

付 属 資 料

- 1．ミニッツ（合同評価報告書）
- 2．フォローアップ協力投入実績
- 3．ネパール園芸開発計画研修実績
- 4．キルティプール園芸センター年間活動計画（1999～2000）
- 5．ネパール農業省及び園芸センター組織図
- 6．園芸セミナー資料
- 7．「ネパール丘陵地域農業改善計画」要請書案及び日本語による要約
- 8．NEPAL AGRICULTURE PERSPECTIVE PLAN（APP）抜粋
- 9．THE NINTH PLAN（1997～2002）抜粋

**Minutes of Discussions on
the Final Evaluation for
The Follow-Up Programme of
the Horticulture Development Project Phase-II
in the Kingdom of Nepal**

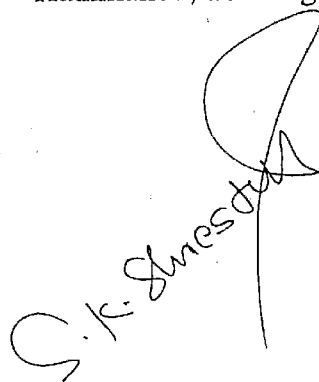
Japan International Cooperation Agency (hereinafter referred to as "JICA") organized the Final Evaluation Team (hereinafter referred to as "the Team") headed by Dr. Kenzo KOMAMURA, Director, Apple Research Center, National Institute of Fruit Tree Science, Ministry of Agriculture, Forestry & Fisheries and assigned to the Kingdom of Nepal from the 3rd to 13th August, 1999.

A Joint Evaluation Committee which consisted of 6 members from both the Government of Japan and His Majesty's Government of Nepal (hereinafter referred to as "HMG/N"), was jointly organized for the purpose to conduct final evaluation and make necessary recommendations for the Follow-Up Programme of the Horticulture Development Project PhaseII in the Kingdom of Nepal(hereinafter referred to as "the Follow-Up"),

The Joint Evaluation Committee conducted evaluation activities through documents study, interviews, field surveys, and prepared the Final Evaluation Report (hereinafter referred to as "the Report"). The Report was presented and discussed in the Joint Coordination Committee Meeting of the Project.

The major items agreed in the Joint Coordination Committee Meeting are attached, and are being recommended to the respective Governments.

Kathmandu, 10th August, 1999


S.K. Shrestha


Kenzo Komamura

Dr. Kenzo KOMAMURA
Leader,
Japanese Final Evaluation Team

Dr. Surendra Kumar SHRESTHA
Joint Secretary,
Ministry of Agriculture, HMG/N

ATTACHMENT

1. The Joint Evaluation Committee has presented the Report as per attached as ANNEX.

2. The Joint Coordination Committee has agreed and accepted the Report presented by the Joint Evaluation Committee and taken note of the recommendations made for sustainable development of the Project achievements.

3. The recommendations made by the Joint Evaluation Committee are highlighted as follows.

Recommendations for immediate realisation

1) For sustainable development of achievements of the Project, HMG/N should secure necessary budget and reassign the staff to Horticulture Centre -Kirtipur (hereinafter referred as "the Centre").

2) Long and short term training system introduced through the Project should be continued at the Centre.

3) Long term trainee should be organised to exchange their knowledge, skill, information, etc. among them.

4) Machines and Equipment provided through the Project, should be utilised and maintained under the responsibility of the Centre.

Recommendations for long-term realisation

1) Technically the Centre has been developed as a centre of excellence in horticulture. Therefore, institutionally it should be upgraded to have a national status in horticulture for the hilly area of Nepal.

2) In order to develop fruit production, HMG/N is hoped to introduce support system for fruit farmers in hilly area such as low-rate loan.

4. The HMG/N appreciated the result of the Japanese Technical Cooperation to the Horticulture Development Project for over past 12 years very much.

Furthermore, the HMG/N expressed their sincere expectation of the Japanese technical support to solve the problems occurring in accordance with growth of the fruit trees and increase of the fruit production.



ANNEX

Final Evaluation Report on the Follow-Up Programme of the Horticultural Development Project Phase-II

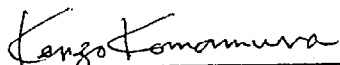
FINAL EVALUATION REPORT
ON
THE FOLLOW-UP PROGRAMME OF
THE HORTICULTURE DEVELOPMENT PROJECT
PHASE-II
IN
THE KINGDOM OF NEPAL

10th AUGUST, 1999
KATHMANDU
NEPAL

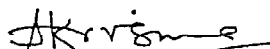
JAPAN – NEPAL
JOINT EVALUATION COMMITTEE
JOINTLY ORGANISED BY
JICA AND HMG/NEPAL

This Joint Evaluation Report has been prepared by the following members with the cooperation of the Follow-Up Programme of the Horticulture Development Project Phase-II (hereinafter referred as "the Follow-Up"), Department of Agriculture, Ministry of Agriculture, and Ministry of Finance, of His Majesty's Government of Nepal (hereinafter referred as "HMG/N"), Embassy of Japan in Nepal and Japan International Cooperation Agency (hereinafter referred as "JICA") Nepal Office.

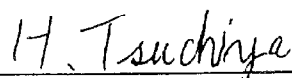
Here, the members of the Joint Evaluation Committee (hereinafter referred as "the Committee"), jointly organized by JICA and the authorities concerned of HMG/N, agree to put their signature as confirmation of the Report contents.



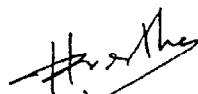
Dr. Kenzo KOMAMURA
Team Leader, Japanese Team




Mr. Suresh K. VERMA
Team Leader, Nepalese Team



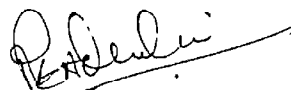
Mr. Hiroshi TSUCHIYA
Member of the Japanese Team



Dr. Yogesh H. SHRESTHA
Member of the Nepalese Team



Mr. Akio TAKIGUCHI
Member of the Japanese Team



Mr. Ramesh ADHIKARI
Member of the Nepalese Team

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1. Outline of the Follow-Up

1-1. Background of the Follow-Up

HMG/N implemented "Horticulture Development Project"(hereinafter referred as "the Phase-I") for 5 years from October 1985, and "Horticulture Development Project Phase-II " (hereinafter referred as "the Phase-II") from November 1992 with the cooperation of the Government of Japan.

Final Evaluation of the Phase-II was jointly conducted by the Government of Japan and HMG/N on July 1997. It was found and concluded that the objective of the Phase-II had been almost successfully achieved, but some critical issues were to be solved. Based on these findings, it was recommended that 2 year Follow-Up programme was necessary.

Based on this recommendation, Resident Representative of JICA in Nepal and the authorities concerned of HMG/N agreed to sign on Record of Discussions for the Follow-Up on 10th November 1997. (hereinafter "the Project" means the Phase-I, the Phase-II and the Follow-Up)

1-2. Design of the Follow-Up

Duration of the Follow-Up : 12th November 1997 ~ 11th November 1999

Responsible Authority:

Department of Agriculture, Ministry of Agriculture, HMG/N
JICA

Project Sites:

- 1) Centre Horticulture Centre -Kirtipur
(hereinafter referred as "the Centre")
- 2) Demonstration farms ——— 9 farms
Sub-Demonstration farms ——— 4 farms

Project Area: 6 districts namely

Kathmandu, Bhaktapur, Kavre, Lalitpur, Sindhuli and Ramechhap

Target Fruits:

Citrus(Junar, Suntala), Japanese Pear, Persimmon, Grape and Chestnut

Overall Goal:

To develop fruits production particularly in the hilly areas in Nepal

Project Purpose:

To establish suitable techniques for fruit production especially Japanese Pear as well as continue in achieving the set objective for the Phase-II

Outputs:

- 1) Improvement of techniques for fruit production
- 2) Training and Extension

Activities:

- 1) Improvement of techniques for fruit production
 - a) Suitable cultivation techniques including pruning / training, shoot management, fruit thinning, development of canopies, etc.
 - b) Harvesting and handling techniques, and improvement of the introduced variety at the farmer's level
 - c) Improvement of equipment and tools
- 2) Training and Extension
 - a) Training at the Centre
 - b) Extension activities in Demonstration farms
 - c) Circuit technical guidance
 - d) Seminars (promotion activities)
 - e) Publications

Inputs:

Inputs for the Follow-Up from both the Government of Japan and HMG/N are shown in detail in Annex 2

2. Methods of the Evaluation

2-1. Parameters of the Evaluation

The evaluation was carried out from the following perspective.

- 1) Effectiveness
- 2) Efficiency
- 3) Impacts
- 4) Relevance
- 5) Sustainability

2-2. Composition of the Joint Evaluation Committee

The evaluation was jointly conducted by both the Japanese and Nepalese members.

Japanese members

Team Leader

Dr. Kenzo KOMAMURA

Director, Apple Research Center,
National Institute of Fruit Tree
Science, Ministry of Agriculture,
Forestry & Fisheries(MAFF)

Mr. Hiroshi TSUCHIYA

Senior Officer,
Extension and Education Division,
Agricultural Production Bureau,
MAFF

Mr. Akio TAKIGUCHI

Staff, Livestock and Horticulture
Division, Agricultural Development
Cooperation Department, JICA

Nepalese members

Team Leader

Mr. Suresh K. VERMA

Joint Secretary,
Ministry of Agriculture (MOA)

Dr. Yogesh H. SHRESTHA

Assistant Citrus Development Officer,
Citrus Development Division,
Department of Agriculture (DOA),
MOA

Mr. Ramesh ADHIKARI

Section Officer,
Planning Division, MOA

2-3. Evaluation Schedule

The Committee spent 6 days from 5th to 10th August 1999, and carried out the following activities.

| Date | Time | Schedule |
|-------------|----------------|---|
| Aug.5 (Thu) | 14:00 | Joint Committee Meeting JICA Mission members and Nepalese counterparts to discuss on the evaluation methods. |
| 6 (Fri) | 11:00 13:30 | Observation of the Deciduous Fruit Exhibition. Participation on the Seminar on Horticulture Development. |
| 7 (Sat) | 9:00 16:00 | Observation of the Demonstration farms and farmers. (Lalitpur, Kavre) Joint discussion for the preparation of the Evaluation Report |
| 8 (Sun) | 9:30 14:00 | Observation of the Demonstration farms and farmers. (Thankot, Machhegaun, Kathmandu) Discussion with C/Ps to survey of the Project Activities. Compiling of the results of survey. Preparation of the evaluation report and draft of the Minutes of Meeting (M/M) |
| 9 (Mon) | 10:00 14:00 | Survey of the Project Activities. Joint Committee Meeting to discuss on the evaluation and the contents of the M/M |
| 10 (Tue) | 15:30 | Presentation of the Final Evaluation Report. Signing on the M/M. |

3. Results of the Evaluation

3-1. Effectiveness

Suitable techniques for fruit production have been established and disseminated in the project area, and Project Purpose of the Follow-Up have been achieved as follows.

In the Phase-I & II, the activities such as assessment of introduced varieties, production of nursery trees and improvement of fruit cultivation techniques were carried out, and objectives of the Phase-I & II were almost successfully achieved.

Then in the Follow-Up period, activities for the remaining issues, like development of suitable cultivation techniques, harvesting and handling techniques, and improvement of the cultivation of introduced varieties at farmer's level, improvement of equipment and tools, have been resolved.

Although, there are still some issues to be addressed in harvesting, grading, packing, and suitable measures against pests and diseases, the C/Ps can resolve the issues since they have acquired necessary techniques through the Follow-Up.

The technicians and leader farmers also have acquired necessary techniques through the long and short term training at the Centre.

Similarly, the Extension activities in Demonstration farms, Circuit technical guidance, Seminars, and Publications have further expanded their knowledge and skills on fruit cultivation techniques.

Therefore, it is expected that Nepalese staff will take necessary measures by themselves, even after the termination of the Project.

3-2. Efficiency

Inputs and Outputs of the Follow-Up are as follows. Comparing Inputs to Outputs, it is evaluated that Outputs are enough to justify the amount of Inputs. Therefore the Efficiency of the Follow-Up is high level.

Inputs

Inputs for the Follow-Up from both the Government of Japan and HMG/N are shown in detail in Annex 2

Outputs (To be referred to Annex 3)

1) Improvement of techniques for fruit production

a) Suitable cultivation techniques:

It was confirmed that Japanese pear varieties Hosui and Kosui grow well and show high quality by using the rootstock of native varieties, and also confirmed that propagation of the rootstock from seed was easy.

Suitable techniques on pruning / training, shoot management, fruit thinning, development of canopies, bagging fruits etc. have been

successfully established.

It has been realised that the farmers are aware of the importance of harvesting Kosui, Hosui at proper time by the appearance and test eating. The farmers tend to harvest late maturing variety SINKOH at same time. Therefore C/Ps should provide necessary guidance to the farmers about proper harvest time of SINKOH.

b) Harvesting and handling techniques, and improvement of the introduced variety at farmer's level:

In order to keep good quality, methods of grading fruits were transferred, and wrapping with old newspapers was promoted.

c) Improvement of equipment and tools:

Blacksmiths were trained to improve the quality of horticultural tools, and now, some of them have opened and run their own workshop.

2) Training and Extension

a) Training at the Centre:

20 JT/JTAs have been trained through the long term (1 month \times 3 times) training on fruit cultivation.

224 leader farmers, 213 women farmers, 20 nursery farmers have been trained through the short term (1 week) training.

12 blacksmiths have been trained.

b) Extension activities in Demonstration farms:

Field level training on pruning / training, shoot management, fruit thinning, development of canopies, etc. for extension officers and farmers were implemented.

c) Circuit technical guidance:

Campaigns for the prevention of the foot rot disease, top grafting, bagging fruits were implemented for leader farmers.

d) Seminars (promotion activities)

Seminar was held once on key achievements of the Project and Fruit Exhibitions were held 4 times on deciduous and citrus fruits.

e) Publications

Newsletters, One Point Extension, Fruit Production Calendar etc.

3-3. Impacts

The committee found the following positive impacts on various aspects through the implementation of the Project.

No negative impacts were observed.

Policy Impact:

1) Fruits introduced by the Project have been considered as important high value crops in the national development plan of HMG/N (Agricultural

Perspective Plan).

Economic Impact:

- 1) Fruit production has become an important means to generate income for farmers in hilly area.
- 2) Environment has been created to establish the industry for processing and marketing.

Technical Impact:

- 1) Staff of the Project have become more closer to work with the farmers.
- 2) The Centre has been a centre of excellence for Japanese Technology on fruit cultivation.
- 3) Technical publications published by the Project are being used in different technical institutions.

Socio-Cultural Impact:

- 1) Values of fruits have risen and some farmers started commercial-level fruit production.
- 2) Networks of roads and electricity have been developed due to increase of fruit production.
- 3) Through the hard working nature and result oriented activities of Japanese experts, friendly feelings and highest consideration toward Japanese nationals have been spreading in Nepal.

Institutional Impact:

- 1) Better understanding and mutual cooperation among the staff exist significantly.
- 2) Relationship of trust between farmers and extension offices has been established.

Environmental Impact:

- 1) The Project has developed the method of fruit cultivation by using 20-30% less agricultural chemicals than usual in Japan.
- 2) Recycling of the waste resources has been utilised for producing horticultural tools in the Project.
- 3) Fruit tree plantation has been success to protect soil erosion.

3-4. Relevance

Relevance of Overall Goal

At the moment of this evaluation, it is found that development of fruit production in the hilly areas of Nepal has occupied important position in the

national development plan of HMG/N such as "Agricultural Perspective Plan". Thus, the Overall Goal designed is justified.

Relevance of Project Purpose

To achieve Overall Goal of the Project, it was necessary to implement 2 year follow-up.

Through the Follow-Up, C/P of the Project, extension officers and fruit production farmers in the project area have acquired enough techniques for fruit production, especially for Japanese pear.

Thus, the Project Purpose designed is evaluated as appropriate.

Relevance of Outputs

Outputs envisaged in R/D are adequate in order to achieve the Project Purpose within 2 years.

3-5. Sustainability

Sustainability of the Project is evaluated in technical, institutional and financial aspects as follows.

Technical Sustainability:

1) Improvement of technique for fruit production

Through the Follow-Up, C/Ps, extension officers, leader farmers have accumulated experiences of fruit cultivation, and have acquired necessary knowledge and techniques. They have been able to manage works of fruit cultivation and innovate appropriate techniques by themselves. In the project area, some districts have become as to fruit-producing districts. Machines & equipment of the Project are well maintained.

Referring to the reasons above, the Committee evaluates that the achievements of the Project will sustain after the termination of the Follow-Up, and also finds that for sustainable development, it is necessary that maintenance of the machines & equipment, as well as development and extension activities through the work of the project staff should continue.

2) Training and Extension

Through the experiences of the 2 year Follow-Up, the Project staff have been able to plan training and circuit guidance on fruit cultivation smoothly.

So the achievements of the Project will sustain if the trained Project staff will be reassign to the Centre.

Institutional Sustainability:

After the termination of the Project, the function of the Project will be succeeded by the Centre.

Then the post of the project staff should be assigned to the Centre.

Financial Sustainability:

After the Project completion, without sharing of operating costs by Japanese side, the activities of the Project may be scaled down.

However, in order to sustain the activities of the Project, necessary budget to sustain and further develop the Project achievements, including KR2 fund, should be allocated to the Centre.

3-6. Conclusion

The Committee finds that

- 1) Through the activities of the Project, the suitable techniques for fruit production have been developed and disseminated to the farmers in the project area,
- 2) C/Ps, AC/Ps have acquired necessary techniques for sustaining and further developing the achievements of the Project.

Thus the results of the evaluation is concluded that Project Purpose of the Follow-Up has been accomplished. It is understood that the Japanese Project-type Technical Cooperation to the Project will be completed on 11th November 1999 as per scheduled.

However, in order to sustain, for further development and dissemination of the project activities to the wider beneficiaries, necessary budget for the Project including KR2 fund and necessary number of qualified staff of the Project should be allocated to the Centre.

The Committee also finds that the activities of Japanese Overseas Cooperation Volunteers (JOCV) will be an effective measure for further dissemination of the achievements of the Project.

4. Recommendations

4-1. Recommendations for immediate realisation

- 1) For sustainable development of achievements of the Project, HMG/N should secure necessary budget and reassign the staff to the Centre.
- 2) Long and short term training system introduced through the Project should be continued at the Centre.
- 3) Long term trainee should be organised to exchange their knowledge, skill, information, etc. among them.
- 4) Machines and Equipment provided through the Project, should be

utilised and maintained under the responsibility of the Centre.

4-2. Recommendations for long-term realisation

- 1) Technically the Centre has been developed as a centre of excellence in horticulture. Therefore, institutionally it should be upgraded to have a national status in horticulture for the hilly area of Nepal.
- 2) In order to develop fruit production, HMG/N is hoped to introduce support system for fruit farmers in hilly area such as low-rate loan.

Annex 1.

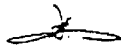
R/D, DIP, M/M

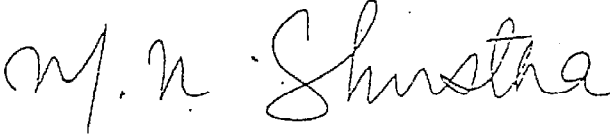
RECORD OF DISCUSSIONS
ON THE FOLLOW-UP PROGRAMME
OF JAPANESE TECHNICAL COOPERATION
FOR THE HORTICULTURE DEVELOPMENT PROJECT PHASE II

With regard to the follow-up programme of the Japanese technical cooperation for the Horticulture Development Project Phase II (hereinafter referred to as "the Project") in the Kingdom of Nepal based on the Record of Discussions signed in Kathmandu on the 12th November, 1992, Mr. Masao Watanabe, Resident Representative of Japan International Cooperation Agency in the Kingdom of Nepal, held a series of discussions with the Nepalese authorities concerned. The discussions were in accordance with the results of the joint evaluation by the Japanese and Nepalese team conducted in Kathmandu on the 17th July, 1997.

As a result of the discussions, both sides agreed to recommend to their respective Governments, the implementation of the follow-up programme of Japanese technical cooperation for the Project along the lines described in the document attached hereto.

Kathmandu, November 10, 1997


MASAO WATANABE
Resident Representative
Nepal Office
Japan International Cooperation Agency


Dr. Mukti Narayan Shrestha
Acting Secretary
Ministry of Agriculture
His Majesty's Government
of Nepal

ATTACHED DOCUMENT

I. DURATION OF COOPERATION

The duration of the follow-up programme of Japanese technical cooperation for the project will be two (2) years from the 12th November, 1997.

II. SCOPE OF FOLLOW UP PROGRAMME

1. ACTIVITIES OF TECHNICAL COOPERATION

(1) Improvement of techniques for fruit production

- (a) Suitable cultivation techniques including pruning/training, shoot management, fruit thinning, development of canopies, etc. of Japanese Pears
- (b) Harvesting and handling techniques and improvement of the introduced variety at farmer's level
- (c) Improvement of equipment and tools

(2) Extension and Training

- (a) Training at the Horticulture Development Research and Training Centre
- (b) Extension activities in demonstration farms
- (c) Circuit technical guidance
- (d) Seminars (promotional activities)
- (e) Publications

2. DISPATCH OF JAPANESE EXPERTS

(1) Long-term Experts in the fields of:

- (a) Fruits Culture acting as Team Leader
- (b) Extension and Training acting as Coordinator

(2) Short-term Experts

Short-term experts will be dispatched when necessity arises.

3. SERVICES OF NEPALESE COUNTERPART

- (1) Project Director
- (2) Project Manager
- (3) Pomiculture
- (4) Extension and Training
- (5) Agricultural Machinery

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- III. All matters other than those mentioned above will be treated in the same manner as prescribed in the Record of Discussions signed in Kathmandu on the 12th November, 1992.

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DETAILED IMPLEMENTATION PLAN
FOR THE FOLLOW-UP PROGRAMME
OF THE HORTICULTURE DEVELOPMENT PROJECT PHASE II
IN THE KINGDOM OF NEPAL

With regard to the Detailed Implementation Plan for the follow-up programme of the Japanese technical cooperation for the Horticulture Development Project Phase II in the Kingdom of Nepal (hereinafter referred to as "the Project") based on the Record of Discussions signed in Kathmandu, November 10, 1997, the Japan International Cooperation Agency (hereinafter referred to as "JICA") held a series of consultations with the Nepal authorities concerned. As a result of the consultation, both sides jointly formulated the Implementation for the programme as annexed hereto.

Kathmandu, November 10, 1997

MASAO WATANABE
Resident Representative
Nepal Office
Japan International Cooperation Agency

M. N. Shrestha
Dr. Mukti Narayan Shrestha
Acting Secretary
Ministry of Agriculture
His Majesty's Government
of Nepal

I. ACTIVITIES OF TECHNICAL COOPERATION

(1) Improvement of technique for fruit production

| Item | Subject of technical Guidance | Activity | Goal | Remark |
|---|-------------------------------|---|---|---|
| a. Suitable cultivation techniques including pruning/training, shoot management, fruit thinning, development of canopies, etc., of Japanese Pears | (1) Raising of root stock | <ul style="list-style-type: none"> Selection of suitable root stock | <ul style="list-style-type: none"> Selection of suitable lines of root stock | |
| | (2) Tree Management | <ul style="list-style-type: none"> Training and pruning Fruits thinning Shoot management Plant Protection Management practices | <ul style="list-style-type: none"> Popularize tree management Techniques | |
| b. Harvesting and handling techniques, and improvement of the introduced variety at farmer's level | (1) Harvesting techniques | <ul style="list-style-type: none"> Harvesting techniques and estimation of optimum harvests | <ul style="list-style-type: none"> Implementation of suitable harvesting techniques and estimation of optimum harvests | |
| | (2) Fruit handling techniques | <ul style="list-style-type: none"> Fruit grading Fruit Packing | <ul style="list-style-type: none"> Popularize acceptable fruit handling techniques at farmer's level | |
| c. Improvement of Equipment & Tools | (1) Quality management | <ul style="list-style-type: none"> Quality check Brush up training for blacksmiths | <ul style="list-style-type: none"> Maintain productive techniques | <ul style="list-style-type: none"> Technical advice and guidance will be made by short-term experts HMG/N side will encourage of continued development of Equipment & Tools at farmer's level |

(2) Training & Extension

| Item | Subject of technical Guidance | Activity | Goal | Remark |
|--|---|--|--|--|
| a. Training at Center | (1) Improvement of training curriculum | <ul style="list-style-type: none"> Guidance and advice for improvement different fruit varieties and Seasonable training program Guidance and advice for short & long-term training | <ul style="list-style-type: none"> Implementation of various types of effective training | Long-term Training: 1 month Short-term Training: 4 week |
| b. Extension activities in Demonstration farms | (1) Demo-farm management | <ul style="list-style-type: none"> Tree management Technical training at Demo-farms | <ul style="list-style-type: none"> Implementation of suitable Demo-farm management Effective utilization of Demo-farms | |
| c. Circuit technical Guidance | (1) Planning of effective technical circuit guidance | <ul style="list-style-type: none"> Promoting closer connections and relations between Center and DADOs Support for various types of campaigns Support for fruit development activities by DADOs | <ul style="list-style-type: none"> Implementation of effective technical circuit guidance | |
| d. Seminars (promotional activities) | (1) Promotion of fruit products to JT/JTAs and farmers | <ul style="list-style-type: none"> Implementation of fruit exhibitions | <ul style="list-style-type: none"> Spreading of fruit production | |
| e. Publications | (1) Grasping effective publication approaches and also utilize the mass media | <ul style="list-style-type: none"> Extending cultivation techniques | <ul style="list-style-type: none"> Grasping effective publication approaches for extended cultivation techniques | |

II. ASSIGNMENT OF JAPANESE SIDE

| ITEM | YEAR | | Remarks |
|---|--------------------------|------|------------------------------------|
| | 1 ST | 2 ND | |
| 1 Dispatch of Japanese Experts | | | |
| (1) Long-term Experts | | | |
| a. Team Leader cum Fruits Culture | | | |
| b. Extension and Training cum Coordinator | | | |
| (2) Short-term Experts | When necessity arises | | |
| 2 Provision of equipment and machinery | | | Spare parts and minor equipment |
| 3 Training of Nepali counterpart personnel in Japan | | | |

III . ASSIGNMENT OF NEPALESE SIDE


| ASSIGNMENT | YEAR | | Remarks |
|---|------|------|---------|
| | 1 ST | 2 ND | |
| 1 Allocation of counterpart personnel (1) Project Director (2) Project Manager (3) Pomiculture (4) Extension and Training (5) Agricultural Machinery | | | |
| 2 Allocation of Administrative Personnel Clerks, Service employees, Operators, Drivers, Laborers and Other necessary support staffs | | | |
| 3 Buildings and facilities | | | |
| 4 Running Expenses | | | |
| 5 Adequate budget to conduct appropriate Project activities, including expenses for demo-farm maintenance, trainig, and circuit guidance of Nepalese experts | | | |

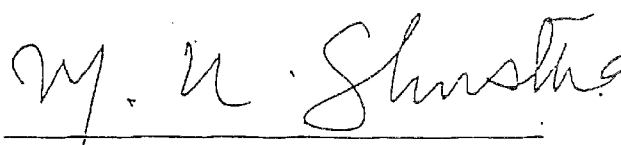
MINUTES OF THE MEETING ON THE RECORD OF DISCUSSIONS
ON THE FOLLOW-UP PROGRAMME
OF JAPANESE TECHNICAL COOPERATION
FOR THE HORTICULTURE DEVELOPMENT PROJECT PHASE II

Mr. Masao WATANABE, Resident Representative of Japan International Cooperation Agency in the Kingdom of Nepal and the Nepalese Authorities concerned have signed the Record of Discussions in Kathmandu, November 10, 1997, on the follow-up programme of Japanese Technical Cooperation for the Horticulture Development Project Phase II.

The mutual understandings between the both sides concerning the attached document to the Record of Discussions are recorded as attached hereto.

Kathmandu, November 10, 1997


MASAO WATANABE
Resident Representative
Nepal Office
Japan International Cooperation Agency


Dr. Mukti Narayan Shrestha
Acting Secretary
Ministry of Agriculture
His Majesty's Government
of Nepal

ATTACHMENT

For smooth and effective operation of the follow-up programme, Japanese side request the followings to Nepalese authorities. Nepalese side agreed to make necessary efforts for accomplishment of them.

- (1) Arrangement for sustaining the project activities.
 - 1) Continuation of employment and creation of some necessary permanent status should be secured in the Horticulture Centre, Kirtipur in order to facilitate to hand over the project activities to the Centre.
 - 2) The same or higher-level budget, including KR II fund, for sustaining the activities of follow-up cooperation and other necessary activities of the Horticulture Development Project II should be continuously allocated.
- (2) Assignment of C/P and AC/P
 - 1) Substantial full time C/P and AC/P should be continuously allocated. However in the field of Agro-machinery, the Project Manager may concurrently serve as C/P to supervise the Agro-machinery maintenance section and to promote the use of developed equipment and tools at farmer's level.

Annex 2.

Tables of Inputs

Input by Japanese side

| Fisical year | Month | 1997 | | | | 1998 | | | | 1999 | | |
|-----------------------|--|------|---|----|---|--|---|----|---|---|---|----|
| | | 4 | 7 | 11 | 3 | 4 | 7 | 11 | 3 | 4 | 7 | 11 |
| Dispatch of Expert | <u>Long term Expert</u> | | | | | | | | | | | |
| | Y. Tomiyasu(Team leader cum Fruit Cultivation) | | | | | | | | | | | |
| | S. Yamanaka(Coordinator cum Extension and Training) | | | | | | | | | | | |
| | <u>Short term Expert</u> | | | | | | | | | | | |
| | T. Tokudome(Agromachimery) | | | | | | | | | | | |
| | K. Kudoh(Harvest Technology) | | | | | | | | | | | |
| | T. Matsumoto(Pear Pruning) | | | | | | | | | | | |
| | W. Ueno(Entomology) | | | | | | | | | | | |
| Provited Machinery | | | | | | Motor Bike,OA machine, Agromachinery,Spare Parts 2,300,000Japanese Yen | | | | Spare Parts 1,200,000Japanese Yen | | |
| Carried Machinery | | | | | | Pruning secature, Grafting Knife,Lavel 210,000Japanese Yen | | | | Fruits Processing Machine 248,000Yen | | |

Training in Japan

| Fisical Year | 1997 | | | | | 1998 | | | | | | | | | | | 1999 | | | | | | | | | | |
|---|-----------------------|----|---|---|---|-----------------------------|---|---|---|---|---|----|----|----|---|---|---------------|---|---|---|---|---|---|----|----|--|--|
| | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | |
| C/P Training in Japan (6 Personels) | MsV.Pandey | | | | | Extension Method | | | | | | | | | | | '98.9.7~11.10 | | | | | | | | | | |
| | Mr.J.Khadkha | | | | | Soil and Nutrient | | | | | | | | | | | '99.1.25~3.24 | | | | | | | | | | |
| | Mr.R.K.C | | | | | Deciduos fruits cultivation | | | | | | | | | | | '99.1.25~3.24 | | | | | | | | | | |
| | Mr.F.Pandey | | | | | Entomology | | | | | | | | | | | '99.7.1~9.30 | | | | | | | | | | |
| | Mr.Bhandari | | | | | Deciduos fruits extension | | | | | | | | | | | '99.8.1~10.31 | | | | | | | | | | |
| | Mr.D.Sharma | | | | | Pear pruning extension | | | | | | | | | | | | | | | | | | | | | |
| Mission team | | | | | | | | | | | | | | | | | 8/4~8/12 | | | | | | | | | | |
| Leader meeting | '98/1/27~2/8 Tokyo | | | | | '99/1/30~2/11 Tokyo | | | | | | | | | | | | | | | | | | | | | |
| Coordinator meeting | | | | | | | | | | | | | | | | | | | | | | | | | | | |

日本側投入実績一覧表

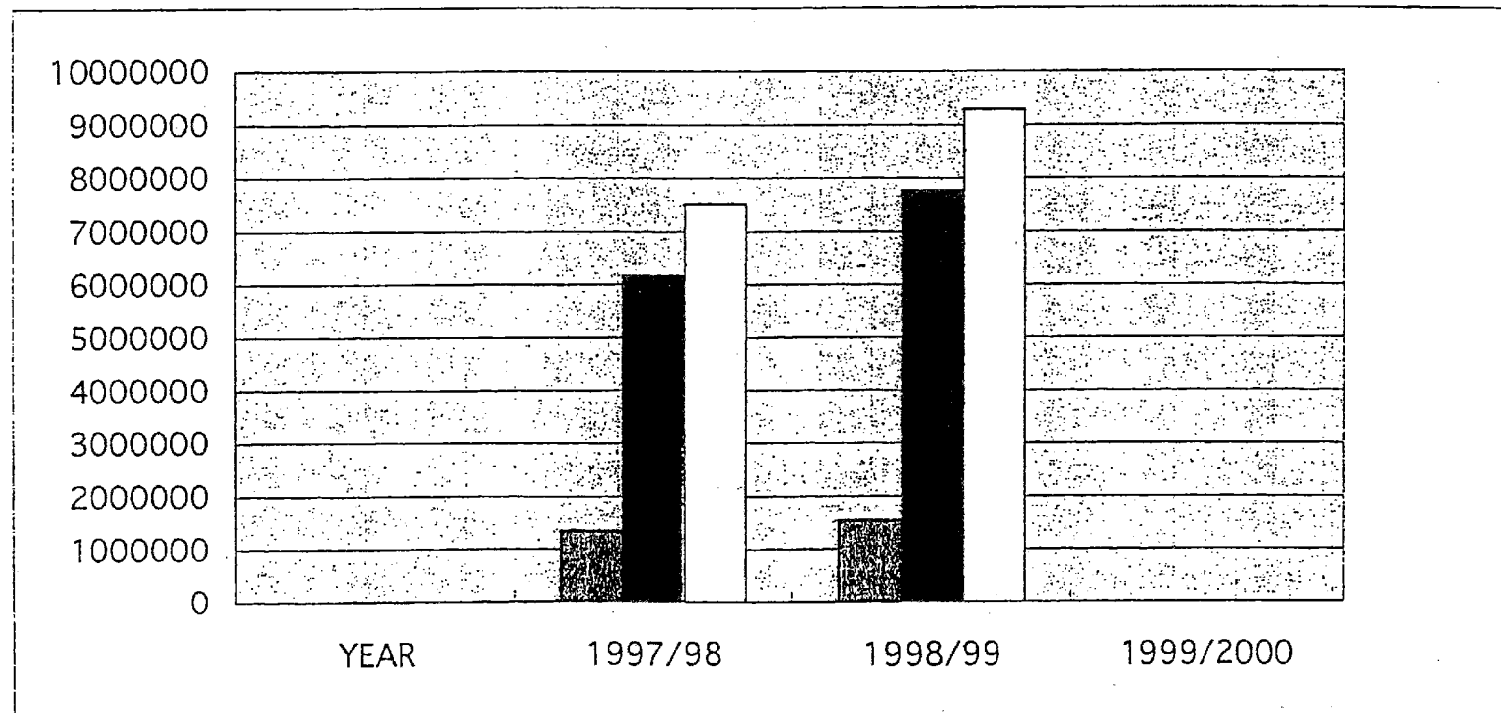
| 予備三 期三 | 月 | 1997 | | | | 1998 | | | | 1999 | | |
|--|------------------|------|---|----|---|------|---|----|---|------|---|----|
| | | 4 | 7 | 11 | 3 | 4 | 7 | 11 | 3 | 4 | 7 | 11 |
| 専 門 家 派 遣 | 長期 | | | | | | | | | | | |
| | 高田 裕一(果樹栽培、リーダー) | | | | | | | | | | | |
| | 佐田 恵(普及研修、業務調整) | | | | | | | | | | | |
| | 田代 隆(リーダー) | | | | | | | | | | | |
| | 佐藤 昭雄(農業機械) | | | | | | | | | | | |
| | 三宅 隆雄(農業経営) | | | | | | | | | | | |
| | 大野 隆行(業務調整) | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 短期 高田 裕一(農業機械) ————— '98.5.18~7.17 上野 直(指導) ————— '99.6.17~8.16 三宅 隆雄(双葉技術) ————— '98.6.17~7.5 早稲田 田代 隆(ナシ特定技術) ————— '99.1.20~3.19 | | | | | | | | | | | | |
| 機 材 | 共同 機材 | | | | | | | | | | | |
| | 機材 | | | | | | | | | | | |

研修員受入、現地活動費、相手国側投入実績、その他

| 予算年 細目 月 | 1997年 (H9) 1 1 1 2 1 2 3 | 1998年 (H10) 4 5 6 7 8 9 1 0 1 1 1 2 1 2 3 | 1999年 (H11) 4 5 6 7 8 9 1 0 1 1 |
|-----------------------|---|---|---|
| C/P 日本研修 (合計6名) | Ms.V.PANDEY 果樹普及方法 98.9.7~11.10 Mr.J.Khadka 土壌肥料 99.1.25~3.24 Mr.R.K.C 落葉果樹栽培 99.1.25~3.24 Mr.F.Pandey 虫害 99.7.1~9.30 Mr.Bandali 落葉果樹普及 99.8.1~10.31 Mr.D.Sharma | | |
| 現地活動費 | 一般現地業務費 ¥1620000 | 一般現地業務費 ¥280万 啓蒙普及活動 ¥200万 LLDC特別 ¥40万 | 一般現地業務費 ¥200万 啓蒙普及活動 ¥200万 LLDC特別 ¥40万 |
| 相手国投入実績 | Pマネージャー 1名 C/P 5名 AC/P 6名 人夫 50名 主要調達機材 圃場管理機材 スベアパーツ | Pマネージャー 1名 C/P 5名 AC/P 6名 人夫 50名 主要調達機材 圃場管理機材 スベアパーツ | Pマネージャー 1名 C/P 5名 AC/P 6名 人夫 50名 主要調達機材 圃場管理機材 スベアパーツ |
| 調査団 | | | 8月4日から12日まで |
| リーダー会議 | '98/1/27 ~2/8東京 | '99/1/30~2/11東京 | |
| 調整員会議 | なし | | |

ネパール側予算負担

| FISICAL YEAR | According to Annual Budget | | | Currency Nepal Rs. |
|-----------------|----------------------------|---------|---------|-----------------------|
| | HMG | KR-2 | Total | |
| 1997/98 | 1343311 | 6161292 | 7504603 | |
| 1998/99 | 1541000 | 7753000 | 9294000 | |
| 1999/2000 | | | | |

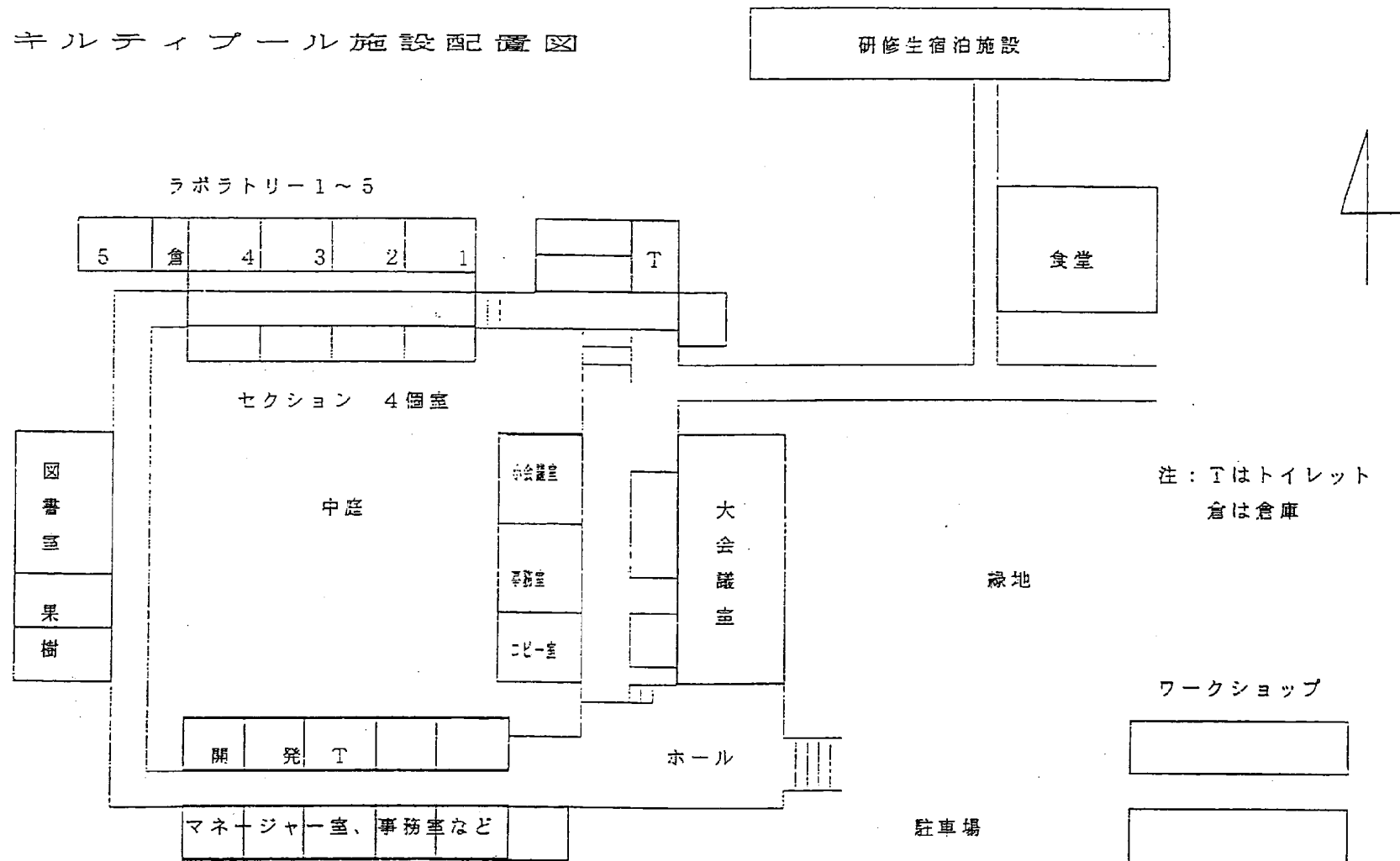


C/P 配置一覧表

平成11年第1四半期現在

| 氏名 | | | | | | | | | | | | | | 所属部署 | 備 考 | |
|-------|---------------------|-----|---|----|---|-----|---|----|---|-----|---|----|---|------------|------|--------------------|
| | 所属部署 | H 9 | | | | H10 | | | | H11 | | | | 年次 | 主な経歴 | |
| | C/P係 | 4 | 7 | 11 | 3 | 4 | 7 | 11 | 3 | 4 | 7 | 11 | 3 | | | |
| P. 係長 | Mr. R. D. Shahi | | | | | | | | | | | | | H8 | 果敢課 | 1級官昇進に伴う移動。5月14日まで |
| P. 係長 | Mr. S. Shrestha | | | | | | | | | | | | | | | 5月15日より新マネージャー |
| 係長 | Mr. C. B. Grung | | | | | | | | | | | | | | | 果敢係長に転属 |
| 係長 | Ms. V. Pandy | | | | | | | | | | | | | 1998年 | 果敢 | F/U課よりラホから転属後、 |
| 係長 | Dr. Y. H. Shrestha | | | | | | | | | | | | | 愛媛大学博士課程修了 | | 甘藷園長長府より甘藷関係の協力者 |
| 係長 | Mr. E. P. Shimkhada | | | | | | | | | | | | | H9 | 口之津 | 普及活動 |
| 係長 | Mr. J. Khadka | | | | | | | | | | | | | 1999年 | つくば | 二重 |
| 係長 | Ms. F. Pandy | | | | | | | | | | | | | | | 三重 |
| 以下 | AC/P | | | | | | | | | | | | | | | |
| 係長 | Mr. R. Maharjan | | | | | | | | | | | | | | | メカニック |
| 係長 | Mr. B. P. Giri | | | | | | | | | | | | | H8 | 安芸津 | JT |
| 係長 | Mr. R. Khadka | | | | | | | | | | | | | 7年-ズ1 | | JTA |
| 係長 | Mr. Jyoshi | | | | | | | | | | | | | | | JTA |
| 係長 | Mr. D. B. Thapa | | | | | | | | | | | | | H7 | 口之津 | JT 昇進による転属 |
| 係長 | Mr. M. R. Pant | | | | | | | | | | | | | H9 | 果敢課 | JTA |
| 係長 | Mr. Choudari | | | | | | | | | | | | | | | JT |

キルティプール施設配置図



注：Tはトイレット
倉は倉庫

1. 長期研修

| | 鍛冶屋研修 | JT / JTA * 長期研修 | 計 |
|---------------------------|-------|--------------------|----|
| フェーズ I 1985-1990 | 16 | 0 | 16 |
| フェーズ II 1992-1997 | 10 | 32 | 42 |
| フェーズ II, F/U 1997-1999 | 12 | 20 | 32 |
| 計 | 38 | 52 | 90 |

* JT / JTA 長期研修の期間は、フェーズ II では1年間、フェーズ II, F/U では1ヶ月×3回（剪定期、摘果期、収穫期）

2. 短期研修

| | 課題 | 期間 | JT / JTA | | | デモファーム農家 | | | 苗木農家 | | | 篤農家 | | | 計 |
|---------------------------|------------|-----------------|----------|----|-----|----------|----|----|------|----|-----|------|-----|------|------|
| | | | 男性 | 女性 | 計 | 男性 | 女性 | 計 | 男性 | 女性 | 計 | 男性 | 女性 | 計 | |
| フェーズ I 1985-1990 | 落葉果樹及び柑橘栽培 | 1週間 | - | - | 122 | - | - | - | - | - | 110 | - | - | 830 | 1062 |
| フェーズ II 1992-1997 | 落葉果樹及び柑橘栽培 | 3日間 ～ 1週間 | 167 | 18 | 185 | 42 | 0 | 42 | 35 | 1 | 36 | 1038 | 735 | 1773 | 2036 |
| フェーズ II, F/U 1997-1999 | 落葉果樹及び柑橘栽培 | 1週間 | 19 | 1 | 20 | 0 | 0 | 0 | 20 | 0 | 20 | 224 | 213 | 437 | 477 |
| 計 | | | - | - | 327 | - | - | 42 | - | - | 166 | - | - | 3040 | 3575 |

注：実績は延べ人数

付属資料 4. キルティプール園芸センター年間活動計画 (1999~2000)

合計予算 51052.00千ルピー

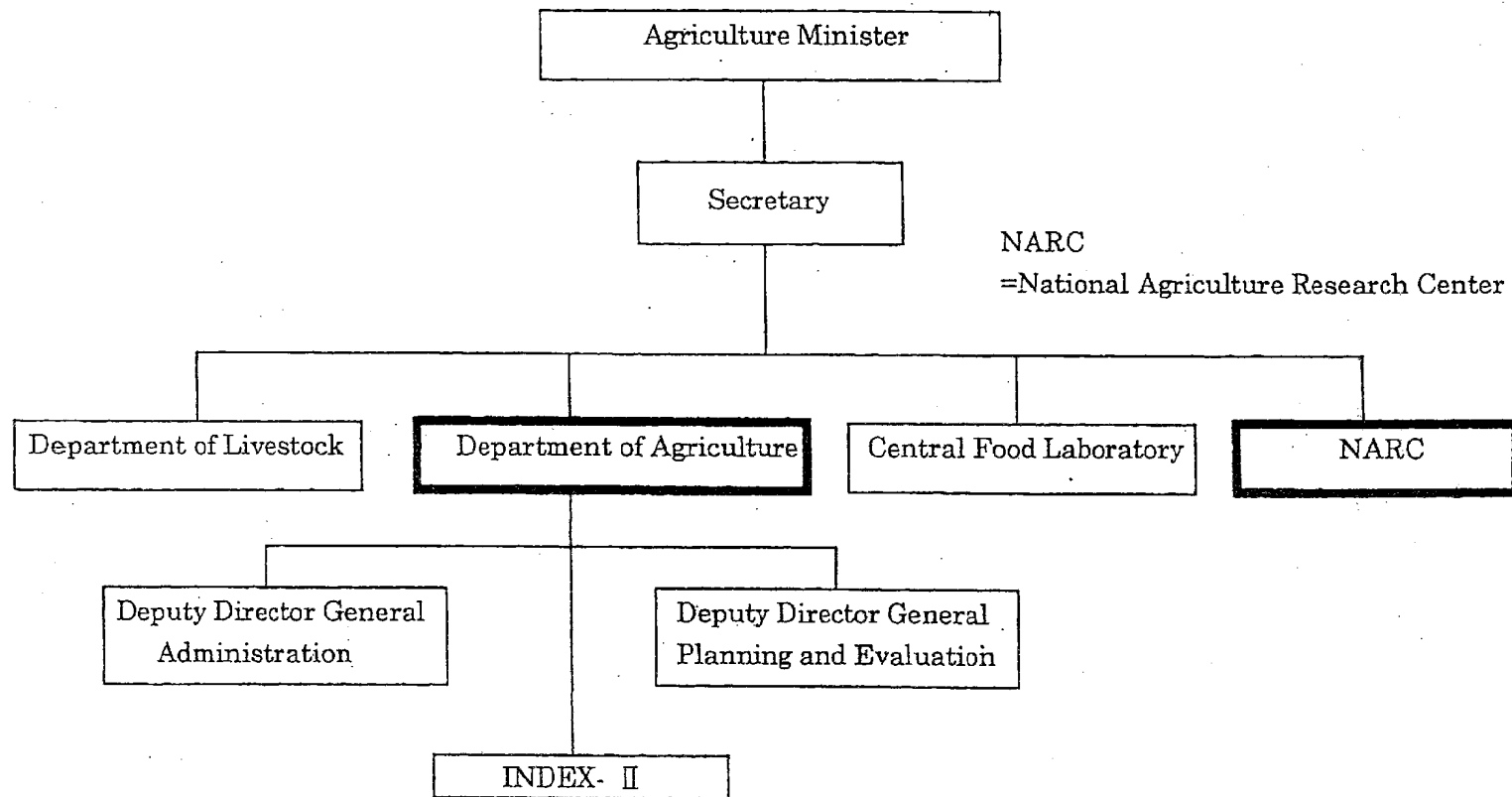
内訳 ネパール政府予算 9990.0 外国援助 (第2KR予算含む) 41062.0

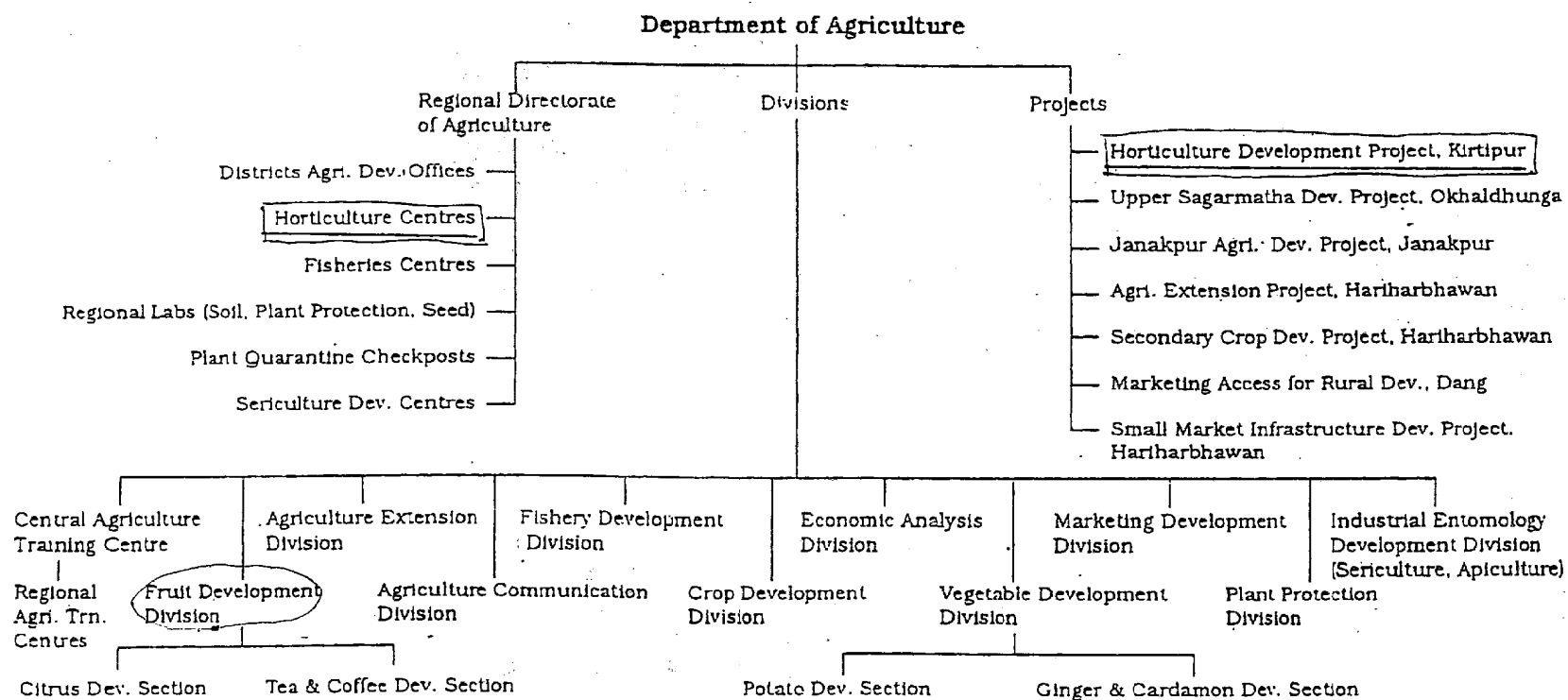
本会計年度 (056/57) 5494.00千ルピー

内訳 ネパール政府予算 1032.0 外国援助 (第2KR予算含む) 4462.0

| 事業項目 | 予定数 | 経費 (千ルピー) | 事業費における 構成 (%) |
|---|------------|--------------|-------------------|
| 常緑果樹栽培 | | | |
| 品種選抜 | 100本 | 85.0 | 4.3 |
| カンキツ苗供給 (スンタラ 800、ジュナール 500、ムンタラ500) | 1500本 | 30.0 | 1.5 |
| カンキツ台木供給 | 10000本 | 15.0 | 0.8 |
| カラタチ種子生産配布 | 100kg | 20.0 | 1.0 |
| ガラス室苗増殖ウイルスフリー化 | 100本 | 75.0 | 3.8 |
| 圃場管理 | 2ha | 160.0 | 8.0 |
| 落葉果樹栽培 | | | |
| 品種選抜 | 100本 | 20.0 | 1.0 |
| 苗供給 (ナシ 2000、ブドウ 500、カキ500、クリ 1000) | 4000本 | 70.0 | 3.5 |
| 台木供給 | 25000本 | 50.0 | 2.5 |
| ガラス室ブドウ繁殖 | 100本 | 25.0 | 1.3 |
| 圃場管理 | 2ha | 160.0 | 8.0 |
| 実験室 | | 300.0 | 15.1 |
| 土壌分析 | | | |
| 土壌試料採取分析 | 150点 | | |
| ジュナール施肥試験 | 100% | | |
| キャンペーン | 2回 | | |
| 病害虫 | | | |
| 試料採取分析 | 100点 | | |
| ブドウ、スンタラIPM | 2点 | | |
| 研修プログラム | | 450.0 | 22.6 |
| ハイレベル研修 (1週間) | 1回 (14人) | | |
| J T / J T A (1ヶ月) | 1回 (30人) | | |
| 農家 (1週間) | | | |
| カンキツ栽培 | 4回 (80人) | | |
| カンキツ女性リーダー | 2回 (40人) | | |
| 苗木生産者 | 1回 (20人) | | |
| 落葉果樹栽培 | 2回 (40人) | | |
| 落葉果樹女性リーダー | 2回 (40人) | | |
| ワンポイント技術マニュアル | 4回 (1000部) | 50.0 | 2.5 |
| 巡回指導 | 12回 | 60.0 | 3.0 |
| 園芸用小農具購入 | 100% | 50.0 | 2.5 |
| 事務備品購入 | 100% | 50.0 | 2.5 |
| 警備員住居建設 | 100% | 300.0 | 15.1 |
| 品評会 | 1回 | 19.0 | 1.0 |
| 事業費合計 | | 1,989.0 | 100.0 |
| 管理費 | | 3,505.0 | |
| 総合計 | | 5,494.0 | |

MINISTRY OF AGRICULTURE ORGANIZATION CHART

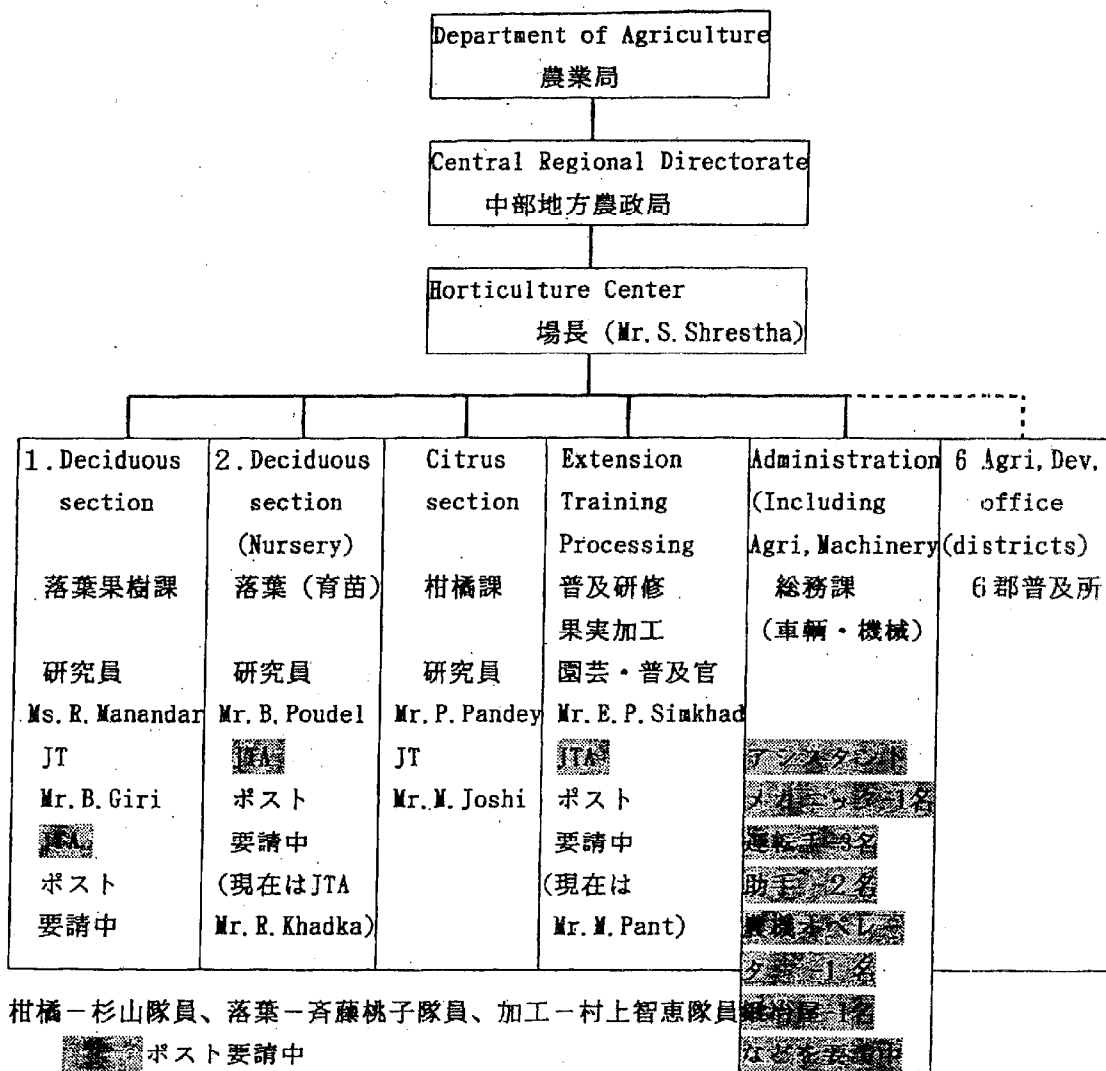




Note : All Division under DOA play the role of technical leaders for providing technical support and guidance to farm. centres and extension offices in their respective technical areas.

3) Organization Chart of Horticulture Center

プロジェクト移管後の園芸センター組織見込み



付属資料 6. 園芸セミナー資料

Program for Horticulture Seminar

Date: August 6, 1999

Time: 13:30 - 14:45

14:45 - 18:00 (paper presentation)

Venue: Horticulture Development Project

| Time | Activities |
|---------------|---|
| 13:30 | Arrival of the guests (Programme chaired by Secretary, MOA) |
| 13:35 - 13:45 | Welcome address by Director general, DOA |
| | Few words by |
| 13:45 - 13:55 | * Minister of Japanese Embassy / JICA Nepal Office DRR |
| 13:55 - 14:05 | Chairperson's remark |
| 14:05 - 14:15 | Vote of thanks by Project coordinator, HDP |
| | Closing |
| 14:15 - 14:45 | Tea break |

PAPER PRESENTATION (14:45 - 18:00)

| | |
|---------------|---|
| 14:45 - 15:05 | a. Horticulture Development in Nepal. -Mr. P. P. Shrestha |
| 15:05 - 15:25 | b. Brief introduction to Horticulture Development Project. -Mr. S. K. Verma |
| 15:25 - 15:45 | c. Citrus section. - Dr. Y. H. Shrestha |
| 15:45 - 15:05 | d. Deciduous section (Persimmon, Grape and Chestnut. - Ms. V. Pandeya |
| 15:05 - 16:25 | e. Soil Laboratory. - Mr. J. Khadka |
| 16:25 - 16:45 | f. Plant protection section. - Ms. Sashi Adhikari |
| 16:45 - 16:05 | g. Training and extension section. - Mr. E. P. Simkhada |
| 16:05 - 16:30 | Discussion |
| 18:00 | Seminar closing ceremony |

Seminar on Key Achievement of HDP, Kirtipur

August 8, 1999

List of seminar participants

| S. No. | Name | Post | Affiliation | Remarks |
|--------|----------------------|-------------------|-----------------------------|-----------|
| 1 | Mr. M. N. Shrestha | Secretary | Ministry of Agriculture | |
| 2. | Mr. J. N. Thapaliya | Joint Secretary | M O A | |
| 3. | Mr. Suresh K. Verma | Joint Secretary | M O A | |
| 4. | Dr. Kenzo Komamura | JICA Team Leader | Technical Guidance Team | MoA Japan |
| 5. | Mr. Hiroshi Tsuchiya | Team Member | ditto | MoA Japan |
| 6. | Mr. Akio Takiguchi | Team Member | ditto | JICA |
| 7. | Mr. S. Gyaltshen | Leader | Ministry of Agriculture | Bhutan |
| 8. | Dr. Pema Choephyel | Team Member | ditto | Bhutan |
| 9. | Mr. Chime P. Wangdi | Team Member | ditto | Bhutan |
| 10. | Mrs. R. B. Pradhan | Director General | Department of Agriculture | |
| 11. | Mr. S. B. Aryal | DDG | D O A | |
| 12. | Mr. A. Jha | DDG | D O A | |
| 13. | Mr. T. B. Thapa | Regional Director | R D O A | |
| 14. | Mr. H. Baud | Consultant | F A O | Germany |
| 15. | Mr. P. Bartolucci | Researcher | F A O | Italy |
| 16. | Mr. B. R. Kaini | Coordinator | Vegetable Dev. Division | |
| 17. | Dr. K. B. Shrestha | Coordinator | ARP Project | |
| 18. | Mr. B. R. Sainju | Chief Pomologist | Fruit Development Division | |
| 19. | Mr. G. P. Shrestha | Pomologist | ditto | |
| 20. | Dr. G. L. Shrestha | Professor | T. University Agri. Faculty | |
| 21. | Mr. P. P. Shrestha | President | Horticulture Society Nepal | |
| 22. | Mr. B. B. Shah | Vice President | ditto | |
| 23. | Mr. B. B. K. C | Member | ditto | |
| 24. | Mr. S. B. Nepali | Member | Senior Pomopologist | |
| 25. | Mr. R. Adhikari | Section Officer | M O A | |
| 26. | Dr. P. K. Thapa | Pomologist | WDD M O A | |
| 27. | Mrs. R. Manandhar | Pomologist | WDD M O A | |
| 28. | Mr. B. R. Dhakal | Pomologist | Tea and Coffee | |
| 29. | Mr. P. Younjan | Pomologist | VDD | |
| 30. | Mr. R. D. Shahi | ADO Chief | District Agr. Dev. Office | |

| S. No. | Name | Post | Affiliation | Remarks |
|--------|----------------------|-------------------|---------------------------|-----------|
| 31. | Mr. A. B. Nepali | ADO Chief | ditto | |
| 32. | Mr. L. N. Deuju | Chief | Citrus Dev. Division | |
| 33. | Mrs. S. Adhikari | Entomologist | D O A | |
| 34. | Mr. C. R. Gurung | Pomologist | Hort. Center. Marpha | |
| 35. | Mr. B. D. Karmachary | Asst. Pomologist | Hort. Center. Godhawari | |
| 36. | Mr. N. Bhandari | Asst. Pomologist | Hort. Center. Panchkhal | |
| 37. | Ms. Kimari Shrestha | Asst. Pomologist | HDO. Kathmandu | |
| 38. | Mr. K. S. Paudhal | Asst. Pomologist | HDO. Kavre | |
| 39. | Mr. R. A. Lamichhane | Asst. Pomologist | Fruit Dev. Division | |
| 40. | Mr. B. P. Paudhal | Asst. Pomologist | Hort. Center. Kirtipur | |
| 41. | Mr. S. Shrestha | Project Manager | Hort. Development Project | |
| 42. | Dr. Y. H. Shrestha | Counterpart | H D P | Citrus |
| 43. | Mr. J. Khadka | Counterpart | H D P | Soil |
| 44. | Mr. K. B. Shrestha | Counterpart | H D P | Pathology |
| 45. | Mr. A. P. Simkhadha | Counterpart | H D P | Extension |
| 46. | Mr. D. B. Thapa | Counterpart | H D P | Deciduous |
| 47. | Mr. B. P. Giri | Asst. Counterpart | H D P | Deciduous |
| 48. | Mr. M. P. Joshi | Asst. Counterpart | H D P | Deciduous |
| 49. | Mr. R. N. Khadka | Asst. Counterpart | H D P | Nursery |
| 50. | Mr. M. Pant | Asst. Counterpart | H D P | Training |
| 51. | Mr. S. Chaudhary | Asst. Counterpart | H D P | Citrus |
| 52. | Ms. C. Fujimoto | JOCV | ADO/Lamjung | |
| 54. | Ms. N. Yamashina | JOCV | ADO/Kavre | |
| 55. | Mr. H. Sugiyama | Citrus | JOCV/HDP | |
| 55. | MS. C. Murakami | Fruit Processing | JOCV/HDP | |
| 56. | Ms. M. Saito | Deciduous | JOCV/HDP | |
| 57. | Mr. Gurung | Senior staff | JICA Nepal Office | |
| 58. | Mr. T. Yabe | R. Representative | JICA Nepal Office | |
| 59. | Mr. S. Yamanaka | Expert | JICA/HDP | |
| 60. | Mr. Y. Tomiyasu | Expert | JICA/HDP | |

HORTICULTURE DEVELOPMENT IN NEPAL *

Mr. P.P.Shrestha

Introduction

The description of fruits in old scriptures about their importance in religious ceremonies and medical values indicate that growing fruit trees in homestead gardens must have been a traditional practice since thousand of years. In Nepal first fruit orchards were developed in the periphery of royal palaces of Kantipur, Lalitpur and Bhaktapur in Kathmandu valley much before the unification of Kingdom of Nepal. And, first commercial orchard was established at Seraphant in Nuwakot district during the reign of His Late Majesty the King Rana Bahadur Shah. The history of horticulture development in Nepal dates back to 1937 with formation of Agriculture Development Board and establishment of Fruit Nurseries at Godavari and Balaju. In 1955 Horticulture Section under Department of Agriculture was established. During the sixties 14 Horticulture Farms/Stations were established at different agro-ecological zone of the country and 10 more Horticulture Farms/Stations were added in the list during the period of seventies. In 1967 a separate Department of Horticulture was established to meet the demand of horticultural development activities of the country and remained functional until 1972. During this period horticulture development gained the real momentum. In the same year four national level institutions - Fruit Development Division, Vegetable Development Division, National Citrus Development Programme and National Potato Development Programme were established. In 1982 a position of Deputy Direction General to look after horticulture sector was created in Department of Agriculture. In Ministry of Agriculture an Assistant Minister was designated to look after plan and policies for horticulture development in the country in 1989. In 1990 at the dawn of democracy a separate Department of Horticulture was reestablished and separate Horticulture Development Offices were set up at 20 districts at first phase and programme was to expand gradually in all the remaining districts of the country. These events show the commitment on the part of the government indicating the necessity for the development of horticulture in the country.

* Paper presented in Horticulture Seminar, Horticulture Development Project, Kirtipur, Kathmandu, August 6, 1999.

HORTICULTURE DEVELOPMENT PROJECTS

Many donor agencies were assisting to this Majesty's Government (HMG) through bilateral and multi lateral assistance programmes to develop horticulture sub-sector in Nepal. During the period of 1960-1973 there was Indian bilateral assistance mainly to establish Horticulture Farms/Stations at different agro-ecological zones of the country. From 1977-1980 UNDP/FAO technical Support programme for strengthening. Horticulture farms and introduction of exotic species and varieties of different fruit crops were functioning. In 1988/89 Hill Fruit Development project under loan assistance of Asian Development Bank and technical assistance of UNDP was launched in eleven hill districts of Eastern Development Region with the objective to develop selected fruit crops for increased production and there by increase farmers income. This project terminated in 1994/95 at per project agreement. The latest and recent one was Horticulture Development Project under grant assistance and Technical cooperation of Government of Japan. This project was launched in nine districts of central and Mideastern Development Region during 1985-1990 and 1992- 1997 with the main objective to increase the production of assigned fruit crops through technological development, training and extension. The achievements of this project as per objective are remarkable and encouraging. In 1981 Swiss/FAO Fresh Vegetable and Vegetable Seed Production Project was started to produce fresh vegetables and seeds. The achievements were impressive.

Besides those projects many other externally funded agricultural and rural development projects like integrated hill Development Project (Swiss). Hill Agriculture Development Project -Sinkalama (ADB), Rapti RDP (USAID) Mahakali IRDP(World Bank), K-BIRD IRDP(Canada), Dhading and Gorkha Development Projects(Germany), Pakharibas Agriculture Centre and Lumle Agriculture Centre (U.K.) had horticulture as one of the components in their respective Agriculture development Programme. Definitely some achievements have been made in their targeted areas. Along with those projects there are number of INGOs and NGOs still working in different parts of the country having horticulture at one of their developmental activities some with good achievements. But at the same time many horticulture development activities of NGOs are duplicated even triplicate in the same area where government institution has been back. This

is happening simply because of lack of coordinates and this shows how the financial resource is mis - mobilized.

His Majesty's Government has given due attention to increase the production and productivity of fruits, vegetables and potato along the accessible roads and market centre areas. As a result of which from sixth Five Year Plane (FYP) to Eighth Five Year Plane (FYP) period production of all the three have been in increasing trend (Table 1). The table clearly indicates that at the end of sixth Five Year Plan production of fruits vegetables and potato increased by 25, 41 and 47 percent respectively over fifth FYP. Like wise increasing trend of production of all the three horticultural crops continued in seven and eight FYP periods also. Consequently per capita production of fruits, vegetables and potato together comes about 43 kg by the end of eight FYP. How close these production figures comes for the daily consumption quantity of fruits, vegetables and potato by the most common people of Nepal is yet to be analyzed.

PRESENT SITUATION

After the restoration of democracy in the country we were very hopeful that the horticulture development would get speedy momentum with clear-cut policies and strategies. Through HMG adopted some rational policies and strategies like comparative for overall agriculture development in the country but the implementation part could not materialized fully because of mismanagement of human resource, frequent changed in the organizational set up and poor allocation of financial resource. Therefore the abundant horticultural natural resources present in different agro-ecological zones of the country have remained under utilized. And also due to lack of transportation, storage, preservation, marketing facilities agro-climatically best suited remote areas for high value low volume different horticultural crops have not been exploited at yet, the only way out means of economic upliftment of the people there. Except few cases of off-season fresh vegetable production, the strategy adopted for commercial horticulture development along the highway corridors and vicinities of urban centres has not been fully implemented.

Because of lack of pricing policy for horticultural products produced in the country, export of horticultural produces is discouraging and import is encouraging.

The present system of fixing the targets does not have well defined goal and output oriented but simply numerically splitted activities, which leads no where. The budgetary expenditure on horticulture development is not in clear-cut shape and transparent. Some of the main constraints for horticulture development in the country are:

- Lack of political commitment and beaurocratic willingness.
- Lack of coordination between research and development institutions (Nepal agriculture Research council and Department of agriculture)
- Insufficient budget allocation even for specific priority programmes.
- Poor management of human resource.
- Lack of coordinated and integrated approach for providing production inputs and credit.
- Lack of mid-level trained manpower for providing technical resources to the farmers.
- Lack of physical facilities like transport, roads, market yards, cold stores etc.
- Lack of stable institutional development.

In recent past HMG has published planning documents with some good policies and strategies for horticulture development in the country. Master plan for Horticulture Development (MPHD) is one of them, which serves at the framework for the short- medium and long-term development of horticulture sub-sector in Nepal. The horticultural development activities being carried out in practices do not show the indication that policies and strategies mentioned in MPHD have been fully adopted. The most recent well-appraised planning document is Agriculture Perspective Plan (APP). The document has prioritized four horticultural commodities, which are apple, citrus, vegetable and flower seed and off-season vegetable for different agro-ecological zones prevailing in the country. These high value crops are demand driven enterprises. For the successful implementation of the plan risk minimizing measures development of specific technological packages and transfer for the farmers reliable infrastructure and service support, inputs and credit programmes also should be considered.

DISCUSSION

The above mentioned are some of the aspects responsible for the low profile in the horticultural crops. For the real development of horticulture it requires sustained and dedicated efforts with sufficient technical and financial backing both at private institutions and government level. The agro-ecological conditions are favorable for most of the horticulture crops; farmers are hard working receptive to new ideas and technology. The only thing required is the strong organization and infrastructure capable of handling different and even difficult aspects of horticulture industry in an organized, scientific and coordinated manner. If these requirements are met horticulture will not only flourish and play an important role in national economy but will lead to a change in the existing cropping pattern which mainly consists of cereal crops.

The development of horticulture is in the interest of individual farmer people at a whole and the country. In Nepal about 92 percent land holdings are small and marginal. The land resource is limited. The only way out is the increase in productivity and net income per unit area. This only can be possible through the introduction and development of horticultural crops. And of course it should be strongly backed by improved technology, technical services, inputs and credit, post harvest handling, cold storage, marketing and processing facilities. Some basic requirements like rural or agriculture roads, irrigation, market infrastructures storage etc. also should go hand in hand.

There is a lacking of reliable statistical data on horticulture and which is one of the main factors responsible for horticulture development to be in low profile. It is an urgent need to establish an information flow system and database facilities on horticulture.

In the context of institutional build up and organizational set up for horticulture development in Nepal many ups and downs have been experienced in the past. Keeping in mind the policies and strategies and to realize the increased contribution up to 15 percent to GDP as mentioned in APP. It is high time to give priority to reinstate Department of Horticulture to speed up the horticulture development activities in a planned, organized and coordinated manner.

Table 1. Area and Production of Fruits, Vegetables and Potato in different Five Year Plan periods in Nepal.

| Five year Plan | Area | | Production | |
|--------------------------------|---------------|-------------------|---------------|--------------|
| | ha | % increase | Mt | % increase |
| A. FRUITS | | | | |
| End of 5th FYP (1979/80) | 42077 | | 275000 | |
| End of 6th FYP (1984/85) | 51176 | 21.60 | 343204 | 24.80 |
| End of 7th FYP (1989/90) | 63123 | 23.35 | 461743 | 34.59 |
| End of 8th FYP (1996/97) | 63500 | 0.60 | 428200 | |
| B. VEGETABLES | | | | |
| End of 5th FYP | 96000 | | 528000 | |
| End of 6th FYP | 138000 | 43.75 | 743000 | 40.70 |
| End of 7th FYP | 140500 | 1.80 | 970200 | 30.51 |
| End of 8th FYP | 145000 | 3.20 | 1350000 | 39.75 |
| C. POTATO | | | | |
| End of 5th FYP | 51000 | | 279000 | |
| End of 6th FYP | 58400 | 14.50 | 409000 | 47.10 |
| End of 7th FYP | 59000 | 2.39 | 521425 | 27.40 |
| End of 8th FYP | 108000 | 83.05 | 928800 | 78.13 |
| D. PERCAPITA PRODUCTION | FRUITS | VEGETABLES | POTATO | TOTAL |
| End of 5th FYP | 18.33 | 37.80 | 18.50 | 24.88 |
| End of 6th FYP | 20.50 | 45.50 | 21.50 | 30.19 |
| End of 7th FYP | 24.27 | 50.90 | 30.38 | 35.18 |
| End of 8th FYP | 20.49 | 64.62 | 44.46 | 43.19 |

Source: MOA, HMG

Note: In 1994/95 MOA Agricultural Statistics division curtailed about 25 % of the total area and production figures of fruit crops considering the mortality rate, removal of old trees and short period fruit plants.

Key Achievements on Citrus Section

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Introduction:

The agro-climatic condition of the mid-hill of Nepal ranging from 900m to 1400m altitude is highly favourable for producing good quality citrus fruits. Many citrus fruits are being grown since time immemorial especially Suntala (*Citrus reticulata*), Junar (*Citrus sinensis*), Lime (*Citrus aurentifolia*), Pummelo (*Citrus grandis*), Sweet lime (*Citrus limettioides*), Lemom (*Citrus limon*) and Citron (*Citrus media*). Some of the citrus fruits are also being grown in terai region of the country such as Lemon and Pummelo. The Horticulture Development Project (HDP) has been contributing not only in the development and promotion of citrus fruit but also introducing late and early exotic varieties, selection of local germplasm, root stocks and improved technology for production of export quality citrus fruit.

Major activity of citrus section

1. **Out reach program:** (Detailed information of out reach program will be presented by my colleague)
2. **Research activity:** (Research program divided in to three sub headings)

Cultivation Technology:

1. Effect of altitude on fruit quality of Suntala and Junar

Study was conducted to find out the appropriate altitude for producing high quality Suntala and Junar fruits. The quality of fruit is different according to the altitude. Result showed that, the Brix % is high with low citric acid content in the fruits harvested from the altitude range of 1000m to 1250m. Juice percentage is also high with less thickness of pericarp in that range. Thus, quality of fruits can be improved if grown in the range of 1000m to 1250m altitude.

2. Quality of Suntala and Junar fruits stored at room conditions on different maturity stage

The study was carried out for 3 years from 1995 to 1997 to know the right stage of maturity to harvest the fruits for better quality and storability at room temperature for long period. The fruit harvested at 50% maturity and stored for 2 months appeared better in fruit quality without much loss of fruit weight. The appearance and colour development of the

fruits were also noted better. Thus, it can be concluded that Suntala and Junar fruit harvested at 50 ~ 60% maturity can be stored for 2 months without loss of juice percentage and fruit weight with good appearance. Similarly, Suntala fruit can be stored well for 1.5 months without deterioration of its quality.

3. Effect of leaf number on bearing habit of Suntala and Junar

Fruit thinning is a very important activity for getting better quality fruits and also regulating the production of good quality citrus fruits and thereby avoiding the on and off year. A study was conducted to determine the approximate leaf fruit ratio in the bearing Suntala and Junar trees.

The result showed that the trees of Suntala become weak and resulted into alternate bearing in the following year if the leaf number was less than 100 per fruit. Similarly, fruits became more acidic if the leaf number per fruit was more than 120. In the case of Junar, Brix percentage, citric acid content and peel thickness was satisfactory in the fruits with 70 leaves per fruit. Thus it clearly reveals that 60~70 leaves per fruit in Junar and 100~110 leaves per fruit in Suntala are better leaf fruit ratio for providing quality of citrus fruits production without the problem of alternate bearing.

4. Storage of citrus fruit in room conditions and cold storage

Proper storage of citrus fruits for a long time is very necessary for the development of citrus industry of Nepal. At present, farmers are not getting good price for citrus fruits due to the lack of post harvest technology. They can fetch a good market price if the excess fruit (in the harvesting season) is stored for some time and released gradually avoiding glut in the market.

The result showed that rotting of fruit were virtually negligible till March 20 in all media. But rotting was very high in Suntala and low in Junar at the end of this study. It was noted that non cover and newspaper media recorded very low rotting of fruit (Suntala) in cold storage as compared to room condition. Similarly, non cover and pine leaves media recorded less rotting of fruits (Junar) in cold storage. Fruit weight was drastically decreased at the end of this study. Juice percentage and peel thickness was slightly decreased in room condition and there was little change in Brix percentage during the whole study period but citric acid content in fruits decrease with the storage under both situations.

5. Selection of Pummelo

Pummelo is a popular citrus fruit in Nepal and cultivated in mid-hill and some parts of terai districts too. Its cultivation started since long time before and lot of variations are found in the quality of fruit due to planting of seedling rather than grafted plants. In Kathmandu valley, good germplasm of Pummelo have been found in old house of Ranas and others but systematic survey and analysis of fruits were not done seriously. Keeping this in view, the survey was conducted for 4 years and quality analysis of the fruit was done. The result showed that satisfactory Brix percentage was found in seven samples with low acid content leading to good taste of the fruit. Sample from Narayan Prasad Shrestha from Pulchok, recorded maximum Brix and acid ratio of 8.3 having good taste.

6. Selection of local Suntala

Suntala fruit is a prominent citrus fruit of Nepal with good quality. But there is no record of selection and quality analysis of local Suntala fruits. In order to record and select the best performers, a survey programme was carried out in 19 districts with 450 samples and fruit quality was analysed for three years.

Brix percentage and citric acid content was slightly higher in the samples collected from eastern region as compared to central and western region. It was also noticed that citric acid percentage decreased with the increase in tree age but this might not be the only reason for it. At the end of this study, 72 Suntala trees were selected in term of better quality and efforts are under way to use these trees as mother stocks for multiplication in future.

7. Performance of introduced varieties of citrus

Since the Phase I the project has been giving due priority to collect different types of germplasm of citrus fruits. Besides the locally available germplasm, many exotic varieties have also been introduced in order to study and select the better performers under the Nepalese agro-climatic conditions.

Among all the introduced varieties some varieties have shown promising results in term of size, weight, juice content, test and maturity time. On the basis of fruit quality analysis of mandarin variety Yoshida Ponkan, recorded Brix 13.1% and citric acid 0.96% indicating the better quality fruit because of its fullness of pulp. Among the orange variety Tarocco Nucellsr and Murcott have shown better quality on late maturity variety. Similarly, Thai Tangerine which needs warm climatic condition has given good result and can be harvested one month earlier than the Nepali suntala.

Fruit character of some introduced variety

| Name of variety (Citrus line) | Fruit shape | Fruit wt.(g) | Skin colour & surface | Citric acid % | Brix % | B/C ratio | Harvest month | General comment and remarks |
|-------------------------------|-------------|--------------|-----------------------|---------------|--------|-----------|-----------------------------|--|
| Yoshida Ponkan | R/flat | 188 | Rough red/o | 0.96 | 13.1 | 13.6 | End of Dec | Loos skin, better test |
| Tarocco Nucellsr | R/long | 240 | Smooth, thin, red/o | 1.70 | 11.0 | 6.5 | 1 st week of Feb | Juicy, soft pulp slightly late maturity than Junar |
| Murcott | R/flat | 126 | Smooth yellow/o | 1.7-2.0 | 14-16 | 8.2-8.0 | Mid of Feb | A month storing better taste, late maturity |
| Thai Tangerine | R/flat | 125 | Very thin o/red | 1.06 | 11.0 | 10.3 | Late Oct | Greening resistant |

8. Grading of citrus fruits (Suntala and Junar)

To fetch a good price for their produce, farmers must be conscious of selling the quality fruits. Nepalese market is not sensitive to grading yet. No grading system has been developed in Nepal and only the retailers do grading by visual observation. Promotion of the technical knowledge of grading fruits will help farmers in the future. Different grading sizes using the wire were prepared and grouped in 5 different categorises such as LL, L, M, S, and SS size. The average fruit weight was also recorded for Suntala and Junar according to the

standardised size. Based on this experience different diameter for different size were recommended for Suntala and Junar (Refer: Table 1 and 2).

Average diameter and weight of different Junar grades (Table 1)

| S.No | Size | Average mm | | Average wt./fruit (g) | Recommended size mm | Remark |
|------|-------------|------------|--------|-----------------------|---------------------|--------|
| | | Diameter | Height | | | |
| 1 | LL size | 79.7 | 79.8 | 250 | 81 and above | |
| 2 | Large size | 76.3 | 74.0 | 208 | 75-80 | A |
| 3 | Medium size | 69.3 | 67.5 | 165 | 68-74 | B |
| 4 | Small size | 62.6 | 61.9 | 125 | 62-67 | C |
| 5 | SS size | 56.1 | 56.4 | 93 | below 61 | |

Average diameter and weight of different Suntala grades (Table 2)

| S.No | Size | Average mm | | Average wt./fruit (g) | Recommended size mm | Remark |
|------|-------------|------------|--------|-----------------------|---------------------|--------|
| | | Diameter | Height | | | |
| 1 | LL size | 74.5 | 66.8 | 140 | 76 and above | |
| 2 | Large size | 68.7 | 62.4 | 115 | 70-75 | A |
| 3 | Medium size | 65.1 | 59.5 | 100 | 65-69 | B |
| 4 | Small size | 58.5 | 53.0 | 78 | 59-64 | C |
| 5 | SS size | 52.5 | 49.4 | 60 | below 58 | |

9. Marketing survey of citrus fruits

In order to record prevailing market price of Junar, Sunatala and Lime, a survey was conducted in the markets of Sindhuli and Ramechhap. The result obtained from the survey showed that there was not much fluctuation in the price of Suntal and Junar at Ramechhap bazar as compared to Sindhuli bazar. The price were a little higher at Sindhuli bazar than at Ramechhap bazar. The price of Junar at Sindhuli bazar went up drastically at the end of February whereas there is not much increase in price at Ramechhap bazar.

10. Selection of early varieties of citrus line (Suntala)

The history of citrus cultivation in Nepal is very old and due to the polyembryonic characteristics of citrus fruits lot of variation are found in quality and time of maturity in citrus growing pocket of the country. It was found that there was a lot of scope to select the better quality and early maturing strains of Suntala and Junar which might push up the citrus industry of Nepal.

55 varieties of citrus were collected from different districts of Nepal and analysed their characteristics like skin colour, size, weight, juice percentage, Brix, acidity and maturity time. Though the Japanese origin Dekopon and Ponkan have been recently introduced as suitable early and Murcott as a late variety in Nepal and its performance should be study further continuation.

Propagation Technology:

1. Selection of suitable root-stocks for Suntala and Junar

In the early days, most of the Suntala and Junar tree were grown from seeds. When production of grafted plants started Setijyamir (Rough lemon) was used as root stock. But the Setijyamir was found to be susceptible to foot rot disease.

Different types of root stock used in study

| | | | |
|---------------------|--------------------|---------------------|-------------------------|
| 1. Setijyamir | 5. Kalijyamir | 9. Shikasha | 13. Rough Lemon (Japan) |
| 2. Suntala (India) | 6. Nibuwa | 10. Junar | 14. Lime |
| 3. Trifoliat orange | 7. Suntala (Nepal) | 11. USDA | |
| 4. Pummelo | 8. Yuzu | 12. Troyer citrange | |

14 different root stocks were used in this study each for Suntala and Junar. Maximum Brix percentage was recorded in the fruit of Suntala and Junar grafted on Pummelo but it seemed to be little bit acidic due to high citric acid content. Brix percentage, fruit weight, B/C ratio, citric acid content and trunk growth were satisfactory in Suntala and Junar which were grafted on Trifoliat orange, USDA, Kalijyamir and Troyer citrange. Detailed study indicated that root stock of USDA and Troyer citrange seemed to be quite suitable for successful cultivation of Junar whereas USDA, Trifoliat orange, Kalijyamir for Suntala.

2. Effect of time and method of grafting

For the successful cultivation of Suntala and Junar, use of quality saplings is very essential. Grafted plants is more preferred because it ensures true to the mother type plants, uniform quality, regular bearing. For the Kathmandu condition the best suitable grafting time was recorded to be from middle of January to last March. Junar scion was used on Trifoliat orange root stock with the help of veneer and side grafting methods.

Plant protection:

1. Virus test by indicator plant and control of Greening disease

Mid-hill of Nepal are quite suitable for successful citrus cultivation but some parts of the country have Greening and other Virus disease problems. Therefore, a study was conducted to know the time and occurrence of this disease and its control measures. The following indicator plants were used to test Greening and other viruses.

1. Greening test on Orland Tangelo
2. CTV test on Mexican Lime
3. Exocortis test on Etrog Citron (Arizona 861)
4. Tatter leaf test on Rusk citrange
5. Xyloporosis on person's special mandarin

The result showed that symptom of Exocortis, Tatter leaf and Xyloporosis were negative. Whereas Greening shows positive result on the samples collected from western development region as compared to those of eastern region. One of the reason of this may be the establishment of orchards at lower altitude in the western region.

2. Result of Greening and CTV survey and indexing on indicator plant

Due to its varying altitudes and topographical differences the climatic conditions of Nepal are suitable for citrus growing but at the same time also difficult for survival of plants from Greening pathogen and its vector. The experts of the project had surveyed different citrus growing pockets of Nepal for Greening and CTV. The prevalence of Greening, CTV and *Diaphorina citri* in some part of the country was found.

Conclusion

- 1000m to 1250m altitude is the appropriate climatic condition for producing high quality Suntala and Junar fruits in Nepal. By introducing early and late variety the three months long harvesting time of Suntala and Junar can be extended to six months long and citrus fruits can be promoted as a major export commodity of Nepal.
- At 50 to 60% maturity time harvested Suntala and Junar fruits can be stored at room temperature condition for 1.5 to 2 months without deterioration of its quality.
- 60 to 70 leaves per fruit in Junar and 100 to 110 leaves per fruit in Suntala are better leaf fruit ratio for producing good quality of citrus fruit without alternate fruit bearing problem.
- Side and veneer grafting on mid January to last March are the best methods and time respectively for grafted plant production of Suntala and Junar and USDA and Trifoliate orange are to be the best root stocks.
- Greening disease is more prevalent on the western development region as compared to eastern region. For prevention of Greening disease citrus nursery should be above the altitude 1000m.

Key achievements on grapes persimmon and chestnut

Bidya Pandey ¹

Tea and Coffee Development Section

ABSTRACT

Various experiments were conducted on grapes persimmon and chestnut to study the adaptability of the introduced varieties of the respected fruits. According to the results obtained from the studies, few varieties of grapes and persimmon show significant results to recommend their cultivation in the mid hills of Nepal, along with their study subjects are discussed and presented in this paper.

INTRODUCTION

The Horticulture Development Project was implemented with the aim to promote horticultural development in the mid hills of Nepal. Pear, grapes, persimmon, chestnut and citrus are the five targeted fruit crops of the project. The climate of the mid hills is favorable for growing these fruit crops, HDP also emphasized to develop the improved cultivation technology adopted in the donor country i.e. Japan by introducing the improved varieties and their cultivation techniques to Nepal.

During the project implementation period, we have studied on various subject matters about the introduced varieties of the targeted fruits. Among them only a few studies on grapes, persimmon and chestnut are discussed and presented in this paper. They are as follows:

- Selection of suitable varieties
- Propagation techniques
- Management of tree form

RESULTS AND DISCUSSION

Grapes:

- Selection of suitable varieties

Among 10 introduced grape varieties, three are recommended to cultivated in Nepal. They are Steuben (Harvesting period - Late July), Kyoho (Harvesting period - Early August) and Muscat Bailey A (Harvesting period - Early September). These varieties have better fruit quality, easy cultivation and propagation technique. The varietal characteristics feature of the recommended varieties are given in the following table:

Characteristics of recommended Grape varieties observed in HDP Kirtipur Centre (1993 - 1997)

| Varieties | Full Bloom date | Maturation date | Bunch | | | Berry | | | Tree growth vigour |
|-----------|-----------------|-----------------|-------------|------------|--------------|------------|------------------|----------|--------------------|
| | | | Shape | Weight (g) | Skin color | Weight (g) | Shape | Brix (%) | |
| Steuben | May 01 | Jul. 04 | Cylindrical | 375.5 | Violet black | 3.3 | Short elliptical | 18.0 | Medium |
| Kyoho | May 04 | Aug. 22 | Conical | 368.2 | do | 10.7 | Ovate | 16.5 | Vigorous |
| M.B.A. | May 04 | Aug. 29 | do | 474.4 | do | 4.8 | do | 17.5 | do |

M.B.A. Muscat Bailey A

¹ Assistant Horticulturist

Deciduous Counterpart, Horticulture Development Project, Kirtipur

- Suitable propagation technique

Among the different grafting techniques cleft grafting, dormant bud grafting, tongue grafting and green wood grafting were some of the important propagation techniques studied. Green wood grafting was found the most suitable grafting technique followed by tongue grafting. Green wood grafting is rather important to recommend because it produces saplings within a year. Last week of May to 1st week of June is recommended as the favorable period for grafting. The result of the green wood grafting done in 1996 and 1997 are more than 66 % which is very high success percentage where the tongue grafting technique requires highly sophisticated equipment and arrangements to control temperature, this technique is not significant to recommend. SO-4 and 5 BB were used as rootstocks.

Success Percentage of Tongue Grafting of Grape-vine

Grafted date Feb. 14 - 21, 96

| cv /root stock Var. | Grafted No. | Rooting No. | Success % |
|------------------------|----------------|----------------|--------------|
| Himrod/3309 | 9 | 4 | 44.4 |
| Himrod/5BB | 33 | 28 | 84.8 |
| Himrod/SO5 | 55 | 36 | 65.5 |
| Steuben/8B | 135 | 11 | 8.1 |
| Kyoho/5BB | 447 | 274 | 61.2 |
| M.B.A./101-14 | 279 | 103 | 36.9 |
| M.B.A./3309 | 86 | 32 | 37.2 |
| Total, Average | 1044 | 488 | 46.7 |

- Tree form

In Nepal the training system used in grapes vine are flat, manson, fence type. The modified manson type using bamboo is recommended for the project districts.

Persimmon

- Selection of suitable varieties

Astringent type: Hiratanenashi (early variety), Dhaula and Taku (late variety - promising Nepalese local varieties)

Non astringent type: Ziro (early variety) and Fuyu (mid seasoned) are selected as suitable varieties in persimmon for cultivation in Nepal. Zenjimar (early variety) is taken as polinizer variety.

-Propagation technique

Transplanting of persimmon is difficult because of the draught condition during the period of transplanting season in Nepal. Top worked plants have higher success affinity. In situ venear grafting at sprouting has better result than the grafting done in transplanted rootstocks. Seedlings of Nepalese local varieties can be used as rootstocks.

- Tree form:

Persimmon take long time to come into bearing stage, it can be trained both by modified leader system as well as open centre system. To facilitate sufficient light penetration over the plant canopy open centre system is recommended for training the persimmon tree.

Chestnut

- Selection of suitable varieties

Chinese and Japanese varieties resistance for *Dryocosmus kuriphilus* (Tsukuba, Ishizuchi, Tanzawa) of chestnuts are recommended for the project districts.

- Propagation technique

Success percentage vegetative propagation of the chestnut is very low. However studies were carried out to select appropriate grafting technique on chestnut but none of them (Chinese and Japanese) grafted plants survived. Such negative result may be due to moisture stress in the field or less grafting affinity is still unknown. So, raising seedlings is the appropriate method for chestnut propagation.

Conclusion

Steuben, Kyoho and Muscat Bailey A of grape varieties, Ziro, Fuyu and Zenjimar of Non-astringent type persimmon and Chinese and Japanese chestnut (Tsukuba, Ishizuchi and Tanzawa) are recommended with suitable cultivation technology for the farmers of the project districts.

Key achievements of Soil laboratory

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ABSTRACT

Horticulture Development Project is taking its momentum since 1985. This article focus on HDP targeted fruit crops with regard to soil lab activities, common nutrient disorders and suggestion to improve the production and productivity of fruit crop in the future.

Additional key words: Soil nutrient, deficiency, toxic, citrus, pear, persimmon, grapes, chestnut.

Introduction

Horticulture Development Project (HDP) has been carrying out various activities among which, Soil and Plant nutrient management is a major activity, which contributes, in better fruit production. HDP has set eyes on five major crops i.e. Citrus, Pear, Persimmon, Grapes and Chestnut, considering them as the targeted fruit crops for the upliftment of the economic status of the farmers. Citrus is a major fruit of Nepal and its cultivation in Nepal is very old. Most of the Citrus like Suntala, Junar, Lime, Pummelo and Citron are grown in mid hills of Nepal ranging from 900 m to 1400 m in elevation. The HDP has been contributing major role in the development and promotion of Citrus fruits. Many kinds of Pear like European pear (high chilling), Oriental pear (low chilling) and indigenous pear (mayal) are well adapted and are available in Nepal. Low chilling pear is well adapted to the mid hills of Nepal. Japanese pear Hosui, Chojuro, Shinko and Nitaka are recommended for Kathmandu valley (Kathmandu, Lalitpur and Bhaktapur) and Kavre and their performance are very good. Persimmon is mostly cultivated in the Kathmandu valley and warm temperate regions of Nepal. Two types of persimmon astringent and non-astringent type are grown in Nepal. Non-astringent type (raw eaten type) is popular now a days and HDP recommend Ziro and Fuyu for the project districts. Zenjimar is taken as pollinizer variety. Grape cultivation has been tried in many districts of Nepal but its cultivation has not yet been commercialized. HDP recommend Stueben, Kyoho and Muscat Bailey-A for the project districts.

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Soil lab activities

- Soil analysis and recommendation
- Soil campaign
- Fertilizer trial
- Demonstration
- Training

Soil analysis and recommendation

Physical characteristics

Fruit orchard must have sandy loam sandy gravelly loam and loam soils. Normal growth does not occur in soils having impervious sub-soil or exceedingly shallow soil with sandy or gravelly sub-soil or having very little moisture retaining capacity. Soils underlain with hard pan or impervious clay layer, which create improper drainage and water infiltration during the rainy season are not satisfactory. Improper drainage conditions lead to accumulation of free water in the root zone, resulting in poor aeration and injury to roots. Shallow soils less than 50 cm in depth for orchard plantation, citrus may grow and crop well for a few years but later show symptoms of decline. Dieback is predominant in clay and sticky soils. Soil conditions such as deficiency of aeration, hard substratum and waterlogged conditions cause it.

Soils with uniform profile, within the normal root zone are most satisfactory for fruit cultivation, because water movement is not impeded by variations in texture.

Chemical Characteristics

Some of the soil properties, which are considered important for successful fruit cultivation, are soil reaction, nutrient deficiencies and excess soil fertility. The most common commercial rootstock for citrus is *Poncirus trifoliata* and it does not perform well where the soil pH exceeds 6.5. Under these conditions the uptake of Fe, Mn and Zn is seriously impaired. Zn deficiency is a problem in case of citrus. Pear and grapes have a Boron deficiency problem. Chinese chestnut has Mn toxicity. These are the common problems found in the project area.

Soil lab, Kirtipur analyzed more than 1000 soil samples from the project and project area fruit orchard. From these samples, we can say that the fertility status of fruit orchard is very low. Organic matter content and nitrogen are very low. Phosphorus content is medium to low. Potash content is medium to high. Apart from routine analysis of Nitrogen, Phosphorus, Potash, Organic matter, Soil reaction and texture, soil lab also analyze Calcium, Magnesium, Iron, Manganese and Boron as per the need of the problems.

Rating chart (Range for Hills)

| Range | Organic matter (%) | Nitrogen (%) | Phosphorus P ₂ O ₅ (kg/ha) | Potash K ₂ O (kg/ha) | Soil reaction pH |
|--------|--------------------|--------------|--|---------------------------------|---------------------|
| Low | 1.00 - 2.50 | 0.05 - 0.1 | 10 - 30 | 55 - 110 | <6.5 (acidic) |
| Medium | 2.50 - 5.00 | 0.1 - 0.2 | 30 - 55 | 110 - 280 | 6.6 - 7.0 (neutral) |
| High | 5.00 - 10.00 | 0.2 - 0.4 | 55 - 110 | 280 - 500 | >7.0 (alkaline) |

Common nutrient disorders

CITRUS

| | |
|-----------------------|--|
| Nitrogen deficiency | - Critical time for N deficiency: Prior to and during flowering fruit set and December leaf drop. |
| Excess Nitrogen | - Poor fruit quality, fruit colour, delays maturity, reduce juice content and resselect in thick skins. |
| Phosphorus deficiency | - Low juice content, thick skins and acid juice. |
| Magnesium deficiency | - Yellowing of leaves with an inverted V of green tissue at the base of the leaf. |
| Manganese deficiency | - Interveinal yellowing with a band of darker green along the midrib and veins. |
| Zinc deficiency | - Produce Symptoms, which are similar to Mn deficiency but the interveinal yellowing is less blotchy and more clearly defined. In extreme cases leaves can be small, narrow and pointed. Manganese and Zinc deficiency often occur together and can be corrected together or singly. |

PEAR

| | |
|------------------|--|
| Boron deficiency | - Boron deficiency shows up in many different ways depending on the crop and the extent of the deficiency. Symptoms usually appear on the fruit before vegetative parts are affected. Fruit symptoms in apples and pears are quite similar. In Pharping pear fruit is malformed and hardly misshape. |
|------------------|--|

GRAPE

| | |
|----------------------|---|
| Nitrogen deficiency | - Typically young leaves near the shoot tips are yellow, internodes are short and yields are greatly reduced. |
| Magnesium deficiency | - Chlorosis of margins of basal leaves in mid season. The chlorosis moves inward between primary and secondary veins. |
| Boron deficiency | - Fruit set is much reduced and small seedless berries are commonly found along with normal sized ones. |
| Water stress | - Fruit Cracking |

CHESTNUT

| | |
|--------------------|----------------------------------|
| Manganese toxicity | - Chlorosis of Chinese chestnut. |
|--------------------|----------------------------------|

b) Soil campaign

Soil campaign is out reach program of soil lab. This program is very effective for the farmers to solve their common problems in fruit cultivation. Farmers have to spend minimum time and they get recommendation in their village. In this program soil lab take standard samples from the problematic area and analyzed in the lab. With the reference of standard sample and study of problematic area common problems and their solution are well identified in the lab. After technical discussion of the problem in the centre, one-day campaign program is conducted. Soil samples are analyzed and suitable solution is given in their field.

c) Fertilizer trial

Fertilizer trial on Junar (*Citrus sinensis*) is conducted in the field of Horticulture Development Project. Different combination of N, P, K with FYM is taken as a treatment and three replications are done. The date of planting is July 6, 1996 (Asadh 30, 2053). In this year, plant bearing some fruit. Essential operation and measurement are done as per the program schedule.

d) Demonstration

Demonstration of application of micro nutrient (Boron) in pear and grape, effect of commercial biological products (Multiplex, Agromin, Visimax, Swan etc), mulching, compost making and application of organic and chemical fertilizer to the fruit crops.

e) Training

Training on soil and soil management to the fruit crop is given by Horticulture Development Project to the JT/JTAs, leader farmers, women leader farmers and nursery owners.

Problems related to soil and soil management for fruit orchard.

- a) Land selection
- b) Transplanting
- c) Application of fertilizer
- d) Mulching
- e) Drainage

Suggestions

- Good fertility status, medium texture, deep and uniform profile with drainage provision land should be selected for fruit crop.
- Fruit sapling should be transplant according to the recommendation of Horticulture Development Project.
- Application of compost and chemical fertilizer is must as per the need of crop.
- Mulching is very effective to conserve soil and soil moisture.
- Drainage is very important for fruit crop. Surface and sub-surface drainage provision should be made in case of heavy texture soil.

Conclusion

Commercial fruit orchard establishment has tremendous potential throughout mid hills and high hills of Nepal. Especially citrus is the main fruit crop for the mid hills and that is the good way for upliftment of economic status of farmers. For the Katmandu valley (Kathmandu, Lalitpur and Bhaktapur) and Kavre Japanese pear, raw eaten persimmon and grapes are the best fruit crops.

Key achievements on PEAR

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ABSTRACT

Various experiments were conducted on pear to find out the most suitable variety for mid hills of Nepal. Different varieties, their characteristics, propagation techniques and tree management are discussed and presented in this paper. Top working, the best and quickest propagation way for producing fruits of desirable variety and harvesting technology are also presented in this paper.

INTRODUCTION

Horticulture Development Project (HDP) takes five major crops as a targeted fruit. Among the five major crops, pear is the important one and Japanese pear is the most popular fruit in the Kathmandu valley (Kathmandu, Lalitpur and Bhaktapur) and Kavre. The climate is also favorable for the cultivation of pear.

HDP studied various aspects of pear cultivation to provide package of technology to the fruit growers. Among them only a few studies on pear is presented in this paper. They are:

- Selection of suitable varieties
- Propagation techniques
- Top working
- Management of tree form
- Harvesting technology

RESULTS AND DISCUSSION

Selection of suitable varieties

13 Japanese varieties (four varieties of Japanese pear during the first phase and nine varieties during the second phase), four European varieties, two Chinese varieties and local pear variety were introduced in the project to study their performance and select the suitable variety for the project districts. Suitable varieties for our project districts are Kosui, Hosui, Chojuro, Shinko and Nitaka. Hosui is harvested in the early of August. Kosui is harvested in the last week of July. Hosui and Kosui are soft, fleshy and juicy but Kosui is susceptible to pink disease. Therefore Kosui is not recommended by the project. Next to above two varieties are Chojuro and Shinko. Chojuro is harvested at early to middle of August and Shinko at early to middle of September.

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Different pear varieties that were under study.

| | | | |
|-------------------|---------------|--------------|-------------|
| 1. Japanese pear | European pear | Chinese pear | Local pear |
| a) Hosui | a) Barlet | a) Ya-li | a) Pharping |
| b) Kosui | b) Hawana | | |
| c) Shinko | c) Anjou | | |
| d) Chojuro | | | |
| e) Yakumo | | | |
| f) Kikusui | | | |
| g) Okusankichi | | | |
| h) Niitaka | | | |
| i) Aatago | | | |
| j) Gold nijisseki | | | |
| k) Meiengetsu | | | |
| l) Waseaka | | | |

Characteristics of suitable pear varieties observed in HDP Kirtipur Centre (1993 - 1998)

| Variety | Harvesting time | Full Weight (g) | Hardness (kg) | Brix (%) | Tree growth vigor |
|---------|------------------------------|-----------------|---------------|----------|-------------------|
| Kosui | Last week of July | 300 | 2.2 | 13.0 | Medium |
| Hosui | Early of August | 400 | 2.0 | 12.9 | Vigorous |
| Chojuro | Early to middle of August | 400 | 3.5 | 11.3 | Medium |
| Shinko | Early to middle of September | 450 | 2.43 | 11.4 | Medium |
| Nitaka | Early of August | 500 | 2.86 | 10.42 | Medium |

Characteristics of Pharping local pear (1993).

| Fruit weight (g) | Brix % | Hardness Kg |
|------------------|--------|-------------|
| 258.14 | 10.46 | 6.86 |

- Suitable propagation technique

Different studies were done on propagation of Japanese and local pear. Some of the important studies and its result are briefly describe in this section.

Rootstock trial:

Different rootstocks Mayal, Bhote mayal, Pharping seedling and Pharping cutting were used in this trial. From this trial, we can say that Bhote mayal is the best rootstock of pear. The growth of tree and quality of fruit is good and HDP recommend Bhote mayal as a rootstock of pear. Apart from Bhote mayal, Mayal and pharping seedling is also good.

Top Working

Top working is the best and quickest propagation way for producing fruits of desirable variety. Main reason of top working is the replacement of varieties for better quality of fruit. The time of Top working is beginning of flowering stage i.e. the end of February to second week of March near by Kathmandu valley. Rootstocks are Pharping local, Mayal or Bhote Mayal trees between 3 - 5 years are suitable for Top working. Four to seven years old trees are more preferable for Top working.

Fruit tree management

A study was conducted to find the suitable training system for pear. To facilitate sufficient light all over the plant canopy, open centre system is recommended for training of Japanese pear.

Fruit management

a) Fruit bagging

Quality fruit production is one of the essential operations in the fruit cultivation. There are many factors, which lessen the quality of fruits. They are:

1. Diseases
2. Insects
3. Chemicals
4. Birds and human injuries
5. Sun burning
6. Adhesion of dust etc.

To protect the fruits from above problems, mainly from Hornet (Insect), Fruit fly (Insect) and Bird paper bagging is must. Netting is also essential for quality fruit production.

b) Fruit thinning

For the quality fruit production, fruit thinning is essential. Moreover, heavy fruiting on one year may cause very low production on the other year. Similarly over bearing may reduce the size and quality of the fruits.

c) Using Polinizer

Horticulture Development Project select some of the polinizing varieties which help to increase fruit production. They are:

1. Chojuro
2. Shinko
3. Hawana
4. Barlet

d) Harvesting and storing of fruit

Suitable harvesting period and their keeping quality are studied in the centre. Generally, farmers harvest Kosui and at the same time they harvest other varieties. These shows that they can not identified suitable harvesting period for other varieties or they can not differentiate one variety from others. This problem needs more technical assistance to the farmers. Another study was keeping quality of pear. We can say that the fruit weight loss was more significant in unwrapped fruit than in paper wrapped fruits. The decrease in fruit weight of pear exceeding 4% was observed inferior quality. Brix of fruit also showed declining trend with the storage time and dryness of fruits. Japanese pear can be stored for 5 - 7 days when fruit wrapped by paper. The unwrapped fruits of above fruit varieties could be stored for 2 - 4 days only.

Conclusion:

Hosui, Chojuro, Shinko and Nitaka are the recommended varieties for the project districts. These varieties with the package of technology are one of the best ways to increase farmers' income and upgrading their living standard.

Report on Insect Pests and Disease Occurrence and their management in Deciduous and Citrus fruits*

Mrs. Shashi Adhikari**

INTRODUCTION

Horticulture Development Project (HDP), Kirtipur in its second phase of five years (1992-1997) period had the major objective to increase fruit production in hilly areas of Nepal through technology development, besides training and extension. Nepal has potential to grow a variety of fruits suited to mid hill's climate that is sub tropical to temperate. HDP to promote horticulture development in Nepal introduced deciduous as well as citrus fruits suited to these climate during its first phase (1985-1990). In process of fruit production, a number of insect pests and diseases have been encountered from its center Kirtipur, Kathmandu and demonstration farm (demo-farm) and sub-demonstration farm (sub-demo-farm) of six command districts, Kathmandu, Bhaktapur, Lalitpur, Kabhre, Ramechhap and Sindhuli.

The present report tries to inlist the insect pests and diseases observed seasonally as problems on regular monitoring basis of the orchard of grapevine, persimmon, pear, chestnut and citrus (suntala and junar). Emphasis have been given on fruit flies, spider, mite and thrips in pear and thrips in grapevine and persimmon. So far the diseases are concerned no detail studies have been carried out yet. This paper is the joint contribution of the Assistant Plant Protection Officer who worked during the second phase as the Nepalese counterpart and also of the Japanese counterparts. The major insect pests and diseases of the Kirtipur Center and of the demo-farms and sub-demo farms of Kathmandu Valley (Lalitpur, Kathmandu and Bhaktapur district) and Kabhre are as follows.

*Paper present at the Seminar on Key Achievements of Horticulture Development Project - August 6, 1999. Kirtipur, Horticulture Development Project.

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Insect Pests and Diseases of Grapevine.

Out of the nine varieties of grapevine introduced Himrod, Steuben, Kyoho fall among the most suited varieties for Nepal. Hence the insect pests and diseases observed on these varieties are mainly listed here.

A. Insect Pests.

1. Thrips : *Scirtothrips dorsalis*

Damaged grape berry when examined by naked eye were suspected with thrips damage. Hence young leaves were collected from grapevine and washed in 70% ethanol and filtered. The filter paper examined under binocular microscope were detected with *Scirtothrips dorsalis* Hood.

Study was carried out for monitoring thrips population on three different varieties of grape (Himrod, Steuben & Kyoho at two different dates of CaCN_2 treatment, 25 Dec. 1994 & 25 January '95). Ten fourth leaves from 3 plants of each variety were taken and washed in MAIRINO (polyalkalineglycoal kilthane 27%, water and organic solvent 73%) diluted to 250 micromillilitre per 500ml of water and filtered. This observation was taken every week. The filter paper with different stages of thrips (nymph and adults) were examined under binocular microscope, the result in the Table 1 represents the number of adult *S. dorsalis* only.

Table 1. Number of Thrips (*s. dorsalis*) per 30 leaves of different varieties of grapevine from 17 April to August 2, '95.

| Variety | CaCN ₂ Treat | 30 Fourth leaves from the top of branch | | | | | | | | | | | | | | | |
|---------|----------------------------|---|------|-----|------|------|------|------|-----|------|------|------|-----|------|------|------|-----|
| | | 17/4 | 24/4 | 3/5 | 10/5 | 17/5 | 24/5 | 31/5 | 7/6 | 14/6 | 21/6 | 28/6 | 5/7 | 12/7 | 19/7 | 26/7 | 2/8 |
| Stuben | 25 Dec. | 0 | 7 | 2 | 3 | 0 | 2 | 2 | 2 | 0 | 3 | 3 | 0 | 9 | 13 | 2 | 5 |
| | 25 Jan. | 1 | 5 | 1 | 0 | 0 | 0 | 4 | 1 | 0 | 1 | 5 | 6 | 6 | 8 | 6 | 4 |
| Himrod | 25 Dec. | 0 | 0 | 2 | 0 | 0 | 0 | 5 | 0 | 0 | 10 | 7 | 3 | 4 | 31 | 5 | 3 |
| | 25 Jan | 0 | 2 | 5 | 0 | 1 | 2 | 0 | 5 | 1 | 7 | 10 | 4 | 2 | 14 | 4 | 1 |
| | Untreat | 8 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 1 | 4 | 6 | 9 | 9 | 8 | 2 | 3 |
| Kyoho | | 7 | 15 | 5 | 3 | 1 | 5 | 1 | 7 | 0 | 7 | 11 | 3 | 1 | 21 | 24 | 15 |

Note: Numerous nymphs were seen since July but here only adult numbers are given.

From the Table 1, it was clear that the thrips number was more on kyoho than Steuben and Himord. The number was maximum in July in all grape varieties mentioned. Similar observation was taken in Inumaki (The Japanese ornamental nonflowering hedge plant) and no thrips was found on it.

2. Sphingid moth (*Theretra alectal* and *Hippotion celerio*) were also observed to attack grape nursery. They were mostly found feeding on grapevine plants during July. *Theretra alectal* were large dark brown moths with tapering body swift flyers hawk moth. Hind wings were red and forewings were brown like body colour and pointed hence were swift flyers. Pupae was big brown with pointed beak like anterior end and a fin like anal portion. *Hippotion celerio* adult was greenish brown, with white shades here and there like paintings on wings and body. Antenna and legs are milky white and shining. Larva was with big head and prominent eyes with yellow band surrounding the eye.
3. Defoliating beetles : Defoliating beetles like *Basilepta puncticollis* and flea beetles were observed to damage grapevine leaves in nursery and orchards during May-June.
4. Common cutworm: *Spodoptera litura* were observed to infest grapevine during July-September damaging the leaves and shoots. This was observed in Banepa demo-farm.

B. Disease

1. Anthracnose (*Elsinoe ampelina*)

The disease occurs on vines, shoots, tendrils. Light brown lesions with blackish brown margin were observed on affected part. The symptoms on berry appears as special shape like birds eye, round with blackish brown margin. It initiates in April (1994) and became severe due to heavy rain during pre-monsoon season. It was observed that a dormant spray lessen the incidence of Anthracnose.

2. Downy mildew (*Plasmopara viticola*)
It is fungal disease with yellow translucent spots (oil spots) appeared on the upper surface of leaves. On the lower side of affected leaves patches of white downy mildew appeared. Severely affected vines readily defoliated. It was observed to be severe during August at Kirtipur center.
3. Powdery mildew (*Ulcimula necator*).
This also a fungal disease affecting all the aerial parts of the plant in orchards and nursery. Powdery patches appeared on leaves, cane, tendrils, flowers and young berry bunches. On leaves, the powdery patches enlarge and upper leaf surface became white dusty. The powdery growth turned grey and finally became dark in color.
4. Besides, Pestalotia bunch rot, was also reported to attack grapevine berry bunch.

II. Insect Pest and diseases of persimmon.

Hachiya and Hiratanenasi were the two astringent varieties of persimmon recommended for Nepal. Besides, Makawa and Ziro were among sweet varieties.

A. Insect pests

1. Persimmon nursery was heavily infested with defoliating larva of *Hypocala rostrata* F. It damaged the leaves and the young shoots during September. The damage was severe during mid-July to September.
2. Persimmon bark borer (*Euzophera* sp. or *Sanninoidea* sp.) It was reported from Kirtipur. Persimmon trunk was attacked by the bark borer (1994). The moth was black with yellow marking on body and wings. The wings were transparent except veins and margins.
3. *Scirtothrips. dorsalis* were also recorded to attack young leaves of persimmon.

4. San Jose Scale was also observed to damage persimmon (1994).

B. Disease :

Circular leaf spot. (*Mycosphaella nawae*) cause small round brown spots on the leaves of persimmon.

III. Insect Pests and Diseases of Pear

Kosui, Hosui and Chojuro were selected and recommended for Nepal . Besides, Shinko and Okusankichi and Pharping local were also introduced in Kirtipur Center and some of the demo-farms. The insect pests and diseases observed on pear were as follows.

1. Thrips : In March with full bloom of the Chinese pear, numerous thrips were noted to attack flowers and leaves of Chinese and Japanese pear. The thrips sp. was identified as *Thrip flavus*. The color of the infested part turned dark brown to black. In early April the severely damaged parts of young fruit looked corky. *T. flavus* was also found in clover. Damage was more severe on Japanese pear in Kirtipur. Similarly thrips were also noted in Pharping and Banepa demo-farms.

Observation on leaves and flowers were made for thrips population on 2nd week of March and end of March on Chinese and Japanese pear. Towards the end of March, numerous nymphs and adults were observed to attack leaves and young fruits. Damaged part turned brown to black in colour. In April, the young fruits attacked by thrips gave corky appearance. The species found was *T. flavus*. Thrips were checked on clover also during early April, the species found on clover was also *T. flavus*. As regards the damage, the damage was severe on Japanese pear.

Study on Spider mite infestation on leaves, buds and branches of Pharping pear trees was also done. And the relation between the mite damage and mite population density was also studied on Pharping and other pear trees. The assesement was done by

counting the number of thrips by naked eye on young leaves just after emergence in different varieties of pear. Damage on 5 Pharping and 5 European pear trees were checked on March 5, 50 buds per tree were also examined and categorised for convenient as no damage, slight damage (the shape slightly changed in for 1 or 2 leaves), moderate damage (almost leaves apparently transformed) and severe damage (almost all leaves turned to brown color and shrinked or curved). Ten buds from each 5 pharping were randomly checked on March 6 and 10 and from European Pear on March 8. The percentage of buds damage was clearly increased with the increase in the number of spider mite in both Pharping and European pear. The density of mite was apparently higher on Pharping pear trees than European pear. 20 individuals of mite attacked the bud, at this density damage was found in all leaves observed. The number of spider mites on buds were less in European pear and the percentage of severely attacked buds were also less relatively.

Damage on Japanese pear and Chinese pear were also studied on March 20 and 31 as above. The number of Chinese pear tree studied were 4 and Japanese 5. The number of buds examined were 256, 257, 195 and 232 from pharping, European pear, Chinese pear and Japanese pear respectively. The damage was more in Pharping (moderate to severe) as it flowered first followed by European pear, Chinese pear and lastly Japanese pear. It was observed that the damage decreased with delay of bloom.

2. Spider mite: *Bryobia rubrioculus* were found to infest pear. The severely damaged leaves changed into abnormally small leaves. The relationship of the damage and the mite density was investigated in pharping pear and other pear trees.

The number of spider mites on Pharping and European pear trees were examined as before on March 15. The density on leaves of each bud apparently decreased on all trees. The mites were observed to migrate on short branches in association of bud in numerous numbers (Table 2).

Table 2. Number of individuals of *B. rubrioculus* like spider mite on pear tree on March 17,

| Pear type | No. of Tree | No. of mites on the leaf of bud | No. of mites on the branches of a bud | Remark |
|-----------|-------------|---------------------------------|---------------------------------------|--------|
| Pharping | 2 | 4.0 + - 8.9 | 54.5 + - 48.9 | |
| Europen | 5 | 1.2 + - 2.4 | 4.8 + - 5.3 | |

including the number of mites on the short branch without the bud and in the circle (3 cms. in diameter) around the bottom of short branch on the joining bud.

Different acaricides like Dicofol and chlorobenzilate were tested on different stages of mites on laboratory condition on March 3 and mortality was observed on March 5. The result showed Dicofol at 200 ppm to be more effective giving 100 % corrected mortality than chlorobenzilate at 210 ppm giving 91 %. The mortality correction formula adopted was $M = C - \frac{C \times A}{100}$, (where M = mortality C = percentage of individuals alive from control treatment; A = percentage of individuals alive from chemical treatment).

Monitoring of fruit fly population trend was done at Kirtipur centre in the F.Y. 1994/95. Five steiner traps with lure (methyl eugenol + cuelure + Diazinon) was installed at five different orchard blocks, like, Persimmon, Peach, pear and citrus blocks.

The data here represents from August '94 to July '95 (Table 3)

Table 3 The Trend of Fruit flies trapped per month at Kirtipur Centre.

| Fruit Flies | Aug '94 | Sep. | Oct. | Nov. | Dec. | Jan '95 | Feb. | Mar. | April | May | June | July |
|------------------|---------|------|------|------|------|---------|------|------|-------|-----|------|------|
| Dacus cucurbital | 267 | 250 | 367 | 44 | 5 | 0 | 0 | 4 | 2 | 6 | 25 | 222 |
| D.dorsalis | 226 | 26 | 21 | 18 | 2 | 0 | 0 | 0 | 45 | 13 | 163 | 602 |
| D.Zonatus | 5 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 37 | 93 | 308 | 89 |
| D.scutellaris | 21 | 6 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 15 |
| D.tan | 49 | 51 | 91 | 44 | 6 | 0 | 1 | 8 | 1 | 4 | 8 | 42 |
| D.yashimotoi | 42 | 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 32 |
| Total | 610 | 367 | 482 | 106 | 12 | 0 | 1 | 12 | 85 | 116 | 511 | 1002 |

From the above data, it was observed that the number of fruit flies trapped collectively from all five traps increased slowly from the month of April, there by, being maximum during July (1002), August (610) and remained

high upto October then from November suddenly dropped down to 106, finally to zero in January. Till March the number remained quite low, below 12. As regards, the trend of the different *Dacus* species trapped, *D. dorsalis*, was found in highest number during July and *D. cucurbitae* during three months, August, September and October. Similarly *D. zonatus* was observed to be trapped in highest number during May-June. *D. zonatus* was followed by *D. tau* but its number remained always below 100. *D. scutellaris* and *D. yoshimotoi* were among the least and their number never increased more than 100. So the major species of *Dacus* reported around Kirtipur center were *D. dorsalis*, *D. cucurbitae* and *D. zonatus*.

Percentage infestation was studied on different varieties of pear. Five fruits were harvested from each variety at different dates randomly and were checked in laboratory for fruit fly infestation. The infested fruits were reared under laboratory condition for at least two weeks or more if felt necessary in plastic box, cages and glass jars with sandy soil in them to let the maggots to pupate on them. According to the result, 20-40 % in Shinko; 20 in Pharping and 50 % in Okusankichi.

Other insects found to attack pear were slug caterpillars, Tortricid moth, oriental fruit moths, defoliating beetles. The slug caterpillars, tortricid moths and oriental moths were observed during June to September while the defoliating beetles were observed during May to early June.

B. Disease :

1. Ashy leaf spot (*Mycosphaella sentina*) was observed in Pharping pear from middle of June. Due to heavy damage, shedding of leaves occurred with the approach of September and in such trees flower setting were observed to be in middle of September. The damage was observed more in European pear.
2. Pink disease : (*Corticium salmonicola*) It is a fungal disease and was reported from Kirtipur in pear. The infected limbs and trunk showed the characteristic smooth pink encrustation. This was more abundant around middle of June. Branches and twigs girdled with mycelia causing yellowing of plants which eventually die.

IV. Insect pests and diseases of chestnut :

Both Japanese and Chinese varieties of chestnuts were recommended for Nepal. Insect pest and disease observed in chestnut were as follows.

A. Insect pests

1. Bluish shining beetle, *Themus nepalensis* is medium sized orange beetle with bluish black elytra. Thorax orange red, antennae orangish yellow with tips black
2. *Erthesina fullo* were medium sized brown bugs found feeding on chestnut other insect were slug caterpillar, defoliating beetles like *Nodostoma spp.* and *Himastra spp.*

B. Disease

1. Rootrot (*Phytophthora cinnamomi*) was serious in chestnut.
2. Canker (*Endothia parasitica*) was also as a problem in chestnut trees.

V. Insect pests and diseases of citrus (Junar & Suntala):

Regarding citrus the main focus was on suntala and junar in which 7 varieties of suntala and 15 varieties of junar were being introduced and maintained. The problems encountered reflects irrespective of the citrus type and its varieties.

A. Insect pest

1. California red scale (*Aonidiella auranti*) It was the common serious pest of citrus in Nepal. The male was some what oval and covered with scale and possesses a pair of wings. The insect was red in color. It sucked the plant resulting yellowing of leaves, defoliation, fruit dropping and dieback of twigs.

2. Citrus leaf minor : *Phyllocnistis citrella* It is the serious pests of citrus nursery as well as the old orchards. Adults were minute silvery color moth which miner the underside of the leaves making serpentine form which have air inside as a result looks like silvery.
3. Mites: Two species of mites *Tetranychus sp* and *Panonychus citri* were reported to infest the citrus plants in Kirtipur and Kabhre.
4. Aphids : *Aphis spiraecola*, *Toxoptera citricidus* and *T. auranti* have been reported to infest citrus.

B. Disease

1. Scab (*Elsinoe fawcetti*) was one of the serious disease of citrus. The infestation occurred on leaves, twigs, fruits resembling canker in being warty.
2. Canker (*Xanthomonas Compestris*) It was a bacterial disease attacking all the aerial parts like, leaves, twigs, fruits and thorns. The canker lesions appeared as minute water-soaked roundish spots which enlarged slightly and turned brownish and corky.
3. Powdery mildew was also common in citrus as in case of other fruits.

For the management of insect pests and diseases, the infected leaves, twigs and branches were pruned. Good sanitation was maintained by cleaning the orchard from infested dropped fruits, leaves and surrounding weeds. The spraying schedule was followed as mentioned.

Spray schedule for citrus to control insects pests and diseases

| Period | Name of target diseases and insects | Chemicals and concentration |
|----------------------------------|---|---|
| 1. Late of Dec. to Jan | canker, scab (scab Benomyl 1g/1 litre) | Bordeaus mixture (5-5) |
| 2. end of May | scale insect | Rogar (dimethoate) 1ml/1-5 litre |
| 3. late of June to early of July | canker (if necessary) citrus leaf miner mites and aphids | Bordeaux mixture (5-5) Rogor (dimathoate) 1ml/1-5 litre |
| 4. early of July | powdery mildew (if necessary) | Karathane (dinocap) 1gm/litre or Lime sulphur 2g/litre |
| 5. late of July | scale insect | Rogar (dimethoate) 1ml/1.5 litre |
| 6. late August | mites | Rogor 1ml/1litre |

For citrus nursery :

To control Phytophthora rot :

maintain good drainage.

spray Bordeaux mixture (5-5) in dry season.

spray Indofil M 45 1-5g/litre in rainy season.

Sprey schdule for deciduous fruit trees

| Time | Pear | Grape | persimmon |
|--------------------------------------|---|---|---|
| 1. Middle of February | General treatment for paste with insecticide | each trees paint to trunk | Bordeaux |
| 2. Late of March | San Jose scale Thiodan EC 1ml/1L Sumicidin 1ml/1L (after full bloom) | Anthracnose Indofil 4g/1L (dormant satge spray) | San Jose scale Thiodan EC 1ml/1L |
| 3. Middle of April | | Anthracnose Indofil 1.5g/1L | |
| 4. Middle of May | leaf spot Indofil 1.5g/1L aphid etc. Thiodan EC 1ml/1L Or Sumicidin 1ml/1L (bagging for fruit) | Anthracnose Indofil 1.5g/1L or Bordeaux mixture Thrips Sumicidin 1ml/1L | |
| 5. Late of May | | Anthracnose leaf spot Indofil 1-5g/1L Or Bordeaux mixture Sphinx moth Thrips Sumicidin 1ml/1L | |
| 6. Early of June | Preventive treatment for stem borer paint Sumicidine 2ml/1L | | Circular leaf spot Indofil 1-5g/1L Hypocala moth Thiodan EC 1ml/1L |
| 7. Middle of June | leaf spot Indofil 1-5g/1L tortricid moth Thiodan EC 1ml/1L | downy mildew Benomyl 1g/2L with Indofit 1-5g/1L sphinx moth Aphids. Sumicidin 1ml/1L | |
| 8. Late of June | | downy mildew Indofil 1.5g/1L Sphinx moth Apnids & leat beetles Sumicidin 1m/1L | Circular leaf spot Indofil 1-5g/1L Hypocala moth Thiodan EC 1ml/1L |
| 9. Early of July | leaf spot Pink disease Indofil 1-5g/1L tortricid moth Thiodan EC 1ml/1L | Downy mildew Indofil 1.5g/1L common cutworm Sumicidin 1ml/1L | |
| 10. Middle of August (after harvest) | Pink disease remove the lesion and paint Bordeux mixture | | |

References :

Annual Report 1993/94, Horticulture Development Project Phase II Kirtipur

Annual Report 1994/95, Horticulture Development Project Phase II Kirtipur

Annual Report 1995/96, Horticulture Development Project Phase II Kirtipur

Annual Report 1996/97, Horticulture Development Project Phase II Kirtipur

Acknowledgement :

I am thankful to Mr. Suresh Shrestha co-ordinator HDP, for his kind co-operation and help. Thanks are to all the Japanese and Nepalese Plant Protection Counter parts whose contribution could serve as the ingredient to this paper. I also would like to thank Mrs. Rojee Pradhan, the Assistant Post Harvest Technologist for her help Krishna Kaji Maharjan is also thankful for printing out the materials.

Key Achievements of Training and Extension Activities of Horticulture Development Project, Kirtipur

E. P. Simkhada 1
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ABSTRACT

One year long term training for JT/JTAs and short term training on fruit cultivation for leader farmers, women leader farmers, JT/JTAs, nursery farmers and officers were provided by Horticulture Development Project. Apart from this training this paper also present various extension activities in demonstration farms, Circuit technical guidance and publication.

INTRODUCTION

Extension activities are important activities of the project, which focuses on the transfer of technologies to the farmers. This is done in the form of training to the farmers about the technology so that they can apply the same on their orchards supported by technical backup programme by trained JT/JTAs and by establishing Demonstration farms. All the Demonstration farms have already started bearing fruits and giving income to the owners.

RESULTS AND DISCUSSION

One year long term training was organized every year for JT/JTAs of project districts and two non-project districts. 32 JT/JTAs were trained under the long term training programme. From 1998, three months training has been organized for JT/JTAs of project and non-project districts of Nepal. The objective of the training was to produce skilled field staff who could effectively transfer appropriate fruit cultivation technologies to the farmers. The training mainly focused on the following subjects.

- Improved fruit cultivation techniques.
- Demonstration farm management.
- Quality sapling production techniques.
- Quality fruit production.
- Plant protection measures.
- Handling of harvested fruits.
- Marketing advice of fruits.

Assistant Horticulturist
Training and Extension Counterpart, Horticulture Development Project, Kirtipur

A number of short-term training on fruit cultivation were organized each year by the project for the leader farmers, JT/JTAs, women farmers, nursery owners, demo-farm owners etc. of the project area. Training was mostly of one-week duration. About 3549 trainees were benefited from this programme.

Many demonstration farms were established in 1994 in 6 project districts. There are altogether 9 demo-farms and 4 sub demo-farms in the project area. These demo-farms were established as outreach programmes of project where farmers could be motivated to grow various types of fruit successfully with suitable techniques. These demo-farms jointly managed by project and extension staff served as training centres also to provide training to the farmers on different aspects of fruit cultivation for example, time of manuring the orchard, training and pruning, thinning, bagging, plant protection measures, harvesting techniques, orchard management etc. Most of these demo-farms have bearing fruits, which are of good quality, and fetching better prices in the market than other varieties. The success of these demo-farms has been observed making positive impact to the neighboring farmers also. Now many neighboring farmers are also showing interest in cultivating the types of fruits recommended by the project. After starting follow-up programme, planting area of recommended fruit has been increased almost three times than end of Phase-II.

Demo- farm

| District | Location | Main Crop |
|-----------|------------|--|
| Kathmandu | Pharping | Japanese pear, persimmon and chestnut |
| Lalitpur | Badikhel | Grape, pear, persimmon and chestnut |
| Bhaktapur | Dadhikot | Grape, pear, persimmon and chestnut |
| Kavre | Banepa | Japanese pear, persimmon, grape and chestnut |
| Kavre | Panchkhal | Junar, suntala, persimmon |
| Sindhuli | Bijaychhap | Junar, suntala, chestnut |
| Sindhuli | Tinkanya | Junar, suntala, chestnut |
| Ramechhap | Salu | Junar, J. pear, chestnut |
| Ramechhap | Pakarbas | Junar, suntala, chestnut |

Sub-Demo farms

| District | Location | Main crop |
|-----------|----------|----------------|
| Kathmandu | Thankot | Pear |
| Lalitpur | Badikhel | Grape and pear |
| Kavre | Subagaon | Junar and pear |
| Kavre | Banepa | Pear, Chestnut |

Conclusion:

Long term as well as short-term training is very effective for the transfer of improved fruit cultivation technology to the fruit growers. 32 JT/JTAs were trained under the long term training programme about 3549 trainees benefited from the short term training program. Demonstration and sub-demonstration farms play vital role to motivate farmers and to learn techniques of fruit cultivation. There are altogether 9 demo-farms and 4 sub-demo farms in the project area. The nurseryman of the project areas have established Ramsinbhakla Central Nursery association in 1996. In this way, Horticulture Development project covers more than 300 ha of its targeted fruits area.

Key Achievements of Training and Extension Activities of Horticulture Development Project, Kritipur

INTRODUCTION

Extension activities are important activities of the project, which focuses on the transfer of technologies to the farmers.

It establishes the linkages between Center, DADO and Farmers.

Under training programme, the project organized 2 types of training based on duration i.e. Short term training and Long term training.

Short-term training are organized for 3-7 days to Horticulture officers, JT/JTAs, Demo-farm owners, Leader farmers, Nursery farmers and Commercial growers.

During 1985-1999 July, altogether 3549 trainees of different category were participated in various training programme.

Several one day Field Spot training were organized by the project.

Long-term training is organized for 3 month to one year to Black-smith and JT/JTAs.

These training programmes were conducted at Kritipur Centre on different type of fruit crops grown in the centre with much emphasis on practical fruit cultivation technologies. Learning by doing principles were followed.

During 1993- 1997 July, 32 JT/JTAs were trained from 6 project districts and 2 from non project districts.

In follow-up programme, 20 JT/JTAs are being trained for 3 months at different times interval coinciding with main working season of fruit crops.

During 198⁵~~7~~-1999, 38 black-smiths were trained for 3-4 months to develop the private entrepreneurship in making and marketing the horticultural tools .

Overseas Training :-

37 Personnel (JT/JTAs and officers) were trained in Japan to develop knowledge and skills in fruit crops.

39 short- term and 9 long-term Japanese experts has been involved in generation and transfer of new technologies in fruit cultivation in Nepal.

Demonstration Farm Establishment and Maintenance

Demo-farm : 9

Sub Demo-farm : 4

Demo- farm

| District | Location | Main Crop |
|-----------|------------|--|
| Katmandu | Pharping | Japanese pear, persimmon & chestnut |
| Lalitpur | Badikhel | Grape, pear, persimmon & chestnut |
| Bhaktapur | Dadhikot | Grape, pear, persimmon & chestnut |
| Kavre | Banepa | Japanese pear, persimmon, grape & chestnut |
| Kavre | Panchkhal | Junar, suntala & persimmon |
| Sindhuli | Bijaychhap | Junar, suntala & chestnut |
| Sindhuli | Tinkanya | Junar, suntala & chestnut |
| Ramechhap | Salu | Junar, J. pear & chestnut |
| Ramechhap | Pakarbass | Junar, suntala & chestnut |

Sub-Demo farms

| District | Location | Main crop |
|-----------|----------|----------------|
| Kathmandu | Thankot | Pear |
| Lalitpur | Badikhel | Grape and pear |
| Kavre | Subagaon | Junar and pear |
| Kavre | Banepa | Pear, Chestnut |

All the Demonstration farms and Sub demo-farm have started bearing fruits and giving income to the owners.

Private Nursery Establishment

With the encouragement of Horticulture development project the nurseryman of the project areas have established Ramsinbhakla Central Nursery Association in 1996. Ramsinbhakla represents the project districts viz., Ramechhap, Sindhuli, Bhaktapur, Kathmandu, Kavre and Lalitpur, The association acts as a catalyst in the production of fruits saplings and promotion of private nurseries.

Commercial Orchard Establishment

| District | Location | Main Crops |
|------------|--|---------------------|
| Kathmandu | Thankot, Chovar, Macchhegaun, Pharping, Sankhu | Pear, Persimmon |
| Lalitpur | Badikhel, Bungmati, Chapagaun, Setipakha | Grape, Pear |
| Bhaktapur | Dadhikot, Bageshori | Grape, Pear |
| Kavre | Banepa, Khatrigaun, Chaukot, Subagaun | Pear |
| Nuwakot | Jurethum Madanpur | Pear, Chestnut |
| Dhading | Chhatredeurali | Junar, Orange, Pear |
| Makawanpur | Chitlang, Palung, Tistung | Pear |

Technical Guidance Services

Under the technical assistance of the project undertook various activities such as field visits by technicians, plant protection campaigns, support to the private nurseries and demonstration farms. The JICA experts and other HMG technicians paid regular visits to the potential areas of project district to guide and assist the farmers in various technical aspects of fruit cultivation.

Publication:

Following are the key publications regularly published by the project.

1. Annual Report of every year showing the achievements and proposed programmes.
2. News letter: Trimonthly published for the project activity during the past three month period.
3. Poster, pamphlet, booklets, concise cultivation guide books, manuals, brochures etc.
4. Calendars not only for reading dates but also assisting the interested fruits growers in knowing the required technical works to be under taken to maintain better fruit orchards both of citrus and deciduous fruits.

Support to District Programme

Budget Support

- ⇒ Maintenance of demonstration fruit farm.
- ⇒ Technical services to commercial fruit growers.
- ⇒ Assistance in strengthening private fruit nursery.
- ⇒ Commercial fruit orchard establishment.
- ⇒ Citrus foot-rot control campaign.
- ⇒ Scale insect control campaign.
- ⇒ Long term training to JT/JTAs on fruit cultivation.

Conclusion

Long term as well as short-term training is very effective for the transfer of improved fruit cultivation technology to the fruit growers. 32 JT/JTAs were trained under the long term training programme . About 3549 trainees benefited from the short-term training programme.

Demonstration and sub-demonstration farms play vital role to motivate farmers and to learn techniques of fruit cultivation. There are altogether 9 demo-farms and 4 sub demo-farms in the project area. The nurseryman of the project areas have established Ramsinbhakla Central Nursery Association in 1996. In this way, Horticulture Development project covers more than 300 ha of its targeted fruits area.

付属資料7.「ネパール丘陵地域農業改善計画」要請書案及び日本語による要約

0.背景

ネパールの丘陵地帯の気象条件は園芸作物生産に適しており、またネパール政府は長期的政策として丘陵地帯における高価値作物（果樹、野菜、工芸作物）の開発、なかでも輸送インフラの既に発展した地域、あるいは発展しつつある地域での商業果樹栽培は最重要課題として挙げていものの、財政支援の不足により、十分な開発がなされていない状況にある。よって日本政府に対し、無償資金協力と技術協力を要請する。

1.協力期間

第一フェーズ（無償資金協力？） 2年（2000-2002）
プロジェクトフェーズ 5年（2003-2007）

2.プロジェクト対象地域

- ・事務所 Pokhara
- ・サブセンター Kirtipur, Mustang（園芸センター）
- ・柑橘、夏野菜、工芸作物 Kaski, Syangja, Tanahu, Gorkha, Dadhing, Lamjung（中部、西部）
- ・ナシ、カキ、冬野菜 Kathmandu, Lalitpur, Bhaktapur, Kavre（Kathmandu周辺）
- ・リンゴ、野菜種子生産、換金作物 Jomsom（西部）

3.上位目標

果実や野菜の商業的な生産のための技術的バックグラウンドを強化する、及び高付加価値農産加工を基盤とした農村企業を確立し、丘陵地の人々の経済状態の強化を図る、これによりネパール国の貧困の緩和に寄与する。

4.プロジェクト目標

技術開発と研修、普及を通じて園芸開発及び園芸関連産業の振興に寄与し、特に丘陵地域において現金収入と雇用機会を増加させる。

5.プロジェクト活動

- ・対象地域における農家レベルの展示農場と技術指導場の開発
- ・果樹、野菜、工芸作物の技術開発
- ・商業的果物、野菜、工芸作物の農場の開発
- ・種苗生産の発展
- ・収穫後処理技術の強化
- ・研修、研究
- ・輸送の改善
- ・販売の支援

6. 無償資金協力

- ・プロジェクトオフィス（事務室、プロジェクトマネージャールーム、プロジェクトリーダールーム、スタッフルーム、会議室、図書室、食堂、貯蔵室）
- ・研修施設（大教室、小教室、会議場、食堂、貯蔵室）
- ・機材
- ・その他（スタッフ宿舍、給水施設（飲用、灌漑用）、ガレージ等）

7. 技術協力

- ・長期専門家（柑橘栽培、野菜栽培、普及・研修、落葉果樹栽培）
- ・短期専門家（植物保護、収穫後処理・普及、その他）
- ・機材供与（研修用の機材及び施設、車輛、農場用の機材及び施設）

8. 実施体制

- ・実施機関 農業省
- ・ネパール側負担 人員、土地、税関措置、運営費
（人員は柑橘開発部、及び茶・コーヒー開発部から配置され、園芸助手は対象地域の地方農業開発事務所から配置され、土地はPokhara, Malepatan に提供される。）

以上

A PROJECT PROPOSAL ON
HIGH VALUE CROPS BASE:
Hill Farming Improvement Project

Project period: Seven years
Primary Phase: Two years
Project phase: Five years

Submitted to
Government of Japan
Japan International Cooperation Agency
(JICA).

Proposal submitted by
Ministry of Agriculture
Department of Agriculture
Kathmandu, Nepal

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Application for the Grant Aid And Technical Cooperation by the Government of Japan

HIGH VALUE CROPS BASE

Project Title: Hill Farming Improvement Project.

I. Background Information

1. Introduction:

Due to the extreme variation in altitude and topography, Nepal experiences a wide range of climatic conditions in different parts of the country. Accordingly, the suitability of land for growth and production of crops varies in different geographic regions. Though the agricultural productivity in the country in general is low and the farmers are poor, the economic condition of high-hill and mid-hill farmers are relatively more wretched and becoming worse over time. The quality of agricultural land is generally poor and marginal soil. Due to the rapid growth in the population and the lack of alternative opportunities for employment and income, there is an increasing pressure on land resulting into deforestation and cultivation on steep slopes which otherwise are not suitable for tillage. As a consequence, there have been serious problems of environmental degradation, soil erosion, declining productivity of agricultural land, lower farm income, malnutrition and out-migration of the people from hills. Therefore, there is a need to introduce some new variable in the economy of the hill to improve economic conditions of the people of the areas and at the same time help check the awful trend in environmental degradation.

The mid-hill region (650m to 1500m altitude) has a comparative advantage in the cultivation of citrus fruit, vegetables and industry crops. In the high-hill (Mountain) region (1800m to 2800m altitude) especially, cash crop and apple (*Malus pumila* Mill. var. *domestica* Schneid) is considered as the most important temperate fruit of Nepal. Cultivation of these fruits has been found more paying as compared to the traditional food-grains crops like maize, wheat, millet and buckwheat. Notwithstanding the vast potentials for the production of citrus and apple domestically, these fruit crops are being imported in a large quantity every year to meet the growing demand.

Vegetables are equally important because most vegetable that are grown in the terai region during the winter months grown well in the mid-hills during summer and hill development of vegetable crops will make available a continuous supply throughout the year. And industry crops are also important because they are mainly high value low-volume crops appropriate for mid-hill development not only because of their attractive export potential but also because of their suitability in the condition of the infrastructure base of the mid-hill region. There is scope for promotion of these horticultural crops for both the import substitution as well as for export promotion particularly, if agriculture roads are constructed to join high-hill and mid-hill to terai region as per envisioned in Agriculture Perspective Plan.

2. High Value Crops Development in Nepal:

Nepal is a predominantly agricultural country where about 81 percent of its population are engaged in agriculture contributing about 41 percent of total gross domestic product. Major part of the cultivated land in Nepal is used for food grain production. The productivity of the cereal crops has been in decreasing trend in the past years leading to

food deficit in many districts. The proportion of population under absolute poverty line increased from 40 percent in 1977 to more than 49 percentage in 1996.

Realizing the above facts and the natural endowment of Nepal, which suggests to switch on to horticultural development by applying better and appropriate technologies, management skills and better cultivation practices. It is a known fact that most of the horticultural crops alone can give much more return than any other cereal crops in the hill of Nepal. The marginal lands in the high-hill and mid-hill could be judiciously used for fruit, vegetable and industry crops production, which can provide employment opportunities, better environment, and more income to the rural poor and can reduce migration from hill to the plain. Realizing these facts, the Agricultural Perspective Plan has given emphasis on the high-value crops such citrus, apple, vegetables and industry crops in the high-hill and mid-hill.

3. Agricultural Perspective Plan:

Agricultural Perspective Plan (APP) is a 20 years' agricultural development plan being implemented from 1995. It is designed to add two percentage point to the country's agricultural growth rate, and this increase, combined with a 0.5 percentage decline in the rate of population growth, would expand per capita agricultural growth six-fold, from its current level of 0.5 percent to 3 percent per year. This rise would stimulate nonagricultural growth in employment-intensive goods and services throughout Nepal's dispersed villages and market towns.

Such expansion would provide jobs for the poor, particularly poor women, and thereby greatly reduce the number of rural people in poverty, whose lot has been gradually deteriorating over the past few decades. It would allow Nepal to withdraw its most fragile land resources from arable agriculture and return them to environmentally sound forestry and other more suitable and natural uses. There are five interrelated objectives and six essential strategic moves embodied in the Agricultural Perspective Plan. The following are the main objectives of the Agricultural Perspective Plan (APROSC and JMA, 1995a).

3.1. Objectives:

- To accelerate the growth rate in agriculture through increased factor productivity.
- To alleviate poverty and achieve significant improvement in the standard of living through accelerated growth and expanded employment opportunities.
- To transform the subsistence-based agriculture into a commercial one through diversification and widespread realization of comparative.
- To expand opportunities for an overall economic transformation by fulfilling the precondition of agricultural development.
- To identify immediate, short-term and strategies for implementation, and to provide clear guidelines for preparing periodic plans and programs in future.

3.2. Strategy:

- A technology-based green revolution in agriculture becomes the initial engine of accelerated growth.
- Accelerated agricultural growth creates a demand pull for the production of high-value commodities in agriculture, as well as for nonagricultural commodities, with consequent large multiplier effects on other sectors of the country.
- Broadly based high employment growth then becomes the mechanism for achieving societal objectives.

- Public policy and investment focus on a small number of priorities; building on past investment in human capital and physical and institutional infrastructure.
- A package approach to development is introduced, which in Nepal's case would be differentiated for the terai, hill and mountains and would recognize the powerful complementarity between public and private investment and priorities and would ensure their coordination.
- To achieve broad participation, the strategy is regionally balanced and explicitly ensures the participation of women.

4. Development Policy of the Nation/Local Government:

The HMG/N has a general and long-term policy of promoting fruit crops in the high-hill and mid-hills. At present the Agricultural Perspective Plan (APP 1995-2015) has considered citrus, apple and vegetables crops sub-sector as high value crop commodity for high-hill and mid-hills and is given priority and planned with emphasis on quality fruit production and increase yield by upgrading technology and improving competitive marketing by developing and integrating with road and other infrastructure facilities. The Ninth Five Year Plan (1997/98-2002/03) has accordingly set up a target of increasing the additional area under citrus by 5000 ha. with fruit production of 1,26,000 Mt. To achieve these targets pocket package strategy has been taken by the government.

5. Rational:

His Majesty's Government of Nepal is aware of the importance of promotion of vegetables, industry crops and fruit crops (citrus, apple, pear, persimmon, plum and strawberry), in particular for improving the economic condition of high-hill and mid-hill farmers and its positive impact on the hill ecology. Past experience has shown that the scattered plantation and disjointed efforts to promote of the horticultural production have met limited success. Hence, in order to exploit the potentials of high-hill and mid-hill region for commercial cultivation of horticultural crops, Agriculture Perspective Plan has planned to develop a pocket package program at the implementation level. For horticultural crop production, the pocket area has been categorized as: (1). with irrigation, road and electricity facilities; (2). with irrigation and road facility; (3). with irrigation facility; (4). with road facility; and (5). others (subsistence farming). Area with road and irrigation facilities will be emphasized for commercial crops. And, area with also electricity facility will be emphasized for establishment of grading, packing and food processing.

The project has been designed keeping in view its overall objectives, and with due considerations of the constraints and potentials for development of fruits as discussed in introduction. As the project districts and types of fruits have already been specified such as citrus, vegetable and industry crop in Gorkha, Tanahu, Lamjung, Syanja, Kaski, and Dading districts. In recent years pear, persimmon of Japanese variety, which are, introduced by Horticulture Development Project are highly demanded by the farmers as well as consumers, thus area extension in Kathmandu, Lalitpur, Bhaktapur and Kavre districts. And apple and cash crop in Muatung districts (Mainly post harvest and transportation improvement).

Citrus fruit occupies about 25% (16000ha.) and apple occupies 7% (3006ha) of the total cultivated fruits area (63000ha) and the production of citrus fruit is estimated to be about 22% (9300Mt) and apple 6% (28595Mt) of total fruits production (4,28,000Mt). The demand of vegetable and citrus fruit, apple, pear and persimmon is increasing in the country due to several factors including population growth, rapid urbanization and

awareness regarding importance of fruit and vegetables consumption, and increased tourist flow. At present these fruits are in short supply particularly in urban area where demand for it is quite high. Demand of these fruits will probably increase in a large scale in future in the wake of export liberalization policy which will give impulse for increasing export of processed and fresh fruit to world market.

The farmers of the high-hill and mid-hills region are growing citrus, pear, persimmon and apple fruit since time immemorial hence the area of these fruits are gradually increasing year after year. The productivity and production of these fruits is quite low due to 1. Poor management of the orchard; 2. Lack of technical know-how; 3. Shortage of standard planting materials; 4. Improper availability of agricultural input. We could not meet the growing demand of consumers and 54.4% of total fruit requirement is being imported from India. There are many rooms to increase citrus, apple, pear and persimmon fruits productivity and production in Nepal. The on-going activities are on a very limited scale and Ministry of Agriculture is keen to develop these fruit crops in specified and potential districts on commercial scale.

II. The Proposed Project

1. The Project:

Realizing the above facts that the high-hill and mid-hill of Nepal have undoubtedly suitable agro-climatic condition for horticultural crop production, which suggests to switch on to horticultural development by applying better and appropriate technologies, management skill and better cultivation practices. His majesty's government of Nepal has adopted a general and long term policy to develop high value crops in the high-hill and mid-hill region. Accordingly, top priority has been accorded to the development of commercial fruit cultivation in production pockets in the high-hill and mid-hill region where transport infrastructures have already been developed or are in the process of being developed. There are many rooms to increase high value crop (fruits, vegetables, and industrial crops) production and productivity in Nepal. The on-going activities are on a very limited scale and Ministry of Agriculture is keen to develop these high value crops in specified and potential districts on commercial scale. Eventhough Nepal is gifted with favorable climatic condition for the cultivation of high value crop, due to the lack of financial support the land has not been utilized properly. So, a request is hereby made for the grant aid support of the government of Japan and also to the technical cooperation from Japan International Cooperation Agency (JICA) under the government of Japan, anticipating the poverty alleviation of the high-hill and mid-hill people of Nepal.

2. Proposed Project Area: (Districts)

The head quarter of the project will be in Pokhara at Malepatan and sub centre will be Horticulture centre, Kirtipur. The districts designated for the different crops will be as:-

For citrus, summer vegetable and industry crops:- Potential citrus production of central and western region of Nepal such as: district Kaski, Syangja, Tanahu, Gorkha, Dadhing and Lamjung.

For pear, persimmon and winter vegetables:- Kathmandu, Lalitpur, Bhaktapur and Kavre

For apple, vegetable seed multiplication and cash crops:- Jomsom.

3. Goal of the Project:

The goal of the project will be to enhance the technical background for commercial fruit and vegetable production, and help to increase economic status of the high-hill and mid-hills people through establishing income generating enterprises based on high value crops industry of the country thus resulting in poverty alleviation.

4. Objectives of Project:

The objective of the project is to increase the cash income and employment opportunities particularly in high-hill and mid-hill area through technological development, training and extension, thus, contributing to the promotion of horticulture development and horticultural based subsidiary industries in the country.

5. Activities of the project:

The project will develop demonstration farms and technical guidance sites in the proposed districts at farmer field level. And others activities will be as follows:

- Fruit, vegetable, and industrial crops technical development;
- Commercial fruit, vegetable and industrial crops orchards development;
- Nursery development;

- Strengthening of post-harvest technology;
- Training/study;
- Transportation improvement;
- Marketing supports.

6. Grant Aid Support:

Grant aid support will provide project implementation office, training facilities and equipment machinery.

Material supply and installation of physical facilities.

Main building

- Office room
- Project manager room
- Project leader room
- Staff rooms
- Meeting room
- Library room
- Kitchenette & store rooms

Training building

- Class room (Big)
- Class room (Small)
- Conference hall & Exhibition hall
- Kitchenette & store rooms

Miscellaneous

- Staff quarter (Single type) - 4
- Staff quarter (Duplex type) - 6
- Guard house
- Water facilities (Drink & irrigation water)
- Shades for equipment (Garage etc.)

7. Technical Cooperation Support:

Technical cooperation will support the experts in the following fields:

7.1. Long term expatriate:

- Citriculturist - 1
- Vegetable cultivation- 1
- Extension and training-1
- Deciduous fruit-1

7.2. Short term experts:

- Plant protection
- Post harvest and extension
- Others

7.3. Equipment supply:

- Equipment & machinery required for training
- Vehicles
- Farm equipment & machinery

8. Time Schedule:

Implement Phase: 2 years. (2000 – 2002)

Project Phase: 5 years. (2003 – 2007)

9. Implementing Agency:

Ministry of Agriculture will be overall implementing agency of the project.

9. 1. HMG/N Responsibilities:

Man power, land, customs clearances and running cost.

9. 2. HMG/N Responsibilities: Man power

From: Citrus Development Section and Tea and Coffee development section, Kirtipur, Kathmandu); and

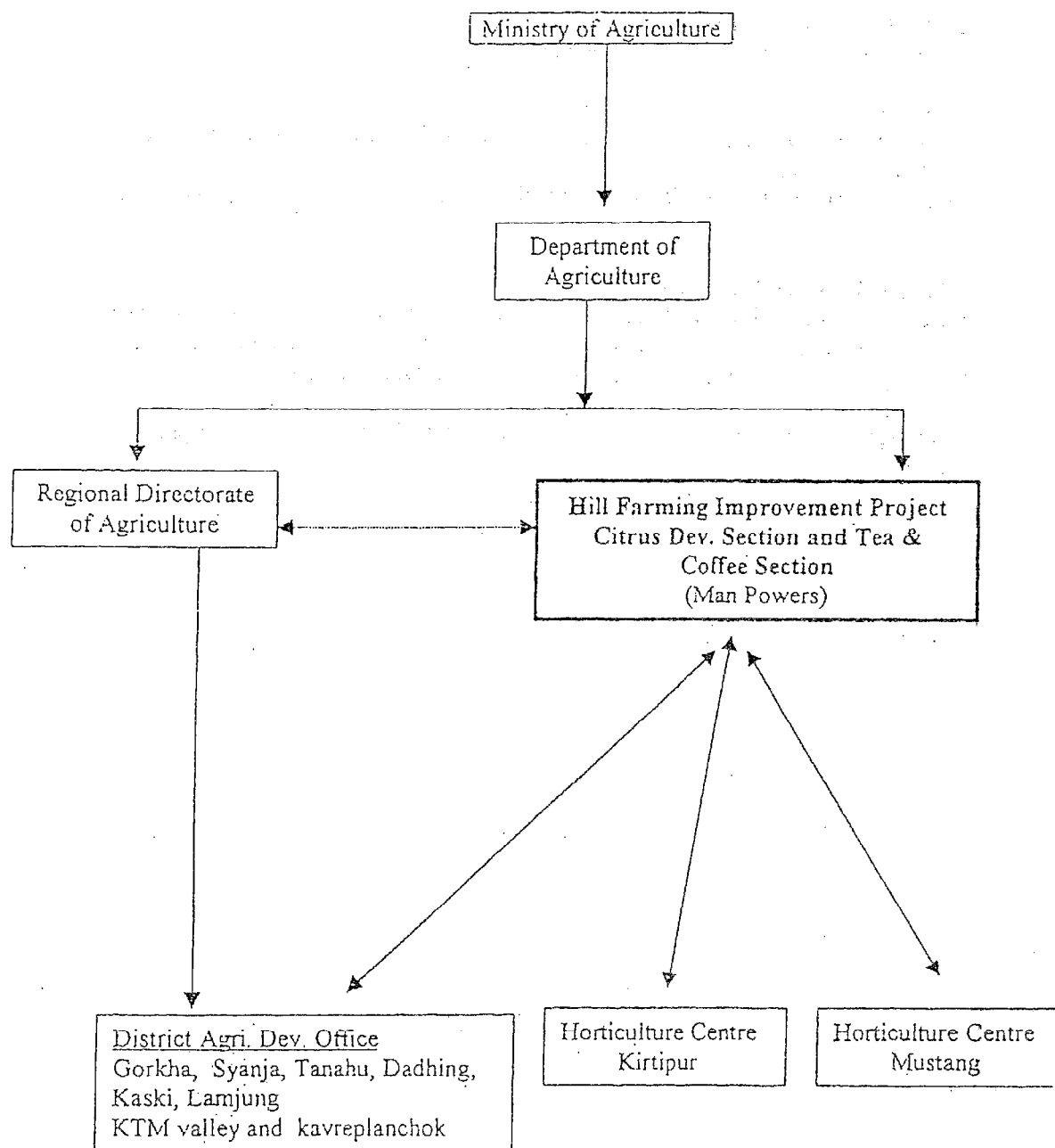
Asst. Horticulturist from: District Agriculture Development Office of the project areas.

9. 3. HMG/N Responsibilities: Land

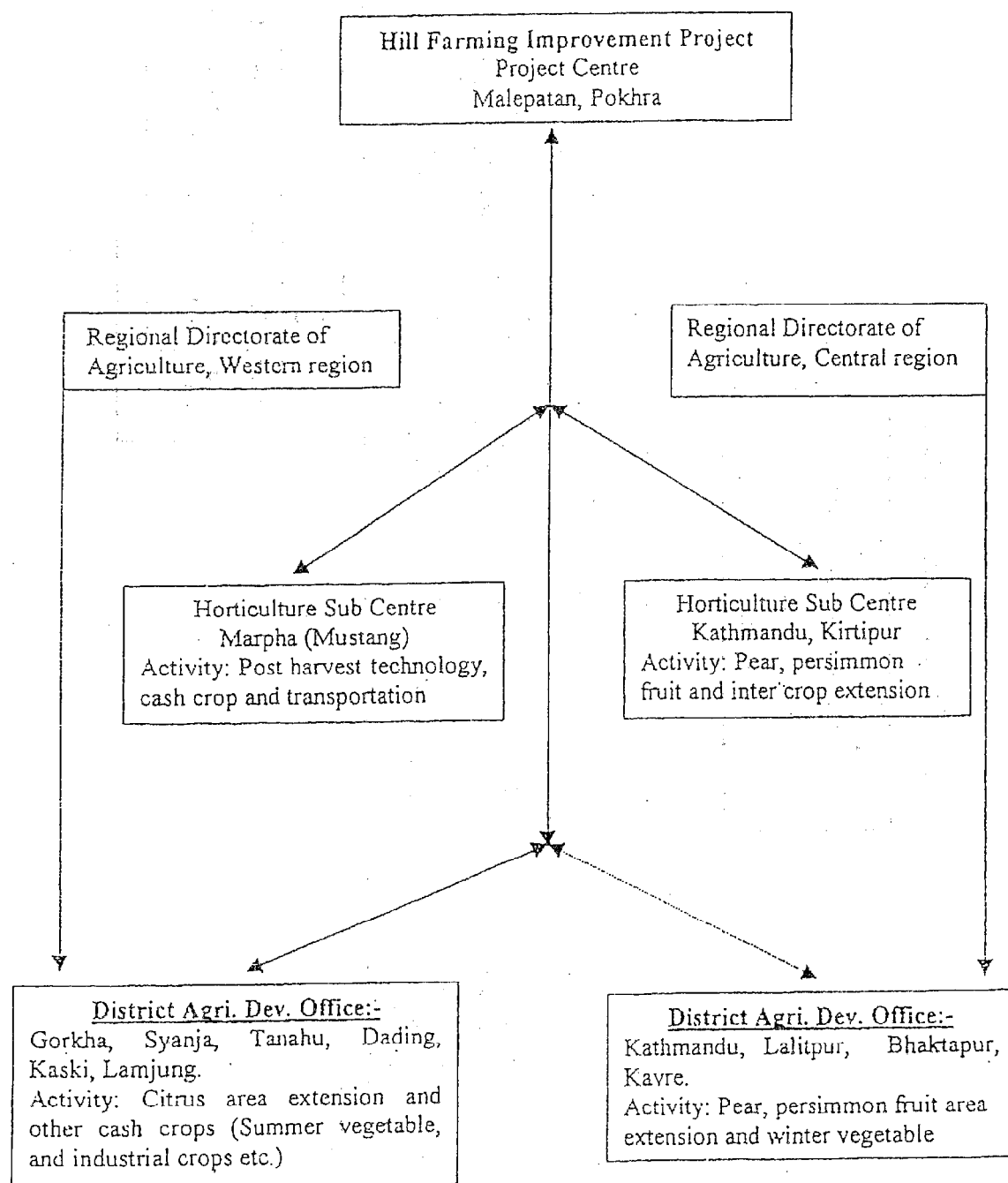
Ministry's of Agriculture will provide land in Pokhara, Malepatan, (Western side of Horticulture Research Center and Eastern side of Western Agriculture Directorial building which land under the Nepal Agriculture Research Council).

10. Donor Agency: Government of Japan and Japan International Cooperation Agency (JICA)

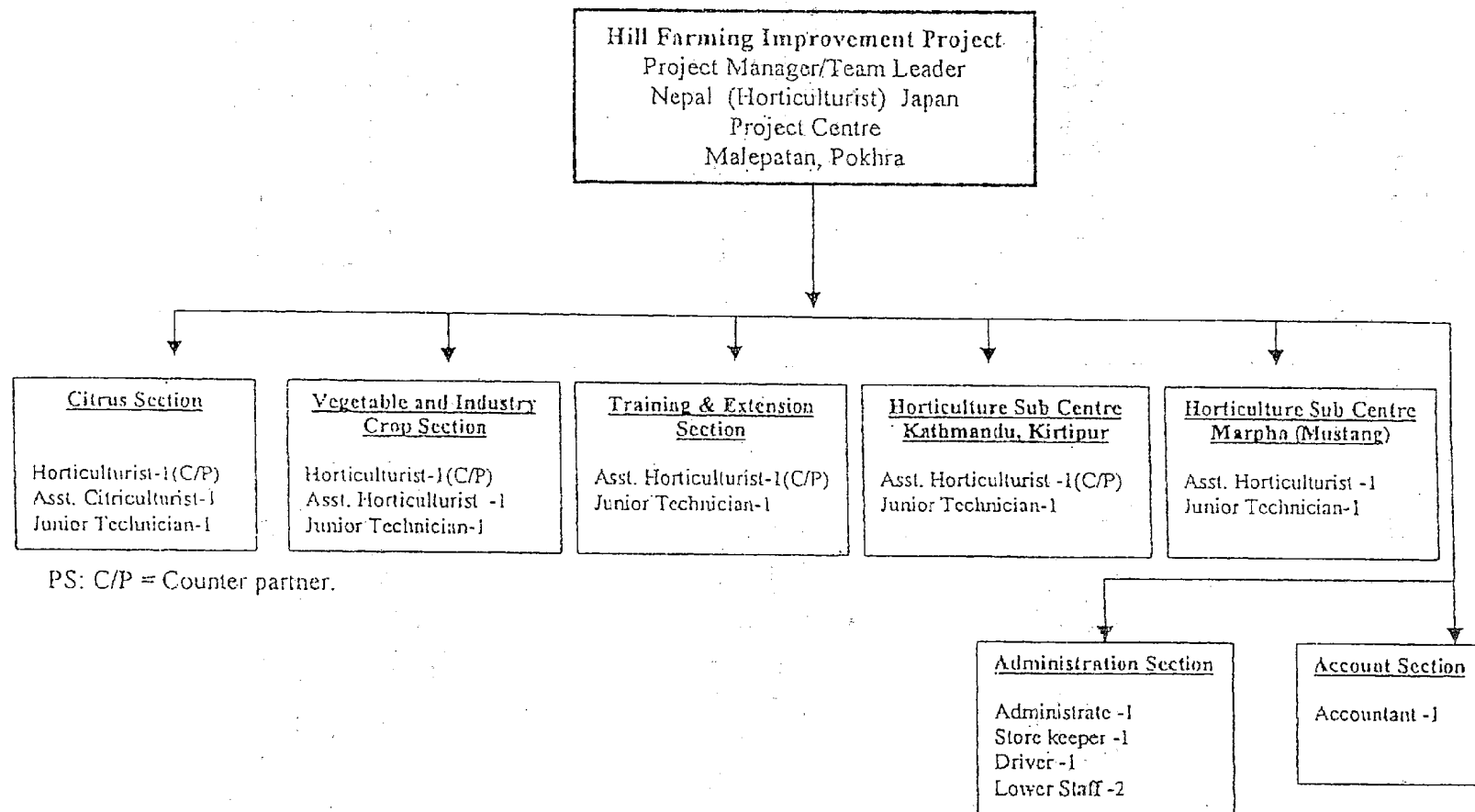
Ministry of Agriculture Organization Chart



Project Organization Chart



Proposed Project Organization Chart



付属資料 8. NEPAL AFRICULTURE PERSPECTIVE PLAN (APP) 抜粋

Prepared for:

National Planning Commission
His Majesty's Government of Nepal
and
Asian Development Bank
(T. A. No. 1854-NEP)

NEPAL

AGRICULTURE PERSPECTIVE PLAN

1995/96-2014/15 A. D.
(2052/53-2071/72 B. S.)

(Final Report)

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SUMMARY DOCUMENT

Agricultural Projects Services Centre
Kathmandu
and
John Mellor Associates, Inc.
Washington, D. C.

June 1995



APROSC

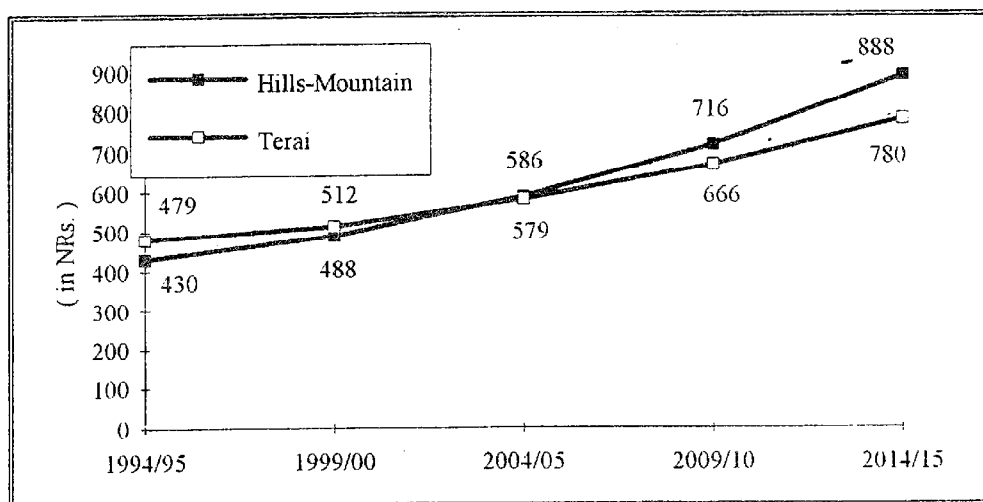


9. PRIORITY OUTPUT: HIGH-VALUE CROPS

Over the course of the APP, the income from high-value crops is expected to triple. The annual growth rate of these crops will accelerate from 4.8 percent during the base period to 5.8 percent during the end period, while its share in AGDP will increase from 13 to 15 percent during the same period. The production may expand at possibly even higher rates than predicted because high-value crops have strong export potential. Indeed, their development requires an export-driven strategy. It shows great potential as a provider of off-season vegetables, and thereby illustrates the strategic complementarity between the terai and the hills and mountains.

Horticulture is more dominant in the hills and mountains than in the terai and the APP envisages a somewhat higher growth rate in the hills and mountains. As a consequence, the per capita horticultural GDP in the hills and mountains will be higher than that in the terai after the second period of the APP (figure S-6).

Figure S-6. Growth Path of Per Capita Horticultural GDP in Terai and Hills and Mountains.



Source: APP calculations.

The growth rate for horticulture is considered as demand-driven. Horticultural crops are risky enterprises and the policies for the sector will have to deal with risk minimizing measures through research, infrastructure, strong support services, and credit programs.

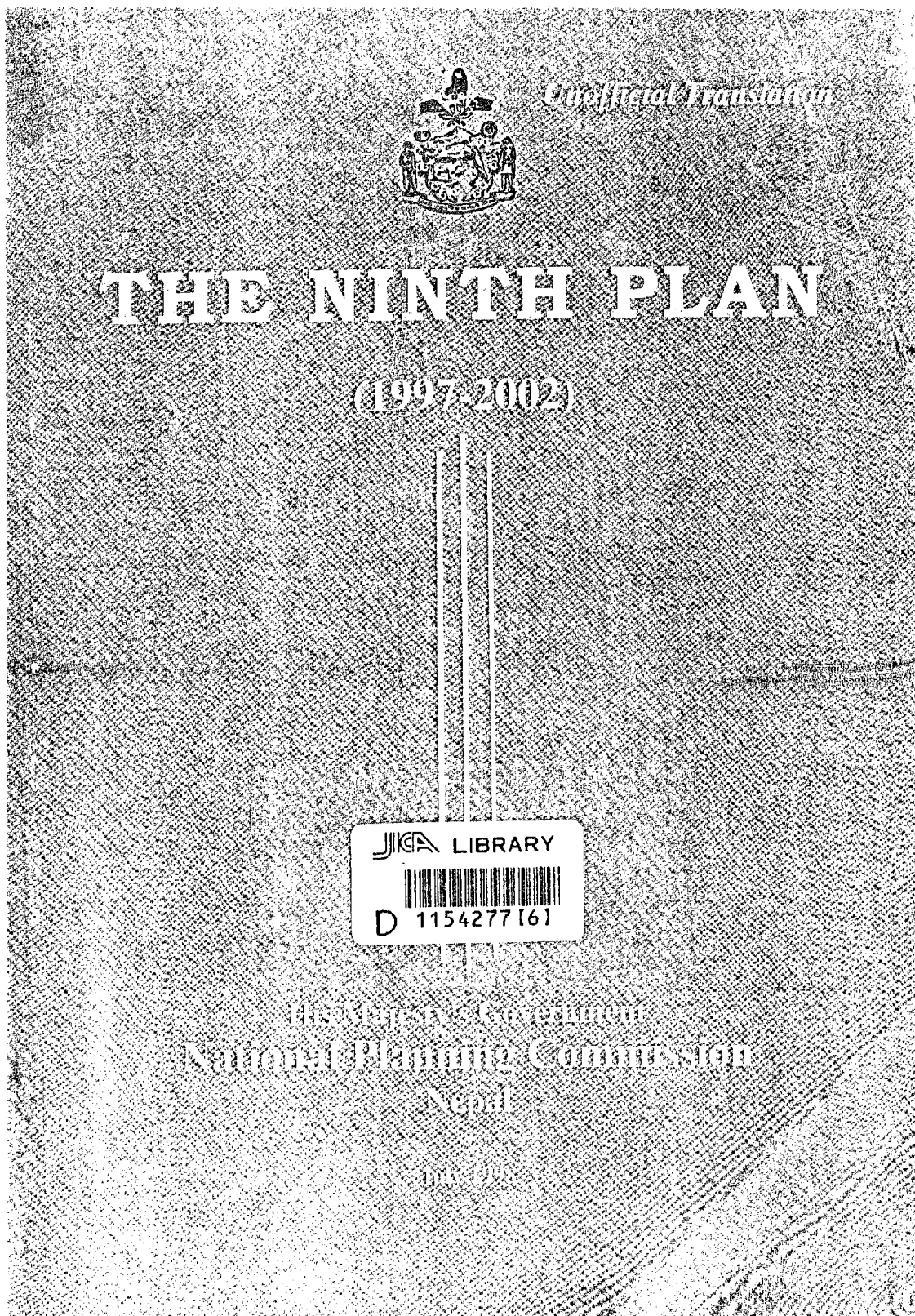
The APP strategy for the high-value crops sector is a private sector strategy. The role of government agencies, while important, is small. The strategy emphasizes raising incomes, and hence effective demand, investment in roads to increase the

regional participation in high-value crop production; investment in irrigation to reduce the risks in high-value commodities; strong research support, again to reduce risk; and strong support of the Department of Agricultural Development in several activities, primarily to assist private sector development.

Tree crops are a major component of high-value crops and of course have a favorable environmental impact, particularly on hill slopes. Similarly, women play a vital role in the production of all high-value commodities, most notably in sericulture, vegetables, ginger, and vegetable seeds.

Commodity Priorities: The APP priorities limiting the number of commodities emphasized to allow scale economies include:

- citrus, throughout the mid-hills;
- apple, in the inner Himalayan zone,
- off-season vegetables in the hills as well as the terai;
- vegetable and flower seed in the hills and mountains;
- beekeeping products in the hills and mountains; and
- raw silk in the hills.



9.2 High Value Crops Production Programme :

There will be enough possibilities to produce comparatively advantageous high value crops in different ecological zones on the basis of ecological diversity of the country.

High value crops are especially horticulture crops such as citrus based fruits, apple, seasonal and off-seasonal fresh vegetable, vegetable seed production, bee keeping, sericulture, floriculture and commercial farming and other crops such as tea, coffee and spices crops. Such high value crops are mainly export oriented. The farming of such crops will generate five times more income than that of food crops in mountainous area with road facilities. Such farming will help improve the environment by stopping landslide and land degradation, especially through cultivation of fruit plant and providing food security through the increase of purchasing capacity from the income generated by high value crops. This will especially benefit women community. Thus, it is necessary to focus special attention to the expansion and development of these high value crops.

An analysis of areas under high value crops shows that during the Eighth Plan period, vegetable, potato, cardamom, and mulberry (silk) areas were slightly more than targeted but the area coverage by fruit, tea and coffee were less than targeted. In production side, citrus fruit production has not been achieved according to its target but the production of other fruits has been more than the target. Production of the vegetable, cardamom and tea has achieved its target. The production target of coffee, silk and potato has not been achieved.

Table 7
Progress of some major high value agricultural products in the Eighth Plan
(Area in '000 ha; Production in '000 mt ; Yield in mt /ha)

| | Unit | Target of the Eight Plan | | | Level of 1996/97 | | |
|-----------------------------|------|--------------------------|------------|-------|------------------|------------|-------|
| | mt | Area | Production | Yield | Area | Production | Yield |
| Fruits | | | | | | | |
| Citrus | " | 17463 | 105325 | 9.82 | 15924 | 92994 | 9.97 |
| Others | " | 47620 | 275212 | 10.29 | 46996 | 335231 | 10.17 |
| Total | " | 65083 | 380537 | 9.0 | 62920 | 428225 | 10.13 |
| Vegetables | " | 14,1000 | 1278000 | 9.1 | 145000 | 1350000 | 9.31 |
| Vegetable seed distribution | " | - | 181.6 | - | - | 261 | - |
| Potato production | " | 96,000 | 10,33,000 | 10.76 | 109800 | 961490 | 8.76 |
| Cardamom | " | 7411 | 3540 | - | 9554 | 4456 | - |
| Tea | " | 4187 | 2485 | - | 3564 | 2905 | - |
| Coffee | " | 350 | 153 | 0.3 | 300 | 37 | - |
| Silk production | " | 533 | 300 | - | 1127 | 24.5 | - |
| Honey production | " | - | 50 | - | - | 60 | - |

Inadequate supply of technical services and production inputs, inefficient mobilisation of manpower and budgets are the major problems in production and development of high value crops. Quality production is also a problem. Processing capacity has not been adequately developed and producers are not working in an organised manner to mobilise the scattered production. Appropriate technology was also not available adequately in such crops due to the lack of co-ordination among units that rendered resource and the services. Supervision and evaluation of such activities have not been done in an effective way.

High value crops have great potential in improving environment through planting of fruit in marginal land, providing food security from income generation, providing three times employment opportunities to women, helping increase value added, bringing diversification and commercialisation in agriculture and possibility of earning income five times more than food crops since this sector is the priority sector of the APP. The programmes for the development of this sector in the Ninth Plan need focus obviously.

In this background, the food crop oriented subsistence agriculture system has to be transformed to diversification and commercialisation in agriculture by adopting the

production system of high value crops, which are comparatively more profitable than other crops in specific ecosystem. This will help promote agriculture industry, increase employment opportunities and improve economic growth rate. The programme to boost the production of high value crops will be launched to bring sustainable agricultural development by improving women leadership in decision making process.

Policy-oriented Programme:

- Programme will be launched to develop pocket area of appropriate agriculture land in such a way that agriculture product will be produced in commercial way. Considerations will be given to export and sale in local market on the basis of possibility of availability of necessary services. Commercialisation of bee keeping, silk farming, off-seasonal fresh vegetables and vegetable seed, high value fruit such as orange varieties and apples will be achieved by encouraging farmers group or private entrepreneurs in areas accessible by road.
- Programmes will be launched to make necessary services available on the basis of comparatively profitable production programmes such as marketable cut flowers, special fruit and food crops. Supply of qualitative resource inputs for the execution of programmes to establish co-ordination among marketing centres, processing industries and the producers will be ensured.
- Co-ordination will be established among the related sectors in order to manage rural electrification and to construct agriculture roads linking with potential production pocket areas. Programme will be executed to provide transportation facilities to local resource centres until the resources are not fully developed and available in local area for the production of high value crops. Special attention will be given to minimise environmental pollution by applying integrated plant protection technology through the use of pesticide and to facilitate all marketing services of products, agriculture inputs, technical services and agriculture training in package form.
- Pay back period of agriculture credit taken for the crops, which take longer time to produce, will be amended and the process to get credit will be made easy and cost effective. Monitoring and evaluation of each programme will be carried out effectively to formulate time bound projects in pocket area with active participation of farmers of identified pockets so as to mobilise agriculture technical services, to help promote agriculture profession, extension services by bringing co-ordination among the programmes of financial institutions. The members of district agricultural development committee will execute the plans after selecting pocket area and monitor the development programmes.
- A separate arrangement will be made to look after high value crops as a national priority programme. An authority responsible for production, research, marketing and national level co-ordination of the programme will be fixed. Technical staff relating to high value crops will be provided with career development opportunities in the specific programme area.

- Horticulture farm resources will be fully utilised by using the concept of programme operating fund on the basis of cost-effective production and motivation to the employees. Such farms will be the main resource centres of improved genetic material.
- Programmes will be launched to disseminate the information from pocket area to central level by removing the pitfalls in the process of data collection, analysis and publication, especially in pocket area of high value crop production.
- Programme will be launched in order to co-ordinate and disseminate appropriate technology developed by agriculture research, to provide training for capacity building of personnel, to increase the role of women in decision making process of agriculture profession and to provide regular training to technical staff of local and the central level.

Priority Programme:

Citrus Development

Since citrus fruit like tangerines, oranges and the lemons can help increase the farmers' income in mid hills, the programme will be launched in potential pocket areas with priority.

Commercial Citrus Orchard Development Programme

- Commercial orchard establishment programme will be implemented as a campaign in potential pocket areas of districts where citrus fruit farming especially in mid hills connected by highways, feeder roads or roads to be constructed in future. The situation of highway, feeder roads, populated area, transportation infrastructure or nearby pocket areas or easily accessible in a day on foot from the road-head will be taken into consideration while developing commercial orchards.
- Activities will be implemented to set up farmers' groups in order to develop pocket area under commercial orchard establishment programme. Technology related to all activities from planting to fruit marketing will be delivered through farmers groups.
- Co-ordinated research activities will be carried out by establishing co-ordination with Nepal Agriculture Research Council to carry out research works for solving the problems faced by farmers especially in citrus type fruit farming.
- Marketing will be facilitated with construction of cold storage and collection centre with the active participation of farmers' groups or commercial groups in different places of the country to minimise post harvest loss and to provide proper price to fruit products. Packaging will be improved. Special subsidies will be provided in electricity bill and packing equipment used to sell preserved fresh fruit in cold store and to open industry related to the processing of citrus fruits.
- The private sector will be encouraged to export of citrus fruits by exploring markets and providing information related to these markets.

Nursery Establishment and Strengthening Programme

The demand for the fruit plants for establishing citrus orchards will be supplied through the farms and the private sector nurseries. Focus will be on the private nursery establishment and strengthening of private nursery in the district so as to supply citrus fruit plants from the local resource centre. Government farms will complement the supply of such plants. Private nurseries will be established according to the needs of district for the sake of expansion of fruit farming. Old nurseries will be strengthened to increase their capacity to produce qualitative plants in a competitive way.

There will be a ban to bring or send out citrus plants from disease prone area. Legal act will be formulated for the sale and distribution of quality fruit plants and certify high quality scion for the production of fruit plant.

Demonstration Programme

Management Demonstration: The programme for the demonstration of establishment and management of model citrus orchards will be launched in joint technical supervision of technical staff in the service centre and horticulturist of concerned district. Producer farmers from the potential pocket area will be chosen under this programme. The model orchard will be developed as training site for that pocket area. At most, 15 model orchards will be developed in each district in such a way that farmers groups will have model orchards. Established model orchards will be strengthened through providing continuous technical services.

Promotion of Orchard in Other Areas: Problem solving demonstration programme will be executed for solving the problems faced by citrus fruit farmers. Activities for preventing and controlling citrus orchard disease such as pest control demonstration, pruning and use of micro nutrients inter-crop and green manure demonstration, weeding, mulching and irrigation demonstration activities will be launched through the participation of efficient manpower and farmers' groups. Demonstration programmes will be launched from time to time by evaluating its effectiveness.

Beehive Demonstration: Since bees help increase pollination and production, demonstration programmes will be carried out through keeping beehives in the orchards. The bee-keeping farmers will be the resource persons to provide training on beehive and bee-keeping to farmers. Such programme will be implemented under bee development programme.

Other Programme

Kitchen Garden Development: Fruit plants, required by the farmers will be made available from local resource centre of potential districts. Kitchen gardening programme will be executed to increase the farmers' income and nutritional status of common people. Such programme will include regular technical services.

Physical Target: During the Ninth Plan period, commercial gardening of citrus fruit will cover additional 3,400 hectares and kitchen gardening an additional 1,600

hectares. From the existing plants, it is projected that citrus fruit production will be 126,000 mt during the Ninth Plan. It is also projected that productivity will be 1,050 mt at the end of the Ninth Plan from 9.97 mt of the base year. Productivity of the commercial orchards under the priority programme will reach 11.5 mt from the present 11 mt.

Table- 8
Projected area extension of citrus fruit in the Ninth Plan

| | Programme | Additional area of the Ninth Plan (Ha) | | | | |
|----------------|-----------|--|---------|-----------|---------|---------|
| | | 1997/98 | 1998/99 | 1999/2000 | 2000/01 | 2001/02 |
| Commercial | 580 | 620 | 680 | 740 | 780 | 3400 |
| Kitchen garden | 300 | 310 | 320 | 330 | 340 | 1600 |
| Total | 880 | 930 | 1000 | 1070 | 1120 | 5000 |

Table 9
Projected production of Citrus fruits in the Ninth Plan
Area: ha, Production: mt, Yield:mt /ha

| Programme | Status as of 1996/97(approx) | | | | Projection for the Ninth Plan (FY 2001/02) | | | |
|----------------|-------------------------------|-----------------|-------|-----------------------|--|-----------------|-------|-----------------------|
| | Total area | Productive area | Yield | Production joint area | Total area | Productive area | Yield | Production joint area |
| Commercial | 9236 | 5411 | 11 | 59525 | 12636 | 7200 | 11.5 | 82800 |
| Kitchen garden | 6688 | 3919 | 8.55 | 33469 | 8288 | 4800 | 9 | 43200 |
| Total | 15924 | 9330 | 9.97 | 92994 | 20924 | 12000 | 10.5 | 126000 |

• **Apple Farming:**

Commercial Apple Orchard Development Programme

- Commercial apple gardening programme will be launched in successful pocket areas of mid hills and high hills of western, mid-western and far-western regions by focussing on apple production programme, especially in potential pocket area of high hill districts of Karnali zone. Technology dissemination programme will be implemented through farmers' groups. Agriculture inputs necessary for the farmers will be made available at the production site by easy procedure from Agriculture Inputs Corporation, co-operative society, related institution or private sector. Special training package will be given to apple producing farmers about apple orchard establishment and technology that includes fruit packaging time,

- fruit picking process, fruit storage, packing and fruit transportation activities and adoption of special precaution.
- Special attention will be given to the use of integrated plant nutrition management activities for the preservation and management of soil fertility of apple orchard by thick mulching to increase quantity of compost for maintaining wetness in the orchard. Appropriate water ponds will be constructed by mobilising the farmer/farmer groups, wherever possible.
- Priority will be given to construct, gravitational ropeway, short-distance ropeway and agriculture roads in the potential apple production sites.
- Internal marketing system will be efficiently managed for apple sale. Search for apple export will be carried out. Farmer groups will be mobilised to build collection centres and cellar store in the production sites. Agriculture credit will be made available to construct small cold store near the airport and potential urban areas. Minimum import tax will be levied on equipment needed for cold store construction. Operation of cold store will be made cost effective by subsidising electricity bill.
- Private entrepreneurs will be encouraged to establish apples processing industry by providing them technical services. Women will be encouraged to set up cottage industry for apples processing by providing them training on the use of small-scale technology in the production sites.
- Statistics on apple farming will be maintained up-to-date by conducting survey on production cost and collection of apple farming data. Co-ordination will be established with the research component so as to make apple-farming production oriented according to the needs of farmers and market.

Nursery establishment and Strengthening Programme

Private nursery will be given special priority for the production and supply of apple plants needed for apple orchards. A minimum of two nurseries will be established in private farms for the production of apple saplings in the potential districts. Nursery strengthening programme will be launched to maintain old nurseries.

Nursery establishment and management technology kit will be made available to the nursery owners. Horticulture centres will be made responsible to supervise and monitor nursery management and their registration.

Demonstration Programmes

Problem Solving Demonstration: Demonstration programme will be launched for inter cropping such as soybean in order to increase soil fertility in the orchard until the beginning of apple production. Demonstration programme such as apple pruning, integrated plant protection for apple disease and pest, integrated plant nutrition management for orchard nutrition will be launched to solve the problems faced by apple producing farmers.

Model Orchard Establishment And Management Demonstration: Model orchard will be established in the selected private farm of apple production pocket area with

the objective of supporting commercial orchard management activities to be done by apple orcharder. Programme will be implemented to impart site training for the development of resource centre in the pocket area to make it effective through technical supervision.

Beehive Demonstration: Demonstration programme will be launched by keeping beehive in the apple orchard since bees help in pollination to increase apple production. Resource centre will be developed by making farmers and farmers' groups efficient to impart training in beehives management and bee-keeping. Commercial entomology development programme and bees development programme will provide necessary technical services in order to launch beehive demonstration programme.

Other Programme

Kitchen Garden Programme: Regular technical services will be provided to the farmers of apple production districts to execute kitchen gardening programme where few saplings will be grown in their orchards inaccessible by roads.

Physical Target: Additional 2,275 ha will be covered by apple orchards in the Ninth Plan period. A total of 31,397 mt apple production is projected in this plan by strengthening old orchards and establishing new orchards.

Table- 10
Projection of the Apple area extension in the Ninth Plan
Area: ha

| Programme | Additional area in the Ninth Plan | | | | | |
|-------------------|-----------------------------------|---------|-----------|---------|---------|-------|
| | 1997/98 | 1998/99 | 1999/2000 | 2000/01 | 2001/02 | Total |
| Commercial | 117 | 169 | 264 | 626 | 825 | 2000 |
| Kitchen gardening | 72 | 65 | 55 | 45 | 38 | 275 |
| Total | 189 | 234 | 319 | 671 | 862 | 2275 |

Table- 11
Projection of apple production in the Ninth Plan.
Area: ha Production: mt, Yield: mt /ha

| Programme | Estimated Status as of 1996/97 | | | | Projection for the Ninth Plan (FY 2001/02) | | | |
|-------------------|--------------------------------|-----------------|-------|------------|--|-----------------|-------|------------|
| | Total area | Productive area | Yield | Production | Total area | Productive area | Yield | Production |
| Commercial | 2352 | 1520 | 10.6 | 16112 | 4352 | 1650 | 10.8 | 17820 |
| Kitchen gardening | 2300 | 1486 | 8.4 | 12483 | 2575 | 1614 | 8.4 | 13577 |
| Total | 4652 | 3006 | 9.5 | 28595 | 6927 | 3264 | 9.6 | 31397 |

- **Bee-keeping**

- **Other fruit-crops**

The prioritised fruit and vegetable programmes as guided by the agriculture perspective plan have been described above. Programme will be conducted to provide basic service to promote production programme of high value agricultural commodities like pear, walnut, peach, plum, persimmon, pomegranate, lemon, groundnut and grapes, among the temperate fruits; mango, banana, guava, papaya, jackfruit, lichi, nut, coconut among the tropical fruits; ginger, turmeric, garlic and chilly among the spices; and mushroom.

Priority: While conducting production programme of these crops, priority will be given to mobilise facilities like support service, training, credit on the basis of package in order to develop commercial orchard.

Physical target: The projection of area and production of fruits and spices crops as mentioned in the Ninth Plan are shown below. The services to be provided to develop commercial orchard along with other basic technical information for kitchen gardening will contribute to achieve these physical targets (Table 17). Fruit production projection, as a whole, is shown in table 18.

Table- 17
The Production target of other fruit and spices in the Ninth Plan

| Programme | Estimation of FY 1996/97 | | Estimation of FY 2001/02 | |
|-------------|--------------------------|------------------|--------------------------|------------------|
| | Area (ha) | Production (mt) | Area (ha) | Production (mt) |
| Other Fruit | 42344 | 306636 | 45469 | 342603 |
| Spices | 11636 | 87208 | 12000 | 89800 |
| Cardamom | 9554 | 4456 | 10000 | 4700 |

Table- 18
The Projection of overall Production of Major fruit in the Ninth Plan
Area: ha; Production:mt ; Yield: mt /ha

| Programme | Estimated Situation as of 2001/02 | | | | Target of the Ninth Plan (2001/02) | | | |
|------------------------|-----------------------------------|-----------------|-------|------------|------------------------------------|-----------------|-------|------------|
| | Total Area | Productive area | Yield | Production | Total Area | Productive Area | Yield | Production |
| Commercial | | | | | | | | |
| Citrus Fruit | 9236 | 5441 | 11 | 59525 | 14236 | 7200 | 11.50 | 82800 |
| Apple | 2352 | 1520 | 10.60 | 16112 | 4352 | 1650 | 10.80 | 17820 |
| Others | 11856 | 8385 | 10.40 | 87214 | 13775 | 10357 | 10.69 | 110748 |
| Kitchen orchard | | | | | | | | |
| Citrus Fruit | 6688 | 3919 | 8.55 | 33469 | 7238 | 8400 | 9.00 | 43200 |
| Apple | 2300 | 1486 | 8.40 | 12483 | 2575 | 1614 | 8.40 | 13577 |
| Others | 30488 | 21563 | 10.17 | 219422 | 33724 | 25358 | 10.71 | 271721 |
| Total | 62920 | 42285 | 10.13 | 428225 | 73870 | 48079 | 10.40 | 500000 |
| Citrus fruits | 15924 | 9330 | 9.97 | 92994 | 21474 | 12000 | 10.50 | 126000 |
| Apple | 4652 | 3006 | 9.50 | 28595 | 6927 | 3264 | 9.62 | 31397 |
| Others | 42344 | 29949 | 10.24 | 306636 | 45469 | 32815 | 10.44 | 342603 |

Training and Manpower Development:

To conduct production programme of prioritised high value agricultural commodities, necessary additional manpower and training will be arranged in the plan period.

Available manpower will be mobilised in the prioritised areas providing the chances of career development.

Monitoring and Evaluation:

To implement the programme successfully and effectively, commodity-wise programmes will continuously monitor the planned programme and implementation situation, and make the reports available. On the whole, district offices will monitor service centres, and regional offices will monitor district offices and farm centres. On the basis of need, the central office will monitor regions, districts and farms. To make the monitoring effective, responsible personnel will be assigned to monitor and evaluate whether the high value agricultural commodity programme is conducted as directed by the central office according to agriculture perspective plan.

Table 3
Major Agricultural production
(base year 1996/97 = 100)

| Particulars | Weigh- tage | Produc- tion target for FY 1996/ 97 (000mt) | Produc- tion Target for FY 2001/02 (000mt) | Percentage | | | |
|---|----------------|---|---|------------|-------------------|------------------------|--------------------------|
| | | | | Total | Annual average | weightage increment | Annual in- crement |
| <u>Cereals</u> | 41.13 | | | | | 52.94 | 5.18 |
| Paddy | 23.10 | 3699 | 5000 | 135.7 | 6.21 | 31.42 | |
| Maize | 9.98 | 1313 | 1600 | 121.95 | 4.04 | 12.17 | |
| Wheat | 5.10 | 1056 | 1300 | 123.11 | 4.25 | 6.28 | |
| Millet | 2.66 | 289 | 300 | 103.81 | 0.8 | 2.76 | |
| Barley | 0.29 | 39 | 42 | 107.69 | 1.5 | 0.31 | |
| <u>Cash crop</u> | 6.62 | | | | | 9.07 | 6.50 |
| Sugarcane | 0.46 | 1622 | 2100 | 129.47 | 5.30 | 0.60 | |
| Oil seed | 2.02 | 119 | 155 | 130.25 | 5.43 | 2.63 | |
| Tobacco | 0.40 | 5 | 6.5 | 130.00 | 5.39 | 0.52 | |
| Jute | 0.62 | 14 | 18 | 128.87 | 5.15 | 0.80 | |
| Potato | 3.12 | 961 | 1300 | 135.27 | 6.22 | 4.22 | |
| Pulses | 2.17 | 224 | 300 | 133.93 | 6.02 | 2.91 | 6.04 |
| <u>Horticultur e</u> | 13.84 | | | | | 16.47 | 3.54 |
| Fruit | 7.04 | 428 | 500 | 116.82 | 3.16 | 8.22 | |
| Vegetable | 4.82 | 1350 | 1716 | 127.11 | 4.91 | 6.13 | |
| Others | 1.98 | 96 | 103 | 107.29 | 1.42 | 2.12 | |
| Total crops | 63.76 | | | | | 81.39 | 5.00 |
| <u>Total of Livestock- Products</u> | 35.78 | | | | | 47.56 | |
| Milk | 22.42 | 1012 | 1326 | 131.03 | 5.56 | 29.38 | |
| Meat | 11.56 | 174 | 235 | 135.21 | 6.22 | 15.63 | |
| Egg(Millio n) | 18.0 | 42 | 595 | 141.67 | 7.21 | 2.55 | |
| Fish | 0.46 | 23 | 35 | 152.18 | 8.76 | 0.70 | 8.76 |
| Grand Total | 100.00 | | | | | 129.63 | 5.33 |