulture.

Asian Vegetable Research and Development Center - AVRDC the World Vegetable Center is one that is giving priority to Indigenous Leafy Vegetables to for the health of the impoverish people. It is worthy to take up the initiative of AVRDC. Recently international Seminar was held in ICRISAT, Hyderabad, India.

FAO the Agriculture Organization of UN is very important for the development of agriculture in general has initiated the program called HORTIVAR that records the information of fruits and vegetables grown in a country and the same information is made available to other country having the similar growing climatic conditions. It is important to participate actively in such initiative.

The growth of horticulture is very important for the country like ours. Market is the key to success of horticulture growth, well supported by post harvest technology, harvesting time and methods, production technologies, value addition, quality of seeds and seed production practices. The role of Research and Extension including training can not be minimized. Therefore it is a full circle of activities that are to be integrated so that all the stakeholders are benefited.

Nepal Horticulture Society together with similar related societies domestically and International Organizations like ISHS, FAO, AVRDC and other Horticulture Societies, on joining hands, can lead and go a long way to build the national economy, improve the health of the people in general and help improve the quality of life specially of impoverish people with the improvement in their income from the cultivation, production and marketing of horticultural commodities.

Mr. Shiva B. Nepali Pradhan,
Convener, Fourth National Horticulture Seminar
Nepal Horticultural Society January 18-19, 2007
Kirtipur, Kathmandu, Nepal

Greetings from the International Society for Horticultural Science

Dear Convener Pradhan and Seminar Participants,

I am very pleased to know that the Nepal Horticulture Society is assembling at the Kirtipur Horticulture Development Center to discuss how strengthening horticulture can improve food security, employment, and economic development of your country. I wish you every success for an excellent meeting and I extend warm greetings from the Board of Directors of the International Society for Horticultural Science.

Convener Pradhan is aware of the ambitions of the International Society to play a much more active role in addressing the United Nations Millennium Development Goals about reducing hunger and poverty. The theme of your seminar is exactly in line with our belief that strengthening horticultural science and industry in Nepal can lead to important benefits - perhaps the most important being the potential to improve incomes from small holdings and provide healthy food and employment for rural communities. However, we must keep in mind as well that the successful production and marketing of fresh fruits and vegetables in and near large urban centers also requires the support of knowledgeable professionals in horticultural science. Thus, your deliberations at Kirtipur are of great importance to the whole of Nepalese society.

Consistent with this greater emphasis on supporting international development, the ISHS has played an important part in developing the Global Horticulture Initiative. This Initiative, with many partners, will most certainly have an impact on Nepalese horticulture in coming years. Perhaps 1 will have an opportunity to visit your beautiful country within the context of this Initiative and its various program elements.

Finally, let me take this opportunity to invite each of you to consider joining the International Society for Horticultural Science as individual members. In doing so, you will join more than 6500 colleagues from at least 140 countries. 1SHS members believe in the importance of horticulture for a healthy society. They also recognize the value of standing together to promote the profession.

Sincerely and collegially yours,

Norman E. Looney
President
International Society for Horticultural Science

Prospects for Fighting Poverty, Hunger and malnutrition through the promotion of indigenous Vegetables: A brief message from Dr. M.L. Chadha

Indigenous vegetables (IVs) are a rich source of many disease-fighting, health-promoting phytochemicais, vitamins and essential micronutrients. These underutilized vegetables and legumes provide a great contribution to world food production, economic opportunities for the farmers and landless laborers. The IVs have always been important food commodities and vegetable system research and development (R&D) in the World. But in most countries, researchers have focused towards the major food crops or on cash crops with export potential, and IVs are fallen into isolation and are thus marginalized. Recent emphasis on collection and utilization of indigenous vegetables and legumes has endorsed the additive role they can play in achieving food anal nutritional security. The use of IVs by non-privileged populations further emphasizes the need to focus on the crops. While sporadic efforts on improvement of these vegetables and legumes have been made, there is need to draw the attention of the international communities and researchers to highlight their diversity, regions of availability, efforts on improvement, and use to which they can be put.

In this regards, First international Conference on indigenous Vegetables and Legumes involving policymakers, researchers, nutritionists, technology transfer experts, socio-economic scientists was organized at AVRDC-The World Vegetable '%-'.enter during December 12-15, 2006 with the aims to efficiently identify the current scenario of development and constraints, take an expert look at the challenges and opportunities that lie ahead, and deploy feasible approaches for enhancing IVs to fight the poverty, hunger, and malnutrition affecting the urban poor and rural communities. The conference focused attention on the importance of conserving, improving and utilizing indigenous vegetables and legumes. It had the participation of more than 220 participants from 42 countries. There were as many as 100 oral presentations and an equal number of poster presentations during 13 concurrent sessions covering the themes of the conference. There was an overwhelming interest expressed in setting up collaboration at country, regional and global levels by adopting an integrated approach towards work on Indigenous Vegetables and Legumes by maximizing the networks. We look forward working with Nepal for the promotion and utilization of IVs in near future and hope to develop a bilateral and their active participation in the regional projects. We need to work together on the on the following issues:

- Assess R&D trends in the conservation, utilization and management of IV species
- Document scientific information available on R&D on IVs
- Develop strategies to promote the use of indigenous vegetables and legumes worldwide
- Synergize inter-institutional collaboration on research and development initiatives on IVs for future prospects to fight poverty, hunger, and malnutrition.

I wish all the success in the conduct of Fourth National Horticulture Seminar which is being organized by Nepal Horticulture Society.

Few words: Dr. Harikrishna Upadhyay, Nepal Agriculture Federation.

Being invited in the fourth hoticulture seminar organized by Nepal Horticulture Society, Dr. Hari Krishna Upadhyaya president in Nepal Agriculture Federation thanked to all members in the society and highly appraised the theme given to the program. He observed the theme well tuned to the time-demand and much consciously fabricated envisioning 'new-Nepal' that he meant to the economically properous, self-relient and inclusive Nepal. Such a state in our context, he added, would only be possible through development of agricultural sector for which he emphasized on the contribution of horticultural subsector and major role by horticultural society. Suggesting 'weaker situation of horticultural researches' in the country as a remark, Dr. Upadhyaya wished that the society would find its way towards making the country self relient through harnessing comparative economic advantages visible especially on horticultural commodities.

Few words: Mr. Bhairab Raj Kaini, officiating Secretary, MOAC.

Based on retrospection, Mr. Bhairab Raj Kaini mentioned that horticulture development was almost absent in the country when he entered into the service. Comparing present situation of horticulture to the past and to other subsectors, the progress the country has achieved is, as Mr. Kaini observed, much satisfactory. 'However', he explained 'many challenges still persist in connection to the so envisioned 'new-Nepal', and therefore the society, as mentioned by Dr. Upadhyaya from his valuable experiences in NGO and horticulture development, has crucial role to play. He admitted that the state had performed positively in many of the peiodic plans in fixing high priorities and accordingly allocating resonable resources to the horticultural subsectors. In his speech, Mr. Kaini suggested the society to move forward with a plan of action so that the issues and problems identified so far would be dealt effectively to reap high level of prograss. NHS had been such a forum that included many intellectuals from diversified fields. However, He added, 'the strength in it had not been utilized in a better way', and promised 'to avail every sort of assistanc from the side of the ministry'.

Inaugural address: Chief guest Mr. Mahantha Thakur, the minister in the MOAC.

'Wherever we (the politicians) go, we have to deliver some words for the public. ... I put my ideas in brief for that you all might be tired of listening' the minister initiated. 'In the context of human civilization development' he appealed 'the progress achieved by mankind could be explained spiritually and materialistically'. He chose the materialistic approach to define 'the nature' as an '*anadi*' (meaning having no end and initiation), which on the earth showed a balanced and harmonious relationships among the plants, animals and the mankind. Any deviation in the balance would lead to devastation he warned and hoped that the prudence, the experience and the contemplation by the intellectuals participating there would contribute to the development of human society and its welfare. He added 'the God let us the earth and asked the wise people (*Prithu*) to govern it'. He expected that the intellectuals with their astuteness contributed towards eliminating any misbalance in the nature's system. The mankind, as he believed, in an organized manner could solve all sort of problems to achieve a prosperous nation and society; while disorganized, it would lead to devastation. Finally the minister wished for every success of the participants and the horticultural society.

Vote of thanks:

On behalf of the society Mr. H.P. Gurung expressed heart felt thanks to the chief guest, the secretary, sponsors and all other participants in the seminar for their all sort of contributions and their attendance despite their busy schedule.

Chairman's remarks: Dr. Krishna Bahadur Shrestha, the president of the society

"Nepal Horticulture Society established in 1990 is now going to complete its fourth general assembly successfully" Dr. Shreshtha initiated. For the truth, as he mentioned, we cannot immediately go for industrial products for achieving economic growth in the country. For the higher comparative advantage, we have inevitably to depend on horticultual subsectors also. In this way and restating Dr. Upadhyaya and Mr. Kaini, Dr. Shrestha mentioned that the role and the importance of horticultural subsectors as well as the society in the nation's development had been acknowledged many times in such forums. Many of the high-ranking speakers in the similar programs in the past had expressed their consent on laying high priority on horticultural development in the country. Some of them had even suggested the society to ask for horticultural department, and in its pursuance, the society even ran behind futile efforts of presenting '*jynanpan-patras*' to them. He questioned 'if the country had to develop its horticultural subsectors, why would not a department for horticulture be established? 'Small is beautiful', based on this, he justified 'smaller organization would make proper decisions and implement the programs effectively'. Finally the president extended his sincere thanks on behalf of the society to SIMI , CoPP, APPSP, VDD, FDD and Dahal Agrovet for financial and other supports provided to the society.

Fruit Development in Nepal: Success Cases

Bhairab Raj Kaini[1]

Abstract

Fruit development program in Nepal has been fetching state priority ever since the Fifth Plan. Since then many efforts have been made in fruit research and development. Among many efforts of the past, introduction and evaluation of exotic varieties, intensive fruit production programs in the late sixty, private fruit nursery development, national priority program for citrus development in 20 mid-hill districts, special junar production program of Sindhuli and Ramechhap, establishment of demo-farms in production areas, LARC/ PARC model of fruit development program, command area approach of government farms and the programs in farmers' initiation were reported as successful ones. The impact of these programs could be justified by an increase in fruit production in the areas they were implemented. If we analyze the reasons of the successes, many lesions can be learned from them.

Introduction

Nepal has a long history of growing fruits in kitchen gardens. Formal collection and evaluation of exotic germplasms of fruit crops started from 1952 at Singh Durbar (Kathmandu) and Kakani (Nuwakot). During the Fifties, many varieties of pear, plum, peach, persimmon, chestnut etc., were introduced by the government for evaluation. But systematic approaches of fruit research and development were started only after 1967 when a separate department of horticulture and 13 farms under it were established at different agro-ecological regions of the country. Since then many efforts have been made in the development of fruit industry. Fruit development programs started to receive support of the government in an impressive way since the Fifth plan (1975-1980), which gave priority on production oriented researches and establishment of commercial orchards mainly in the mid-hills. Before the period, 'the agriculture year' was observed in 1973 which gave emphasis on establishment of private fruit-nurseries throughout the country.

In the Sixth Plan (1980-85), efforts were made to develop orchards in areas where transport infrastructures were developed. Also the areas near urban centers got priority for the establishment of orchards. As in the Sixth Plan, the Seventh Plan (1985-1990) also continued the concentrated effort of fruit development around highway corridors, cities and densely populated areas. Emphasis was given on the production of mango, litchi, banana, pineapple, mandarin, orange and apple. The plan also aimed to substitute import and promote export of these fruits. Interest subsidy on the credit was provided to encourage farmers for the establishment of commercial orchards. During the period, a number of donor supported project were started for the development of fruit sub-sector. For example, an excellent training center was established at Kirtipur with JICA support. The Eight Plan (1992-97) focused on those fruit development programs which could provide both employment and income to farmers. The Ninth Plan (1997-02), the first phase of Agriculture Perspective Plan, laid priority on citrus development in the Middle-mountain and apple development in the Trans-himalayan Zone. Poverty reduction through fruit development program is the focus of the Tenth Plan (2002-07). Combined efforts in

[1] Joint Secretary, Ministry of Agriculture and Cooperatives

the past considerably increased the area, production and productivity of important fruit crops (Appendix 1).

Among the efforts in the past, some were much successful to impart positive impacts on fruit industry, which are discussed hereunder.

1. Introduction and evaluation of exotic varieties

After the establishment of 13 horticulture farms at different agro-ecological zones of the country, many exotic varieties of fruit crops were introduced and tested at these farms. In fact, almost all the so-called improved fruit-varieties that we have today were then introduced. The horticulture development program in collaboration with the Government of India introduced many varieties of citrus in Dhankuta and Pokhara; apple in Jumla, Mustang, Rasuwa Helumbu, Baitadi and Daman; peach and plum in Kirtipur, Mustang, Jumla, Helumbu, Daman and Baitadi and Mango in Janakpur, Trisuli and Dhunibesi during 1960–1973. Altogether 123 varieties of 104 fruit crops were introduced during the period; some of them are still giving good yields in the farms. Excepting citrus, the varieties were found promising under Nepalese conditions. The orchards of these fruit crops are still serving as the progeny orchards.

Hill Agriculture Development Project (1977-80) was the other important project which introduced 118 new varieties of different fruit-crops. Besides these varieties, the project also introduced maling-morten series and *Malus prunifolia apples* at Kirtipur, which are still being used as source-materials for apple rootstocks. The Horticulture Development Project (1985-97) also played a major role for introducing fruit crop varieties in Nepal. This project introduced 10 varieties of pear, six varieties of grapes, eight varieties of persimmon, three varieties of chestnut, one variety of Kiwi fruit, two varieties of loquat, two varieties of plum and nine varieties of citrus. The project also selected some local types of Junar, mandarin and limes. Lumle Agriculture Research Centre (LARC) and Pakhribas Agricultural Research Centre (PARC) also introduced many varieties of different fruit crops. Among them Anna and Vered of Apple; Taxes, Spring Time, Orion, and Alton of Peach; Methley and Black Champa of Plum and Kumini and Tsukaba of chestnut are the main ones. The centers also screened local germplasms of citrus and banana. There are many other formal and informal sources of exotic fruit varieties. As compared with the size of the country, Nepal is very rich in fruit biodiversity. In fact, 186 varieties of 42 different fruit crops are reported to be in cultivation (Kaini, 1995). The introduction of exotic fruit varieties has enriched fruit biodiversity and increased fruit production of the country. The program of fruit variety introduction is, therefore, a successful case, which should be continued in future.

2. Intensive fruit production program of the late sixties

The first intensive fruit production program was started from the fiscal year 1968/69. This program was implemented in 16 districts of the country. In eleven districts – Bara, Parsa, Rautahat, Chitawan, Jhapa, Bardiya, Kailali, Kavre, Dhading, Makwanpur and Nuwakot, fruit crops like mango, litchi, pineapple, guava and lemon were planted. Kathmandu, Lalitpur, Bhaktapur, Rasuwa and Sindhupalchok districts were selected for apple, pear, peach, plum, persimmon and apricot. Altogether, one hundred thousands fruit saplings were distributed in the districts under this program. Then a similar type of program was launched in Jumla and Mustang districts for apple. The apple trees planted at that time are still giving good harvests to the farmers. This program could also be listed as a success case, and the reasons for the success were as listed below.

1. A block of 40 *ropani** was a unit for providing support to plant fruit trees.
2. Intensive technical services were provided to the farmers free of cost.
3. Eighty percent subsidy was provided on the cost of fruit saplings.
4. Similarly, 50 percent subsidy on the cost of sprayer, fertilizer, insecticides and fungicides were also given to the farmers.
5. After plantation, regular monitoring of fields was done to provide necessary technical advises to the farmers.

3. Private fruit nursery development program

The establishment of private level fruit nurseries started from 1973 associated with many other special programs to observe 'Agriculture Year'. Since then private sector is being encouraged to develop fruit nurseries. As a result, there are 375 such nurseries in the country (Appendix 2), which have been contributing to the supply of 83 percent fruit saplings required by the state. Therefore, private nursery program was also a success in supplementing fruit development program in the country. Some of the reasons behind the success are as follows.

1. Nurseries are located close to the fruit growing areas.
2. Intensive training is provided to the nurserymen.
3. There is increasing demand of fruit saplings.
4. Execution of support programs for nursery establishment and strengthening such as subsidies, technical advices and nursery competition.

4. National priority program for citrus development in 20 districts.

This program was started in the fiscal year 1983/84 with an objective of boosting up citrus production in 20 mid-hill districts namely Dhankuta, Terathum, Sankhuwasabha, Bhojpur, Okhaldhunga, Ramechhap, Sindhuli, Dhading, Gorkha, Lamjung, Tanahun, Kaski, Syangja, Palpa, Gulmi, Arghakhanchi, Salyan, Khotang, Dailekh and Illam. Though it was a nationally prioritized program, there was no external source of funding. The program was launched with strong commitments of the government. Hence, it became successful, and the impact of which is now seen in those districts where citrus production has increased in a considerable volume. Many commercial orchards of mandarin-orange were established after implementation of this program. The followings were the reasons of the success.

1. A strong organizational setup with a National Citrus Development Program in Dhankuta and three citrus research and development centers in Dhankuta, Pokhara and Dailekh.
2. A strong commitment and support programs of the government.
3. Qualified, experienced and dedicated staffs.
4. Regular and close monitoring of program implementation.
5. Monthly review of progress at departmental level.
6. Expanding markets for citrus fruits.
7. Suitable land and climatic conditions.
8. Farmers' interest in citrus cultivation.
9. Strong research extension linkage.

* 1 ropani= 500 sq.m.

5. Special junar production program

This program was started in the fiscal year 1980/81 in Ramechhap and Sindhuli districts with the establishment of private nurseries. Junar belongs to sweet-orange group, and is commonly known as orange in English. The area, production and productivity of Junar in Nepal are 5255 ha, 35474 Mt and 12 Mt/ha respectively (NCDP, 2005). Ramechhap and Sindhuli produce more than 75% of the production as the districts have many commercial orchards of Junar at bearing stage. This is the outcome of the efforts made to implement the special program which was supported by the Horticulture Development Project funded by JICA. The reasons for the success of the program were-

1. Very strong commitment of the government to implement the program
2. Adequate budget allocation
3. Selection of suitable pockets
4. Planting materials locally produced
5. Coordination office established at Sindhuli Horticulture Farm with provision of necessary staffs, authority and other resources
6. Program launched as a campaign
7. Proximity of production areas to the market
8. Expanding market of Junar and
9. Regular monitoring and progress review.

6. Demo-farms in production areas

The Horticulture Development Project established Junar demo-farms at production areas of Sindhuli and Ramechhap districts to demonstrate improved technologies of Junar production. These demo-farms were managed by leader farmers, and were found very supportive to promote Junar production program in those two districts. The reasons for this could be as listed below.

1. Demo-farms were established and managed under local conditions.
2. All farmers of the area could see management practices and their effect on orchard.
3. Demo-farms were used as venues for practical trainings.

Recently, the author had an opportunity to make a comparative study on mango production, post harvest management and marketing in Nepal and Bangladesh. One of the recommendations of the study is toestablish demonstration orchard in production area and the recommendation is made based on the experience of Bangladesh.

7. The LARC/PARC's model of fruit development program

The Lumle Agriculture Research Center and Pakhribas Agriculture Research Center, established in the late sixties as training centers and later as research and development centers, have played vital roles in development of fruit sub-sector in the eastern and the western hills of Nepal. The centers carried out research, extension and training programs in an intensive way. Introduction of exotic varieties, development of orchard management (including plant-protection) and post-harvest technologies and scaling up of recommended technologies to command areas are some of the success cases. The followings are the reasons of the successes.

1. Integrated approach of fruit research, extension and training.
2. Adequate resources including qualified staffs and better incentives to them.
3. Consolidated command areas.
4. Selected fruit crops.
5. Support program to the farmers.
6. Practical trainings to the farmers.
7. Regular and close monitoring of program implementation.
8. Full authority given to the centre for execution of the program.

8. Command area approach of government farms

Each of the horticulture farms in the country launched some intensive programs of technology transfer in their command area during the eighties and the nineties. As per the program, farm-technicians visited command areas to provide technical services to the farmers. Available technologies and production inputs were provided to the farmers in an integrated way. District Agriculture Development Offices were also involved in farmers' selection. This approach was much effective to establish commercial orchards in vicinity of the farms. As a result, many commercial orchards were established in the command areas of horticulture farms. Followings are the noteworthy points in this approach.

1. Quick transfer of technology.
2. Better services to the farmers.
3. Regular follow up programs.
4. Farm-technicians well aware of farmers' issues and problems.

9. Programs in farmers' initiation

There are many examples of fruit development program initiated by leader farmers and rapidly scaled-up by the surrounding farmers, such as the banana pockets of Kabaswati (Nawalparasi) and Tikapur (Kailali). In Kabaswati, an area of more than 300 hectares has been brought under banana cultivation within 5 years' period. This is one of the most success cases of fruit development in the recent years. The reasons of the success are as listed below.

1. Program initiated by self-motivated farmers.
2. Production pocket connected to road head.
3. Locally produced planting materials.
4. Selection of suitable variety to the local conditions.
5. Group approach in production and marketing.
6. Educated farmers.
7. Backstopp support of DADO, NARC and IAAS.

Conclusion

Fruits are important sources of nutrition and income in the country. While grown successfully along the contours of mountain slope, fruit-trees not only provide income to the mountain farmers but also check soil erosion. Realizing these facts, several efforts were made in the past to develop fruit in the hills and the mountains. As discussed earlier, one of the success efforts is the introduction of improved fruit varieties. The development of fruit varieties is a slow and costly process, but the demand of varieties is changing with time. Nepal cannot meet the demand of modern varieties with her internal source and effort. Hence, continuous effort is to be made to introduce desirable varieties as in the past. These days, it is said that plant genetic resources are the common heritage of mankind, and they should be made available to all those who need them. However, such efforts should not minimize the importance of indigenous varieties. Nepal is rich in local fruit germplasms. Fruit crops like mandarin-orange, sweet-orange, pear, lime and lemon have very popular local varieties. Introduction and evaluation of exotic varieties and collection, evaluation and selection of local landraces should get priority for variety development of fruit crops. All varieties should be documented in monographs giving major emphasis on desirable traits.

Role of private sectors in the production of fruit saplings is very encouraging in Nepal. However, Nepal does not have certification laws for the planting materials, and hence, quality issue is emerging as a challenge these days. Therefore, formulation and implementation of fruit nursery act should get high priority.

We have to learn lessons from the success-cases of the past and, on such basis, design future program. If we analyze the reasons behind the successes, many lessons can be learned from them. A strong commitment of the government, adequate resource allocation, demand and market led programs, supports to the farmers, accessible production areas, use of appropriate varieties and production technologies, educated farmers, regular and close program-monitoring are some essentials of fruit development program to make it a success. Post-harvest management including handling, packaging, transportation, storage and marketing did not receive much attention in the past. Researches on post-harvest management and processing need to be pursued more actively for value addition and diversification of the products.

References

Gautam, J.C. and P.K. Thapa, 1995. Consolidated Approach to Fruit Development in Nepal. In proceedings of Seminar on Fruit Development in Nepal, pp. 20-49.

Kaini, B.R., 1994. Status of Fruit Plant Genetic Resources in Nepal. In Plant Genetic Resources – Nepalese Perspective, NARC and IPGRI, pp. 103-111.

Kaini, B.R., 1995. Fruit Development in Nepal. In Proceedings of Seminar on Fruit Development in Nepal, pp. 53-64.

Kaini, B.R., 2004. Horticulture Development in Nepal: an overview. In proceedings of the Third National Horticulture Seminar on Environmental protection and poverty Reduction through Horticulture Development, pp. 10-21.

Shrestha, G.K. 1995. Research activities on Fruit Crops in Nepal. In Proceedings of the Seminar on Fruit Development in Nepal, pp. 191-201.

Shrestha, P.P. 1993. Fruit Production, research and development in Nepal. In Research and Development of Fruits in the Asia-Pacific Region, RAPA, Bangkok, pp. 125-138.

Subedi, P.P., D.P. Lohar and G.B. Gurung, 1995. Fruit crops technologies developed by Lumle Agricultural Research Centre. In Proceedings of the Seminar on Fruit Development in Nepal, pp. 176-190.

कैनी, भैरवराज, २०४३ । जुनार उत्पादन तथा संरक्षण । वागवानी विकास आयोजना, कीर्तिपुर ।
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सघन कृषि कार्यक्रममा फलफूल विकास, २०२६ । फलोधान विभाग, हरिहरभवन ।

Appendix 1: Area, Production and Productivity of Important Fruit Crops (2004/05)

Kind of Fruits	Area (ha)	Production (Mt.)	Productivity (Mt./ha)
Mango	22960	132496	9.37
Mandarin Orange	15987	97480	11.31
Banana	5055	51581	14.22
Guava	4355	36446	11.51
Junar	5255	35474	11.97
Apple	7799	34983	9.57
Pear	3576	33362	11.89
Papaya	2711	29445	14.01
Lime	3895	19132	8.01
Jack Fruit	2201	17865	11.61
Litchi	3850	16734	7.74
Peach	2448	13653	6.90
Pineapple	936	9980	14.24
Plum	1625	9425	7.03
Lemon	600	3822	7.84
Areca nut	2487	3816	1.91
Apricot	154	567	6.75
Persimon	143	443	6.72
Pomegranate	143	441	4.59
Coconut	347	352	2.03
Almond	16	11	1.00
Others	25910	156956	10.75
Total	**89312.25**	**552879**	**9.99**

Source: FDD

Appendix 2: Private Fruit Nurseries in Nepal (2004/05)

Dev. Regions	Citrus	Winter Fruits	Summer Fruits	Mix Fruits	Total
Eastern Development Region	46	2	31	1	80
Central Development Region	30	5	43	12	90
Western Development Region	38	-	3	7	48
Mid-western Development	33	59	7	15	114
Far-western Development	21	1	3	10	43
Total	**176**	**67**	**87**	**45**	**375**

Source: FDD

[Queries from the participants of the seminar:

Breaking silence and with a humorous sense, Mr. I.R. Pandey queried on 'why committed staffs and other resources as required had not been available for horticulture development in the country despite being of high ranking horticulturists including the presenter and writer of this paper in the policy level. Mr. B.R. Sherchand raised the issue that the horticulture farms/centers in the country are not only lacking necessary supports from the center, but also they are suffering from undue administrative interventions like that of Kirtipur. In response to the queries, the presenter added that the districts on an average had more than 25% of the total budget allocation on horticultural sector. On such ground, he denied that the center had not supported horticulture sector. However, he accepted that horticultural farms and centers were deteriorating due to poor budget allocation by the state. On the concluding remarks, the chairperson of the session linked fruit germplasm introduction achievements in the country to the past period of Ten Years' Plan for Agriculture Development, when a Plant Introduction Unit was operative in the Ministry of Agriculture (MOA)and research-extension linkage was strong due to well operating commodity programs.]

Prospect of Coffee Commodity to Improve Livelihood of Middle Mountain Farmers in Nepal

Prachanda Man Shrestha[1]

Abstract

Coffee cultivation has a great potential to provide farmers a very good on-farm employment and income generation opportunities and is well adapted to the climatic conditions especially in the middle mountains of central and western Nepal with a range of altitude from 800 to 1600 masl. Despite the potentiality of improving livelihood of small-farmers and generating foreign currency by its export in the international niche market, coffee has received a little attention from the Government and other development agencies.

Estimated coffee production in Nepal in terms of green-bean in 2006 was 156 metric tons. There have been consistently increasing trends in area and production of coffee. Introduction of wet processing has improved the quality of Nepalese coffee and, thereby, added to its value at village level resulting in increased income to coffee producers and job opportunities to village processors. Export of Nepalese coffee to the international market increased from nine mt. in 2000AD to 80 mt. in 2006 AD.

Major bottleneck in the coffee sector is the lack of research to develop suitable production and processing technologies under Nepalese condition. Despite some risks and constraints, several opportunities have been observed in the sector. Proper policy interventions and coordinated efforts in addressing producers, processors and traders' needs such as their access to credit would help in the sustainable development of coffee industry to benefit the stakeholders in general and small resource holder producers in particular.

Introduction

Agriculture in Nepal is subsistence in nature. Agriculture remains Nepal's principal economic activity, employing almost 2/3rd of the population and providing 39% of GDP. The population has increased to about 25 million on a land area of 147,181 Km^2, about 18% of it being arable. As population pressure grows, increasing number of farm households struggle to produce sufficient food from smaller holding and marginal land. Decreased per capita production combined with limited income-generation opportunities has deteriorated rural economy.

Commercialization of potential crops suitable for small-holder farmers in the mountains would help in achieving economic growth, food security, and poverty reduction in Nepal. Coffee, well-adapted to the climatic conditions of middle-mountains in Nepal, is emerging as one of the potential crops to provide rural farmers with on-farm employment and income generation opportunities. Superior high altitudinal coffee can be produced at an altitude higher than 800 m. Ease of production and low input requirements render coffee cultivation possible by small holder farmers even in marginal-lands and existing cropping/farming systems, which has positive impacts on soil and environmental conservation.

Despite these benefits, coffee has so far received little attention from Government and other development agencies. Excepting some public and private efforts motivating the

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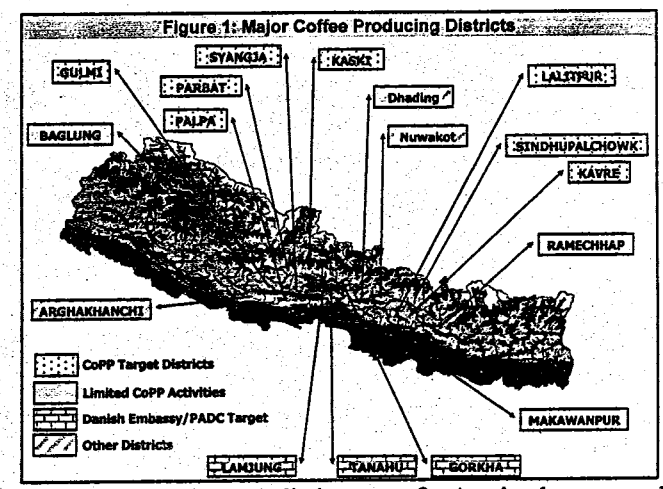
farmers to grow coffee, there has been a lacking of clear policy support on coffee production, processing and marketing. Regardless of which, area under coffee is increasing every year as many new farmers are introducing coffee in their farming, and older grooves are being extended. Nepal Coffee Producers' Association (NCPA) has been providing limited technical and organizational support to the producers' groups. However, the association has been facing a lack of resources and trained manpower to promote the crop as per expectation. Coffee Promotion Project (CoPP) of Helvetas Nepal has been under implementation since 2003 with provision of some supports on production, processing and marketing of coffee as well as development of producers' organizations at village, district and central level. There are few other development agencies (NGOs) presently intending promotion of coffee area for crop diversification and income generation. Provided systematic interventions in a coordinated manner to address the producers, processors and traders' needs such as increased access to credit and sound policy, coffee industry could develop in a sustainable manner to benefit small resource holder producers (CoPP, 2006).

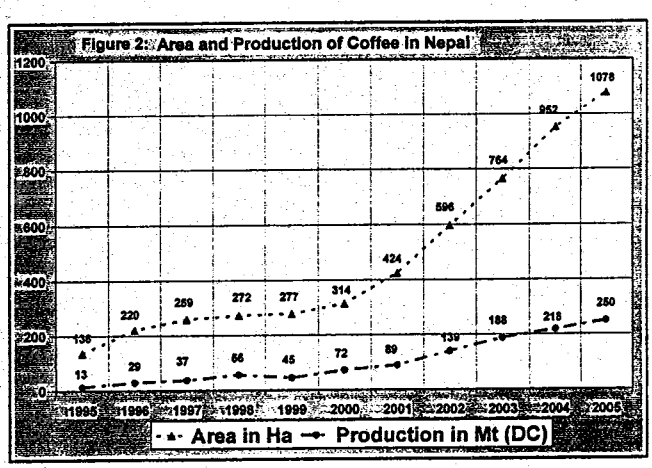


Coffee in Nepal

After the introduction of coffee in Nepal by Monk Hira Giri in Aanpchaur, Gulmi in 1938, the crop remained unnoticed till 1970. However, it spread in Gulmi and neighbouring districts as a matter of farmers' curiosity on the crop as it controlled soil erosion. During late seventies, expansion of coffee as commercial crop took place to some extent when Ministry of Agriculture and Cooperatives imported coffee seed from India for distribution. Commercial coffee production initiated with establishment of commercial nurseries during 1980s. The major shift to commercial coffee production took place when the farmers were able to sell dry cherry to Nepal Coffee Company in 1983/84. Organic coffee production was not known to majority of the farmers till then, which was initiated in Madanpokhara, Palpa in 1989. In 1997, Coffee Producers' Association decided to produce coffee under organic system. Since then, the producers have been consistently following organic system of production and major guiding principles adopted by the producers' associations regarding technical service delivery. As per the guidelines, the association members are asked to comply with the organic standards of coffee production as far as possible, and any producer using unacceptable chemical inputs in the crop is penalized by relinquishing his/her membership from the association.

Area and production

Initially, coffee used to be planted as a hedge-crop for soil erosion control. Recently, the crop, as an additional source of farm income in the mountain system of farming, is predominantly grown in marginal uplands under rain-fed condition, where other crops do not perform well. Usually no fertilizer or pesticide is applied. Coffee is



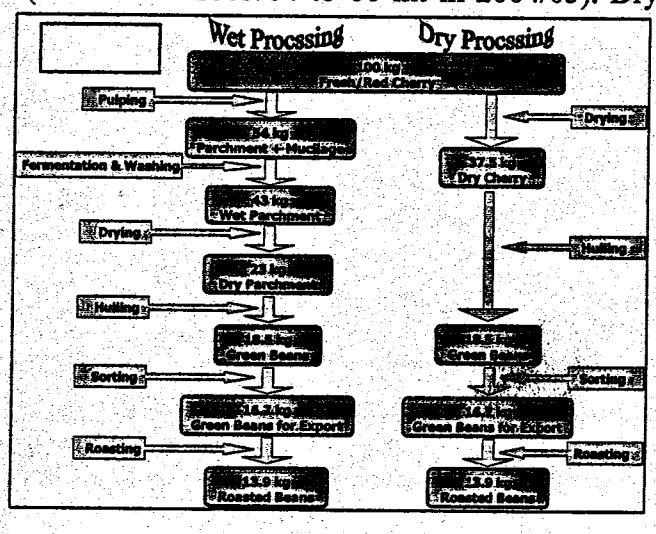
therefore regarded as an agronomically less demanding and easy crop to grow. However, in areas with commercial production of vegetables and fruits, farmers might be using some fertilizers and pesticides in the companion/inter crops. Such situation is limited to infrastructurally build up areas, where farmers have easy access to external inputs.

Presently coffee is grown in more than 40 districts in Nepal. However, 15 districts in the Western and Central Development Regions are the major coffee producing districts (NTCDB, 2006). Among which, eight districts namely Gulmi, Palpa, Parbat, Syangja, Kaski, Lalitpur, Kavre and Sindhupalchwok are the CoPP target districts (Fig.1). Coffee promotion activities in Gorkha, Lamjung and Tanahu are implemented by People's Awareness Development Centre (PADC) under financial support from Danish Embassy in addition to limited activities by District Coffee Producers' Associations (DCPAs). Arghakhanchi, Baglung, Nuwakot and Dhading are other districts producing substantial amount of coffee. Limited CoPP activities are also conducted in Baglung, Makawanpur and Ramechhap for high quality coffee production potentiality there.

According to available information, area under coffee has increased consistently from 136 hectares in 1995 to 1078 hectares in 2005 (Shrestha et al., 2006). Similarly, production of dry cherry increased from 13 mt. in 1995 to 250 mt. in 2005 (Fig. 2). It is estimated that production of coffee in 2006 is about 156 mt., which is equivalent to 312 mt. dry cherry.

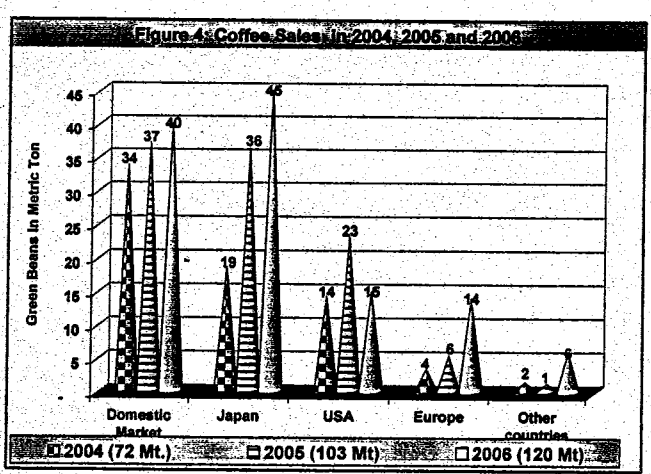
Processing

Coffee in Nepal was predominantly processed by dry processing method till 2002/03. Wet processing has been gaining popularity since 2003/04, and a sizable quantity of green beans of coffee has been wet processed (19.1 mt. in 2003/04 to 60 mt in 2004/05). Dry processing that involved simple drying at farm level is easy process (Fig. 3). In case of wet processing, fresh cherry is processed at pulping center to produce dry parchment. Introduction of wet processing has successfully contributed to value addition at village level resulting in increased income and job opportunities to coffee producers.

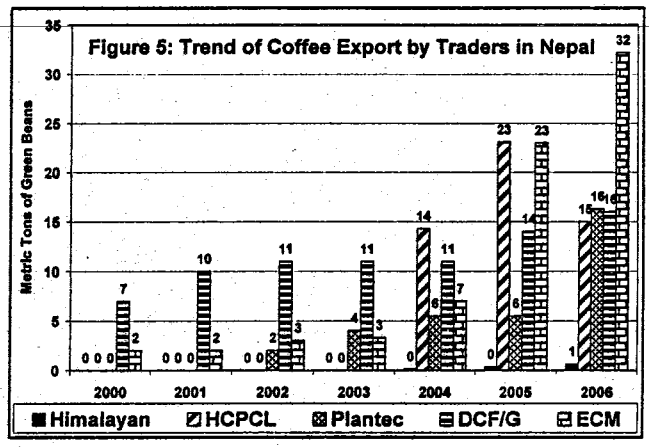


Market

Coffee produced in Nepal is mainly targeted for export market. Estimation of marketed coffee presented in fig. 4 shows that total coffee marketed in 2004 was 72 mt., which increased to 103 mt. in 2005 and 120 mt. in 2006. Export of Nepali coffee increased significantly from 30 mt. in 2004 to 66 mt. in 2005 and 80 mt. in 2006. Likewise, domestic consumption has also increased to some extent. Figure 5 shows trend of coffee export by different traders from the year 2000 to 2006. It reveals that not only the



export quantity has increased but also an increasing number of traders is getting interested in coffee commodity. Majority of coffee consumers in the domestic market includes tourists and expatriate residents. So both the markets are quality and environment conscious. Nepalese coffee is potential for securing a place in the international market provided quality of the coffee is increased with necessary interventions in production, processing and marketing.



Problems

Although the coffee commodity in Nepal has potentials for improving small-farmers' livelihood, the product is still untested in broader international market. The coffee sector, now in fledgling condition, is vulnerable to haphazard production techniques, little or no coordination among stakeholders, poor processing facilities and very little quality control (Shrestha, 2005). There has been a lack of systematic and solid support in production, processing and marketing promotion resulting in the sector's poor performance in quality coffee production for domestic as well as international market.

Major coffee sector problems in Nepal are listed below:

1. The production is organic by default. But the sector is subject to policy neglects as observed by
   - absence of research and development.
   - lack of national standard and guidelines for organic production.
   - lack of information flow on technologies, quality requirements and market potentialities among stakeholders.
   - No direct support program (subsidy) on organic promotion, inspection and certification
2. Majority of coffee producers are poor farmers with small number of coffee plants.
3. Lack of pocket production program that would help in cost effective production and marketing of coffee and effective monitoring and implementation of quality control mechanism.

Opportunities

Coffee has been accepted as an income generating crop by the small farmers of the middle mountain region in Nepal. Systematic interventions in the areas of production, processing and marketing could improve the productivity and quality of coffee to be recognized as a specialty Nepali coffee in the international market.

Major opportunities associated with coffee promotion in Nepal are listed below:

1. Availability of sufficient labor for intensive operations such as harvesting and post-harvest processing.
2. Coffee is mainly cultivated under shade of diversified tree species.

3. Coffee production system in Nepal that uses locally available resources and no chemical input is environment friendly.
4. Nepali coffee is specialty in nature with room for quality improvement
5. Nepalese government is optimistic on pocket based organic production of high value commodities including.
6. Logo of coffee is developed pending the development of coffee CoC.
7. Policy focus on producing organic coffee for export market
8. Small farmers based self employed industry
9. Possibility of domestic market promotion for import substitution.
10. Coffee production in Nepal offers a great scope for production of organic coffee.

Risks

There are several risks in the coffee commodity that should be considered for coffee promotion in Nepal. They are-

1. Chemical contamination due to commercial fruit and vegetable cultivation in coffee production area.
2. A shift of fertile maize land to coffee area could affect food security.
3. Much scattered area of coffee production.
4. Possible epidemics of diseases like leaf rust upon expansion of coffee in humid eastern districts.
5. The price, farmers are getting for the fresh cherry, is already high. While that pulper operators are getting for dry parchment is low.
6. Nepali coffee on its export has fetched attractive price due to its uniqueness. Similar product in India (Uttaranchal declared as organic zone) could increase competition for export coffee market
7. Coffee is taken only as a part-time business by majority of the processors and traders.

Need of the Sector

Based on the CoPP experience, followings are the major needs for systematic development of coffee sector.

1. Knowledge dissemination on organic production system through intensive training, not only to the producers but also to the people involved in processing, marketing and quality management.
2. Quality management as per ICS requirements should be initiated to guarantee organic quality of the product.
3. Capacity building of existing institutions and private service providers.
4. Introduction and verification of technology recommended elsewhere.
5. Producers' easy access to credit.
6. Collaboration with international agencies involved in organic agriculture including IFOAM
7. Independent monitoring body to assure product quality as per the CoC
8. National coffee standards for organic production, processing, handling and marketing.
9. Marketing promotion taking into account of international niche market.
10. Less costly mechanism of participatory guarantee in domestic market
11. National network for organic agriculture production promotion.

Major Constrains of Organic Coffee Production in Nepal

- Lack of proper understanding of organic standards and regulations.
- Lack of research and extension support services.
- Poor production and lack of on-farm post-harvest quality management practices.
- Lack of high yielding varieties and high quality planting materials.
- Existing high price of fresh/dry cherry compared to international market; and big range of prices of dry parchment.
- Absence of minimum quality standards and quality control measures.
- Unfair competition among processor and traders.
- Rather than a competitive basis, presently the coffee is reached in international market through personal approaches by the traders.
- Inconsistency in the taste of the coffee.
- Lack of knowledge and experience on group certification and internal quality control mechanism.
- Lack of a national organic coffee production program.

Conclusions and Recommendations

1. Coffee can increase small farmers' income supplementing them for food and nutrition. Therefore, strong coordination and collaboration among different stakeholders is essential to support coffee production, processing and marketing in a sustainable and environment friendly way.
2. Lack of research on organic coffee production and processing is one of the major bottlenecks for the development of coffee sector.
3. Since coffee policy emphasizes organic production, it should be promoted through strict regulations.
4. Organic certification could be expensive. Sustenance of organic certification without donor's support should be studied, and attempts should be made to certify Nepali coffee as Fair Trade Coffee.
5. International coffee experts have recommended discriminating coffee into two groups, depending on production altitude namely 800-1100masl and above 1100 masl to improve quality and consistency in the taste of coffee. Such effort would increase reputation of Nepalese coffee.
6. Wet processed Nepalese coffee has been recognized as high quality coffee with potential for further improvement. Studies and other attempts should be made for further quality promotion through improvements not only in production system at producers' level but also in wet processing at village and central level.
7. Since minimum quality standards for coffee are not yet defined for Nepalese coffee, such attempts should be made with institutionalization of quality monitoring system.
8. Lack of coordination among traders results in collection of low quality coffee. For which, traders should be supported for their better organization and coordination.
9. .Coffee expansion, specifically in the eastern region of the country, should be discouraged to avoid possible disease epidemics. For which, coffee promotion activities should be concentrated in the central and western Regions

References

CoPP, 2006. Coffee Promotion Project Annual Report, Helvetas Nepal.

NTCDB, 2006. Tea – A – Tea, Smarika, National Tea and Coffee Development Board, Kathmandu, 2063 BS.

Shrestha, P. M., 2005. "Prospect, Challenges and Opportunity of Organic Coffee Production in Nepal". Paper presented at the National Workshop on Organic Agriculture organized by Agriculture Extension Directorate, Department of Agriculture, June 2006

Shrestha, P.M., I.S. Shrestha and M. Ghimire, 2006. "Present Status, Problems, Opportunities and Risks in Organic Production and Certification of Tea and Coffee Commodity in Nepal". Paper presented at the Stakeholder Consultation/Interaction Workshop on Organic Agriculture: Global Perspective and Feasibility in Nepal. Jointly organized by Helvetas Nepal and MoAC, Lalitpur. 9 November 2006.

*[**Queries from the participants of the seminar:***
Mr. R.B. Shreshtha queried on the importers' preference for wet-processed coffee against dry-processed ones, He asked if the wet-processed coffee had some physiochemical factor that the importers preferred. Secondly, he also queried how public-private partnership could be established for sharing coffee promotion in the country. The presenter clarified that dry-processed coffee in Nepal is not preferred by the importer. The wet-processed one is considered comparable to Mexican mild coffee. Besides, production location also helped to fetch international market for Nepalese coffee. Mr. Ganapati Pandey added that small coffee farmers in Nepal are suffering due to a year's delay in payment for their produce. They can hardly participate in coffee promotion unless cash on delivery is established in coffee marketing. On the other hand, he observed most of the NGOs involved in coffee promotion to deploy non-agricultural technicians. Regarding the first query, the presenter expected district level market facilitation committee to manage the problem.

Mr. D.P. Khanal argued against the statement "coffee is hardly known to Nepal". Rather he added the grooves in Palpa were being removed due to marketing problems. Coffee producers are not fetching genuine price, while the traders are mentioned to reap attractive share. The planting materials distributed by DCPA/NCPA would have been problematic regarding which there had been no coordination with DADOs.

To summarize the presentation, the chairperson also raised some queries. Such as - Nepalese coffee is mentioned good in quality, but what type of coffee it is compared with - how is the coffee husk utilized in the system - whether vegetative techniques of coffee propagation were developed - if the information regarding optimum price distribution along marketing channel was available. He added, coffee in Nepal was initially introduced by British-Gorkha-soldiers in Gulmi, and also proposed for good collaboration among MOA, tea and Coffee Development Section and Helvetas for coffee promotion in the country.]

Evaluation of Satsuma Mandarin (*Citrus unshiu*) Varieties for Early Season Production

Dr. K. P. Paudyal[1] and Basant Chalise[2]

Abstract

Mandarin (*Citrus reticulata* Blanco) the most important citrus species of Nepal covers nearly 58 percent of citrus area in the country. Since only mid-season local genotypes are used commercially, its harvesting duration lasts only for three months: November–January. So, to explore the possibility of early commercial production two satsuma mandarin (*Citrus unshiu* Marcvitch) varieties namely Okitsu Wase and Miyagawa Wase were evaluated for their fruit characters under screen house and open field condition at National Citrus Research Program, Dhankuta (1350 m) for two years. Total soluble solids (TSS), total acid (TA), TSS/TA ratio and sweetness of the fruits were determined from August 20 to October 10 at 10 days interval. Sweetness of the fruit was rated as sweet, slightly-sweet and sour by organoleptic test. The fruit-taste was found sweet enough for commercial use when value of TSS/TA ratio crossed 6:1 and therefore, this value was suggested as maturity index for the varieties. Under screen house condition with annual mean maximum temperature of 32^{0}C, minimum temperature of 14.4^0 C and total heat unit of 3639, the TSS/TA ratio reached to 6 in the first week of September in Okitsu Wase, and 10 days later in Miyagawa Wase. Under open field condition, where mean maximum annual temperature (25^{0}C) and heat unit (2718) were less, TSS/TA ratio hardly reached to 6 after 10th of October because of low TSS and high acid content in fruit juice. It indicated that warmer areas of 900-1000 m altitude could be the suitable locations for early production of the varieties. Further performance study at different altitude is needed to identify the best production climate. Farmers and consumers' reactions on fruit quality and taste of the varieties have been very positive, and their demand for the planting materials is high. Excepting maturity period, both varieties have been similar in fruit characters. Under screen house condition fruit weight ranged from 51 to 200 g, segment number from 8 to 14, peel content from 14 to 33 percent, TSS from 6.0 to 11.3 percent, TA from 0.88 to 2.0 percent and TSS/TA ratio from 4.9 –12.8. Fruits from both the varieties were seedless in both the conditions.

Introduction

Mandarin (*Citrus reticulata*) occupies first position among citrus fruit crops in acreage and contributes nearly 60% of total citrus production in Nepal. At present, nearly 97,478 t of mandarin-fruit is produced in Nepal from 15,987 hectare of orchards (FDD, 2002). However, in Nepal, varietal diversity is lacking in mandarin cultivation and so almost all plantations are composed of local genotypes with mid-season and narrow maturity period from November to January, which is considered as the normal season for citrus production in Nepal. During this season there is glut in the market, leading to low price as well as spoilage. On the other hand during other period of shortage prices go up and almost all the demands of citrus fruits are fulfilled from the imported ones from India (Shrestha and Shrestha, 2000). Earlier studies and surveys (Paudyal, 2004 and HDP, 1996) carried out in different parts the country could not find any local genotype that can mature prior to November. Whatever, differences in maturity period (November-January) has been noticed in local genotypes is attributed to altitude variation of production areas (environmental effect) rather than genetic diversity. Variety diversification with early, mid and late season maturity period can help to expand the availability of locally produced

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mandarin fruits in the country. Since early maturing local genotype of mandarin is lacking in the country, Horticulture Development Project introduced several exotic citrus varieties including Okitsu Wase and Miyagawa Wase from Japan during nineties ((HDP, 1996)). In Japan, these are the top early ripening cultivars of satsuma-mandarin, which covered about 30 thousands hectares of area (Omura, 1996). In recent years these varieties are also becoming popular in Italy, Spain, Australia and New Zealand for early season marketing (Gallasch, 1992). Therefore, these varieties were evaluated for their maturity period and fruit characters for two years at National Citrus Research Programme, Dhankuta to explore the potentiality of early season commercialization production in Nepalese condition.

Materials and Methods

Two satsuma mandarin varieties namely Okitsu Wase and Miyagawa Wase grafted on trifoliate orange rootstock and grown under screen house and open field condition were evaluated for fruit characters for two years at National Citrus Research Programme, Dhankuta (1130 m altitude). The roof of the screen house was covered by Silpoulin (a durable plastic). The daily minimum and maximum temperature under both conditions were recorded and total heat unit was calculated as the annual sum of the (average monthly temperature – 13) x (number of days per month). To determine the maturity period 5 fruit samples were evaluated for total soluble solids (TSS), total acids (TA), TSS/TA ratio, juice content and sweetness at 10 days interval from 20th August (5th Bhadra) to 10th October (25th Aswin). TSS was recorded by hand Refracto meter. Two ml fruit juice was titrated with 0.1 N sodium hydroxide (NaOH) solution to Phenophthalein end point and percentage of TA was calculated using formula of Rangana (1995). Sweetness of the fruit was also categorized as sweet, slightly sweet and sour by organoleptic test during chemical test and corresponding TSS/TA ratio at which fruits were sweet enough for commercial consumption was determined. To determine the detailed fruit characters of the varieties, a total of 21 fruit samples were collected on 30th September (15th Aswin) from screen house grown plants and evaluated for fruit weight, fruit size, segment number, seed number, peel weight, juice content, TSS, TA and TSS/TA ratio. Juice and peel content was calculated based on total fruit weight. Means of two years data with standard deviations within variety were used for comparison.

Result and Discussion

Maturity Period

Change in TSS, TA, juice content was evaluated from 10th August to 10th October at 10 days interval to determine the maturity periods. In variety Okitsu Wase TSS was higher inside screen house grown plants than in open field condition throughout the evaluation period. Increase in TSS content was found faster after 20th September (Fig.1-a). In case of Miyagawa Wase, TSS content in fruit juice was almost equal in both conditions until 10th of September but after that TSS increased at faster rate under screen house condition (Fig. 2-a). In both condition TSS content was higher in Okitsu Wase than in Miyagawa Wase. In California, TSS in Okitsu Wase was recorded 9.3 during 3rd week of September and increased to 11.4 by second week of December (CCPP, 2004).

Acid content in the fruit juice is the other parameter of fruit quality and maturation. Decrease in acid percentage in fruit juice indicates the initiation of maturity of fruits. Until September 20, acid content in Okitsu Wase was almost equal inside the screen house and in open condition but after this period it decreased rapidly under screen house condition and reduced to 0.95% on October 10 which was 1.5% on August 20 (Fig. 1-b).

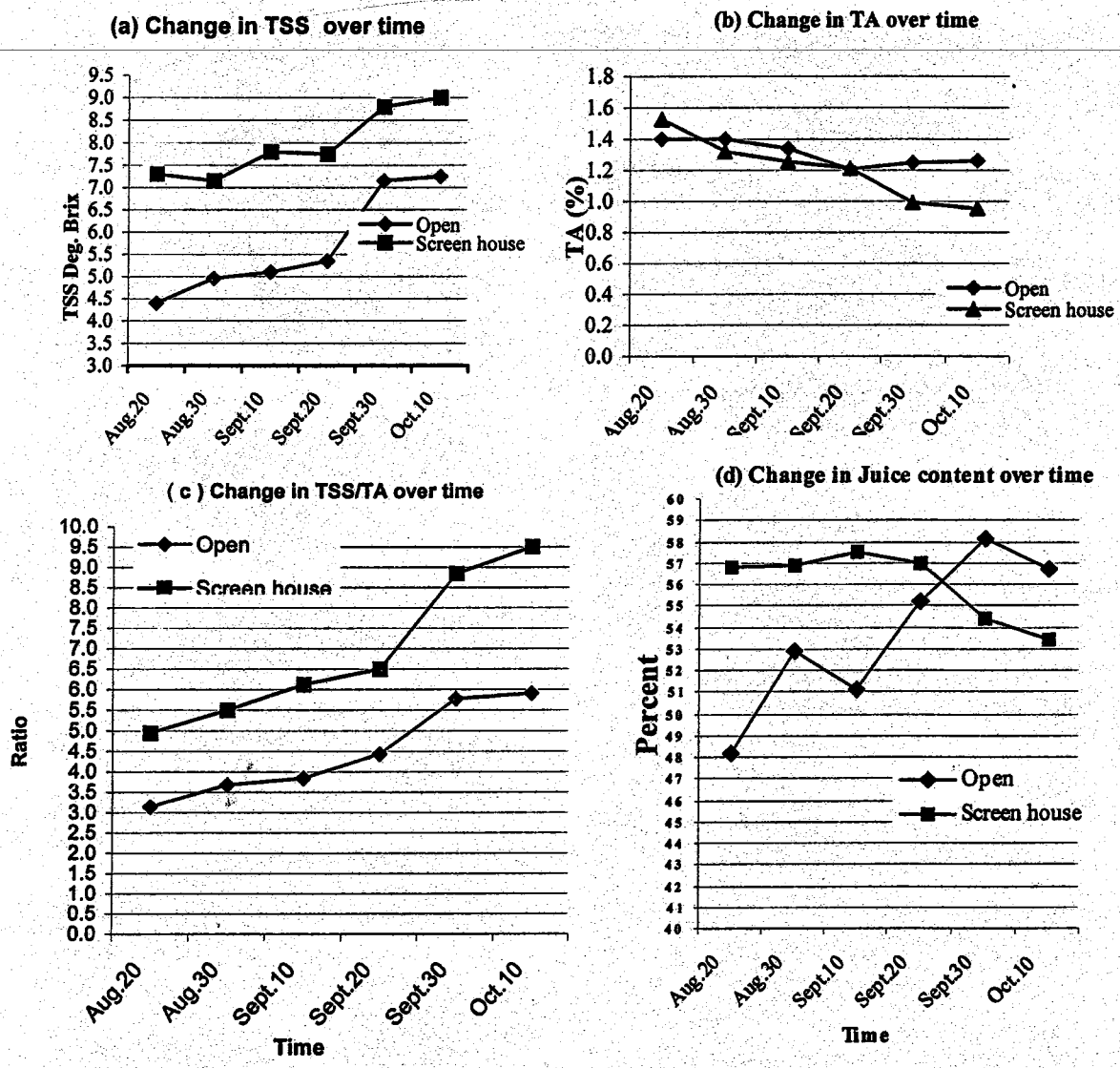

Fig. 1. Internal fruit characters of Okitsuwase over time during maturity.

However TA content of the fruits grown in open field did not decrease below 1.2% even on October 10. Acid content in the fruit juice of Miyagawa Wase decreased rapidly over the period of August 20 to Aug 30 in both conditions and after that the rate of acid break down was slow (Fig. 2-b). In all the dates of observation percentage of acid was found less in the fruits harvested from screen house than those from open field. Acid content in Okitsu Wase was less than in Miygawa Wase in all the dates of evaluation (Fig. 1-b & Fig.2-b). Okitsu Wase was found sweeter than Miyagawa Wase in sensory test. Most possibly it is because of low acid content on Okitsu Wase.

Ratio of TSS to TA is the most important factor to determine the maturity period of sweet type citrus fruits. Trend in TSS/TA change in Okitsu Wase and Miyagawa Wase has been presented in Fig. 1-c and Fig. 2-c respectively. Under screen condition TSS to TA ratio of Okitsu Wase crossed 6:1 on 10th of September (Fig. 1-c) whereas in Miyagawa Wase it crossed 6:1 ratio 10 days later (Fig. 2-c).

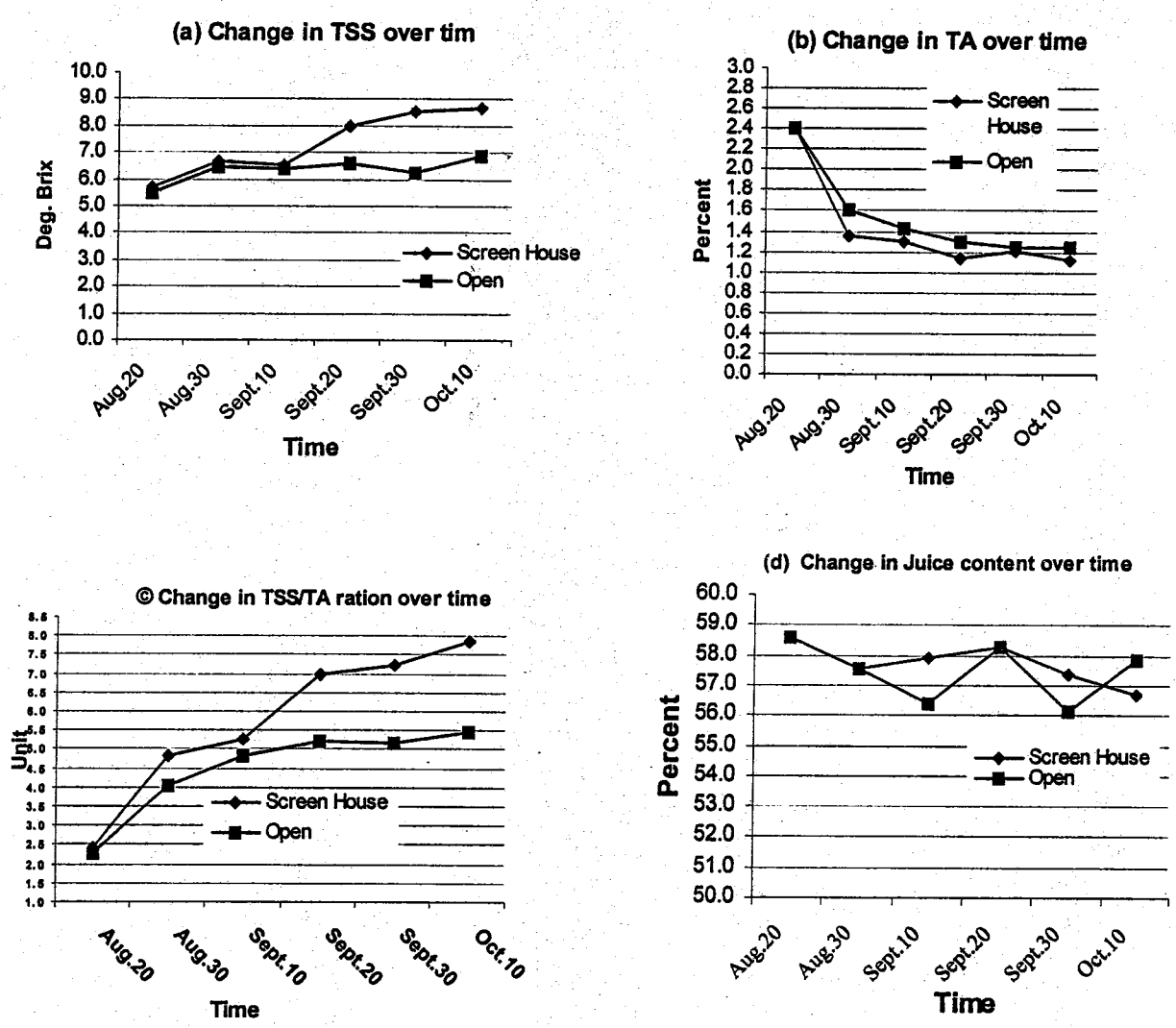

Fig. 2 Change in internal fruit quality of Miyagawa Wase over time during maturity.

The date when the value of TSS/TA ratio crossed 6 was considered as the initiation of maturity period because the fruits having ≥ 6:1 TSS/TA ratio were found sweet enough for commercial use in organoleptic test. Under relatively warmer condition of screen house receiving 3640 heat unit (Table 2) Okitsu Wase started to mature on first week of September (3rd week of Bhadra) and Miyagawa Wase about 10 days later. However, under open field condition where total heat unit was less (2718), TSS/TA ratio reached hardly up to 6:1 only after 10th of October (25th Aswin) because of low TSS and high TA in fruit juice. Under field condition of California, Okitsu Wase achieved legal internal maturity 6.5 Brix/acid ratio by third week of September but did not achieve requisite 75% colour break until two weeks later and it produced good yields with high percentage of large seedless fruits at the time when no other citrus fruits are available and hence have market potential (Feryson, 1999). About 4% of the Satsuma mandarins have been cultivated under plastic coverage or green house for off-season shipment in Japan (Nito, 2000). Under such conditions good quality fruits of Satsuma can be harvested four months earlier than normal cultivation with high sugar (>12^0 Brix), low acid (<1.0%) and attractive appearance. The average yield is almost double of that in normal cultivation. These results support the findings of our study that under plastic house condition maturity was earlier with better quality fruits.

Table 1. Fruit characters of Okitsu and Miyagawa Wase under screen house condition

Fruit Characters	Okitsu Wase		Miyagawa Wase	
	Mean ± SD	Range	Mean ± SD	Range
Weigh (gm)	100.7 ± 34.1	58.5-190	122.3 ± 49.0	51.7-210
Diameter (mm)	62.5 ± 7.1	51.1-78.5	35.9 ± 10.5	48.5-77.5
Height (mm)	48.9 ± 7.0	37.5-61.1	54.5 ± 12.6	38.7-84.1
Segment number	11.1 ± 1.5	8.0-13.0	11.0 ± 1.3	8-14
Peel (%)	18.1 ± 5.0	12.8-32.8	18.6 ± 4.3	13.9-31.1
Juice (%)	57.7 ± 5.9	37.8-66.5	58.2 ± 5.9	48.7-74.2
TSS (^{o}Brix)	8.6 ± 1.4	6.75-11.3	8.6 ± 1.3	6.0-11.2
Total acid (%)	1.16 ± 0.16	0.88-1.4	1.24 ± 0.25	0.96-2.0
TSS/TA ratio	7.5 ± 1.8	5.38-12.83	7.1 ± 1.3	4.9-9.4

In screen house condition percentage of juice in the fruit started to decline from 20th September in both varieties indicating the full maturity of the fruits. On the other hand in open field condition fruit juice did not show any decreasing trend until October 10 (Fig. 1d and 2d)

Table 2. Temperature (^{0}C) and heat unit under screen house and open field condition

Month	Screen house condition				Open field condition			
	Max	Min	Mean	Heat unit (total)	Max	Min	Mean	Heat unit (total)
Jan	27.0	8.8	17.9	147.0	19.5	6.9	13.2	6.2
Feb	29.6	12.1	20.4	219.3	23.2	11.6	17.4	123.2
Mar	33.6	13.0	23.3	319.3	23.4	13.3	19.4	196.9
Apr	33.4	15.2	24.2	347.2	28.5	18.3	23.4	312.0
May	33.1	17.8	25.5	385.9	26.5	18.6	22.6	296.1
Jun	32.4	18.6	25.5	387.5	27.2	20.3	23.8	322.5
Jul	34.2	20.2	26.7	424.7	26.9	21.1	24.0	341.0
Aug	33.2	19.6	25.9	399.9	26.7	20.9	23.8	334.8
Sept	32.5	17.5	24.5	356.5	27.4	19.6	23.5	315.0
Oct	30.5	12.2	21.4	242.2	26.5	17.7	22.1	282.1
Nov	31.3	9.6	20.0	208.5	23.7	12.0	19.7	145.5
Dec	31.9	7.9	19.9	200.1	20.9	8.8	14.4	43.5
Mean	31.9	14.4	23.1	3639.0	25.0	15.8	20.4	2718.6

Fruit characters

External and internal fruit characters of both varieties were evaluated from the trees grown under screen house on 30th of September (15th Aswin). Table 2 presents the mean, standard deviation and range value of these characters. Fruits of Miyagawa Wase were slightly bigger (122 ± 49 gm) than that of Okitsuwase (101 ± 34.0 gm) and they were oblate in shape (height < diameter), peel (skin) was thin (18%) and fruits were very juicy (58%) in both varieties. Unlike our results, bigger fruits (142-194 gm) of Okitsuwase with less juice content (31-36%) were produced in California condition (CCPP, 2000). Segment number ranged from 8-13 in Okitsuwase and 8-14 in Miyagawa Wase. Likewise TSS in fruit juice was 8.6 ^{0} Brix in both varieties but Okitsuwase had less acid content (1.16%) than in Miyagawa Wase (1.24%). TSS/TA ratio was also slightly higher in Okitsuwase in comparison to Miyagawa. Okitsuwase was sweeter than Miyagawa Wase due to less acid

content and higher TSS/TA ratio. Most other fruit characters were very similar in both varieties.

Conclusion and Recommendation

Mandarin is the major fruit crop of Nepal with about 60 percent share on area coverage and total production of citrus fruit crops. Since this crop gives 5-6 times higher income in comparison to cereal crops it is considered as a high value commodity for mid-hill farmers. However, one of the major constraints faced by the farmers for further commercialization is the seasonality of its production. At present almost all mandarin plantations of the country are composed of local genotypes of midseason (November-January) maturity period. In other months of the year all demands of citrus are fulfilled by import from India. Numerous varieties have been developed for early, mid and late season production in many developed countries of the world. Introduction of exotic varieties with diversity in maturity period can help to expand the production period of mandarin fruits in Nepal. In this context, newly introduced early maturing Satsuma mandarin varieties namely Okitsu Wase and Miyagawa Wase were evaluated under screen house and open field conditions for their maturity period and fruit quality.

Following conclusion can be drawn from the results of the study:

- Taste of fruit was sweet enough for commercial use when TSS/TA ratio was at least 6:1. So, this ratio is considered as maturity index for these varieties.
- Under screen house condition (with 3640 heat unit) Okitsu Wase started to mature on 10th of September (3rd week of Bhadra) and Miyagawa wase 10 days later.
- Under open field condition (2718 heat unit) maturity started only after 10th of October.
- Both varieties are suitable for early season (Aswin-Kartik) commercially production.
- Fruit quality and taste (sweetness) was better under screen house condition than that in open field condition which indicates that the areas warmer than Paripatle farm (1350 m altitude) could be suitable places for early fruit production.
- Since these varieties can be harvested from last week of Bhadra, they can fetch the high demand and price incurred during Dasain and Tihar festival.

It was also realized that following studies need to be further carried out to develop complete production technologies:

- Multilocation production studies at different altitudes to find out best production environment.
- As growth on trifoliate rootstock was found slow, plants grafted on this rootstock should be grown in high density planting
- Performance evaluation on fast growing rootstocks such as citrange and citrumelo is also recommended.
- Peel colour of the fruit remains green while fruits mature internally. So, de-greening will improve the market acceptability.

References

CCPP, 2004. Variety Data: Okitsuwase Satsuma mandarin. In: www.ccpp.ucr. edu.variety Universioty of California, Citrus Clonal Protection Programme.

HDP, 1996. Citrus Selection: Selection of local Suntala. Annual Report 1994/95. Horticulture Development Project phase II, Kirtipur

FDD, 2002. Annual Report 2061/62. Fruit Development Directorate, Kirtipur, Nepal.

Feryson, L. 1999. Satsuma and clementine vatieties and rootstock trials. Annual Report, 1999. Citrus Research Board, California. In: www.citrusresearch.org/annual199

Gallasch. P. T. 1992. Citrus study tour to Italy, Spain, and USA. Department of Agriculture, South Australia. Technical Report No. 201.

Nito, N. 2000. Citrus Industry in Japan. In: Hi-Tech Citrus Management. Proceedings of International Symposium on Citriculture, held at National Research Centre for Citrus, Nagpur, India (Nov. 23-27). Shyam Singh and S.P. Gosh Eds.

Omura, M. 1996. Status report on genetic resources of citrus in Japan. In: Status report on genetic resources of citrus. IPGRI Project NO B06. IPGRI.

Paudyal, K.P. 2004. Development of improved packages of technologies for increased productivity and quality of mandarin orange in eastern hills of Nepal. Summary of HRP projects. Completion Reports (2000-01). Hill Agriculture Research Project (HARP).

Rangana 1995. Hand Book of Analysis and Quality Control of Fruit and Vegetable Products. Tata McGraw-Hill Publishing Company Limited New Delhi.

Shrestha, B. and R. L. Shrestha. 2000. Marketing of mandarin orange in the western hills of Nepal: constraints and potential. Proceedings of the Third National Horticultural Workshop (7-8 June) organized by Nepal Agricultural Research Council, Horticulture Research Division, Khumatar.

[Queries from the participants of the seminar:

Dr. Y.H. Shrestha and Mr. D.B. Thapa commented on the altitude the research was carried out. As the sweetness and color of satsuma-mandarin improved and fluffiness of fruit decreased with increasing altitude, they suggested for further study at higher altitude. Dr. R.C. Bhusal suggested for selection of appropriate rootstock for that trifoliate was not compatible with satsuma mandarin. For selection of early varieties, Mr. L.N. Dewaju suggested to work on local mandarin for that he had observed local trees ripening even in Ashwin and Kartik. Based on Japanese reports those showed an increase of TSS in unshiu grown inside plastic house, the presenter, in response to the queries, added that the response of the mandarin at lower or higher altitudes should be observed through field researches. To conclude the paper, the chairperson of the session suggested verifying not only the variety but also the locations producing early crops, and developing alternative approaches of degreening.]

CEAPRED's Experience in Vegetable and Vegetable Seed Production

Indra Raj Pandey[1]

Background

Agriculture is the mainstay of majority of people in Nepal. Subsistence farming system with survival strategy is predominant in the mountains there. The degraded marginal slopping lands have been brought under cultivation with survival strategies. The overall implications of human pressure on land and thereby soil erosion have resulted on reduction of soil productivity. The consequences are landslides and environment degradation. In the given situation, on one hand the basic needs of the poverty stricken people are to be managed, while on the other hand, we have to impart opportunities to live healthy in pollution free environment. The state effort alone cannot fulfill these requirements. With this consideration, Centre for Environment, Agriculture Policy Research Extension and Development (CEAPRED) was established in 1990 by a multi-disciplinary-team of professionals to develop and institutionalize the concept of participatory-people-centered economic development in Nepal. CEAPRED is a non-profit making non-political and non-government organization. It is registered with the District Administration Office, Lalitpur and has affiliation with the Social Welfare Council and the NGO Federation of Nepal. The Center is a value-based organization committed to promote people-centered-sustainable-development empowering poor, disadvantaged and women.

People are both means and goals of development. A sustainable development strategy must focus on people's empowerment. Guided by this philosophy, CEAPRED, since its inception, has been implementing projects addressing social and economic development especially income-generation, women-development, health and awareness-raising for sustainability.

CEAPRED focuses its intervention in four major areas, namely,

a) Rural poverty alleviation through income generation,
b) Livelihood programs for marginalized and disadvantaged peoples,
c) Local resource mobilization and initiative and
c) Action/policy research on agriculture.

Among these broader areas of interventions, off-season-vegetable-production and vegetable-seed-production has been the major intervention to contribute to poverty reduction and livelihood improvement in the mountains of Nepal. High value off-season-vegetables in accessible areas and high value low-volume-vegetable-seed-production in remote areas have been the priority outputs envisaged in the Agriculture Perspective Plan (APP) of Nepal. Nepal's agroecological conditions are favourable to grow different types of off-season-vegetables and vegetable-seeds. CEAPRED has been implementing different projects for fresh vegetable production and marketing in accessible areas and vegetable seed production and marketing in remote areas with following general objectives.

- To promote viable broad-based economic growth
- To provide sustainable livelihood options to the beneficiaries.
- To explore and promote domestic and export market potentials for fresh vegetable and vegetable seeds

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- To involve large number of beneficiaries and socially deprived and disadvantaged people in agricultural enterprise that has quick income generating opportunities
- Last but not least, to contribute to poverty reduction goal of Nepal Government

The specific objectives of the programs include the following:

- To promote commercialization of fresh vegetables along north-south road corridors
- To contribute to system development in vegetable seed production and marketing
- To ensure food security and improve livelihood of smallholder farmers of both accessible and remote areas facilitating them to adopt suitable enterprises.

Basic principles

Three basic principles,

a) promotion of high value off-season vegetables in accessible areas
b) promotion of high value low volume vegetable-seeds in remote/far-flung areas
c) harnessing comparative advantages of diverse agro-climatic situations for agro-enterprise development,

have been adopted while selecting fresh-vegetable or vegetable-seed in a particular locality or geographical areas. The selection is guided by both production and marketing facilities and perishable nature of the commodity. These principles comply with the principles of Nepal Government as well.

Developmental and institutionalization process

CEAPRED believes in systematic development based on social capacity development. It is the process of igniting internal inertia of a person and society as a whole. Following five steps are the basic approaches of social capacity development for sustainability.

- Social mobilization preparing people to participate in development.
- Various capacity development trainings at local level to change knowledge, skill, attitude and behavior.
- Awareness raising facilitating people to organize groups at local level with inclusive strategy for excluded.
- Federating small-groups to marketing-networks and facilitating them to develop marketing cooperatives, petty-traders and service providers such as resource persons and nursery-owners.
- Helping the groups to inter into networking and collaboration with appropriate line agencies.
- Support to develop self-propelling marketing system through value chain approach promoting business development services.

Some examples of successful projects implemented by CEAPRED

The first income generating project for women-farmers along Dharan-Basantpur highway corridor through fresh vegetable production and marketing is one of the successful projects implemented by CEAPRED. This project was based on the scientific research and experience by various agencies like Parkribas Agriculture Centre, Horticulture Farm Paripatle, Fresh Vegetable and Vegetable Seed Production Project FAO/VDD and DADOs in Dhankuta and Terhathum. CEAPRED utilized their experiences and research findings into commercialization of fresh-vegetables through organizing farmers into several production groups and federating the groups into marketing cooperatives. This program, clicked into commercialization, is continuously progressing off-season vegetable

production and marketing. At present, a cooperative is marketing vegetables to different cities of Nepal and India. It is one of the successful and sustainable programs helping in reducing rural poverty through production and marketing of off-season vegetables (1992-1994 DANIDA Support).

With the success of Dharan-Dhankuta off-season vegetable production and marketing project, CEAPRED implemented several other similar projects. Some of the citable examples including those which have sustainably been successful for income generation through off-season vegetable production and marketing are as follows.

- Fresh vegetable production and marketing along Surkhet-Dailekh highway corridor (1997-2002 support from CECI-MARD).
- Fresh vegetable production and marketing along Arniko highway corridor (DANIDA).
- Fresh vegetable production and marketing along Lumle and ACAP Region (SNV).
- Smallholders' Irrigation and market Initiative (Nepal SIMI, USAID)
- Sustainable soil management and income generation project in Surkhet (SSMP support continued).
- Livelihood improvement project in Freed Kamaiya in Kailali
- Livelihood Improvement project for deprived families of Banke district.

Many GOs and NGOs have replicated the off-season vegetable production and marketing modality for income generation by now.

Vegetable seed production

Vegetable seed production is another avenue to contribute to poverty reduction in remote areas. In this regard, CEAPRED implemented 'Participatory Vegetable Seed Production Program' on the households located in remote areas of the country under the cooperation of Danish Government (DANIDA) from July 2000 to June 2003 with an overall goal to alleviate poverty and promote economic growth of rural Nepal. This program was launched in remote areas of five districts including Dolakha, Kavre, Sarlahi, Surkhet and Baitadi. As an outcome of the program, 2400 farmers involved in seed production generating an income of around Rs. 25.5 million through a sale of 140 mt seed of different vegetable crops. The program indirectly benefited 15000 fresh vegetable growers, who earned around Rs. 225 million.

Based on the success of DANIDA supported vegetable seed production program, CEAPRED continued another project - 'Promotion of Vegetable Seed for Poverty Reduction in Deprived Areas of Nepal' under the cooperation of Swiss Government from January 2004 to December 2006. With an overall goal of reducing poverty and social tension through quick income generation in the conflict-affected remote and deprived areas of the country, the main objective of the project was vegetable seed production promotion focused on deprived communities. The program was implemented in five districts namely Kavre, Dolkha, Surkhet, Baitadi and Dadeldhura. While the project was expected to generate an income of about 33 million rupees from production and marketing of 120mt vegetable seed through an involvement of 3200 farm-families in the remote areas, the actual achievement has been 36.28 million rupees from 239.59mt vegetable-seed production and marketing. To support seed production activities, 88 micro-irrigation schemes and one seed collection store have been constructed with group contribution and project support.

Reasons for successes

The vegetable projects undertaken by CEAPRED were successful because of the following reasons.

- The projects were quick income generating
- They provided rural employment to large number of small producers
- Both fresh-vegetables and vegetable-seeds have domestic and export market potentials
- The enterprises harness comparative advantages of climate and geographic conditions
- For the programs, there is ample availability of service providers and technologies
- On top of continuous technical backstopping provided by CEAPRED, the programs were based on local potentials and indigenous knowledge
- CEAPRED has built-in emphasis on marketing promotion through district and national level marketing-workshops for demand collection from local entrepreneurs.
- Production planning as per entrepreneurs' demand and formal agreement between marketing committee/cooperatives/producer-farmers and entrepreneurs
- CEAPRED's strategy to employ local social-mobilizer and field-technicians

Networking and policy input

CEAPRED has strong linkages with MOAC, DOA, NARC, NSB, SWC, DDC, AEC, DADO, NSC, SEAN and other related stakeholders through workshops, seminars, meeting and personal contacts. The linkages have always been helpful to sustain the program even after the projects phase out. CEAPRED has steering committees at district and central level for different projects.

Challenges

Though CEAPRED has been implementing seed production and marketing program successfully, following challenges have been visualized.

- Linear linkage from research to improved seed production is distorted.
- Vegetable seeds imported freely without testing compete with domestic production.
- Increasing use of imported hybrid varieties has been a challenge to local open pollinated (OP) vegetable seeds.
- Attractively-packed imported OP-vegetable seeds are replacing loosely packed Nepalese seed lots in the market.
- Only 36 vegetable varieties are officially released, but 72 varieties of 30 crops are in use.
- Inadequate variety maintenance practices in government farms (both NARC and DoA).
- Inadequate variety development works both in public and private sector due to low investment.

Lesson learned

CEAPRED has learned some important lessons while implementing seed production program

1. Market led production and crop diversification must be given top priority for sustaining vegetable seed industry of Nepal.
2. Need to promote Nepalese varieties through extension and demonstration.
3. Need to produce seeds of new varieties used by commercial vegetable growers.
4. Farmers are quality conscious. They need guarantee and nicely packed seeds. Price is secondary to the quality.
5. For export, development of varieties based on client demand with competitive quality, quantity, price and delivery-time is a must.

Conclusion and recommendations

The production of high value cash crops especially fresh vegetable and vegetable seed for domestic use and export is feasible and possible due to Nepal's agro-climatic variation and comparative advantages over other SAARC countries. Nepal experiences tropical climate in Terai, sub-tropical and warm temperate in the middle mountains and cool and alpine in the high-mountains. In view of existence of these different climates, mainly influenced by altitude variation, Nepal is suitable for production of varieties of horticultural commodities both for domestic and external markets. Looking into these huge potentialities and possibilities of producing high value off-season fresh vegetable and vegetable seed for income generation, improving living standards of farmers seems easy. However, marketing them outside the country is difficult task as hindered by policy matters and product quality. In the context of WTO, quality assurance and other quarantine requirements including 'pesticide risk free certification' are of prime importance. In this connection following suggestions are presented.

Production level

1. Designation of appropriate production zone of specific crops and varieties for export promotion of both fresh-vegetables and vegetable-seeds.
2. Functional and practical quality maintenance schemes and authorized laboratory for certification.
3. Development of crops and varieties as demanded both in domestic and destination export markets.
4. Production scale of economic size with regularity and guarantee of supply as per demand.
5. Ensured technical backstopping, quality monitoring and management of quality inputs in production chain.

Marketing level

1. Development of product varieties for export based on client demands including crops and crop-varieties.
2. Supply of commodities competitive in quality, quantity, price and timely delivery.
3. Conducive quarantine and regulatory policies for legal export to abroad.
4. Attractive packaging and labeling with third party guarantee.

In the context of free market and especially in case of fresh vegetables, domestic products must be competitive in quality and available in time when the clients in destination markets are in need. While in case of vegetable-seeds, it is the selection of crops and crop-varieties and seed-quality important to harness comparative advantage of their production in Nepalese situation.

[Queries from the participants of the seminar:
In the context of 'quality packing recommendation of seed-lot', Mr R.B. Shreshtha, referring to the case of Daman, mentioned that locally produced open-pollinated vegetable-seeds are being replaced in the domestic market by imported OP-vegetable seeds not only due to loose packing but also due to poor quality of production. Regarding the suggestion for a short cut approach of variety release, Mr. G.P. Shreshtha commented that quick release of varieties with out proper investigation and required qualities in them could invite many problems in future. According to him, a decision on the issue would call for a detail discussion in the appropriate forum. In response to the former queries, the presenter added that marketing of locally produced OP-vegetable seeds deteriorated due to low volume of production and lack of supervision and quality control that could be optimally managed through public-private partnership approach. In response to the second query, he added that short cut release of variety would be possible through officially permitted adoption of locally successful varieties. With concluding remarks, the chairperson of the session suggested for the attempts towards indigenous vegetable production, health conscious and healthy production and organization of diversified marketing expos].

Year Round Fresh Vegetable Production from an Organic Kitchen Garden: Twelve Years' Experience of ARS, Pakhribas

Purushottam P. Khatiwada[1] and Sharmila Piya[2]

Abstract

An organic kitchen garden was established at central farm of Agricultural Research Station, Pakhribas at an elevation of 1747 masl. The objectives of establishing the organic kitchen garden were to explore the potential of growing different types of vegetables without applying inorganic fertilizers and pesticides, and to demonstrate it to the mountain farmers not having access to external inputs. An observational study since 1993 revealed that harvest of 1.14 to 1.9 kg of vegetables per day is possible from a kitchen garden of 109.1 m^2 (net area for cultivation) area without the use of external inputs. Among thirty-one different vegetables grown, twenty-nine vegetable crops, excepting *Jaringo* and *Barmeli Dhania,* have been identified suitable for cultivation. Coriander, spinach, fennel, anise and cress have been found appropriate as intercrops. A year-round production of vegetables in the kitchen garden is possible by adjusting species, cultivars and seasons. Locally available plant materials such as tobacco, *boke-timur* (*Zanthoxylum acanthopodium*) and *siltimur* (*Litsea cubeba*) are useful to maintain pests below economic threshold level.

Introduction

Kitchen gardens are basic sources of vegetable products in Nepal especially in rural areas (VDD 1986). However, a few of the traditional crops such as pumpkin, radish, broad leaf mustard, chilli, cucumber and gourds are grown in limited land in an unorganized manner. It is apparent that these limited vegetables do not meet year round consumption requirements of a family even at a subsistence level. Preserved vegetables such as *Channa* from radish and *gundruk* from broad leaf mustard serve as a source of dry vegetables during especially in dry season, when other sources of green vegetables are in short supply.

Higher importance of organic farming is realized in the mountains due to unavailability of fertilizers and pesticides and a lack of knowledge on proper use of pesticides. Even if available, abuse, misuse and over use of pesticides are the problems in Nepalese context (Klarman 1987; Dahal 1995). Contrary to that, organic farming is gaining popularity in developed countries due to ecological friendliness, clean products, higher profitability, avoidance of pesticide hazards and ethics (Hong, 1994). Hence, organic vegetables farming have great importance in developed and developing world in one way or other. Organic kitchen gardening would also contribute to family-budget considering the constantly rising price of food as well as inorganic inputs. In addition, farmers can utilise organic household garbage that may otherwise be discarded as rubbish.

Considering the above constraints and opportunities, Agriculture Research Station, Pakhribas (then Pakhribas Agricultural Centre) tried to identify vegetable-crops, their sowing/transplanting time and organic technologies capable of producing fresh vegetables in kitchen garden without the use of inorganic agrochemicals. Subsequently, the kitchen

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garden was maintained as a demonstration plot. This paper highlights the findings of an organic kitchen garden.

Objectives

The primary objective was to examine the possibility of year round fresh vegetable production in a kitchen garden without using inorganic agrochemicals. The secondary objective was to demonstrate such technology to farmers.

Materials and Methods

Observations were recorded from kitchen garden demonstration plots maintained at ARS, Pakhribas from 1993 to 2006. Total area allocated for the kitchen garden, including a compost pit and a nursery, was 203.5 m^2. Two small plots of 1.5 m^2 and 2 m^2 were used as a nursery bed and a compost pit respectively. Vegetables were cultvated in a net area of 109.1 m^2 divided into 23 plots of 1 m X 2.8 - 5.75 m size. The beds were prepared by using spade to cultivate the land and compost, wood-ash, decomposed leaves and farmyard manure (FYM) to fertilise the soil. The organic manures were well decomposed in pit to avoid white-grub in the soil, and applied at a rate of 50-80 kg/plot/year depending on the plot size and the crops being grown.

In the case of directly sown crops such as coriander, cress and radish the beds were thoroughly irrigated prior to sowing to facilitate better germination. Similarly, nurseries were irrigated the previous night to facilitate seedling removal with soil and thus to minimise post transplant seedling mortality. The seedlings were hand irrigated with a water-can as required. Taller crops such as cucumber, french-bean and broad-bean were transplanted/sown in the far west corner of the garden so as to avoid shading effect on neighbouring crops.

Thirty-one types of vegetable crops were included in the study. Among them were 14 leafy greens, eight fruit vegetables, 4 shoot vegetables and 5 root/bulb vegetables (Appendix 1). Short duration crops like cress, fenugreek and coriander were intercropped into the main crops to maximise the production from the kitchen garden, Furthermore, crops were rotated in the plots in such a way that deep-rooted followed shallow-rooted and legumes followed non-legumes in succession Some plants of *Mentha arvensis* were also planted in the southern side of the plots. Locally available organic materials were used to suppress diseases and insect-pests as described by Duwadi *et al.* (1993).

Results

Based on the observations during a period of 1993 to 2006, a total of 29 vegetable crops showed promising results (Table 1) in the organic kitchen garden.

Jaringo and *Barmeli Dhania* were also planted in the study. However, the productions were little, and the crops had limited uses also. A glimpse of total vegetable production in the plots is presented in Table 2.

The combined yield of the vegetable crops revealed that at least 1.14 kg of vegetables per day could be produced from the 109.1m^2 area. Average yield of most of the vegetables from the kitchen garden was found comparable with the conventional farming. Seed quality contributed to the variations in vegetable yields in different years. Other limiting factors were the attacks by diseases and insect pests. In the later years, attack of red ants (*Dorylus orientalis)* was the most serious one.

Table 1. List of vegetable crops and their growing seasons

S. N.	Vegetable crops	Growing season	S. N.	Vegetable crops	Growing season
1	Broad bean	Sept-Apr.	16	Pea	July-Jan
2	Swiss chard	May-Mar.	17	Knolkhol	Sept.- Jan.
3	Bunching onion	Perennial	18	Lettuce	Nov.-Jan.
4	Carrot	Year round	19	Broccoli	Sept.-Jan.
5	Cauliflower	Aug.-May	20	Spinach	Year round
6	Garlic	Aug.-May	21	Cress	Year round
7	Brinjal	Mar.-Sept.	22	Coriander (green)	Year round
8	Cabbage	Year round	23	Fenugreek (green)	Year round
9	Radish	Year round	24	Fennel (green)	Year round
10	Squash	Jan.-June	25	Anise	Aug.t-Jan
11	French bean	Feb.-Nov.	26	Shallot	Sept.-May
12	Broad leaf mustard	Year round	27	Amaranths	Mar.-Aug.
13	Chilli	Mar.-Oct.	28	Asparagus	Year round
14	Sweet pepper	Mar.-Sept.	29	Chinese cabbage	Sept.-Nov.
15	Onion	Aug.-June	16	Pea	Jul.-Jan.

Table 2. Production of fresh vegetables from an organic kitchen garden

S. N.	Vegetable type	Production year (kg)			
		1993/94	1994/95	1998/99	1999/2000
1.	Root and bulb	134.6	206.7	89.7	130.3
2.	Fruit	111.2	171.1	56.9	38.2
3.	Leafy greens	210.3	274.8	250.3	229.5
4	Stem/shoot	28.5	31.1	12.0	22.8
Total production kg/year		484.6	683.7	408.9	420.8
	kg/day	1.35	1.9	1.14	1.17

Sole cropping was not found efficient to utilize space properly in the early stage of crops. Intercropping of short duration crops such as coriander, spinach, fennel, anise and cress with long duration crops could maximize yield per unit area per unit time. It was also observed that the attack in the cultivated the crop by flea-beetles was minimal due to repelling properties of cress, coriander, fenugreek and anise. Locally available materials proved useful for controlling insects and diseases. For example, cattle urine against powdery of summer squash and rust of peas and beans, *boke timur (Zanthoxylum armatum*) and *siltimur (Litsea cubeba*) to some extent against red ants of cauliflower, cabbage, aubergine, radish, carrot and capsicum, *Pyrethrum* and tobacco leaf against flea beetles of broad-leaf-mustard cauliflower, radish and cabbage and tobacco leaf and soap against aphids of radish, broad-leaf-mustard cabbage and broccoli.

Discussion

Bhandari and Kayastha (1994) reported that per capita per day consumption of fresh vegetables including garden and wild collection among the mountain farmers in the western Nepal was about 115 g. However, according to the FAO standard 115 g still falls short for a balanced diet. FAO (1972) has recommended that an adult should consume 200 to 300 g of vegetables per day. The kitchen garden produced at least 1.14 kg of edible vegetables per day, which falls within the FAO standard, and suffices to feed a family of 6 adult members.

Anon (1993) reported that a kitchen garden of 200 m^2 is needed for a family of 5 to 6 members. Hence, our way of vegetables production in the organic kitchen garden is as good as that available in the literature. The study also indicated that there are still many avenues to increase production from the garden. First, short duration crops like cress, coriander, spinach and fennel should not be planted in the plots as main crops. Second, the vegetables should be chosen to suit the growing season. For instance, broad-leaf-mustard produced 1.4 kg/plot in off-season (July-August) against 45.5 kg/plot in the main season. Third, better understanding and use of natural pesticides will definitely help to increase vegetable production which is lacking in our context.

Nutrient management is a key issue of organic farming. It has been experienced that internal organic matter cycling was insufficient to meet the nutrient demand of the crops. Hence, organic matter or FYM should be arranged from external sources for successful gardening. However, the requirement could be minimised by cultivating legumes namely broad-bean, french-bean and pea. It is evident that incorporation of compost and FYM are sufficient to grow vegetables if they are applied in adequate amount. Hong (1994) reported that readily available nitrate nitrogen and electrical conductivity were higher in organically managed soils for ten years than average soils in Korea. It is an encouraging finding for the mountain farmers, where fertilizer is a critical limiting factor (Joshi *et al.* 1990).

During the observation it was also experienced that local practices of pests and diseases management were effective only when they were used in the beginning of infestation/infection (Duwadi *et al.*, 1993).

Conclusions

Observations during the period suggested that kitchen gardening without the use of inorganic agrochemicals is possible in the middle mountain, and about an area of 200 m^2 is sufficient to meet organic fresh-vegetables need of a family. A year-round production of vegetables could be improved by adjusting new vegetable species and cultivars in different seasons.

References

Anon (1993). *Karesa Bari* (Kitchen Garden - in Nepali). HMG/N, Ministry of Agriculture, Agriculture Communication Division, Kathmandu.

Bhandari, K B and Kayastha B N (1994). *A Case Study on Home Garden in Nepal.* Report submitted to the Asian Vegetable Research and Development Centre, Shanhua, Tainan, Taiwan, NO-FRILLS Consultants (NFC), P.O. Box 3445, Kathmandu.

Dahal, L (1995). Survey of pesticide pollution in Nepal. In *A study on pesticide pollution in Nepal*, pp. 37-58. National Conservation Strategy Implementation Project, IUCN - The World Conservation Union.

Duwadi, V R, Gautam, S R and Thapa M P (1993). *Test of Efficacy of Some Local Measures Against Pests and Diseases in Vegetable Crops at PAC.* PAC Working Paper NO. 78. Pakhribas Agricultural Centre, Dhankuta.

FAO (1972). *Food Comparison Table for Use in East Asia.* Food and Agricultural Organisation of the United Nations, Rome.

Hong, C W (1994). *Organic Farming and the Sustainability of Agriculture in Korea.* Extension Bulletin 388. Food and Fertilizer Technology Centre, P. O. Box 22-149 Taipei City, Republic of China on Taiwan.

Joshi, Y R, Sharma, A R, Rai, U P and Mitchelhill, B K (1990). *Monitoring and Evaluation of the Kitchen Garden Programme in Local Target Area of Pakhribas*

Agricultural Centre. PAC Technical Paper No. 140. Pakhribas Agricultural Centre, Dhankuta.

Klarman, W L (1987). *Pesticide use in Nepal*. ARDP Consultancy Report No. 9, submitted to Winrock International Institute for Agricultural Development, US Agency for International Development, Kathmandu.

Vegetable Development Division (1986). *Nepal Ma Tarkari Kheti* (Vegetable Cultivation in Nepal - in Nepali). Ministry of Agriculture, Department of Agriculture, Vegetable Development Division, Khumaltar.

Appendix 1. Name of the vegetable crops grown in the kitchen garden

1.1. Leafy greens: Amaranths (*Amaranths spp.*), Anise (*Pimpinella anisum* L.), *Barmeli Dhania,* Broad leaf mustard (*Brasssica juncea),* Cabbage (*Brassica oleracea* var. capitata), Coriander (*Coriandrum sativum* L), Cress (*Lepidium sativum* L.), Fennel (*Foeniculum vulgare)*, Fenugreek (*Trigonella foenum-graecum* L.), Japanese bunching onion (*Allium fistulosum)*, *Jaringo (Phytolacca acinosa)*, Lettuce (*Lactuca sativa* L.), Spinach (*Spinacia oleracea* L.) and Swiss chard (*Beta vulgaris* var. cicla).

1.2. Fruit vegetables: Aubergine (*Solanum melongena* L.), Broad bean (*Vicia faba*), Sweet pepper (*Capsicum annum* L.), Chilli (*Capsicum frutescence* L.), Cucumber (*Cucumis sativus* L.), French bean (*Phaseolus vulgaris* L.), Pea (*Pisum sativum)* and Summer squash (*Cucurbita pepo* L.).

1.3. Shoot vegetables: Asparagus (*Asparagus officinalis*), Broccoli (*Brassica oleracea* var. italica), Cauliflower (*Brassica oleracea* var. botrytis) and Knolkhol (*Brassica caulorapa)*.

1.4. Root and bulb vegetables: Carrot(*Daucus carota* L.), Garlic (*Allium sativum* L.), Onion (*Allium cepa* L.), Radish (*Raphanus sativus)* and Shallot (*Allium ascalonicum* L.).

Present Status of Huanglongbing in some Western Districts of Nepal

Chiranjivi Regmi and Bishwanath Pd. Yadav[1]

Abstract

Huanglongbing (Citrus greening disease), the most destructive disease of citrus, is spreading in different citrus growing areas of Nepal. The research was carried out in December 2006 in three locations of the country namely Bimalnagar of Tanahun, Udipur of Lamjung and Syadul of Dhading districts. Field survey and sample collection was carried out by a team of experts including Prof. J.M.Bove and Dr. Nuria. Samples were analysed by PCR technique in the laboratory of NAST. Results show that HLB is present in all the location under study. It has totally destroyed citrus orchard of two hectare with in 10 years of time. It is spreading very fast in new areas of Udipur causing severe damage to citrus cultivation. Vector *Diaphorina citri* is contributing to its spread in Bimalnagar and Udipur. Introduction of planting material from low-land is the main source of infection in Syadul, where only few newly planted plants were confirmed HLB positive. Syadul is very potential pocket area of citrus, where more than 100,000 citrus trees are being grown in a cluster. There is an urgent need to rescue citrus from HLB in Syadul.

Keywords: Huanglongbing, Vector, Survey, Diagnosis, PCR-test, Rescue

Introduction

Huanglongbing is the most destructive disease of citrus. It has been a serious threat to citrus industry in Asian countries like China, Thailand, Indonesia, India, Nepal, Pakistan and Bhutan. South Africa is another country facing the problem since many years. Recently, the disease is found in Brazil and USAalso. The disease has been reported by different names; 'Likubin' in Taiwan, 'Leaf-mottling' in the Philippines, Huanglonbing in China, Citrus-greening-disease in South Africa, India, Pakistan and Nepal and Citrus-vein-phloem-degeneration (CVPD) in Indonesia. . The 13th Conference of International Organization of Citrus Virologists (IOCV) held in Fuzhow (China) in 1995 has recommended to name this disease as HUANGLONGBING in honour of the Chinese scientist Prof. Lin, who first described the disease by this name in 1920. Therefore, it has to be called as Huanglongbing (HLB) worldwide.

Although the pathogen of HLB was supposed to be a virus and, sometimes, Mycoplasma in the past, it has been now proved to be a gram negative bacterium. The bacterium is pleomorphic, phloem restricted, and sensitive to tetracycline. As the bacterium can not be cultured in artificial media, prefix Candidatus has to be added to the name of the species. Slight differences among HLB pathogens in Asia, Africa and America have been found; accordingly, they have been considered as different species of the same genus Liberibacter. The pathogen of Asian HLB is *Candidatus Liberibacter asiaticus,* that of African HLB is the *Candidatus Liberibacter africanus, and* American one is the *Candidatus Liberibacter americanus* (Bove, 2006). HLB is spreading in different citrus growing areas of Nepal. For example HLB has destroyed all the citrus at Horticulture Research Station Pokhara and Dailekh. There are unreported similar cases of private

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citrus orchards in other locations. Dhading, Tanahun and Lamjung are major citrus fruit producing districts, where the disease has been reported. The study was carried out focused in the major citrus growing pocket-areas of these districts.

Objectives

The objective of this study is to reveal the present status of HLB in selected citrus orchards so that necessary action be undertaken by concerned organizations for its control by carrying out surveys of selected citrus orchards to find out the trees with HLB symptoms and polymeric chain reaction (PCR) tests to confirm HLB presence in the suspected samples.

Materials and Methods

The research was carried out in some orchards of Syadul (Dhading), Udipur (Lamjung) and Dumre (Tanahun). All species of citrus grown in the selected orchards were under study. A team of experts comprising of Prof. Bove, Dr. Nuria, Dr. Regmi, Dr. K.P. Paudel, Mr. L.N.Deoju and Mr. R.P Devkota carried general survey of selected orchards during the first half of December 2006. Leaf samples were collected from symptomatic trees, and analyzed immediately in the PCR Laboratory of Nepal Academy of Science and Technology following the procedure described by Shrestha et al 2003.

Results and discussions

Quite a large number of trees were observed with HLB symptoms during the survey in Udipur and Bimalnagar. Excepting 15-29 years old trees, most of the newly planted trees in Syadul were also showing HLB symptoms. It might be explained by the fact, according to local farmers, that the planting materials for new plantations were brought to Syadul from lower altitude- Charaudi or Mugling, where the disease and the vector *Diaphorina citri* prevailed.And the older trees were of seedling origin locally produced. Results of PCR tests are presented in tables 1, 2 and 3. The results comply with the observations during survey.

Table 1: HLB in mandarin orchard in Udipur, Lamjung

S.N	Owner/ Address	Symptom	PCR test
1	Ganesh Pant, Udipur-2,	Yellowing of whole tree	Positive
2	Ganesh Pant, Udipur-2,	Yellowing of whole tree	Positive
3	Ramesh Paudel, Udipur-2	Yellow shoot and blotchy mottle	Positive
4	Ramesh Paudel, Udipur-2	Yellow shoot and blotchy mottle	Positive
5	Ramesh Paudel, Udipur-2	Yellow shoot	Negative
6	Ramesh Paudel, Udipur-2	Yellow shoot	Positive
7	Hari Kumar Shrestha , Udipur- 2	Yellow shoot and blotchy mottle	Positive
8	Hari Kumar Shrestha , Udipur- 2	Yellow shoot and blotchy mottle	Positive
9	Hari Kumar Shrestha , Udipur- 2	Yellow shoot	Negative
10	Indra Bahdur Khadka, Udipur-2	Yellow shoot	Positive
11	Indra Bahdur Khadka, Udipur-2	Yellow shoot	Positive

The results also show that HLB is spreading very fast in new areas. For example not a single tree was found with HLB symptoms in Bimalnagar in 1992 and 1994, when Prof. Bove, Dr. Garnier and Dr. Regmi visited the 2-hectare citrus orchard of Chij Kaji Shrestha (Regmi et al 1996), while the recent survey in 2006 revealed that most of the trees in the orchard were cutdown following infection. HLB has totally destroyed the orchard causing serious set back to citrus cultivation in the area within last 12-years. Similar situation is

seen in Udipur (Lamjung), where about 100 trees were seen severely damaged. The trees were unproductive, and the farmers were ready to cutdown. The disease is spreading very fast and posing a great threat to other citrus orchards nearby. Both of the locations are at low altitude, and the presence of HLB vector *D. Citri* is accelerating the spread of the disease.

Table 2: HLB in mandarin orchard in Bimalnagar, Tanahun

S.N	Owner/ Address	Symptom	PCR test
1	Chij kaji Shrestha, Bimalnagar	Yellowing of whole tree	Positive
2	Chij kaji Shrestha, Bimalnagar	Yellowing of whole tree	Positive
3	Chij kaji Shrestha, Bimalnagar	Yellow shoot and blotchy mottle	Positive
4	Chij kaji Shrestha, Bimalnagar	Yellow shoot and blotchy mottle	Positive
5	Chij kaji Shrestha, Bimalnagar	Yellow shoot	Positive
6	Annonymus, Dumre	Yellow shoot	Positive
7	Annonymus, Dumre	Yellow shoot and blotchy mottle	Positive
8	Annonymus, Dumre	Yellow shoot and blotchy mottle	Positive

Table 3: HLB in mandarin orchard in Syadul, Dhading

S.N	Owner/ Address	Symptom	PCR test
1	Dilli Narayan Shrestha, Dhusha-8	Yellowing of whole tree	Negative
2	Bal Bahdur Thapa, Dhusha-8	Yellowing of whole tree	Negative
3	Bal Bahdur Thapa, Dhusha-8	Yellow shoot and blotchy mottle	Negative
4	Chandra Bahadur Baral, Dhusha-9	Yellow shoot and blotchy mottle	Positive
5	Chandra Bahadur Baral, Dhusha-9		Positive
6	Kula Devi Silwal, Dhusha-9	Yellow shoot	Negative

Syadul was supposed to be free of HLB, but our results showed that the disease has already entered the area. Though the disease is limited to newly planted trees brought from low-land nurseries, there is no doubt that all the citrus trees (about 100,000) in the pocket will totally be destroyed within few years.

Recommendations

Following recommendations can be drawn from our research.

1 Rescue of citrus in Syadul from being destroyed by HLB. There is an urgent need of developing and implementing special program in the pocket
2 Spatial distribution of vector has to be monitored in all the locations.
3 Infected trees have to be replaced in all locations.
4 Measures have to be applied for vector control in all the locations

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References

Bove J.M. 2006.Huanglongbing : A Destructive, Newly-emerging, Century-old Disease of citrus. Journal of Plant Pathology , 88 (1), 7-37.

Regmi C. Garnier M., Bove J.M., 1996. Detection of the Asian huanglongbing (greening) liberibacter in Nepal by DNA_DNA hybridization. In : Proceedings of 14th Conference of IOCV., IOCV Riversude 1996, 267-270.

Shrestha S., C. Regmi, N. Rana, P. Rana, A.Giri and J.Sijapati. 2003. Polymerase Chain Reaction -based Diagnosis of Citrus Huanglongbing Disease in Nepal. Nepal journal of Science and Technology 5 (2003), 107-113.

[Queries from the participants of the seminar:
Dr. K.P. Poudel suggested that serious decline in citrus is also observed in some areas of Far Western Region, where nurseries have been established, and saplings are distributed therefrom. If such has to continue, citrus in the country can be finished in 10 years. In this connection, Mr. G.P. Shrestha also raised a question how the nurseries could be in better way controlled or managed. Mr. S.P. Sharma gave an example of Gunja Bahadur, a farmer in Sindhuli, who cultivated junar in seven ropani land successfully and has been reaping good income. However, other grooves nearby have already been destroyed. Therefore, the problem is easily manageable at farmers' field provided an appropriate package of cultivation practice. With his consent on the paper, Mr. L.N. Dewaju mentioned that though attempts were being made to manage huanglongbing, he observed the problem being serious while inspecting citrus orchards and nurseries including those in Central Horticulture Center (Kirtipur). He proposed that control on seedling distribution from such orchards and nurseries would be impossible unless a Nursery Act is enacted. "It has been almost forty years since the problem was noticed in the country", Dr. M. Ranjit said. However, he commented, none of the technical recommendations and action plans made earlier had been implemented. As a result, the problem was expanding as 20-30% of the collected samples had turned out huanglongbing positive in PCR test.

The presenter responded to the queries with some remarks such as only agronomic management of the crop would not work nicely once the disease had penetrated the groove - even though DOA, NARC and other organizations such as NAST and NARDEF had been working, they lacked good collaboration in dealing with the problem - compared to huanglongbing CTV had not been much destructive in Nepal - cautions were to be taken regarding the activities by private/ donor agencies since the planting materials distributed/ imported by them bore the disease inoculums - (on such ground) we had to look for donor agencies' support as well. Upon concluding remarks, Mr. S.B. Nepali, the chair-person of the session, warned to monitor the disease that could have spread to the higher altitude due to global warming though it is in general believed to confine below 1000 m in Nepal .He added the problem called for necessary addresses bt the concerned agencies such as Citrus Development Program, Fruit Development Directorate, other GOs and even Nepalese Horticulture Society in the country.]

Role of Attractants in Fruit-Fly Management

Raju Raj Pandey[1]

Abstract

Tephritid fruit-flies are among the most important pests of many fruits and fruit-vegetables. Uses of attractants such as methyl-eugenol, cuelure and protein-bait-sprays have become the major pest control tactics against fruit-flies worldwide. At least eight Bactrocera fruit-flies are found in Nepal, of which B. dorsalis and B. zonata are attracted to methyl-eugenol whereas B. cucurbitae, B. tau, B scutellaris and B. yoshimotoi are attracted to cuelure. Two other species, believed to be present in Nepal, include B. latifrons (a solanaceous fruit-fly infesting wild Solanum spp.) and B. minax (a severe citrus-pest in the eastern mountains of Nepal), which are suspected to fall under non-responsive group. Various attractants and their importance in fruit-fly management programs are discussed.

Background

Fruit-flies belonging to the family Tephritidae (Diptera) are among the most important pests of many fruits and vegetables worldwide. More than 1000 species of tephritids have been described (Metcalf and Metcalf 1992). The sub-family Daciniae includes more than 700 described species (including *Bactrocera* and *Dacus*) originally confined to the tropical and subtropical areas of the old world. *Bactrocera* species have spread to North-America, Africa, Australia, Mediterranean-region, Caribbean, Hawaii, Pacific-islands and many countries in Asia. Pest fruit-fly species reported from Nepal belong to the genus *Bactrocera* only.

Under severe infestations, fruit-flies can cause complete crop failure. With due consideration to the potential damage to agricultural products, many countries including Australia, Japan, New Zealand and USA have strict quarantine requirements imposed on import of fresh-fruit and vegetables from fruit-fly infested countries. In addition to the direct crop loss, the added cost of treatment for disinfestations could affect the international trade opportunities. Billions of dollars have been spent to eradicate accidentally introduced fruit-flies from Florida and California (Metcalf and Metcalf 1992). In Nepal, importance of fruit-fly pest problems had been identified since early 1950s. *Bactrocera dorsalis* was the focus of the early studies, both monitoring and management (Pradhan and Adhikari 1990). The outbreak of this fruit-fly in the eastern Nepal (Bhojpur District) led to the implementation of special program to suppress it. The program greatly relied on insecticide (malathion) cover spray (Box 1) (Pradhan and Adhikari 1990).

Though pesticides have important role in pest management, their unintended impacts on environment and public health limits their wide acceptance. Cover arrays are among the most common pesticide application methods. This method requires bulk of toxic material spread over large geographical areas. It not only raises the cost (material and application) but also increases probability of unintended impacts such as ecological disturbances, pest resistance and resurgence.

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Use of insect attractant in pest management is preferred over cover spray due to its advantages such as reduced volume of pesticide use and cost of pest management, safety to applicators and natural enemies of pests, increased effectiveness and pest selectivity. This paper aims to discuss fruit-fly attractants that have the potentials of being utilised in fruit-fly management strategies and plans in developing nations like Nepal.

Chemical and physical attractants

Insects respond to various physical and chemical stimuli. The detail accounts of these attractants have been presented hereunder.

Physical attractants

Physical stimuli that have been used in pest management include colour, light, sound and shape. Two most common physical stimuli used in fruit-fly programs include the colour and shape of traps. Insects behave differently to various colours. Fruit-flies are usually attracted to the natural colour of the host-plants or their part such as flower and fruit. Many insects including fruit-flies respond positively to yellow colour (Vargas *et al.* 1991). Commercially available sticky traps and modified McPhail traps usually have yellow coloured component. Round traps that mimic the fruit shape (e.g. Ladd traps) were found superior than the flat traps (Alyokhin *et al.* 2000). For such physical stimuli to be effective, they have to be visible. When placed in farms, vegetation obscures the traps making them effective only for a short range. However, when used with other stimuli such as chemical attractant, they can enhance the effectiveness of the trap (Stark and Vargas 1992).

Chemical attractants

Several types of pheromones, allomones and synomones have been identified as chemical stimuli. Among which food and sex lures are the most widely used ones in pest management. Methyl-eugenol and cuelure, the most widely used attractants for attracting male flies of *Bactrocera spp.*, have been identified as parapheromones or plant kairomones because of their origin (Metcalf and Metcalf 1992).

Food lure: Fruit-flies can survive on sugar diet, but they require proteinaceous food to attain sexual maturity and oviposition. Studies conducted by McPhail during 1933-34 provided the insights not only for developing fruit-fly monitoring traps but also for devising protein bait sprays for their control (McPhail 1939). His experiments with various protein sources including fresh cow-hide with hairs suggested ammonia gas to be the source of attraction to the fruit-flies. Subsequently, hydrolysed proteins were used for fruit-fly management. Protein baits serve as a general-purpose attractant (for all fruit-flies species present in the location) with narrow radius of effectiveness. GF-120 has been manufactured in the USA for use with formulations containing highly effective insecticide spinosad. Recently, brewery waste, containing yeast cells, has been converted into fruit-fly bait in Malaysia (Promar) and Tonga (Royal Tongalure). Similar product has been manufactured in Vanuatu also (Loke *et al.* 1992). The baits manufactured from local brewery waste products need to be mixed with insecticides. These products have been found as effective as the commercial products and affordable by poor farmers in developing countries.

Methyl-eugenol (ME): Howlett had discovered the attractiveness of citronella oil to tephritid fruit-fly as early as 1912. Steiner rediscovered methyl eugenol as oriental fruit-fly attractant by 1952 (Steiner 1952). Thanks to the American soldier returning from World

War II, who inadvertently took some tropical fruit infested with oriental fruit-fly to Hawaiian Islands. This invader not just got established but spread over all the islands of Hawaii causing severe losses to many tropical fruits. Steiner found that methyl-eugenol was three times more attractive than methyl-isoeugenol, five times more attractive than isoeugenol and 25 times more attractive than citronella oil (Steiner 1952). Chemical analysis revealed that citronella oil contained 8% methyl-eugenol. methyl-eugenol was found to attract oriental fruit-fly within the periphery of 800 m. Subsequent evaluations have shown that methyl-eugenol was attractive to at least 58 species of *Bactrocera* (Steiner 1952).

Cuelure (CL): Encouraged with the magical effect of methyl-eugenol, scientists from Hawaii discovered Anasyl acetone to be attractive to melon fly, another pest species that had invaded Hawaii since 1907. In an endeavour to develop stable derivative of the compound, 4-(p-acetoxyphenyl)-2-butanone) butatone was synthesized by Barthel *et al.* (1957). This novel chemical was named cuelure. Cuelure is not found in nature; it easily hydrolyses into naturally occurring raspberry ketone (RBK) that is found in raspberries and cranberries. Subsequent tests revealed that cuelure (raspberry ketone) was attractive to at least 176 *Bactrocera* species.

Many of the *Bactrocera* species do not respond to both methyl-eugenol and cuelure. The rest are selectively responsive to one or the other chemical. None of the *Bactrocera* responding to both the chemicals has been reported. There are at least 6 species of fruit-flies reported from Nepal (Gyawali 2006; Shrestha 2006), based on the use of parapheromones (methyl-eugenol and cuelure). *B. dorsalis* and *B. zonata* respond to methyl-eugenol, and, *B. cucurbitae*, *B. tau*, *B. scutellaris* and *B. yoshimotoi* respond to cuelure (Table 1). Two other species, namely *B. latifrons* (solanaceous fruit-fly infesting wild *Solanum spp.*) and an emerging citrus pest in the eastern mountains of Nepal (suspected as *B. minax)*, also believed present in Nepal are non-responsive to the chemicals. Since many fruit-fly species not attracted to the chemicals, other tools such as protein baits and rearing infested fruits would complement fruit-fly diversity studies in Nepal.

Comparison of methyl-eugenol and cuelure

Longevity

Methyl-eugenol, cuelure and raspberry-ketone differ greatly in their release rate (Table 1). Cuelure (0.016) and RBK (0.00084 mg/hr) are considered slow releasing compounds compared to methyl-eugenol (1.1 mg/hr). The lower boiling point and higher release rate of methyl-eugenol probably make it more attractive with an effective range of 800m compared to cuelure with the effective range of about 30m. Methyl-eugenol traps have been found to be effective for about a year. Because cuelure evaporates very slowly, the traps have been found to be effective for more than a year. In fact, following a field exposure of plastic matrix plugs containing 2g cuelure, the plugs contained 0.9g cuelure after 52 weeks (unpublished data). On the other hand, effectiveness of plugs containing 2g methyl-eugenol declined sharply within 6 weeks of field exposure. Longevity of such traps was affected by the presence of shade. Super charged plugs containing 10 g methyl-eugenol lasted for about 26 weeks under shade, while their effectiveness declined sharply after 20 weeks when the traps were exposed to direct sun-light (unpublished data).

Trap placement

It has been seen that many farmers hang fruit-fly traps on poles along crop border such as *zucchini*, probably anticipating that most of the flies would get trapped at their entrance to the crop field. However, both the efficiency and longevity of such traps would impaire due to direct exposure to sunlight (unpublished data). Study conducted in Hawaii by hanging the traps on open field without vegetation caught fewer melon-flies compared to the traps hung on the *Leucaena leucocephala*. Nishida and Bess (1957) indicated that melon-fly spent a considerable part of their life on non-host trees such as amaranthus, castor and corn (roosting host) and visit the host plants during day time in search of oviposition site. It is probable that the flies initially on *roosting sites* would be attracted to the trap. Hanging traps in shade may also have added advantage due to higher relative humidity required for hydrolysis of Cuelure to Raspberry-ketone especially during the dry season. Similarly, shade could slow down the rate of methyl-eugenol evaporation thereby increasing the longevity.

Table 1: Comparison of methyl eugenol (ME), cuelure (CL) and raspberry-ketone (RBK)

	Methyl-eugenol	Cuelure	Raspberry-ketone
Source	Ten plant families	Synthesized	Raspberries, cranberries
Mode of action	Phagostimulant	?	?
Molecular weight	178	206	164
Boiling point	254	345	340
Release rate	1.1	0.016	0.00084
Attractive range	800 m	30m	?
Species attracted	58	176	176
Pest species attracted	8	24	24
Attracted Species in Nepal*	*B. dorsalis, B. zonata*	*B. cucurbitae, B. tau, B. scutellaris, B. yoshimotoi*	

Source: Metcalf and Metcalf (1992).

Fruit-fly pest status in Nepal

Oriental fruit-fly, *Bactrocera dorsalis* Hendel, has been reported as major pest of citrus in eastern (Dhankuta), central (Ramechhap), western (Kaski, Baglung, Parbat), mid-western (Dailekh) and far-western (Baitadi) regions of Nepal. The pest also attacks other fruits such as mango and guava. Similarly, melon fly, *B. cucurbitae* (Coquilette) has been reported as major pest of many cucurbits from terai to high mountains of the country (Pandey *et al.* 1997). Population dynamics of other fruit-fly species has been studied by Shrestha (2006). Studies on distribution and severity of fruit-fly species such as *B. tau*, *B. zonata*, *B. scutellris* and *B. yoshimotoi* are lacking. So called *Bactrocera minax* has been established as a severe pest of oranges in the eastern mountains of Nepal.

Conclusion

Fruit-flies can be managed through multiple tactics such as physical barriers, field-sanitation, mass-annihilation, protein-baits and promotion of biological control agents. Fruit-fly attractants such as methyl-eugenol and Cuelure have played key role in the monitoring and management of several *Bactrocera* species.

*Gyawali, 2006.

Huge information is available on oriental fruit-fly (*B. dorsalis*) and melon-fly (*B. cucurbitae*) from extensive studies in Hawaii and elsewhere. However, little is known about other species such as *B. tau* and *B. zonata*. It is still unclear about the pest status of fruit-flies such as *B. scutellaris* and *B. yoshimotoi*. The suspected citrus fruit-fly *B. minax* requires further studies. Studies on biology and behaviour of these fruit-fly species would enable us design long-term fruit-fly management strategy.

Fruit-fly protein baits are available in many countries including pacific island countries. There is no fruit-fly protein bait available in Nepalese market. Protein bait application is the only viable fruit-fly control method, especially for non-responders such as *B. minax*. Studies should be initiated to convert brewery waste to fruit-fly bait. Additionally, due to high mobility of these pests, efforts must be placed as a campaign on area wide pest management.

With ever-expanding international trade and Nepal's membership in the WTO, Nepal has begun importing fruit from countries such as New Zealand and China. Such an increase in international trade increases the risk of unwarranted pest infestation. We must be careful to keep foreign pest species out of country border. The impact of invasion of Mediterranean fruit-fly (*Ceratitis capitata*), probably the worls's worst fruit-fly species that infested more than 253 host plants, is beyond our imagination.

Acknowledgements

I would like to express sincere thanks to the organisers of the Fourth Horticulture Seminar for inviting me to present this paper. I am grateful to Dr. R. F.L. Mau and his team in the Hawaii Area wide Fruit-Fly Pest Management team for the opportunity to work in the program, where I gathered invaluable experience and knowledge about fruit-fly management.

Text Box 1: Fruit-fly pest control

Fruit-fly has emerged as an important pest of many citrus fruits. Its outbreak has resulted up to 10% loss in sweet orange (Junar) in Bhojpur district. Based on the studies and experiences, it is important to follow following control measures.

1. *Apply 5% BHC or 5% malathion dust as soil treatment, and spray weeds surrounding the orchard with 0.05% malathion in the beginning of the spring season.*
2. *Cover spray malathion or methyl parathion (0.05%) at new flush.*
3. *Apply paste of sugar or jaggery or proteinex mixed with malathion on tree trunks at monthly interval.*
4. *Use pheromone traps charged with methyl-eugenol and malathion.*
5. *Apply cover spray (as in step 2) after fruit set.*
6. *Apply cover spray (as in step 2) two to three weeks before fruit ripening.*
7. *Destroy fruit-fly infested fruits regularly by deep burying, boiling or burning.*
8. *Repeat application of BHC or malathion (5% dust) during fruit drop season.*

(Pradhan and Adhikari 1990)

References

Alyokhin, A. V., R. H. Messing, and J. J. Duan. 2000. Visual and olfactory stimuli and fruit maturity affect trap captures of oriental fruit-flies (Diptera: Tephritidae). Journal of Economic Entomology 93: 644-649.

Gyawali, B. K. 2006. The Fruit-fly, Bactrocera spp. and their composition in Lalitpur, Nepal (Diptera: Tephritidae). *In* I. Press [ed.], National IPM Conference. Plant Protection Society Nepal, Lalitpur, Nepal.

Loke, W. H., K. H. Tan, and S. Vijaysegaran. 1992. Semiochemicals and related compounds in insect pest management - Malaysian experiences., pp. 111-126. *In* A. A. S. A. Kadir and H. S. Barlow [eds.], Pest management and the environment in 2000.

McPhail, M. 1939. Protein lures for fruit-flies. Journal of Economic Entomology 32: 758-761.

Metcalf, R. L., and E. R. Metcalf. 1992. Plant kairomones in insect ecology and control.

Nishida, T., and H. A. Bess. 1957. Studies on the ecology and control of melon fly Dacus (Strumeta) cucurbitae Coquilett (Diptera: Tephritidae), pp. 44, Technical Bulletin No 34. University of Hawaii, Honolulu.

Pandey, R. R., Y. D. Gc, and A. K. Vaidya. 1997. Report on management of fruit-fly, survey of egg parasites of citrus green stink bug and monitoring of pests of rice and maize, 1995-1996., pp. iii + 11 pp., Working Paper - Lumle Regional Agricultural Research Centre.

Pradhan, R. B., and S. Adhikari. 1990. Fruit-flies and its control, pp. 6. Entomology Division, Kathmandu.

Shrestha, K. B. 2006. Surveillance of fruit-fly in fruits. *In* i. Press [ed.], National IPM Conference. Plant Protection Society of Nepal, Lalitpur, Nepal.

Stark, J. D., and R. I. Vargas. 1992. Differential response of male oriental fruit-fly (Diptera: Tephritidae) to colored traps baited with methyleugenol. Journal of Economic Entomology 85: 808-812.

Steiner, L. F. 1952. Methyul eugenol as an attractant for oriental fruit-fly. Journal of Economic Entomology 45: 241-248.

Vargas, R. I., J. D. Stark, R. J. Prokopy, and T. A. Green. 1991. Response of oriental fruit-fly (Diptera: Tephritidae) and associated parasitoids (Hymenoptera: Braconidae) to different- color spheres. Journal of Economic Entomology 84: 1503- 1507.

[Queries from the participants of the seminar:

Recollecting the fruit-fly havoc and the management campaign in Bhojpur, Mr. R. B. Shah mentioned that the fly species in Bhojpur was almost 80% controlled by methyl-eugenol. In this context, he suggested the fly in Paripatle should be different from that in Bhojpur so far methyl-eugenol did not attract it. Memorising the story of fruit-fly that out-broke in Nepal ever since 1985/86 and realizing the difficulties in identification of the existing species, Dr. K.P. Poudel suggested to make necessary efforts on developing appropriate protein-baits which are in general non-selective to fruit-fly species. Though the baits are generally prepared from brewery by-products, Dr. Poudel added, their preparation should also be tried from locally available protein materials. The presenter, in response to the queries, suggested that future programs should emphasize 'preparation of appropriate protein-bait' so far it can put down majority of fruit-flies. While concluding the paper, the chairperson of the session aspired that the fruit-fly problem in the country would get proper solution as soon as possible.]

Enhancing Apple Productivity through Using Pollination Services of Honeybees: A Case Study from Himachal Pradesh, India

Uma Partap[1]

Mountain Peoples' Livelihood Scenario

- Agriculture – the basis of livelihoods of over 80% of the rural population in the Himalayan region
- As many as 90% of the farmers are marginal or small - cultivating less than one ha of land each
- Agricultural land resources - marginal and quality deteriorating
- Many families facing food shortages - Necessary to explore ways to increase productivity and carrying capacity of these marginal farming systems
- Cannot be done by emphasizing the cultivation of cereal crops alone
- Agro-climatic conditions offer comparative advantage in cultivation of cash crops and other high value products

The Process of Agricultural Diversification

- Focus of agriculture shifting from traditional food crops to cash crops' farming
- Cultivation of fruit and vegetable crops increasing in several pocket areas
- Apple emerged as a lead cash crop
- The challenge now is to maintain or improve the productivity of these crops

Apple Farming in HKH Region

- Apple planted in 140 districts
- Apple orchards spread across 370,000 ha
- Annual production about 2.3 million tons
- Apple value about 500 million US$

Apple Farming in Himachal Pradesh, India

- A small province in northwestern Indian Himalayas
- Called as 'Fruit State' or 'Apple State' of India
- Out of 614,000 ha of total arable land about 196,000 ha (32%) is under fruit farming
- The State produces around 312,000 tonnes of fruit every year
- Apple accounts for 42% of total area under fruit
- Over 78,000 ha under apple farming
- More than 150,000 farmers engaged in apple farming producing about 227,000 tonnes of apple every year

Contribution of Apple in State Economy

- Apple playing a major role in State economy
- Its contribution to economy at present is estimated to be around rupees 7,000 crores (US$ 1.7 billion) per year (rupees 675-800 crores (US$ 150-170) direct contribution and rupees 6,500 crores (US$ 1.5 billion) indirect)
- Playing a major role in enhancing food security through creating employment and income generating opportunities for farmers/ orchardists and a number of other people associated with apple farming
- Provides employment to thousands of people in Himachal as well outside

[1] International Centre for Integrated Mountain Development (ICIMOD), P.O. Box 3226, Kathmandu, Nepal

Apple Productivity Concerns of the Himachal Farmers

- Apple productivity low as compared to horticulturally advanced countries
- Farmers reported apple productivity started declining during late 1980s
- Farmers guess productivity declined by over 50 per cent by early 1990s
- Inadequate pollination one of the important reasons for this productivity decline

Factors of Inadequate Pollination in Apple Crop

- Lack of appropriate polliniser proportion - 7-10% (standard requirement about 33%)
- Lack of pollinators –pollinator population declining due to:
  - Excessive and indiscriminate use of pesticides
  - Increase in cultivated area by cultivating forest and grass lands resulting in loss of food and nesting sites of natural insect pollinators
  - Increase in cultivation of cross pollinated varieties
- Weather factors – unfavourable weather conditions (due to global climate change)
  - Rains during flowering wash away pollen grains
  - Hailstorm during flowering damages flowers
  - Low temperature during flowering affects the activities of pollinating insects
  - Occurrence of frost during flowering affects pollination and fruit set

Farmers Management Practices to Enhance Pollination: Increasing Polliniser Proportion

1. Planting pollinisers
   Farmers started planting polliniser to increase polliniser proportion in their orchards
2. Grafting polliniser
   Since newly planted polliniser trees take three to four years to produce flowers some farmers have grafted polliniser on commercial varieties
3. Using polliniser bouquets
   As a short term solution to manage polliniser farmers are practicing what is called as 'Bouquet Pollination'

Supplementing Insect Pollinators: Using honeybees for pollination

- Farmers are using honeybee colonies for apple pollination, because:
- Honeybees are known to enhance yield and quality in several crops and other plants through their pollination services
- Most efficient pollinators of agricultural/ horticultural crops
- Are manageable insects
- Can be managed in sufficient number and transported to fields where and when required
- Farmers are renting colonies of both Apis cerana and Apis mellifera from private beekeepers
- Some are keeping their own colonies for the purpose
- Fees for renting bee colonies is rupees 500 per colony for one apple flowering season that lasts for 10-15 days
- Managed pollination coming up as a new and more rewarding enterprise for beekeepers
- A number of pollination entrepreneurs are coming up in the area
- Beekeepers bring their colonies to the area in apple flowering season and earn a lot of money
- Farmers benefit from pollination services and get higher yield and better quality fruit as a result of honeybee pollination of their crop

Issues in using honeybees for pollination

- Demand for bee colonies for pollination is increasing with increase in awareness about the role of honeybees in pollination
- At present demand for colonies is much more than the number of colonies available for pollination
- Himachal requires over 200,000 bee colonies for pollination of only apples planted on over 78,000 hectares but the actual number of colonies available for pollination is a few thousand

Institutional Efforts in Promoting Beekeeping for Apple Pollination

1. University of Horticulture and Forestry

- Strong scientific expertise
- University field stations in apple areas
- On-farm field research and demonstration programmes on use of beekeeping for pollination
- Training on how to use honeybees for apple pollination

2. Role of Department of Horticulture

- Set up BKDO which maintains and rents bees for apple pollination
- Assesses demand for bee colonies and makes supply arrangement with private beekeepers
- Provides attractive financial support for starting bee enterprise
- Provides bee colonies at subsidized price to promote their use for pollination

3. Fruit Growers' Association

- Provides platform for discussing problems
- Acts as a strong pressure group to seek government intervention
- Raised apple pollination problem with University and Department of Horticulture
- Raised awareness about the problem and encouraged farmers to rear honeybees for pollination

Conclusion

- Horticulture is playing a very important role in enhancing food security through generating income and employment in mountain areas
- Maintaining yield and quality of horticultural crops is a challenge
- Pollination is a limiting factor of crop productivity and remains the missing dimension of apple productivity in many areas of the developing countries
- It is not only apple but there are other crops where pollination management is important, e.g. vegetable seed production
- Beekeeping plays a crucial role in enhancing yield and quality of fruit/ seed through pollination services of honeybees
- Best solution is to promote beekeeping for pollination. For this, there is need to change the focus of beekeeping from honey production to crop pollination

Nepal SIMI Approach on High Value Horticulture Product

Dr. Luke A. Colavito[1]

Our "BDS / Value-Chain" Approach

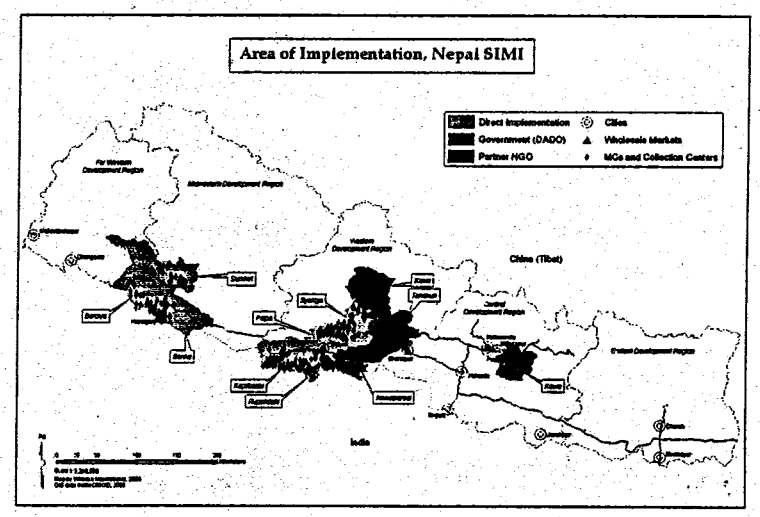
- Sub sector Analysis (SSA) – to identify constraints and interventions
- Building private sector capacity to provide training and embedded services to smallholders
- Direct training and market development for early adopting smallholders
- Public Private Partnership with the government for public goods
- Goal is to energize a whole sub sector

Nepal SIMI

- International Partners: Winrock and IDE
- National Partners: CEAPRED, SAPPROS, and AEC
- Strong partnership with Government (National, Regional and local levels and across related ministries / line agencies)
  - MOU with DOA
  - Advisory body Chaired by MOAC
- Duration: 6/03 to 6/07
- SIMI has mobilized and trained over 230 staff (34% women)
- SIMI is working in 33 pocket areas of 11 districts
- Overall goals:
  - Facilitate 50,000 HH to adopt MI and high-value agriculture helping to increase incomes by more than 50%
  - Establish an invigorated horticulture subsector / value-chains in 11 districts serving to provide expanding opportunities for smallholders
  - Develop program sustainability through partnership and building government capacity for micro irrigation and BDS approaches

Area of Implementation

- Government implementation Kavre, Nawalparasi, and Tanahun.
- Government-NGO Implementation in Kaski
- Butwal Office: Kapalvastu, Rupendehi, Palpa, and Syangja.
- Nepalgunj Office: Banke, Bardia, and Surkhet



SIMI Performance Impacts

- Despite the conflict SIMI is on track to achieve performance goals
- MI sales/adoption to over 42,000 HHs
- 2006 Figures increased incomes of high-value crops by poor smallholders $15 million

[1] Team Leader, Nepal SIMI

- Increased annual income of $198
- Working with over in 2000 MI user groups
- Over all B/C 8 to 1

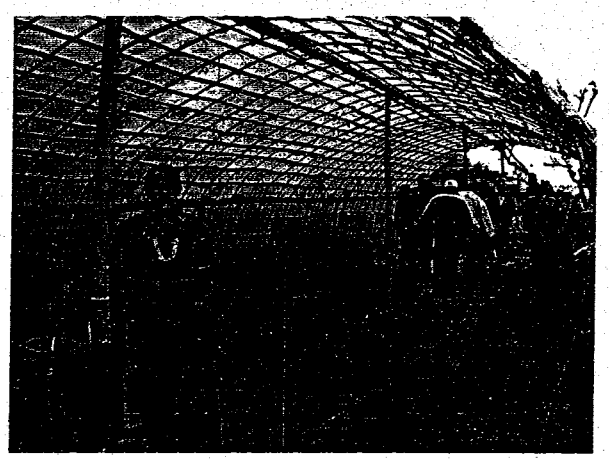
Supply Chain Development

- Developed / strengthened 2,103 input suppliers:
  - 424 agro vets
  - 244 MI dealers
  - 1429 mistris
- SIMI has focused on building the capacity of input suppliers to provide information with the sale of inputs (embedded services)
- SIMI is introducing important new technologies through the supply chain including IPM products, bio fertilizers, micronutrients, and appropriate varieties
- SIMI has established supply chains serving high value agriculture in 9 districts with a population of 3 million people

Dangi Engineering, Kohalpur, Banke: SIMI established Dangi engineering as a Treadle pump manufacturer. To date Dangi has built 503 treadle pumps. The Owner has expressed interest to expand treadle pump production.

Social Mobilization and Agriculture Extension

- SIMI has organized 42,000 households in 2000 groups for MI / high-value agriculture
- SIMI has provided extensive agriculture training and marketing services to these households
- Social mobilization is a key to SIMI success in making linkages and reaching large numbers of households
- CEAPRED leading in Social Mobilization



Muna Vegetable Group, Dhikurpokhari VDC W-5, Kaski. Farmers are growing monsoon tomatoes and off-season crops using low cost green houses. From a plot of 80 sq-m a HH can earn $300 with 3 vegetable crops in a year.

Small Scale Water Source Development: Multi Use Systems (MUS) in the Hills

- MUS cost about $100 per HH to construct
- Households have access to water for multiple uses including micro irrigation and domestic use
- Over 41 demonstration MUS completed
- Strong collaboration with DOI and DOA underway
- Best approach is to build funding from multiple sources

Market Development

- Identify profitable commodities/products
- Establish a network of collection centers and support regional markets
- Support dissemination of market information and knowledge of markets, radio programs and other
- Promote enabling policies for high-value agriculture development
- Link governance activities to marketing committee capacity development

A Market Smallholder Market Solution – Marketing Committees and Centers

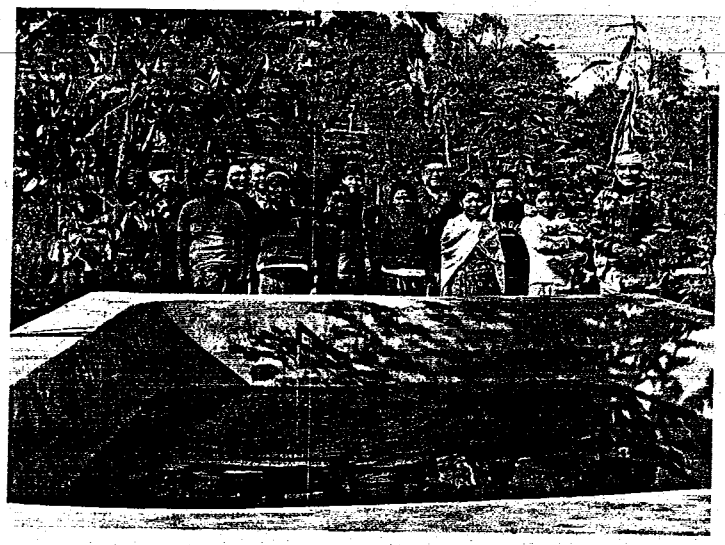
- Marketing groups from production groups
- Marketing committee from marketing groups and traders
- Collection centers SIMI has established 74 marketing committees and 69 collection centers
    - 15 Collection centers are coops
    - Link smallholders to traders
    - Provide services
    - Governance and linkage to government and projects

Gender / Disadvantaged Group Program Revolving Fund

- 53% of group household members to receive training were women and 18% were Dalit
- Revolving fund - micro credit program for women and disadvanted groups
    - Rings of 3 groups with rotation of fund between groups
    - 138 groups (about 20 members per group) have purchased more than 1,600 systems to date
    - Group pressure for repayment effective with 100% repayment
- Literacy program to help women with economic literacy

Government Collaboration – Advisory Body

- SIMI has a government advisory body chaired by Joint Secretary MOAC, members from DG DOA, DOI, NARC, MLD, MOF, DWD, and SIMI partners.
- The advisory body has worked with SIMI to:
    - To develop MIS with government radio broadcasts
    - Investment and policy for water source development (MOAC, DOI, and DOA)
    - Investment in market infrastructure
    - Phytosanitary – reduce fee from Rs. 2,500 to Rs. 1250
    - VAT tax exemption for ag inputs
    - Internal receipts (exclusion)
    - Joint planning with line agencies
    - Matching fund report



Multi use water system in Tanahu District for a Dalit community for vegetable production. DADO Mr. Bishnu Aryal facilitated support through local government.

Government Collaboration

- Research program with NARC:
    - Hybrid tomato seed production
    - Hail stone protection research
    - Solar drying / post harvest
- Training programs with DOA staff
- Joint program activities
    - Collection centers
    - Regional markets
    - Agriculture coops
    - Agriculture Extension
    - MI promotion

APPSP's Support in Horticulture Development for Poverty Reduction

Sangita Khadka[1]

Key Information on APPSP

- Funding : DFID grant
- Implementation : MOAC – M& E Division
- Execution : Central Support Unit
- Period : March 2003 to December 2007
- Budget :
- TC : £ 3,963,500
- FA : £ 5,910,000
- Districts 87%, Center 13%
- Operational area : Central and 20 districts

Programme Goal and Purpose

- Super Goal: Improved livelihoods for the rural poor
- Goal: Agricultural growth that benefits poor producers, agricultural workers and consumers
- Purpose: Deliver appropriate agricultural support services to rural poor through improved policy and institutional arrangements

Components

- Policy support to APP partners, especially MOAC
- Decentralized extension agr. service delivery to P &E
- Institution and organizational development support formore effective pro-poor, inclusive service delivery and policy management

Programme Focus : Central

- Strengthening and support to review, formulation, coordination, planning, monitoring, etc. of APP and other agriculture related policies
- Human and Institutional Development
- Monitoring and Information Systems

Programme Focus : Districts

- Reform in service delivery mechanisms and processes,
- District Agricultural Strategies,
- Strengthening devolution,
- Coordination: horizontal and vertical,
- DADF Establishment - DEF/LIF

District Agriculture Development Fund(DADF)

- Model for effective agricultural service delivery under conditions of decentralisation
- Consisting of District Extension Fund (DEF) and Local Initiative Fund (LIF)
- Managed by the DDC, through the DADC, under an agreement with the MOAC,
- Based on DADF By-laws 2061, framed within the provisions of the LSGA and issued by each DDC on the basis of a model supplied by MOAC

[1] Agriculture Perspective Plan Support Program

Basic Feature of Decentralized Service Delivery System: DADF adopted by APPSP

- No agenda of it's own; no new structures, flexible
- Demand driven
- Focus on the poor and the excluded population
- Reaching Remote Areas (Geographic Coverage)
- Enhance district agricultural service delivery capacity:
  - reaching the excluded,
  - involving alternative (private sector) actors, and
  - establishing organizational and financing framework
- Emphasis on Coordination, accountability and transparency
- Inbuilt strength to continuously improve the system
- Focus on income generating activities for quick impact
- A fine example of role Mix- Public Private Partnership
- In line with Livelihoods and Social Inclusion frame-work - three Domains of Changes.
  a) Rule of the game (focus on policy and system)- Bylaws Guidelines, inclusive institutional development support
  b) Access to assets/ services- DADF (LIF/DEF) and
  c) Voice influence and agency- Participatory proposal development process, Provision of Beneficiaries Monitoring system, public Auditing

DADF and the Peace building

- Use of local people and local organizations
- High levels of honesty, transparency and commitment
- Tangible, effective and impact focused programmes
- Neutrality and no discrimination for political ideology

Implementation status (central level)

- MOAC supported for integration of P&E focused monitoring system – PMAS
- P&E focus incorporated in DADF evaluation and monitoring (LSI format)
- MOAC staff (300 persons) oriented on Livelihood and Social Inclusion (LSI) and Poor & Exclusion focus monitoring in five regional workshops
- 2 SAGA completed
- Contextual data collected for DADF monitoring

Implementation status: (central level completed studies)

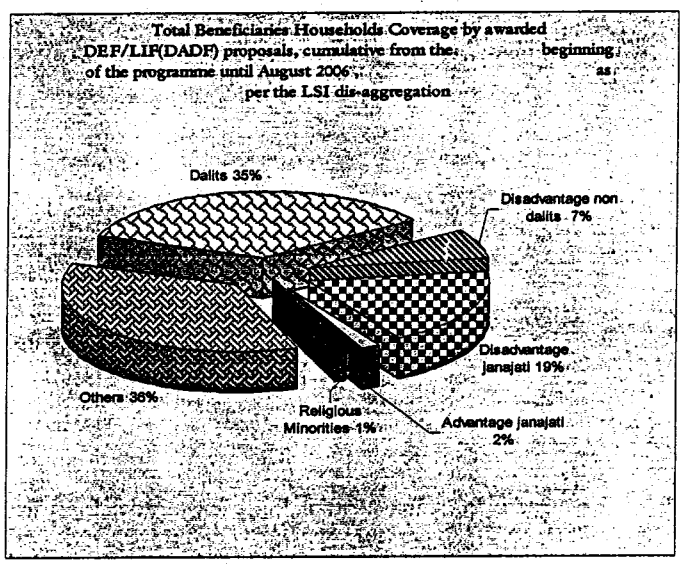
- APP Implementation Status Review and Implementation Action Plan preparation
- Agriculture Research Review
- National Agriculture Extension Strategy
- Establishment of Agricultural Resource Centres
- APP Monitoring and Evaluation System
- Income Generating Opportunities in High Hills and Mountains
- Export Potential for Agricultural Commodities
- Carpet Wool Import Substitution
- Study on HRD and HRM ongoing
- 3 Policy studies under PSF ongoing (Fertilizer deregulation, Devolution model for Agri. Service Delivery, Management Strategy of Farm and Training Centres)
- Study visit by APPSP related officers to Thailand and Vietnam.

Implementation status: Districts (DADF)

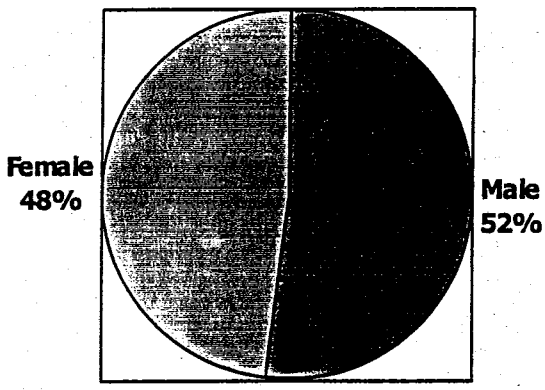
	No. of DEF			Com-pleted		No. of LIF			Com-pleted
	Rec.	App.	Cont.			Rec.	App.	Cont.	
FY 061/062	**798**	**271**	**219**	**2**		**4181**	**1596**	**1280**	**196**
FY 062/063	**758**	**240**	**270**	**128**		**4282**	**1305**	**1260**	**1147**
Grand total	**1556**	**511**	**489**	**130**		**8463**	**2901**	**2540**	**1343**

Geographic distribution

	DEF	LIF
In/Near District HQs	21 %	37%
District HQ surrounding VDCs	23 %	20 %
Remote VDCs	56 %	43 %
	100%	100 %



Total male and female coverage by awarded DADF



Types of activities supported under DADF:

- Agriculture (43 %)
- Livestock Management (31 %)
- Horticulture (16 %)
  - Fruit Cultivation (53 LIF and 17 DEF)
  - Fruit processing 3 LIF)
  - Nursery Management 5LIf and 1 DEF)
  - Vegetable farming (440 LIF and 26 DEF
- Other (10%)

27th INTERNATIONAL HORTICULTURAL CONGRESS 2006, SEOUL, KOREA. THEME: GLOBAL HORTICULTURE: DIVERSITY & HARMONY

Shiva B. Nepali Pradhan[1]

The 27th. International Horticultural Congress 2006, Seoul, Korea was organized jointly by International Society of Horticultural Science (ISHS), the Organizing Committee of ISHS in Korea and the Korean Society of Horticultural Science, Korea. The IHC 2006 was held from 13 - 18 August 2006, COEX, Seoul, Korea. Before the IHC 2006, there was the meeting of ISHS Council. The author, Life Member and Past President of Nepal Horticulture Society, an individual member of ISHS, was invited by the President of ISHS Dr. Norma E. Looney to attend the ISHS Council meeting with Observer status. The ISHS Council meeting was held on 11, 12 and 18 August 2006. This was further reaffirmed by the Executive Director, ISHS Ir. Jozef Van Assche.

A Brief on International Society of Horticultural Science (ISHS).
ISHS is run by the Board composed of President, Vice President, Executive Director, Secretary, Treasurer and Publication Unit. The important publication of ISHS is Acta Horticulture – a compendium of congress, symposium and seminar; and Chronica Horticulture – a very informative quarterly publication of ISHS. In addition to these, ISHS publishes comprehensive information of ISHS – the Executive Committee, the Member Countries, Bodies paying the Country – State Membership Dues, the Chairs of ISHS Working Groups, the Organization members, and Individual members from different countries.

The Executive Committee –
The Executive Committee of ISHS is responsible for the Scientific and Technical Activities of the Society and consists of the Chairs of all Sections and Commissions plus Board. There are NINE Sections and THIRTEEN Commissions. Sections deal with the Commodity like Pome and Stone Fruits, Vegetables, Citrus, etc. Commissions deal with the activities like Biotechnology and Molecular Biology, Economics and Management, Landscape and Urban Horticulture, Plant Genetic Resources, etc.

The Member Countries – States and their Representatives on the ISHS Council –
There are 152 countries. They have been represented in the ISHS Council by their Representatives, mostly by three as in case of Australia, India, Korea, UK, USA and alike; and in some cases represented by one as in case of Denmark, Greece or two as in case of Egypt, Latvia.

For the FIRST time Nepal has been invited to attend the ISHS Council Meeting with Observer status. With the inclusion of Nepal , there shall be 153 countries in ISHS Council.

The Bodies paying the Country – State membership Dues.
ISHS has Country Membership and Individual Membership.
At present there are 51 countries paying the Country Membership dues. The ISHS Council Meeting 2006, Korea proposed to have four different groups of Country Membership dues, but continued to maintain the same regular Country Membership dues US$ 1200 for the Developed Countries and US$ 600- for the Developing Countries and invitation to the

[1] Life member and Past President, Nepal Horticulture Society

Country to attend the ISHS Council Meeting with Observer status only for the First time. Now Nepal will have to pay US$ 600- per annum to continue to be the Member of ISHS Council and attend the ISHS Council Meeting in future. Nepal Horticulture Society or the Ministry of Agriculture & Cooperatives, Government of Nepal could be the member of ISHS Council on payment of country membership dues.

The Chairs of ISHS Working Groups –

It has been mentioned earlier that there are NINE Sections. Under each Section depending up on the commodities, there are a number of Working Groups, for example, under Section Pome and Stone Fruits, there are 13 Working Groups like Apricot Breeding and Culture, Peach Culture, Integrated Fruit Production, Organic Fruit Production, etc. Under Section Vine and Berry Fruits, there are 7 Working Groups; Under Section Nuts and Mediterranean Climate Fruits, there are 9 Working Groups; under Section Tropical and Sub tropical Fruits, there are 7 Working Groups; under Section Medicinal and Aromatic Plants, there are 7 Working Groups; under Section Ornamental Plants, there are 5 Working Groups; under Sections Root and Tuber Crops, there are 3 Working Groups; under Sections Vegetables, there are 13 Working Groups; under Sections Citrus, there is no Working Group but meeting at large takes place.

Hence, under Nine Sections, in total there are 59 Working Groups. Similarly, there are THIRTEEN Commissions dealing with different activities. Each Commission has a number of Working Groups, for example, on Commission Biotechnology and Molecular Biology, there are FIVE Working Groups - Working Group on In Vitro Culture, Working Group on Quality Management in Micro propagation, Working Group on Non-Conventional Conservation of genetic Resources of Horticultural Crops, Working Group on Biotechnology of Tropical and Sub tropical Species, and Working Group on Molecular Markers. Like wise, Commission on Economics and Management, there is no Working Group, but meeting at large takes place, Commission on Education and Training has 1 Working Group, Commission Horticultural Engineering has 6 Working Groups, Commission Nomenclature and Cultivar Registration there is no Working Group, but meeting at large takes place, Commission Plant Protection has 8 Working Groups, Commission Irrigation and Plant Water relations has 2 Working Groups, Commission Plant Substrates has 4 Working Groups, Commission Quality and Post Harvest Horticulture has 6 Working Groups, Commission Protect Cultivation has 2 Working Groups, Commission Landscape and Urban Horticulture has 1 Working Group, Commission Plant Genetic Resources has 1 Working Group and Commission Sustainability through Integrated and Organic Horticulture has no Working Group but meeting at large takes place when needed.

Hence, in Thirteen Commissions, in total there are 35 Working Groups.

ISHS Organization Members-

There are 39 countries in the organization members.

ISHS Individual Members –

There are altogether 5644 individual members from 138 Countries (as of 2005).

It looks from the membership list that the horticultural development of the country is directly related to the number of individual members in ISHS. The higher number of ISHS members the better is the horticultural development in the country. Thus, ISHS is the source of horticultural information, technology and scientific knowledge in the world.

NEPAL has just two Individual Members –
Shiva B. Nepali Pradhan (membership no. 16688) E-mail: sss@vianet.com.np,
Dr. Umed Pun (membership number 30680), E-mail: umedpun@hotmail.com,.
Recently one member has been added as an Individual member, his name is Luc Vossen, E-mail Address(es): lucvossen@mail.com.np .

A BRIEF INTRODUCTION OF KOREAN SOCIETY OF HORTICULTURAL SCIENCE (KSHS) –

KSHS is the National Organization on Horticulture. As in Nepal , Nepal Horticulture Society (NHS), KSHS is composed of the individual members working in the field of horticulture be it in Research, Extension, Development, Production and allied enterprises. It has its own Constitution, General Body and Executive Body. KSHS has 1600 members, and 106 are the member of ISHS.

THE ISHS COUNCIL MEETING, KOREA.

From the morning of 11August, the Council Meeting started. The author, on invitation from the President ISHS, attended as the OBSERVER from NEPAL .
Prof. Dr. Uygun Aksoy (Turkish), Secretary of the Board presented the report to the ISHS Council. Individual membership has grown from 2174 in 1994 to 6151 in 2006, tripled in 10 years. ISHS members can directly download the articles free of cost. ISHS Secretariat is keen to increase the individual member form the countries not representaed well like Nepal .

The Summary of Decisions and Recommendations report of the ISHS Board of Directors on Facilitated Strategic Planning meeting held in Summerland, B.C. Canada on May 15-17, 2006 was presented. The Mission of ISHS is to advance research and education in all fields of knowledge that is concert, contribute to successful horticulture. The Society:

- Advocates internationally for horticultural science as a learned profession
- Facilitates global networking and knowledge \transfer through international symposia and congress
- Publishes, distributes and archives knowledge of importance to horticulture science and industry
- Cooperates with other organizations to support capacity building in horticultural research and education.

Recommendations were presented on seven activity areas to take action by the next Board.
There was report on Scientific Programme Activity and Output by the Vice President I.J. Warrington.
There was report on ISHS Publications by the Director Publication Dr. Jules Janick.
There was Treasurer's Report in detail from the Treasurer R.J. Bogers, followed by the Internal Audit report over the year 2005.
And finally there was the report from the ISHS President Dr. Norman N. Looney, a motivating address.
There were discussions and decisions on the financial, administrative, structural arrangements and Creation of an Electronic Journal of ISHS (eJISHS).

On 12 August, election was held for the new ISHS body. Present President Norman E. Looney was reelected as President. A new position was created to include representative

from South East Asia , to which Dr. Jung-Myung Lee, the present President of the 27th.International Horticultural Congress was elected.

On 18 August, a formal meeting of the new BOARD took place. The agendas covered were the Comments from the Congress President Dr. Jung-Myung Lee, Approval of additional Symposia and Meetings, Date of Executive Meeting 2007 and Joint Executive Meeting and Council Meeting 2008 and other business.

The author congratulated the new Council, wishing the renewal of Nepal Horticulture Society with the ISHS for the enhancement of horticultural science and continues to contribute to improve the economy of the poorer sector of the society and the country as a whole.

THE INTERNATIONAL HORTICULTURAL CONGRESS (IHC) 2006, KOREA

IHC 2006 was organized by ISHS, its Organizing Committee in Korea and Korean Society of Horticultural Science (KSHS). Dr. Jung-Myung Lee was the President, IHC 2006 and on behalf of KSHS President, KSHS, Dr. Kuen Woo Park was in the organizing Committee.

Summary of the IHC 2006.

13 August.
Opening Ceremony took place in COEX, Seoul in a grand ceremony with the presentation of audio-visual depicting the Korean Agriculture, Horticulture in celebrating 100 year of modern Korean Agriculture.

In the Plenary Session, key note speakers were:
Thomas A. Lumpkin, Director, Asian Vegetable Research and Development Center (AVRDC) - The World Vegetable Center gave a key note speech on – Emerging Global Horticulture Research for the Developing World.
Sung-Hoon Kim, President, Sangji University , Wonju , Korea gave a key note speech on – Impact of Environmentally Friendly Horticultural System in the coming decades.
Both the speeches were of profound nature with strong motivational effect on the contribution of horticulture in alleviating human society in general and human society in poverty in particular.
It was followed by a reception

14-18 August, IHC 2006.

COLLOQUIUMS:

Colloquium (C) is the meeting or the conference of especially of a body of scholars, scientists, or other specialists on a special subject or topic. It is like key note address of the day by the prominent speakers. It has so lucid to hear with so much of inspirations.
There were 6 Colloquiums with 18 speakers.

After the Colloquium in the early morning, nine Symposiums started in different rooms simultaneously at day time.

Symposiums (S): Papers were presented on different subjects from different institutions and countries.

There were 16 Symposiums and 495 papers with oral presentations running simultaneously in nine sessions.

Poster (P) presentations were held during the break of the Symposiums and were displayed during the period when symposiums continue to held. The posters were in line with the subjects as is case of Symposiums. In fact, posters are the part of symposium but with display only without oral presentation.
There were 16 poster sessions with 526 posters display on different dates and times.

Workshops (WS) were organized after the Symposiums and continue till 9.00 pm . In Workshop, the person used to present the subject with power point and invite discussion at the end of presentation. Attendance was thin in which author attended.
There were 74 Workshops in the evening on different date in successions on 18 different subjects.

Business Meetings (BM) was conducted along with the Workshops in other venues.
Altogether there were 13 Business Meetings.
Author could not attend any of the Business Meting due to over lapping of the activities and was not aware what the out come of the Business Meetings were.

Exhibition from 16 August was well organized for two days with the participations of producers, traders, manufactures and researchers and extensions. It was told that over 50000 people have visited the show. Leaflets were distributed free. During the same period some trainings and demonstrations and testing were also carried out.

ISHS had stall with display of ACTA and Chronica Horticulture, where one could renew the membership.

FAO had stall with Hortivar approach. Hortivar, the latest initiative of FAO, will collect information and distribute the information to the other needy countries and individuals.

Korean Society of Horticultural Science had stall with information on Korean Horticulture. Similarly, Japan had one.

IHC 2006 distributed free plants of different kinds to the visitors.

18 August Evening:
A **Farewell Party** (contributory) was organized with Korean cultural presentations (two – but superb) and with the sitting dinner.

It was announced that 2048 participated the IHC 2006 from 80 countries including Nepal .

NOTE: From NEPAL, there was another participant, a student from Kagawa University Mr. Puspa Raj Poudel. E-mail: poudelpuspa@hotmail.com

Professional Tours were organized on 19 August on Floriculture & Ornamentals; Vegetables Crops and Pomology. Author was not able to attend as he was scheduled to depart on the morning of 19 August.

INTERNATIONAL HORTICULTURAL CONGRESS (IHC)

The Future Locations -
This time in 2006 it was held in Korea .
IHC is held once in four year. In coming 2010, it will hold in Spain & Portugal , and in 2014, it will held in Australia .
The ISHS Council Meeting is also held during IHC.

SEMINARS & SYMPOSIUMS

Annually Symposiums, Workshops, Conferences, Congress, are held in different countries on different topics. It is so useful to the working scientists and extension workers in generating such technologies for a developing countries would require time and money which are not usually available when in need.
Therefore, attending Horticultural Symposiums, Workshops, and Conferences is of great value in the scientific and development fields.

CONCLUDING REMARKS:

The growth of horticulture is very important in the country like us. With the implementation of off season vegetables production practices, it has amply proved that from a limited land, people could have food security, could support the children to go to schools and yet, have some saving (the example of Baglung in a remote location with market at Baglung – personal communication).

MARKET is the key to success of horticulture growth. Market has to be well supported by POST HARVEST TECHNOLOGY. The post harvest technology has to be supported by HARVESTING TIME AND METHODS. The harvesting time and methods has to do with PRODUCTION TECHNOLOGIES. The production technologies have to do with the QUALITY OF SEEDS. The quality of seeds has to do with the SEED PRODUCTION PRACTICES. Therefore it is a full circle of activities that are to be integrated so that all are benefited leading to continued enhancement of horticultural growth in contributing to the economy of the individual concern and the nation as a whole.

The next emphasis was on INDIGENOUS LEAFY VEBETABLES for nutrition and health, being locally adopted. The only effort has to direct on seed production and distribution.

The benefit of attending IHC is tremendous as it was shown from the earlier information on Colloquium, Symposiums, Poster presentation, Working Groups, Business Meetings, Exhibitions, etc.

Appendix:

COLLOQUIUMS:
01: On Global Horticulture: Diversity & Harmony, there were three speakers.
02: On Unique Features of Horticulture in East Asia , there were four speakers.
03: On Horticulture & Human Well Being, there were four 4 speakers.
04: On Traditional Gardening Worldwide & Cross Cultural approach to Gardens, there were four speakers.
05: On Prospects of Horticultural Science, Education and Industries in the 21stCentury, there were three speakers.
06: On Miscellaneous subjects there were three speakers.

Symposiums (S):
01. On Plant Genetic Resources of Horticultural Crops, there were 55 papers.
02. On Asiatic Plants with Unique Horticultural Potentials, there were 22 papers.
03. On Plants as Food & Medicines: The Utilization and Development of Horticultural Plants for Human health, there were 27 papers.
04. On Enhancing Economics & Environmental Sustainability of Fruit Production in the Global Economy, there were 26 papers.

05. On Ornamental Now! there were 47 papers.
06. On Advances in Environmental Control, Automation & Cultivation System for Sustainable, High Quality Crop Production under Protective Cultivation, there were 47 papers.
07. On Structural & Functional Genomics of Horticultural Plants, there were 31 papers.
08. On the Role of Post harvest technology in the Globalization of Horticulture, there were 53 papers.
09. Endogenous& Exogenous Plant Bio regulators, there were 25 papers.
10. Plants Bio technology, there were 27 papers
11. Sustainability of Integrated & Organic Horticulture, there were 23 papers.
12. Horticultural Practices & Therapy for Human Well-being, there were 19 papers.
13. Seed Enhancement & Seedling Production technologies, there were 24 papers.
14. Turf grass: Breeding, Management & Production, there were 18 papers.
15. Urban & Peri-Urban Horticulture, there were 17 papers.
16. Citrus & Other Tropical & Sub Tropical Fruit Crops, there were 34 papers.

Poster (P)

01. On Plant Genetic Resources of Horticultural Crops, there were 142 posters.
02. On Asiatic Plants with Unique Horticultural Potentials, there were 118 posters
03. On Plants as Food & Medicines: The Utilization and Development of Horticultural Plants for Human health, there were 95 posters.
04. On Enhancing Economics & Environmental Sustainability of Fruit Production in the Global Economy, there were 125 posters.
05. On Ornamental Now!, there were 111 posters.
06. On Advances in Environmental Control, Automation & Cultivation System for Sustainable, High Quality Crop Production under Protective Cultivation, there were 179 posters.
07. On Structural & Functional Genomics of Horticultural Plants, there were 160 posters.
08. On The Role of Post harvest technology in the Globalization of Horticulture, there were 146 posters.
09. On Endogenous& Exogenous Plant Bio regulators, there were 83 posters.
10. On Plants Bio technology, there were 165 posters.
11. On Sustainability of Integrated & Organic Horticulture, there were 107 posters.
12. On Horticultural Practices & Therapy for Human Well-being, there were 40 posters.
13. On Seed Enhancement & Seedling Production technologies, there were 75 posters.
14. On Turf grass: Breeding, Management & Production, there were 13 posters.
15. On Urban & Peri-Urban Horticulture, there were 19 posters.
16. On Citrus & Other Tropical & Sub Tropical Fruit Crops, there were 107 posters.

Workshops were on:

01. Under Utilized Tropical & Sub tropical Fruits with Commercial Potentials. There were 4 presentations.
02. Art & Horticulture: East & West. There were six presentations.
03. Production of High Quality of Ginseng in Asia . There were five presentations.
04. Genomics & Molecular Breeding for Alliums Crops Improvement. There were six presentations.
05. Current Advances in Herbaceous Grafting. There were 5 presentations.
06. Presentation of Ministry – Process Horticultural Products. There were three presentations.
07. Medicinal & aromatic Plants: Production, Biology and Biotechnology. There were three presentations.
08. Open Forum on Orchards. There was one presentation.

09. Effect of the Expected Global Climate Change on Fruit & Wine Quality. There was one presentation.
10. Photo Selective Netting for Improved Performance of Fruit Tress, Ornamentals & Vegetable Crops. There were 8 presentations.
11. Integrating Knowledge, Scholarships, & Learning for Horticultural Progress. There were 8 presentations.
12. Preparing Better Manuscripts for ACTA/Publication Committee Meeting. There were 2 presentations.
13. Current Topics of Hydrophonic Technology in Temperate & Tropical Asia . There were 5 presentations.
14. Orchard System I. There were 6 presentations.
15. Post harvest need for Developing Nations. There was 1 presentation.
16. Role & Responsibility of Horticultural Science in the coming Decades. There were five presentations.
17. Orchard System II. There were 5 presentations.
18. Breeding of Temperate Fruits under Unsuitable Climatic Conditions. There were four presentations.

Business Meetings (BM)

01.	Genetic Resources	08.	Education & Training
02.	Ornamentals	09.	Landscape & Urban Horticulture
03.	Vegetables	10.	Citrus
04.	Biotechnology	11.	Protected Cultivation
05.	Prune & Stone Fruits	12.	Sustainability
06.	Quality & Post Harvest technology	13.	Tropical & Sub tropical Plants
07.	Engineering		

वागवानी विकास कार्यक्रमको अबधारणा तथा रणनीतिक सोंच

*गोपाल प्रसाद श्रेष्ठ**

अवधारणाः

बागवानी बालीमा आत्मनिर्भर भई सम्भाव्य वालीको कम लागत र व्यवसायिक परिमाणमा उत्पादन तथा उत्पादन विविधिकरण र मुल्य अभिवृद्धि गरी आन्तरीक बजारको माग आपूर्ति गर्दै अन्तराष्ट्रिय वजारमा प्रतिस्पर्धात्मक निर्यात प्रवर्द्धन गर्ने अवधारणा राखिएको छ। यसरी खाद्य सुरक्षा, रोजगारी तथा आय बृद्धि भई जीवनस्तर उकास्न सकिने छ।

रणनीतिक सोंच

- Regional Basis मा Specialization गरेका सफलसिद्ध वागवानी बाली विशेषको Scale Up गर्न Growth Centre को अवधारणा अनुसार आवधिक योजना वनाई व्यवसायिक फलफूल, तरकारी, आलु, मसला बालि तथा अलंकारिक बाली कार्यकमलाई बजारसंग आबद्ध गरी उत्पादनलाई उपभोक्तासम्म पुऱ्याउन Value Chain को आधारमा पूर्ण प्याकेजको अवसर सृजना गरी संचालन गर्नु पर्ने।
- Horti Tourism समेतलाई मध्यनजर राख्दै Road Corridor को विकासको साथमा वागवानी वाली विशेषको सम्भाव्यता अध्ययन गराई थप पुर्वाधारको साथमा निजी क्षेत्र, सहकारी, सरकारी तथा गैह्सरकारी समेतको सहभागितामा सघन वागवानी विकास कार्यक्रमलाई अभियानकै रुपमा संचालन गर्न सहभागिता गराई प्रोत्साहन गर्नु पर्ने।
- **एक गाउँ एक उत्पादन** (OVOP): सरोकारवाला समूहको प्रतिबद्धताका साथ निजि क्षेत्रको सम्लग्नतामा संभाव्य उत्पादन क्षेत्रमा निर्यात योग्य वागवानी जन्य बालिको उत्पादन बढाउने र आयात प्रतिस्थापन एंव निर्यात प्रबर्द्धन गर्नु पर्ने।
- **जैविक विविधता कार्यक्रमः** Ecological Belt अनुसार बागवानीजन्य जैविक विविधतालाई समेटेर संकलन, अध्ययन, सम्बर्द्धन र मुल्याङ्कन गर्नु पर्ने।
- ह्यलको परिप्रेक्षमा Action/Adaptive Research लाई कृषकको घरदैलोमा पुर्याउन प्राथमिकता दिनु पर्ने।
- पूर्णरुपमा संचालन हुन नसकेका वागवानी फार्म। केन्द्रलाई दोहोरो मार्ग प्रणाली (Double Track System) द्वारा संचालन गर्दै लैजानु पर्ने।
- निर्यात बस्तुका रुपमा अघि बढेको वागवानी बालीहरुलाई प्राङ्गारिक बागवानी बालीको रुपमा रुपान्तरण गर्दै जानु पर्ने र ती क्षेत्रमा Pest Rest Analysis गरी सो क्षेत्रलाई Pest Free Zone निर्धारण गर्नु पर्ने र Special Economic Zone मा विकास गर्ने।
- संभाव्य जडीबुटीहरुलाइ फलफूल बगैंचा भित्र अन्तरबालीका रुपमा लिन खेती प्रबिधि विकास कार्य बागवानीले गर्नु पर्ने।
- खाद्यसुरक्षालाई मध्य नजर गरी नमुना करेसाबारी प्रदर्शन मार्फत ब्यापक प्रचार प्रसार गर्नु पर्ने।
- Indigenous बागवानी जन्य बालीको उपयोगिता र प्रयोग तथा खेती प्रबिधिको विकास गर्नु पर्ने।
- तरकारीका बर्णशंकर बीउ उत्पादन गर्न सम्बन्धित राष्ट्रिय तथा अन्तराष्ट्रिय निकायको समन्वयमा संचालन गर्नु पर्ने।
- फलफूलमा सिंचाई कार्यक्रमलाई आबद्ध गरी अन्तर बालि कार्यक्रमलाई बिस्तार गर्नु पर्ने।

* कोषाध्यक्ष, नेपाल हर्टिकल्चर सोसाईटी

- बागवानी बालीमा Nursery Act तर्जुमा गरी लागु गर्नु पर्ने र सुन्तलाजात फलफूलमा आन्तरिक Quarentine लागु गरी Bud wood certification programme लाई Reinforce गरी कार्यान्वयन गर्नु पर्ने ।
- केरा र भुइऐसेलु, अलैंची आलंकारीक विरुवा जस्ता छोटो अवधिमा उत्पादन हुने वालीहरुमा तन्तु प्रजननबाट उत्पादित बिरुवाको प्रयोगमा बृद्धि गर्नु पर्ने ।
- Specialized जनशक्ति विकासमा जोड दिनु पर्ने
- School Horticulture मा प्रोत्साहन गर्नु पर्ने ।
- शहर उन्मुख Horticulture को प्रोत्साहन गर्नु पर्ने ।
- Environment Protection कार्यक्रमलाई बागवानी विकास कार्यक्रमसंग समाहित गर्दै लैजानु पर्ने ।
- बागवानी बिकासको मेरुदण्डको रुपमा रहेको अनुसन्धानलाई यथेष्ट श्रोतको ब्यवस्था हुनु पर्ने ।
- बागवानी बालीको लागि बाली बिमाको ब्यवस्था हुनु पर्ने ।
- बागवानी बालीको लागि छुट्टै जवाफ देही संस्थागत ब्यवस्था हुनु पर्ने ।

नेपालमा आलु बीयाँ प्रबिधीको बर्तमान अबस्था, संभावना तथा चुनौती

श्याम प्रसाद. ढकाल[*]

१. परिचय

- कूल खेती गरेको जमिन मध्ये ४.७५ प्रतिशत जमिनमा आलु खेती हुन्छ
- आलु वालीले ढाकेको क्षेत्रफल १,४६,७८९ हेक्टर छ।
- कूल उत्पादन १७,३८,८४० मे.ट. र उत्पादकत्व ११.८४ मे.ट./हे. रहेको छ।
- गुणस्तरिय बीउ आलु र भण्डारणको अभाव, ।
- कूल लागतको ४०–५० प्रतिशत खर्च बीउ आलुमा लाग्ने गरेको।
- ढुवानीको समस्या ,रोग र कीराको प्रकोप।
- आलुको उत्पादकत्व अन्य मुलुकहरुको तुलनामा कम।

२. ऐतिहांसिक पृष्टभुमिः

- सन १९६९ मा प्रथम पटक खुल्ला जमिनमा आलु बीयां रोपी आलु खेती गर्ने प्रयास भएको।
- आलु बीयाँ बाट आलु खेती सम्बन्धी प्रारम्भीक कार्य नेपालमा सन १९७८ बाट शुरु गरिएको।
- १९७८ मा प्रारम्भ भएको सिडलिङ्ग ट्यूबर उत्पादन र बेर्ना सारी खायन आलु उत्पादन गर्ने कार्यले केही सफलता पाएको।
- १९७९ देखि केही वर्षको लागि आलु बीयां सम्बन्धी परिक्षणहरुले नियमितता पाउन नसकको।
- सन १९८५ बाट राष्ट्रिय आलु विकास कार्यक्रमले (NPDP) ले International Potato Center, Regional-VI संग Collaboration मा आलु बीयाँबाट आलु खेती सम्बन्धी कार्य नेपालमा शुरु गरेको पाईन्छ।

३. बीयाँ बाट आलु खेती विस्तारमा भएका प्रयासहरुः

- नेपालमा आलु बीयाँ बाट आलु खेती सम्बन्धी अनुसंधान सन १९७८ मा संस्थागत रुपबाट शुरु।
- १९८५ बाट मात्र यस सम्बन्धी Progeny testing र Technology Generations जस्ता कार्य विधिवत रुपबाट शुरु भयो -Bhomi and Aryal, 1985)।
- नेपालमा योजनाबद्ध रुपबाट आलु बीयांको अनुसन्धानत्मक कार्यक्रम आर्थिक वर्ष १९८५/८६ मा निम्न अनुसार सञ्चालन गर्ने गरी योजना बन्यो।

१) उच्च पहाड–निगाले
   (क) रोप्ने समयको परिक्षण
   (ख) प्रसारण विधी सम्बन्धीको परिक्षण
   (ग) आलुको बीयाँ उत्पादन

(२) मध्य पहाड–खुमलटार र नजिकमा पर्ने क्षेत्रहरु
   (क) उच्च मध्य पहाडका क्षेत्रमा रोप्ने तरिकाको परिक्षण
   (ख) खुमलटार परिसरमा रोप्ने समयको परिक्षण
   (ग) बसन्त ऋतुमा जातीय मूल्याँङ्कनको परिक्षण

(३) तराई
   1. Progeny evaluation in Janakpur
   2. Observation on Date of Sowing and TPS lines in Mid- Western Development Region

- सन १९८५ मा नै Open pollinated (OP) र Hybrid True Potato Seed बाट आलु दाना (Tuberlets) उत्पादन सम्बन्धी एक प्रारम्भीक परिक्षण (Pliminary Study)।
- MF-1 (OP) (ii) TPS-2 (OP) (iii) HPS 2/5 (iv) HPS 2/6 (v) HPS 4/5 (vi) HPS 19/5 सबभन्दा बढि ३२.२९ मे.ट./हे. उत्पादन दिएको थियो (Aryal 1985)
- सन १९९३ देखि नै आलु बीयाँबाट आलु खेती प्रविधी कृषक स्तरमा प्रचार प्रसार सुरु।
- सन १९९५ मा नेपाल सरकार र CIP (International Potato Center, Lima) विच एक सम्झौता पत्रमा हस्ताक्षर आलुको बीयाँ बाट आलु खेती प्रविधि प्रसारको एक पाँच वर्षे आयोजना सञ्चालन।

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[*] राष्ट्रिय आलु बाली विकास कार्यक्रम, खुमलटार

- कार्यक्रमका प्रमुख कार्यहरुमा तालीम (Training), On-farm Technology Verification Demonstration Study Field Days, Tour/visits आदी रहेको थियो ।
- ३ जना अधिकृतहरुलाई भारतको त्रिपुरा, सिमला तथा मोदीपुरममा तालीममा पठाएको।
- १५ जनालाई भारतको विभिन्न आलु अनुसन्धान केन्द्रहरुमा र फार्ममा अध्ययन भ्रमण।
- फिल्ड स्तरमा कार्यरत जिल्लाका प्रा.स./ना.प्रा.स. २५ जनालाई आलु बीयाँ सम्बन्धमा भारतको अध्ययन भ्रमण।
- आर्थिक वर्ष १९९८/९९ देखि बागवानी केन्द्र, सर्लाही र न्यूक्लियस बीउ आलु केन्द्र निगाले सिन्धुपाल्चोकमा आधारभूत प्रविधीको विकास र विस्तार गरी आलु बीयाँ उत्पादन र प्रशोधन कार्य थालनी गरेका।

४. आलु बीयाँ प्रबिधीको वर्तमान स्थिती

- कृषक स्तरमा HPS II/67 र HPS 7/67 बढी लोक प्रिय ।
- हाल कूल मागको ५० प्रतिशत आलु बीयाँको आपूर्ति सरकारी फार्मबाट।
- मागको नपुग मात्रा नीजि स्तर वाट उत्पादित वियां आलु तथा छिमेकी राष्ट्र भारतबाट ।
- आर्थिक वर्ष २०६२/६३ मा १८ के.जी. सरकारी फार्म/केन्द्रबाट र १९ के.जी. नीजि स्तरबाट गरी जम्मा ३७ के.जी. बीयाँ उत्पादन भएको ।
- आलु बीयाँको माग दिन प्रति दिन बढ्दै गई राखेको।
- पाँच वर्ष सम्म (सन १९९५/९६ देखि १९९९/२०००) कृषकको खेतवारीमा गरेको परिक्षणबाट आलु बीयाँद्वारा आलु खेती गर्दा औषत उत्पादन ३७.५ मे.ट./हे.।
- आर्थिक वर्ष २०६०/६१ मा मात्र आलु बीयाँको प्रयोगबाट ६,००० मे.ट. बीउ आलु बचत हुन पुगेको देखिन्छ ।
- आर्थिक वर्ष २०५२/५३ मा आलु बीयाँले ओगटेको क्षेत्रफल ७ हेक्टर मात्र थियो भने आर्थिक वर्ष २०६०/६१ मा उक्त क्षेत्रफलमा ६६५.७१ प्रतिशतले बृद्धि भई ४,६६०(३.३२ प्रतिशत) हेक्टर हुन पुगेको । (तालीका १)

तालिका १. आलु वीयां प्रयोग क्षेत्रफल तथा उत्पादन

आ.ब.	वीयां प्रयोग (के.जी.)	उत्पादन (मे.टन.)		क्षेत्रफल (हे.)
		सिडलिङ टयुबर	बेर्ना रोपेको	
१९९५.९६	१	०.५०	१०.००	७.००
१९९६/९७	१.३५	४.००	३५.००	३०.००
१९९७/९८	२.६	५.५०	१००.००	७५.००
१९९८/९९	१२.६५	५०.००	५००.००	६००.००
१९९९/२०००	१५.००	१३०.००	१५००.००	७६६.००
२०००/०१	१८.००	१५७.००	१८००.००	२१३१.५०
२००१/०२	२७.००	२३६.००	२७००.००	२५८७.००
२००२/०३	३२.००	२८०.००	३२००.००	३८३८.००
२००३/०४	३५.००	३३२.००	३७६०.००	४६६०.००
२००४/०५	३९.००			
२००५/०६	४४.००			
२००६/०७	७०.००			

५.उपयोगिता:

- परम्परागत तरिकाबाट भन्दा आलूवींया प्रविधिबाट आलू खेति गर्दा प्रति रोपनी क्षेत्रफलमा वीउमा हूने खर्चको मोटामोटी लागतको अनूमान गर्दा रु १४८०।- प्रति रोपनी वचत हुन्छ । तालीका ३)
- नेपालको आलुवाली खेति गर्न सकिने र सिचाईको सुविधा भएको सम्पुर्ण क्षेत्रमा वियाँ उपयोग गरी आलु खेती गर्न सकिने ।
- नेपालको कुल १,४६,७८९ हे आलु खेती मध्ये ५ % क्षेत्रमा मात्र वियाँ उपयोग गरी आलु खेती गरेमा मात्र पनि कुल ५५ करोडको विउमा मात्र वचत हुने । (तालीका ५र ६)

- विउ अलवा आलुवींया प्रविधिबाट आलु खेति गर्दा हुने बढी उत्पादन तथा रोग नियन्त्रणका लागि हुने कम खर्चवाट हुने वचत निकै वढी हुने र राष्ट्रिय अर्थतन्त्रमा निकै ठुलो योगदान पुग्ने।
- सिडलिङ टयुवर वाट आलु खेती गर्दा साधरण जातहरुको तुलनामा निकै वढी उत्पादन दिएको र उत्पादन लागत पनि निकै कमा ।(तालिका नं.४)

तालिका २. नेपालमा आलु बीयाँ उत्पादन (के.जी.)

आर्थिक वर्ष	बा.के., सर्लाही	न्यू.बीउ.आ.के. निगाले	नीजि स्तर	जम्मा
२०५४।५५	परिक्षण उत्पादन	०.३५	–	०.३५
२०५५।५६	०.७५	०.५०	–	१.२५
२०५६।५७	५.००	१.७५	–	६.७५
२०५७।५८	१४.००	१०.००	–	२४.००
२०५८।५९	१५.००	१०.००	२.००	२७.००
२०५९।६०	१५.००	६.००	०.२०	२१.२०
२०६०।६१	१५.००	१२.२०	९.००	३६.२०
२०६१।६२	१२.००	९.१५	१८.००	३९.१५
२०६२।६३	१०.००	८.००	१९.००	३७.००
२०६३।६४	–	९.१५	४.५०	१३.६५
जम्मा	**८६.७५**	**६९.४०**	**५२.७०**	**२०८.८५**

तालीका :३ परम्परागत आलु खेती र आलुवीयां प्रविधिबाट आलु खेतीको तूलनात्मक लागत विवरण (१ रोपनीको लागि)

परम्परागत आलू खेती

बीउ ८० के.जी. देखि १०० के.जी सम्म प्रति के.जी. रु २० का दरले बीउ आलु खर्च रु. १६०० देखि २००० सम्म

आल वीयां पविधि

१) आलु वीयां बाट उत्पादित वीउ ४० के.जी. प्रति के.जी. रु. २० का दरले रु.८०० यस तरिकामा बीउ आलुमा लाग्ने खर्च परम्परागत तरिका मा भन्दा ५० प्रतिशतले कटौती हुन्छ साथै बीउ आलुको गुणस्तरले गर्दा परम्परागत तरिकामा भन्दा उत्पादन बढी आम्दानी गर्न सकिन्छ। आलुको बीउ आफूले नै उत्पादन गरी अर्को वर्ष बीउको रुपमा प्रयोग गरेमा खर्च अझ कम हुन्छ।

२) एक रोपनी जग्गाको लागी तयार गर्नु पर्ने वेर्ना ४२०० वटा यसको लागी चाहिने बीउ ४ ग्राम प्रति ग्राम रु.३० का दरले रु. १२० मात्र। यस प्रविधिमा बीउ आलुमा लाग्ने खर्चमा प्रति रोपनी रु.१४८० सम्म कमी हुन जान्छ। साथै बीउको शुद्धता र उत्पादन क्षमताले गर्दा आम्दानीमा निकै बृद्धि हुन जान्छ।

Table 4: **Economic Analysis of Seedling tubers (ST) vs General variety per hacter (In Terai condition)**

Items	Amount in NRs.		Percentage change as compared to ST
	Seedling tubers	Variety *	
A. Variable Cost			
Labour cost for land preparation &12,380 others	12,380		--
Seed cost : - @ ST 800kg/ha (Rs 20.00) - Variety 1.6 t/ha (Rs. 16.00)	16,000	25,600	+1.2
Fertilizers	5,500	5,500	--
Plant protection	600	1,210	+50.4
Interest, transportation, and others	1,700	1,800	+5.5
B. Fixed Cost			
Land and water tax	164	164	--
C. Total cost	36,344	46,654	+22.0
D. Average Production (mt/ha)	20	13.90	-101.4
E. cost of production/kg	1.82	3.36	+61.20

Table 5
Amount Saving in Seed by utilizing TPS seed.
Total saving in potato production through use of Seedling tuber (TPS)
7000 ha. (5% of the total cultivated area)

S.No.	Activities	Saving amount
1	Saving in seed production cost (3.36rs/kg)	Rs.2,35,00,000
2	Saving in seed purchase (Rs 20/Kg) - TPS @30000/Rs /Kg) (Rs.1,05,00,000) (350Kg	Rs.12,95,00,000
3	Saving in storage (Rs 1/Kg)	Rs. 70,00,000
4	Saving in transportation (3Rs /Kg)	Rs.2,10,00,000
5	Saving for table use (Rs 5/Kg)	Rs. 35,00,000
6	Saving in land use(700-175 Ha)	Rs.2,88,00,000
	Total saving	Rs. 21,33,00,000

73

Table 6
Total saving in potato production through use of TPS in Transplanting and Direct Seeding.
7000 ha. (5% of the total cultivated area)

S.No.	Activities	Saving amount
1	Saving in seed production cost (3.36rs/kg)	Rs.4,70,00,000
2	Saving in seed purchase (Rs 20/Kg) (350Kg TPS @30000/Rs /Kg) (Rs.1,05,00,000)	Rs.27,32,00,000
3	Saving in storage (Rs 1/Kg)	Rs.14,70,00,000
4	Saving in transportation (3 Rs /Kg)	Rs.4,20,00,000
5	Saving for table use (Rs 5/Kg)	Rs. 70,00,000
6	Saving in land use(700-175 Ha)	Rs. Rs.3,85,00,000
	Total saving	Rs. 554700000

Table 7 **Total requirement of TPS for 7000 ha.**

S. no.	Mode of utilization	TPS required	Saving
1	For seedling tuber production	350kg.	175 ha.
2	For direct seeding / transplanting (80 Gram/ha)	560 Kg.	

६. समस्या एवं चुनौतीहरु

१. दक्ष जनशक्तिको कमी ।
२. कृषकले आवश्यक मात्रामा गुणस्तरिय आलु बीयाँ समयमा प्राप्त गर्न नसक्नु ।
३. उपभोक्ताहरुको माग र चाहाना अनुसार रातो र छोटा त्यान्द्रा हुने जातको आलु बीयाँ हाल सम्म पनि विकास हुन नसक्नु ।
४. तालिम प्राप्त जनशक्तिहरुको छिटो छिटो अन्य बिषयमा सरुवा हुने प्रकृया बढदै जानु ।
५. यस प्रबिधी बाट अत्याधिक कृषकहरुलाई अर्थिक लाभ दिलाउन सरोकारवालाहरुले सामुहिक अभियानको रुपमा कार्यक्रम अघि बडाउन नसक्नु ।
६ वियां वितरणमा आवश्याक व्यवस्था एवं सुधार हुनु नसक्नु ।

७. सुझाब एवं सिफारिस

(क) अनुसन्धान

- आलु बीयँमा Adaptive research लाई बढी जोड दिनु पर्ने ।
- उपयुक्त Parent lines को पहिचान संबन्धि अनुसन्धान लाई जोड दिनु पर्ने ।
- कृषकको माग र चाहाना बमोजिमका जातहरुको विकास गर्नु पर्ने ।

(ख) विकास

- आलु बीयाँबाट आलु खेती प्रविधीलाई कृषकको खेतमा अझ ब्यापकताका साथ लैजान कृषक नगीच कार्यरत प्राविधकहरुको (अधिकृत तथा प्रा.स./ना.प्रा.स.) क्षमतामा अभिबृद्धि गराउन तालीम तथा अध्ययन भ्रमण लाई निरन्तरता दिनु पर्ने ।
- आलु बीयाँ उत्पादन गर्न नेपाल सरकारले नीजि स्तरलाई प्रोत्साहन गर्न पुर्बाधार बिकास संबन्धि कार्यक्रम ल्याउनु पर्ने ।
- प्रबिधी हस्तान्तरण कृषक पाठशाला मार्फत गराउने ।
- आलु बीयाँबाट स्वस्थ आलु दाना उत्पादन गर्न आलु बीउ उत्पादक समूहलाई सहयोग पुर्‍याई बढदो मागको आपूर्ति गर्नु पर्ने ।
- बीउ आलु ढुवानी गरी लान नसक्ने ठाउँहरुमा आलु बीयाँबाट सोझै खायन आलु उत्पादन कार्यक्रम तर्जुमा तथा संचालन गर्नु पर्ने ।
- यस प्रबिधी बाट आलु खेतीको ब्याबसायिकीकरणको लागी उपयुक्त स्थानहरुको यकिन गरी बजारमुखी उत्पादनको अबधारणामा कार्यक्रम तर्जुमा तथा संचालन गर्नु पर्ने ।
- कृषक सरोकारवाला संघासंस्थाहरु बिच समन्वयनात्मक रुपमा कार्यक्रम संचालन हुनु पर्ने ।

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78

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10. Book reviews of new publication(s) in horticulture and related field.
11. Obituary that includes a short biography of deceased horticulturists.

Nepal Horticulture Society

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- Enhance public awareness towards the importance of horticulture.
- Promote and development linkages with related national and international institutional/organizations/societies.
- Advise governmental and non-governmental organizations in planning and execution of horticulture development program.
- Encourage and recognize professional horticulturists for their contributions and dedication in developing horticulture sector in the kingdom of Nepal.
- Create conductive environment for the development of horticulture in Nepal.
- Develop a strong work ethic in horticulture.
- Promote horticulture as an integral part of environmental conservation activity.

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