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Success and Failure of Seed Multiplication through Agriculture Resources Centres in Nepal

Research Project

Submitted to

Van Hall Larenstein University of Applied Sciences

In Partial Fulfilment of the Requirements for

Master's Degree in Management of Development

Specialization "Rural Development and Food Security"

By

Sagar Dhakal

September, 2011

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The Netherlands

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Cover photo: Store-cum office buildings in ARC Machhagad and Betahani, and old seed grading Machine in ARC Khairapur (Photo by Sagar Dhakal (2011)

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Sagar Dhakal

Wageningen

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Dedicated to My Beloved Wife Rachana Dhakal for her patience and encouragements

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ACRONYMS

ADB	Asian Development Bank
APP	Agriculture Perspective Plan
ARC	Agriculture Recourse Centres
ASC	Agriculture Service Centre
CBO	Community Based Organization
CDD	Crops Development Directorate
CEAPRED	Centre for Environmental and Agricultural Policy Research, Extension and Development
DADO	District Agricultural Development Office
DISSPRO	District Seed Self Sufficiency Programme
DOA	Department of Agriculture
FG	Farmers Group
FM	Frequency Modulation
FO	Farmers organization
FORWARD	Forum for Rural Welfare and Agriculture Reform for Development
FY	Fiscal Year
GATE Nepal	Global Agri Tech, Nepal
GDP	Gross Domestic Product
GON	Government of Nepal
Ha	Hectare
Li-BIRD	Local Initiatives for Biodiversity research and development
MOAC	Ministry of Agriculture & Cooperatives
MOF	Ministry of Finance
MT	Metric Ton
NGO	Non-Governmental Organization
NRs	Nepalese Rupees
NSB	National Seed Board
NSC	National Seed Company
RARS	Regional Agriculture Research Centre
RSTL	Regional Seed Testing Laboratory
SCDP	Secondary Crop Development Project
SEAN	Seed Entrepreneurs' Association of Nepal
SQCC	Seed quality Control Centre
SRR	Seed Replacement Rates

EQUIVALENTS

Currencies (as of 5 September, 2011)
Euro (€) 1 = NRs. 103.87
US $ 1 = NRs. 72.95

ABSTRACT

This was a thesis research carried out in participation of stakeholders to analyse the underlying reasons for the limited success of Agriculture Resource Centres (ARCs) and make recommendation about the alternate way of supporting seed producer groups to make their business viable. ARCs were established by Secondary Crop Development Project (SCDP) which was implemented from 1989 to 1997. ARCs were actively involved in seed multiplication during project, but majority of them could not continue after the project termination.

This research was carried out in two SCDP districts namely Banke and Bardiya. These districts bear immense potentialities of seed multiplication, and ARCs in these districts were most vibrant one during project period. A case study of four ARCs in two districts was made. Focus group discussion and interview with key informant were the selected research tools.

Three ARCs among the four studied were found inactive, only ARC Betahani is multiplying seed at present. The rest three could not continue more than 3 years after termination of project. It was found that ARC Machhagad and Bankatawa were tangled in internal disputes, which could not managed by them. At the same time, they were getting very little support from DADO after termination of the project. The disputes were related to compensation demanded by land donor in Machhagad; and financial cheating by some of board members in Bankatawa. Demotivation of farmers after reduction in support service and marketing constraints were found the cause of collapse for ARC Khairapur. Contrary, support service remained continued at ARC Betahani, which made it possible to continue the seed business. Support from DADO was severely reduced at ARC Machhagad, Bankatawa, and Khairapur, but it was mildly reduced at ARC Betahani after termination of project.

The project support for ARCs was found concentrated on technical part of seed production. However, they got very little support regarding group management, entrepreneurship and marketing promotion. Seed production is not merely a technical job; it is a business and requires business skills. Unfortunately these skills were not adequately developed in ARCs. The marketing of seed was coordinated by DADO during the project. Lack of group management capacities was found the reason for collapse of ARC Machhagad and Bankatawa; while inadequate marketing skill remained a bottleneck for ARC Khairapur. Though ARC Betahani is continuing seed production; their marketing capacity was still not properly developed, they were not being able to carry our marketing promotion activities.

The supply of source seed was found adequate for ARCs. However, the supply of chemical fertilize was found irregular. Seed business was economically beneficial for producer farmers and ARCs as well. There is great gap between seed supply and requirements in Nepal, opportunities are there to expand the seed business for ARCs and rest of farmers groups as well. All ARCs developed welfare fund, which is very helpful for them to purchase equipment, fertilizer and raw seeds. The rules and regulations of ARCs were developed on mutual understanding, they were not binding type. As a result, members were crossing the rules, which lead for dispute. The persisting disputes and cheating of resources depicts the lack of maturity in ARC management body. Scaling up could realised in ARC Betahani only, which is now a member of local cooperatives. ARCs had sold certified seed, still they know very little about truthful labelling. They were operating in formal seed sector only. Linking with informal seed sector seems to give new market opportunities for seed producers.

Based on findings, it is recommended to provide the business skills for seed producers from the beginning. It seemed more logical to provide the big capital supports to somewhat matured group. The need of binding rules in seed groups is clearly observed. There is need of revision on land buying policy of public agencies; flexibility is required to buy land if necessary. ARC need to carry out market promotion activities, for example, advertising by radio, pamphlet, and increasing the selling outlets. Supporters' role is important in this segment. ARC members know little about truthful labelling; they need to be trained on it. There is need of supporting the seed producers groups to adopt integrated way of seed supply; current seed policies should be revised accordingly. There are still possibilities of resuming seed business in inactive ARCs; reorganisation of management body or merging them in existing local cooperatives can be a strategy for reviving them.

CHAPTER 1: INTRODUCTION

1.1 Background

Agriculture is the major source of livelihood of in Nepal; it contributes 33.1% in national DGP (MOAC, 2010). Several programme and projects are being implemented in Nepal for the development in agriculture sector since 1951 with initiation of planned development programmes. Secondary crop development project (SCDP) was implemented in 6 districts of western Nepal (Namely, Dang, Banke, Bardia, Surkhet, Salyan and Jumla) from 1989 to 1997 with the aim of increasing secondary crops production to meet domestic and external demand, to provide additional employment, and to raise the income of small farmers (ADB, 1999). The objectives were to be achieved through measures to strengthen research on secondary crops, agricultural extension, seed multiplication, provision of credit, and consultant services (ADB, 1999).

Strengthening of seed multiplication programme at farmers' level was one of the project emphases. From 1992 to 1997, the project formed 106 farmers groups in 6 districts (ADB, 1999). Seed multiplication was one of the targeted activities of groups. For this purpose, Agriculture Resources Centres established by project in districts, there are 4 ARCs in Banke and Bardiya district. Farmers based seed production was initiated to establish a self-sustaining seed production and supply system at village level. The concept of ARC had its foundation in formal seed supply system.

Formal sector has very limited capacity in Nepal to supply the improved seeds. Study has shown that formal sector is providing only 6% of total seeds in food crops (GON and ADB, 2010). Informal sector is major source of seed supply food crops. It provides 94% of total seed requirement in Nepal.

Several programmes seem to be implemented in the past to strengthen the seed business at farmers' level. Farmers were organised in groups and were provided with skill development and materials supports. However, several cases of failure in seed business are reported. Poudel, et al., (2003) described the case of collapse of seed producing groups after removal of support from donor in 6 districts of Nepal under SPIN project (1992-1997) supported by FAO. Formal seed sector of Nepal is not strong yet in spite of the considerable commitment and support activities from the government and donors to strengthen the sector since the beginning of the seventies (Shrestha and Wullf, 2007).

The case of failure of ARC is not studied yet by any author. Why some of them are collapsed, and what make few of them to still operate are the key questions to be answered, understanding of underlying reasons for these questions seems important to make plan the alternative actions for establishing self-sustaining seed producing groups at community level in coming days. The current programmes for farmer based seed production are still not able to give substantial result to improve the seed supply situation in Nepal (GON and ADB, 2010)

1.2 Agriculture resource centers (ARC) under SCDP

Facilitating the seed production, processing, storage and marketing; four Agriculture Resource Centres (ARCs) were established by SCDP in study districts. ARCs were established in rest of project district also, but they were of small capacity and not well established even during the project (Annex-B). Each ARCs consists of three parts namely, i.

Threshing and storage structures, ii. Seed producing farmer groups or sub groups and, iii. Management body.

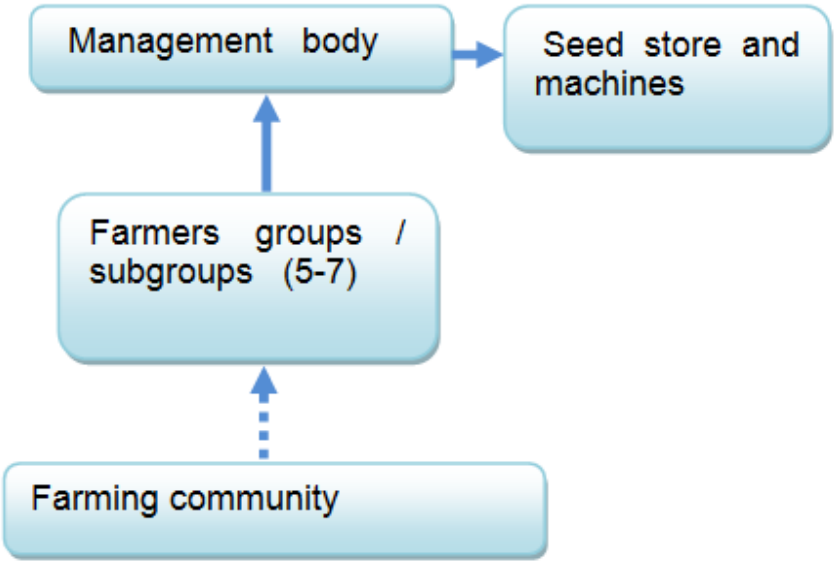

Figure 1. Components in ARCs

1.2.1 Seed producing farmers

Each ARC has identified their command area. Within the command area, 5-7 farmers groups or sub groups were formed. There is no uniformity in naming of seed producing groups in command area of ARC, somewhere they were named as farmers group or somewhere they were named as farmers sub-group. Sometimes, the sub groups were consisting only women and hence known as women sub-groups. Seed producers are mostly the members of group /sub-group. Non-member farmers involved in seed production if their plot is adjacent to plots of members or if somebody is oneself motivated for seed production.

1.2.2 Storage

Threshing and storage structures were constructed in each centre. The stores were of 40 MT capacities. Store building comprised of one small meeting room, one big store room, and PCC threshing floor outside the building. Project provided equipment like weighing balance, seed grading machine and seed racks for each ARCs.

1.2.3 Management body

The structure of operating body was not uniform for all ARCs. In first type, one farmer group was formed who also worked as operating body and sub-groups were formed in its command area. This type of management was reported in ARC Machhagad, Betahani and Khairapur. In second type, an ARC management committee was developed through participation from all farmers groups formed in ARC command area. This type was reported in ARC Bankatawa.

1.3 Sustainability of projects

The projects are expected to continue and grow even after the termination of funding period. Project or Programme Sustainability is about maintaining and continuing program services after the funding period is over (AIDA, 2001). Sustainability of outputs is one of the major concerns for project. If we see the case of seed production, there are rare examples of project supported community based seed production enterprise that became successful (Tripp and Rohrbach, 2001 cited in Witcombe, et al., 2010). This is a serious problem and need to be addressed for long term benefit of community. Sustainability has 3 dimensions, namely

i. Economic
ii. Social
iii. Environmental

These dimensions are interrelated. The program to be sustainable, it should be economically beneficial, socially equitable and environmentally safe. The project sustainability is possible only if it can satisfy the conditions for economic, social and environmental sustainability.

1.4 Significance of the study

My organization, DOA, is implementing seed multiplication programs at community level by organizing farmers in groups. However, the supply of improved quality seed is still very low in Nepal (GON and ADB, 2010). Farmer based seed supply is not well established in Nepal (Poudel, et al., 2003); only few of seed producer groups are successful in their business. DOA is currently implementing DISSPRO and commercial seed multiplication program. These all programs involve the common element that is group of farmer and seed business by them. Little study has been made regarding the performance of seed production farmers groups. In the absence of documentation, getting feedback from past experience is not possible. If there is no feedback, the planned future program may not address the reality at ground. Hence, ARC is studied to know why they have limited success in seed business, why some of them collapsed. The answer of these questions will be useful for policy makers and extensionists to minimize the errors and plan the alternate way of strengthening of smallholder seed business at community level.

1.5. Limitations of the study

This research project explored the existing status of ARCs, reasons for failure and success in seed business in Banke and Bardiya District. Since the coverage is limited for the research site and SCDP project only, the conclusion drawn from the research may not be taken as generalization for other areas and projects in the country. A lot of information were collected through remembrances and recall basis because the actual happenings were of few years ago which may lead to some response errors. The size of the sample taken may not be adequate due to resources and time constraints. It became difficult to contact farmers because of peak season of rice transplanting.

As the study involved single period field work, it was not possible to adequately capture all Information. Moreover, virtual non-existence of baseline data considerably constrained the comparison of the impact before and after the intervention.

1.6. Organization of the thesis paper

Following the introduction, the thesis is divided into altogether seven chapters. The chapter 1 describes about the introduction of the study which includes information about SCDP and seed production activities through ARCs, justification and limitation of the study. Chapter 2 is about research problem, research objectives and methodology adopted to carry out the research. The chapter 3 discusses on different finding of literature review regarding seed supply systems, farmers' organization for seed production and its internal and external environment. The Chapter 4 is about, farming and seed sector in Nepal. Findings of research are presented in Chapter 5. Analysis of results and discussion is made in Chapter 6. Finally, chapter 7 includes conclusions and recommendations. Summary of findings through interviews and focus group discussions, research questionnaires, list of seed producer in Nepal, and some photos from field are included in annexes.

CHAPTER 2: RESEARCH PROBLEM AND METHODOLOGY

This chapter deals with the problem for which this research is designed and the way how research was organised. This chapter describes about the analysis of problem, conceptual framework for theoretical analysis, method of data collection, selection of participant for focus group discussion and interview.

2.1 Problem statement

The four studied ARCs were operating well; processing and storage facilities were utilised by the user during the project period along with increased seed production campaign. The Project procured lentil, chickpea, and mustard seeds from India for distribution in the 50 pocket areas. The total amount of seeds distributed increased from 11 tons in 1993 to 70 tons in 1997 (ADB, 1999). Seed production in ARCs ranged from minimum 15 MT in Machhagad to maximum of 70 MT in Khairapur (Table 11). This figure depicts how the seed production was expanded with project efforts. Some of ARCs won prizes with the project for best quality seed production (Annex-G to J). They sold seed to neighbouring and distant customer as well.

However, after phasing out of project, these resource centres started to degrade. The amount of seed production could not increase in ARCs; rather it started to get down. Up to the present, 3 ARCs out of 4 are non-functional, only one is still active. A large amount of resources has been invested to develop these ARCs, if they could not work then it is certainly a matter of concern for the DOA to know why they could not perform well.

Once being renowned as good achievements under the project, majority of observed ARCs have now stopped functioning. It has raised question about the way of promoting farmers organization in seed business. This case gives examples of unsustainability of project outputs. Why majority of ARCs could not function well? It is central question and need to be answered to get feedback for planning and implementation of programme activities in effective way in coming days. The problem of limited success of ARCs in seed business and its causes are presented in Figure 2. The discontinuation of ARCs has badly affected the improved seed availability at local level.

2.2 Research objective

The objective of this research project is to enhance the understanding of Department of Agriculture with respect to the underlying reasons for the limited performance of agriculture resource centres for seed multiplication activities in SCDP district to contribute to the effective planning and implementation of alternate way of supporting seed producer groups so that they can run in self-sustaining manner.

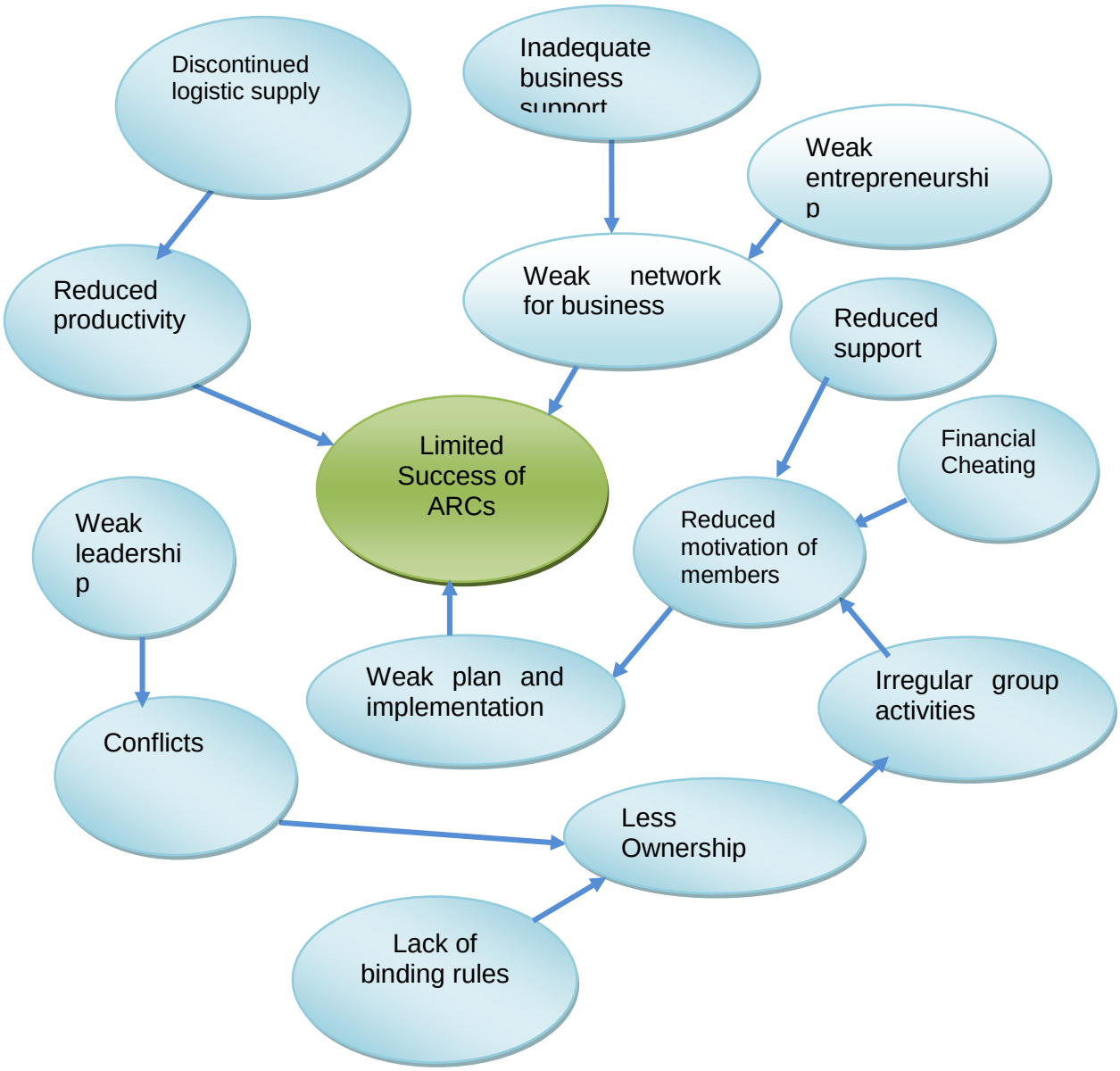

Figure 2. Causal diagram

2.3. Operationalizing of concept

Economic benefits and organizational stability of management body are viewed as key elements for success of seed business based upon the findings from literature. These two dimensions are analysed by making the assessment of their production and marketing activities and relating these to internal and external environment of ARCs.

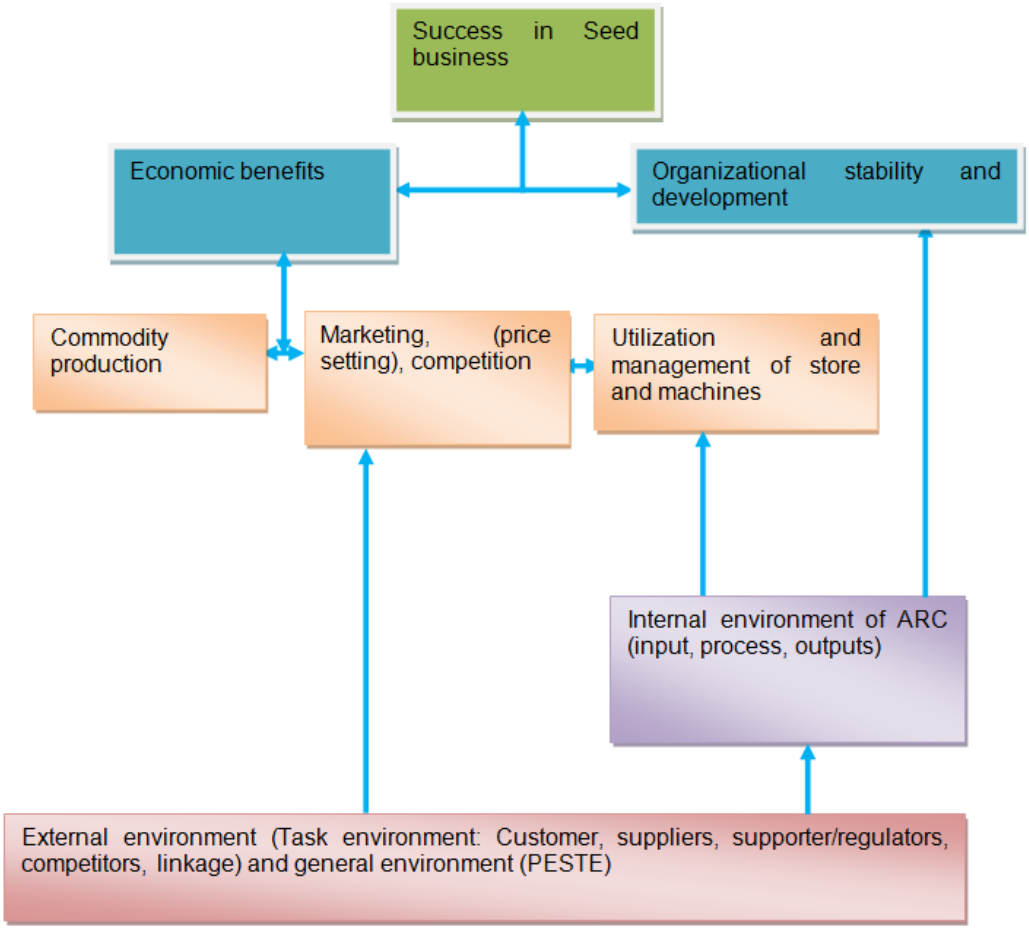

Figure 3 Conceptual framework for the research

2.4. Research question

Why the ARCs have limited success in seed multiplication programme?

Sub research questions

i. In what way production planning, quality control and marketing of seed was carried out in ARCs?

ii. Have the farmers (members and non-members of coops) economically benefited from the seeds production and marketing business through ARCs?

iii. How the physical facilities (store and machines) were utilised and managed in ARC ?

iv. In what way the internal attributes (internal environment) of farmers organization has affected the seed business in ARCs?

v. In what way the external environment has affected the seed business in ARCs?

2.5. Methodology of research

2.5.1 Selection of study area

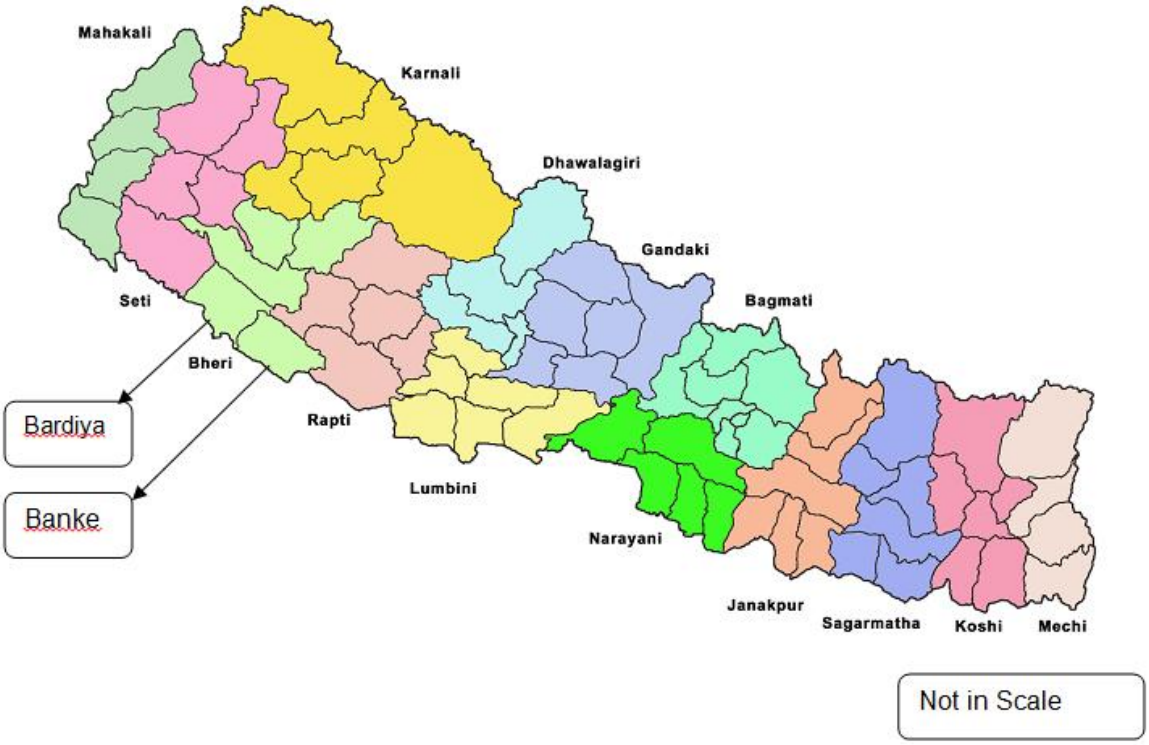

Figure 4 Map of Nepal

Source: Sahara Nepal, 2010

The study was carried out in two of the SCDP districts, namely Banke and Bardiya. Seed multiplication activity was successfully carried out these two districts during project period; the ARCs in these two districts were the most vibrant one at that time. Being plain in geography with large agricultural area, these two districts still poses great potential for seed multiplication of food crops. There are 2 ARCs in each study district; each of them is covered for the case study. So, in total 4 ARCs were studied.

2.5.2 Sources of information

Information is collected from primary and secondary sources for the purpose of this report. Information like seed production and sale by ARCs, support service received, group meetings, disputes, fund development and utilization, use of machines and building were collected from primary sources. Likewise, secondary data were collected from the publications of government agencies, such as Ministry of Agriculture & Cooperatives, Crop Production Directorate, and District Agricultural Development Offices, and reports of other individuals and agencies were referred. Internet, undoubtedly, remained an important source of information to find articles, papers and books related to study project.

2.5.3 Research strategy

The research has a qualitative approach and is based on empirical data. To carry out the research smoothly and draw a meaningful conclusion, it is crucial that the methods and techniques of data collection be precise and accurate. Based on objective to analyse in detail about the reasons for limited performance of ARCs, case study was the selected strategy for research.

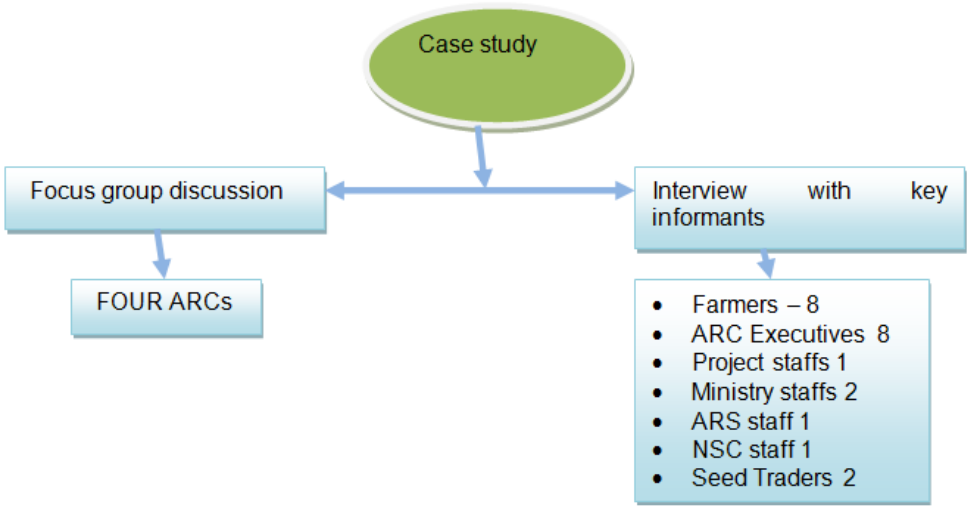

Figure 5. Research methodology

2.5.4 Research tools

Focus group discussions and interview with key informants are the selected research tools.

i. **Focus group discussion**:

Focus group discussions were carried out among 5-6 members of ARC steering committee/farmers groups. Focus group discussions were carried out to get the information on subjects like production planning, economic benefits for members, constrain in production and marketing of seed. The issues like group management (leadership, planning, etc), were discussed in group. Focus group discussion was conducted for two days in each ARC due to long list of topics to be discussed.

Selection of members for focus group discussion

The focus groups were composed of members of ARC. 5-6 persons among the members were randomly selected and invited for discussion. The balance is made in composition of focus group in terms of gender and ethnicity as far as possible (in some cases there were re very few-only one-women in FG).

ii. **Interview with key informants**

Key informant interview was carried out in each ARCs. Information was collected on specific issues like input availability, timeliness, and economic benefits, gathered by

interviewing the executive members of ARCs. Moreover, other stakeholders like seed traders, project staffs, ministry staffs, are interviewed with open questionnaire. These interviews are complementary to the focus group discussions.

Selection of key informant

ARC executive member: ARC executive members like chairperson, or secretary or bookkeeper who were currently in that position or had worked in past in such position were interviewed. Sub research question 2 and 3 were discussed with them during interview.

Similarly, interview related to **marketing** topic of sub-research question 1 and **Specific Environment of sub research question 5** was also discussed with them.

*Farmers***:** local farmers residing nearby area of ARC and who had purchased seed from ARC were selected for interview. Two farmers were selected in ARC area, so 8 farmers interviewed in total.

Project staff: One of the project staff was interviewed.

Ministry staff **:** Chief of DADO in both study district were visited to discuss about current supervision of ARCs, current seed production programs in districts and supports provided for seed production. So, two of ministry staff were interviewed.

National Seed Company: The chief of NSC was interviewed.

Agriculture Research Stations: Seed production supervisor at research station was interviewed.

Seed traders: The seed traders who have business connections (if they have) with ARCs were selected for interview. One seed trade was interviewed in each study district, so there were 2 seed traders interviewed in total.

iii. Observations

Visits were made to the study sites by the researcher to observe utilization of store houses, crop production scenario, and local markets to observe presence of seed traders and their transaction amount.

iv. Desk study

The desk study was carried out by reviewing literature related to seed supply systems, seed business by farmers organisations, seed policies and seed use status in Nepal. Internet search, study of books, journal, and reports was made to obtain the required information. Some of local NGOs and cooperatives were visited to discuss on current status of seed demand and supply at local level.

2.6. Data analysis

The qualitative data was analysed by in text description and , comparisons are made with help of chart and diagrams. Likewise, the quantitative data is analysed with table and charts. Desk research was conducted in the beginning of July 2011 while field study was conducted from 3rd week of July to 3rd week of August, 2011. Data analysis and write up was done till 8th September, 2011**.**

CHAPTER 3: SEED SUPPLY SYSTEMS AND FARMERS ORGANIZATION

This chapter describes about the seed supply systems. The chapter also deals about the relevance of seed production by farmers group to expand the improved seed availability. Internal and external environment of an organisation and its relation to performance of seed producer's organization is discussed in this chapter.

3.1. How seeds are supplied?

The outstanding crops and varieties would have been disseminated in many places through farmers to farmers' channel in past. In modern era, big companies are established as seed producers in industrialized countries, farmers to farmers' seed exchange are becoming rare (Amstel, et al., 1995). With the understanding of world perspectives, Louwaars (1995) describes three systems of seed supply, namely farmers' seed system (informal seed supply system), formal seed supply system and integrated seed supply system.

3.1.1 Farmers seed system

The most common sources of seed for farmers are their own crops or field or from neighbours and relatives. Apart from occasional calamities and infrequent seed exchange with other farmers, they produced their own seed by selecting part of their harvest to plant their next crop (Amstel, et al., 1995). Farmers have continuously selected good parents for their crops, and certainly played role of crop improvements. About 90% of total seed used for staple crops is supplied in this way in developing countries (Almekinders, et al., 1994). Some 60-70 per cent of seed used by these farmers is still saved on farm in developing countries; most of the remaining seed is obtained off-farm, from local sources (Lewis and Mulvany, 1997). Hence, the quality of such seeds is questionable. Like in other developing countries, major part of seed used for crop production comes from the farmers own sources in Nepal (Joshi, n.d). Amstel, et al., (1995) have found the most common characteristics of informal seed system as-

i. Lack of functional specialization, i.e. seed production is a part of farming but not a sole business to depend on it.

ii. New varieties spread primarily through farmer to farmer's diffusion. Seed is treaded by local traders who are not specialized in single commodity.

iii. Varieties developed by farmers or just multiplied by them are never pure (homogeneous).

3.1.2 Formal seed supply system

With the development in agriculture sector, seed production and supply function established as a separate ‘enterprise’ in developed countries (Amstel, et al., 1995). Breeders have considerable right upon the new varieties developed. The authors described that seed companies works as source of seeds, farmers depend on those companies to get seeds in formal seed system. Farmers own source or farmer to farmer seed exchange is not expected. The characteristics, as described by Amstel, et al., (1995), of formal seed supply system are as follows-

I. The relatively few varieties multiplied for trading, which are homogeneous. These varieties generally suitable to grow in favourable environmental conditions, quality of seed are controlled with seed regulations.

II. Farmers depend relatively strongly on external seed supply instead of using their crop as the source of seed for their next planting.

III. Breeding, seed production and seed trade are institutionalized and seed trade is subjected to national seed laws and regulations.

This formal seed system is widely established in developed countries, but it is not well strengthened and established in developing countries. In developing countries, formal sector is providing 10% of seed requirement for staple crops (Almekinders, et al., 1994). This sector is supplying only 6% of total seed requirement for staple crops in Nepal (GON and ADB, 2010). Improvement in present seed supply system is a great challenge in developing countries.

The formal system and farmers systems have their own strengths and weaknesses, and interestingly these are complementary to each other (Louwaars, 1995). Formal seed system can only address the need of commercial growers or commercially important crops, but not the need of people who are in complex, divers and risk prone environment (Tripp, 1995). This system is found more viable in case of cross pollinated crops where the private companies are also interested. In self-pollinated food crops, informal seed supply system is dominating; private sector is rarely operating in this sector (Louwaars, 1995; Guei 2010). The public sectors need to work in low profit segment of seed market where private companies do not operate (Guei, 2010).

3.1.3 Integrated seed supply system

The concept of integrated seed supply has been introduced by Louwaars (Louwaar, 1995). He emphasizes that development of national seed system requires the utilization of strengths of farmers' seed system and formal seed supply system. With integration to formal seed system, farmer's seed system partly subjected to seed regulations and standards.

Louwaars (1995) defines integrated seed supply system as the system to supply new varieties and seed to farmers combining method from both the formal and the local seed supply system. According to the author, method of integration might depend upon the local situation and needs, so there can be many different integrated seed supply systems in space and time, with various level of integration of the interface of the local and formal systems. Formal seed system is more dynamic, fast delivery and, while informal seed system has access to poor, diverse and marginal farming systems (Amstel, et al., 1995).

3.2. Sustainability of seed systems

Louwaars (1995) describes that sustainability of formal seed systems is largely determined by its economic parameters, i.e. it should apparently be economically beneficial for the seed producers. The author also mentioned political framework as another key parameter for its sustainability. Likewise, Thijssen, et al., (2008) has described the need of institutional sustainability of farmers' organization to become their seed business viable over the period. For economic benefits; product quality and its marketing are important dimensions.

Strong and vibrant farmers' organization can provide opportunities to farmers to effectively play a role in market economy and benefit from it (Abaru, et al., 2006). The authors suggest that making the farmers organization viable, it (FOs) shall precisely be formed with understanding of socio-cultural and economic structure of farming community.

3.3. Seed production by farmers' organizations

Most smallholder farmers depend upon self-pollinating food crops for their food security as biology of these crops makes possible to save the seeds for several seasons on farm (Guei, 2010). He further describes that large international seed companies concentrate on those countries with large commercial seed sectors, often focusing on high-value crops grown by larger farmers in more favourable areas. Private companies operate with profit motives, so only target those who are best able to pay for their seed. They tend to avoid self-pollinating crops - including many of the crops smallholder farmers grow and on which they depend for their food security.

Public sector was a major source of new varieties and quality seeds of self-pollinating in the past, however many countries have encouraged privatization or commercialization of public sector seed activities leading for the reduced investment in plant breeding and seed multiplication by public organizations (Amstel, et al., 1995) . As a consequence, public-sector seed activities have tended to focus on a narrow range of crops grown by larger farmers, in this way; reducing supplies of seed of new varieties of subsistence crops to smallholder farmers even further (Bengtsson, 2007). A national seed system is necessary to scale up the improved seed production and diffusion.

Nevertheless, the examples of successful seed enterprise (small to medium) are found through the world which are run by farmers or their groups. Some of them may have succeeded in creating a vibrant seed business able to respond the demand for quality seeds. Smallholder seed enterprise, which in the absence of large companies, provide a valid alternatives for production and distribution of food security crops (Guei, 2010). FAO recognised role of smallholder seed business in addressing global challenges like achieve the MDGs, adaptation to climate change and nutrition security (Ibid). So, development of self-sustaining and self-managed farmers' organization is essential in developing countries for sustained supply of food crops seed.

3.3.1 Internal environment of farmers' organization and its viability

Basically the internal environment of an organization includes the resources, capabilities and the competencies of the organization (Online Resource Centre, 2011). This internal environment plays an important role in making important strategic decisions for the company or organization. In this way the decisions which are made by the managers are affected by the components of internal environment (Rollinson, 2008).

The performance of organization a function of OMR (Output, Method or Process and Input or Resources (Crabbe, n.d.). Every organization achieves their objectives through certain processes. This is sometimes known as OMR model.

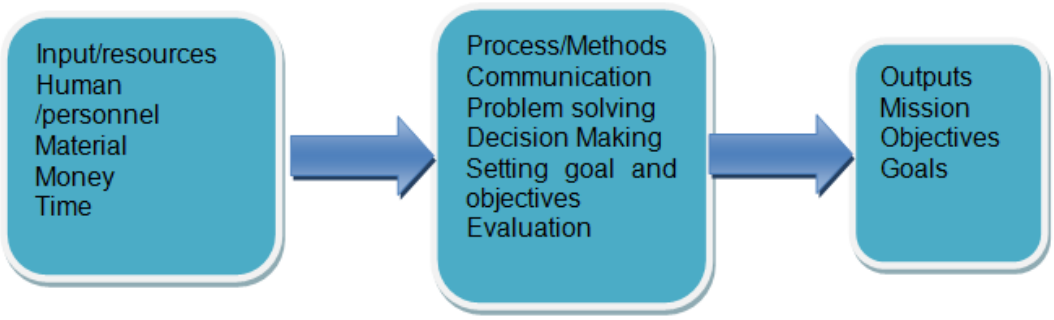

Figure 6. OMR Model

(Source: Crabbe, n.d.)

This model views an organization as a simple open system, and depicts the relationship of processes with organizational input (resources) and outputs (objectives). Crabbe (n.d) has described 9 processes in organization. These are Communication, Goal setting and developing objectives, decision making, problem solving, resource management, delegating, support, evaluation, and conflict management. The same processes can be found in farmers group/ organization also.

Abaru, et al., (2006) in Uganda reported that the leadership, formulation of regulations and its implementation, and group savings have significant effects upon the performance and viability of farmers' organization.

3.3.2 External environment and its effect on organization

External environment is defined as all elements that exist outside the boundary of the organization and have the potential to affect all or part of the organization (VHLUAS, 2011). External environment of organization consists of specific or task environment and general environment.

a. Task environment

The task environment includes the actors with which the organization interacts directly and that have a direct impact on the organization's ability to achieve its goals. In principle, there are 5 actors in task environment namely suppliers, supporters/regulators, customers, and competitors and linkages (VHLUAS, 2011).

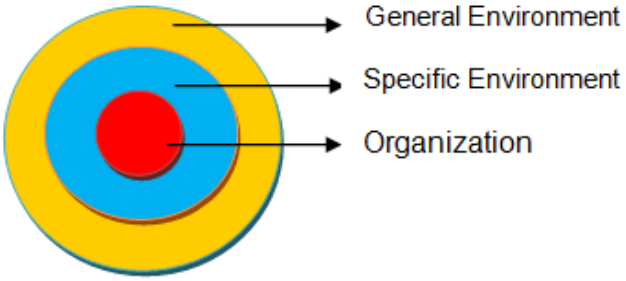

Figure 7. External environment of organization

i. Suppliers

Suppliers are those who can supply inputs, services and finance. Their role is crucial in providing good quality input and service in time of requirement. Capacity of research centre to provide new outstanding variety is crucial in formal seed system (Chakraborty and Schroeder, 1995). There should be continuous flow of new variety new variety to seed

producer for viability of formal seed system and integrated system as well. Availability of fertilizers and pesticides is equally important in seed multiplication program.

ii. Competitors

Competitors are those within the environment who provide or same type of product or service. The relation between organization and competitors; and how market is divided for each, are key concerns to be analysed with regard to the competitors. The existence and nature of competitors have great significance for the organization (VHLUAS, 2011).

iii. Supporters / regulators

They include local government organizations, interest groups, interest organizations, NGOs etc. who can influence the ARCs. As studied by Witcombe, et al., (2010), types of support service provided by supporters have significant influence on the viability of seed producing groups. The authors reported that seed production groups, who are mostly provided with technical assistance, are found unable to continue the seed business. Instead, if the farmers' organizations are provided with business development supports in addition to technical assistance, they are found to be stable in seed business even after external support is removed.

iv. Linkage

Nature of linkages with other organizations, actors has affected the performance of a given organization. The linkage may be vertical and horizontal, formal and informal (VHLUAS, 2011). The formal linkage of seed production group to input traders, business supporters like federations, cooperatives is reported highly important to make demand forecast and make annual production plans (Devkota, et al., 2008). Similarly, the network development and interconnectedness with other groups have also impact upon the group performance regarding marketing of commodities that are produced by group members (Abaru, et al., 2006). Similarly, Guei (2010) has mentioned that there should be functional linkage between formal and informal seed sector for increasing the efficiency of both.

v. Customers

Customer related subjects, for example, what kind of relation exists with customers, what is the organizations attitude towards customers? How do the customers view upon the organization? Have influence on performance of organization (VHLUAS, 2011)

b. General environment

The general environment includes those sectors that may not have a direct impact on the daily operations of a firm but will indirectly influence it (VHLUAS, 2011). The general environment often includes the government, sociocultural, economic conditions, and technology. General environment can be studied in political, economic, social, technological, and environmental (PESTE) dimensions. The general environment is very less influenced by an organization.

i. Political

Conducive policy environment is a pre-requisite of success of seed business (Guei, 201*0*). Abaru, et al., (2006) noted that, cooperatives thrived as a main farmer's organization in

eastern Africa before the era of liberalization. However, they get disappeared after liberalization. As a result, large numbers of farmers do not have organization, so they lack collective voice, access to finance and services and cannot influence the policy that affect their livelihood. Guei (2010) states that the national policies need to be adapted to the stage of development of seed sector in particular country. According to him, rigid application of seed regulations can hamper the seed enterprises as noticed in Ethiopia. Farmers' seed system requires some flexible laws.

ii. Economic

Changes in economic activities in external environment can have influence upon the organization. Demand of high value commodities like vegetables, flowers, egg, meat, and fish in local market can attract the farmers instead of seed growing. Guei (2010) describes that economies of scale in agriculture production can influence the seed selection and its use by farmers. In subsistence oriented agriculture system, farmers tend to use farm saved seeds for self-pollinating crops, rarely purchasing seeds). Even if, farmers do purchase seed of new variety that meets their need, they then start keeping their own seed, leading to few repeat purchases.

iii. Social

Social movements and changes may have influence in business of local people. Nepal has suffered from decade long Maoist war after 1998. It has significantly changed the power relation between so called local elites and layman people in society. Transportation blockage and capturing of public properties by warriors has caused the decline in overall economic activities in country (Rijal, 2010).

iv. Technical

Technical changes in external environment like introduction of new variety, or new crop or any other production technology might create the change in cropping pattern. Guei (2010) states that for seed enterprise to be successful in these circumstances, there is a need to have steady stream of new varieties coming on the market either through conventional breeding programme or participatory breeding programmes.

v. Environmental

Sutton (2004) mentioned that land, water and biological elements like pests and native species of crops are important parts of physical environment in rural areas. Crop production has direct link with environmental. Other factors such as temperature, rainfall seems to be also important for crop production. Modern agricultural activities like use of pesticides and fertilizers, use of ground water for irrigation may adversely affect the components of physical environment like air, water, soil etc.

CHAPTER 4: FARMING AND SEED USE STATUS IN NEPAL

This chapter deals about the crops grown in Nepal and in study area as well. The seed availability and requirement in Nepal, seed producers and current programme implemented in seed sector are discussed. Seed policies and regulatory framework in Nepal is also summarised in this chapter.

4.1. Agriculture in Nepal

Agriculture sector keeps great importance in Nepalese economy. However, subsistence and smallholder production is dominating characteristics of Nepalese agriculture. Family farming sector covers almost all part of total farming; only few farms like tea and coffee farms are commercial (Shrestha and Wulff, 2007). The authors have mentioned that the use of inputs (fertilizer and pesticides) and equipment in agriculture is very low in as compared to countries in south Asia. As a result, current yields of major food crops are lower in Nepal compared to other South Asian countries, except Bhutan. The availability of good quality seed is considered to be one of the pre-requisites to improve agricultural productivity in Nepal (Shrestha and Wulff, 2007).

Cereals forms a major part of crops grown in Nepal in terms of area covered and amount produced. Rice, wheat and maize are the major cereals which occupies about 76% of total cultivated area (MOAC, 2009a), and these three crops supply together 74% of the total calories consumed by the population (Shrestha and Wulff, 2007). In addition to cereals, secondary crops like pulses and oilseeds are integral part of Nepalese agriculture. Pulse crops are looked as a high potential crop in Nepal as well as in rest of south Asia as it can cover the fallow after rice (DFID, n.d.).

4.2. Farming in study area

Banke and Bardiya are two selected study districts, and are located in western part of Nepal. The area of Banke district is 233,700 Ha, out of which 92,068 Ha is cultivated land, which is around 50% of total potential agriculture land (CBS, 2007). Table1 shows that rice occupies about 38% of total cultivated land in Banke district in 2010. Lentil, chickpea, and pigeon pea are the major crops among pulses in study districts. The area of vegetables and fruit is more in Banke than Bardiya, but for the area of other crop is more in Bardiya than Banke(Table 1). It shows the interest of farmers towards high value crops in Banke district. The total area of pulses in the district was14,210 Ha in 2009 (MOAC, 2009a).

Table 1. Crops grown in study districts in year 2009

District	Crop and area (Ha)						
	Rice	Wheat	Maize	Lentil	Chickpea	Vegetables	Fruits
Banke	34500	16856	6600	9790	612	6492	1346
Bardiya	39500	17900	8100	12962	867	3775	1100

Source: MOAC (2009a)

The districts are bordering with India, and the boarder is open. A famous trade hub Nepalgunj in located in Banke with road connection to India. There are big traders of agriculture inputs in Nepalgunj who supplies in nearby districts also. The number of input traders, locally known as Agro vets have been increased over the period (Table2) which

indicates changes in local seed supply system with the widened coverage of formal seed supply system.

Table 2. Input traders in study districts

District	Year	
	2007	2011
Banke	23	42
Bardiya	26	46

Source: Own Fieldwork

Bardiya district has area of 202,500 Ha with cultivated land 46,575 Ha is cultivated land, 68% of total area in district is plain, and rest is hill (CBS, 2007). The district is famous for rice production.

4.3. Seed sector in Nepal

4.3.1 Policy framework

Policy formulation that affects seed business dates back to enacting of plant protection act 2029 (1972). A single policy is lacking to deal the every aspect of seed sector; however it is dealt and guided by set of related rules regulations (Shrestha and Wulff, 2007). Regulations pertaining to plant protection, biodiversity conservation, are also influencing the seed sector in addition to seed regulations.

National seed Act 2045 was enacted in 1988 and regulations were prepared in 1997. This act has defined seed regulatory structures, seed certification processes, and seed standards. This Act has provisioned to produce and distribute two kinds of seed namely certified seed and truthfully labelled seed, having minimum seed standards. New variety has to be registered with the NSB before putting it for commercial cultivation. Farmers and breeders right is not well described by these regulations. Seed health and quarantine issues are dealt by Plant protection act (2029) enacted in 1972 and plant protection rules formulated in 1974 (Manandhar, 2007).

Several Acts including the Plant Variety Protection and Farmers' Rights Act have been drafted but have not yet been enacted. There is no separate legislation dealing with introduction of genetically modified organisms (GMO), biotechnology and bio-safety, but these issues are regulated through several other concerned Acts. GMOs are not permitted in Nepal at present. (Shrestha and Wulff, 2007). National Agriculture Policy 2004 (NAP) has emphasized the private sector involvement in seed certifications with national and international accreditations.

4.3.2. Regulatory framework

Seed sector is regulated by separate authorities at different level. The seed regulatory framework comprises following authorities.

I. National Seed Board

The National Seed Board (NSB), is the apex body in seed sector operating directly under the MOAC, was constituted by the Seed Act 2045 (1988) to formulate and implement policies to relating to the seed sector and to give necessary advice to the government on the matters affecting the sector (Shrestha and Wulff, 2007).

The NSB has three sub-committees: (i) variety approval, release and registration,

(ii) Planning formulation and monitoring, and (iii) quality standards determination and Management sub-committees

II. Seed Quality Control Centre (SQCC)

The Seed Quality Control Centre (SQCC) is an independent quality control organization directly under the Ministry of Agriculture and Cooperatives. The objective of the SQCC is to ensure the availability of quality seed by enforcing the quality control mechanism to the farmers. The SQCC also acts as the secretariat of the NSB, being the head of the SQCC the member-secretary of the NSB.

There are three institutions under the SQCC: i) the Central Seed Testing Laboratory (CSTL), ii) the Seed Certification Unit and, iii) the Seed/Variety Registration Unit.

III. Department of Agriculture (DOA)

The Department of Agriculture (DOA) is a public extension organization with organized network throughout the country. It has 12 programmer directorates, out of which 9 are directly related to seed production. It has regional seed testing laboratories in 5 regions of country; they are mainly responsible for seed certification and seed testing for quality assurance in terms of certified seeds and seeds with truthful labelling (CDD, 2010).

There are 12 horticulture centres, and these are mandated to produce high quality fruit seed and saplings. In addition, there are 9 Vegetable Development Farm and Centres, these are producing foundation seeds.

District Agriculture Development Office has been established in all 75 districts. Seed multiplication is being supported by DADOs at farmers' level through organizing them.. DISSPRO, Seed Bank, Commercial Seed Multiplication programs are the examples of program implemented. At village level, there are Agriculture Service Centres (ASC) are providing the agriculture extension service for farmers including seed multiplication and its use (MOAC, 2009b).

4.3.3. Seed producers

Public sector efforts date back to 1976 for establishing seed processing and storage structure in country. Assistances from international community have played a key role to initiate and promote the seed sector. Seed processing unit was established at Hetauda in 1976 with assistance of Australian government, followed by 6 processing and storage units established during 80s under GTZ-SPIS project (Shrestha, and Wulff, 2007).

In private sector, Seed Entrepreneurs' Association of Nepal (SEAN) is involving in seed multiplication, storage and distribution. In recent days, private sector participation is increasing in seed industries in Nepal (Shrestha, and Wulff, 2007). They are operating in cereals and pulses in addition to vegetables; however they are operating below the actual capacity. It is seen that the role of formal sector is increasing in study area, two private companies GATE Nepal and East west Seed Company were found to be operating in study district Banke (Annex –L). GATE Nepal has started working since last two years in the district.

In public sector, National Seed Company (NSC), Nepal Agriculture Research Council (NARC) and seed production farm under Department of Agriculture (DOA) are responsible for source seed production and distribution. Moreover, NSC has been involved in multiplication of seed for self-pollinated crops that needs bulky seeds. However, the amount of seed supplied by NSC is very low; it is currently providing less than 2% of total seed requirement (ibid). Seed supply for cross pollinated crops is dominated by private sector, while public sector is dominating in self-pollinated crops (GON and ADB, 2010).

International organization like IRRI, CYMMYT, and CIP; INGOs like HELVETAS, CARE Nepal, Plan Nepal; local NGOs like CEAPRED, and FORWARD are supporting the seed production of various crops (CDD, 2010). Some NGO like Li-BIRD is working for participatory breeding and variety development at farmers' level.

4.3.4 Seed use status: seed replacement rates

Improved variety coverage is reported to be 85 % for rice, 86 % for maize and 96% for wheat for maize (MOAC, 2009). However study have shown that farmer are cultivating very old varieties like RR 21 of what released some 30 years ago, Masuli of rice released some 20 years ago are still cultivated by farmers (Shrestha and Wulff, 2007). Though these are improved varieties, but their desirable attributes get lost due to continued cultivation of farm saved seed. Inadequate supply seems one of the reasons for low seed replacement rates in Nepal (GON and ADB, 2010). The current supply of seed from formal sector is fulfilling only 6.9% of total seed requirement (all cereals, lentil, beam, and rapeseed).

Table 3. Seed production and supply in Nepal (2008/09)

S.N	Crop	Area Ha (000)	Requirement (MT)	Seed production and supply (MT)					SRR
				NARC	DOA	NSC	Private	Total	
1	Rice	1549	77463	255	1750	897	2169	5071	6.5
2	Maize	870	17403	32	550	8	450	1040	6
3	Wheat	706	84777	121	900	4006	1980	7007	8.3
4	Millet	265	2655	1	2	0	0	3	0.1
5	Lentil	189	5685	5	23	4.96	0	32.96	0.6
6	Rapeseeds	153	1533	2.75	13.8	0.81	0	17.36	1.1
7			189516	416.75	3238.8	4916.77	4599	13171.3	6.9

Source: CDD (2010)

The Table 3 shows the huge gap between the seed requirement and supply situation. Seed replacement rate in Nepal is found slow than the desirable level. The desirable seed replacement rate (SRR) for self-pollinated and cross pollinated crops at 25% and 33% respectively, however the average SRR is 6.9% with 8.3% in wheat followed by 6.5% in rice, 6% in maize and 1.1% in oilseed in Nepal. Wheat seed replacement ratio seems higher than other crop, while millet seed are most rarely replaced among the given crops (Table 3).

Unavailability of good quality seed has been understood by as one of the key constraints for farmers. According to GON and ADB (2010), “One of the constraints in the process of rapid transformation and commercialization of the agriculture sector of Nepal has been inadequate availability of essential production inputs such as seeds and planting materials”.

As studied by team of experts, the lack of supply of source seed (breeder and foundation seed) for seed companies and entrepreneurs in adequate quantity is an obstacle for

commercialization of new improved varieties in the country (Shrestha and Wulff, 2007). The supply is not only the problem for new varieties, but also for regularly grown improved varieties, including those which are location specific.

4.3.5. Current program and actors involved in seed production

Current programs are aiming to enhance the seed self sufficiency of grains, legumes, oilseeds and other crops. Most potential districts/areas have been identified for seed multiplication for a range of crops. Department of Agriculture is implementing seed production and multiplication projects at farmers' level. The following programs are being implemented at present.

i. Community seed production program

This program is implemented by DOA in three districts (Okhaldhunga, Sindhupalchock, and Dadeldhura) since 2009/10. Skill development, established seed bank committees, varietal map preparation, 50% price subsidy in source seeds, source seed transportation, participatory varietal selection are support activities planned under this programme. (CDD, 2010)

ii. District Seed Self Sufficiency Project (DISSPRO)

The objective is awaring farmers regarding importance of improved quality seeds, embedding of new seed policies up to farmers' level, promoting seed business through empowering local seeds producers and distributors (CDD, 2010). Under this program 25% subsidy in source seeds, seed self-sufficiency fund establishment, trainings and extensions services for seed production techniques. Main strategies are group formation and empowering, sufficient production of improved verities source seeds for quality seed production from it (CDD, 2010). Seed production of Maize, wheat, lentil, Rajma, rapeseed, chickpea under DISSPRO in last 6 years is given in Table 4.

Table 4. Seed production through DISSPRO (amount in MT)

FY	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Amount of seed produced	1642.02	2624.42	4552.03	1873	3881	4077	7080.81

Source: CDD (2010)

Table 4 shows the four fold increment in seed supplied by DISSPRO since 2003/04 to 2009/10. Seed production was drastically reduced in 2006/07, but after that it resumed the pace. DISSPRO have solved to some extent the seed supply problem for the informal sector in the districts (Shrestha and Wulff, 2007), but it is too small to supply the seed in required amount (GON and ADB, 2010).

iii. Commercial seed production support and strengthening project

This project is implemented in 13 districts. Various supports like 25% subsidy in price of source seeds, subsidy in transportation, revolving fund, NRs 60,000.00 seed fund grant, seed processing and machineries purchase NRs 50,000.00, seed storage subsidy NRs 50,000.00 are provided for seed production groups (CDD, 2010).

CHAPTER 5 : RESULTS

This chapter deals with the fact and figures found through the study. These are depicted through tables, chart and text description.

5.1. Seed production planning

The information obtained through research regarding to production planning are summarised on Table 5 and Table 6 below.

Table 5. Seed production planning in ARCs

ARC	Crops selected	Basis of farmer selection	Decision maker in family	Source seed from
Machhagad	Lentil, chickpea, rice	Member of FG, clustering	Males	DADO
Khairapur	Rapeseed, Lentil, Chickpea	,,	,,	DADO
Bankatawa	Chickpea, lentil	,,	,,	,,
Betahani	Lentil, chickpea, rice, wheat, groundnut	,,	,,	,,

Source : Own Fieldwork

Farmers have selected the secondary crops like lentil, chickpea, and rapeseed for seed multiplication (Table 5). Some ARCs have initiated to multiply other crops like rice, wheat and groundnut in their own initiatives based on market demand. Members of FGs were mostly producing seeds; however adjacent farmers also selected in cluster. If we see within the family, males were making the seed production decisions. All ARC have got source seed through DADO.

Table 6. Additional input use in seed crop production

Crop	Inputs (/ha)					
	Urea	DAP	MOP	Compost	Pesticides	Other
Grain				3 MT	As required	
Seed	60 kg	75 kg	45 kg	4 MT	As required	

Source: Own Fieldwork

Farmers use chemical fertilizer only in seed crop plots. They use additional compost in seed crop than for grain production (Table 6).

5.2. Quality control

Farmers are practicing **'clustering'** of land for seed production. They select a block based on suitability for seed multiplication in village (figure 8). ARC Betahani has sub Committees to carry out field monitoring of seed production activities. They thresh the seed crop in separate floor. Seed is directly sent to store house from the field (not taken to home).

Supervision is regularly made by staffs from DADO and Regional Seed Testing Laboratory (RSTL). The number of supervision depends upon crop; 2 to 3 supervisions used to make in one cropping season during the project. But after the project, supervision became irregular and scanty.

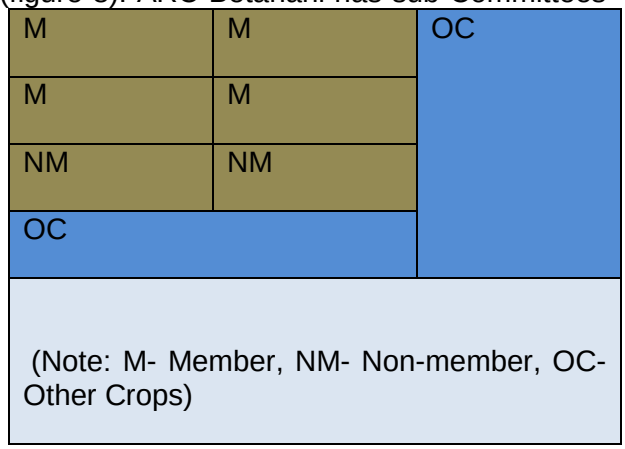

Figure 8. Farmers practice of clustering

5.3. Marketing

The sale of current year forms the basis for forecasting the possible demand in coming year. Farmers generally expect that some more amounts of seed could be sold in upcoming year. Immediately after threshing, seeds are stored in go-down, seeds become ready for selling well advance in cropping season. The seed is sold in packaged bags of 30 to 50 Kg, mostly plastic bags, and sometimes gunny bags are used. Seed was sold from store house; they have no other selling outlets. ARCs put logo over the bags. Publicity and advertisement of seed made in limited scale by oral and written ways. Members share about seed availability and its quality with their fellows in face to face contact. Sometimes ARCs write letters to groups in neighbour about seed availability and quality.

ARCs did not have linkages with traders and customers in past during the project period. They have only linkage with DADO. DADO was coordinating the sale of seed at that time. The customers, except the locals, were in contact of ARCs, they contact DADO only. The corresponding DADO buys seed for own programme activities and collects the demand from neighbouring DADOs during the project period; but nowadays DADO do not collects the demand from other districts. ARC Betahani is now producing seed in support of RARS and contractual basis with NSC. They are in regular contact with local seed traders and are selling some seed to them. Private seed company (GATE, Nepal) and NGOs are also in contact with ARC Betahani. ARCs do not have federations for business; however, ARC Betahani is a member of local cooperatives.

5.4. Economic benefits for farmers

5.4.1 Seed pricing

Premium on raw seed is determined by the meeting of management body of ARC. It may vary year wise. They determine certain percentage as premium over the grain price which ranges 20-25%; it was 23% on rice seed in year in year 2010 at ARC Betahani. The price of cleaned seed is also determined by meeting of management body. However, the seed price is subjected to market fluctuation. The price of raw seed and cleaned seed used to be determined in consultation with DADO during project period by all ARCs.

Table 7. Price of seed and grain in local market (NRs/Kg)

Crop	Grain price	Seed price in market	Seed price in ARC
Rice	17	32	29
Lentil	42	75	
Wheat	19	35	31 (NSC)

Source: Own Fieldwork

The price of cleaned seed is apparently above the grain price. Table7 depicts the price of seed in ARC is lower than market price. Substantial difference in seed and grain price is also depicted in the table.

5.4.2 Additional costs for seed production

During the study, it is found that there are some additional costs incurred in seed production by farmers. They use chemical fertilizer in addition to FYM in seed crop. Foundation seed (source seed) is costlier than certified seeds (Table 8). Farmers have to make regular visit in field, and have to remove the off type plants and weeds in seed crops which requires additional labour.

Table 8. Additional variable cost incurred in seed production of rice (per Ha)

Description	Seed crop	Grain crop	Additional cost incurred (NRs)
Seed price (seed rate @50Kg/Ha)	40*	31	450
Fertilizer	180 kg	-	5500
Rogueing cost	8 Persons	-	1500
Grading	4 person	-	800
Total			8250

*Price of cleaned foundation seed at RARS, Khajura, Banke

(Source: Own Fieldwork)

Table 8 shows NRs. 8250 extra cost (variable costs only) incurred in production of rice seed one hectare of land. This is the additional cost for producer farmers. If we see the costs of ARCs, they have costs incurred in seed processing, treatment, storage and selling of it. They simply calculate and add all these costs in price of cleaned seeds, along with 10-15% margin for them.

5.4.3 Profit

The farmers and ARC members stated that the seed business is beneficial for them. For farmers, the benefit was coming though high productivity of seed crops (due to use of good quality seed and mineral fertilizers) and premium received on raw seed (Table 7 and 9). Similarly, ARC determine price of cleaned seed after putting profit margin, which is the reason for profit for them through seed business.

Table 9. Yield of seed and grain crop

Crops	Seed crop (MT/Ha)	Grain crop (MT/Ha)
Rice	3.5	2.7
Lentil *	1.5	1
Maize	2.8	2.1

(*In ARC Betahani)

Source: Own Fieldwork and MOAC (2010)

Calculations based on information from Table 8 and Table 9 shows that additional revenue equal to NRs 17,000.00 per ha (considering the premium 20%) could be generated by seed crop. In this way, seed business seems economically profitable for producer farmers and concerned ARCs.

Farmers in 3 inactive ARC were found interested in seed production, some members are still hopefully looking for good future of ARC when disputes are resolved. A local cooperative (Everest saving and Credit Cooperatives) at Command area of ARC Bankatawa is producing and supplying rice seeds since 3 year. Similarly GATE Nepal is also producing rice seed in that area since 2 years. Some farmers are still multiplying rapeseed seed in ARC Khairapur area (Annex-I). It shows that there are still potentialities for seed production in area where inactive ARCs are located.

5.5. Physical facilities in ARCs and their use

The store houses of 40 metric tons have been constructed in each ARCs studied. These all are constructed on land which was granted by users. They have got one seed grading machine, seed racks, weighing balances, and sewing machines (for bags) during project period.

Table 10. Summary of utilization of store and machines in ARCs

ARC	Store used	Duration of store use in a year	Grading machine used	Remarks
Machhagad	½ of capacity	9 months	1 year	
Khairapur	2/3 ,,	6 months	2 years	Some Seed stored at home
Bankatawa	½ ,,	6 months	2 years	
Betahani	¾ ,,	12 months	4 years	

Source: Own fieldwork

Table 10 depicts the underutilised conditions of store and grading machine in ARCs. Among ARCs, these are better utilised in ARC Betahani. For rest 3 (inactive) ARCs, the store was hardly utilized in half capacity even though the production was comparatively high in ARC Khairapur. Store was utilized for 6 to 9 months in a year to store seed (of lentil, maize and oilseeds), for rest of period, it remained unutilised. When seed was stored, it could occupy not more than 2/3 of its capacity. The grading machine could not use more than 2 years. Interestingly, ARC Betahani used grading machine for 4 years, and store in ¾ of its capacity at present. Seed racks and balance were used by farmers in good way. Repair and maintenances of equipment and store house is carried as required. The group fund is

utilised in maintenance works. Bookkeepers or treasurer used to be responsible in ARC Machhagad, and in other cases the meeting of group assigns such responsibility to any of member.

The processing and store costs are incorporated in seed price before selling. Additional fees were charged only to non-member farmers for using processing machines and store. The charge was 0.25 Rupees per kg for processing and same amount for store use in ARC Machhagad in year 1998. ARC Betahani is taking NRs 1 per kg of seed at present. This charged amount is used as group fund.

Racks and balances were enough for all ARCs. They faced the problem of water leakage from roof of GI sheets. The roof has been thrown away several times by wind. All stored gunny bags were spoiled in store due to water leakage in ARC Khairapur in 1996.

5.6. Internal attributes of management body

The information regarding establishment of ARCs, seed production, welfare fund etc. is presented in table 11.

Table 11. Summary of internal attribute of ARCs

Descriptions	Name of ARC			
	Machhagad	Khairapur	Bankatawa	Betahani
Establishment	1993	1993	1993	1994
Regulations	In meeting register by mutual understandings	In separate sheet, by mutual understandings	In meeting register by mutual understandings	In meeting register by mutual understandings
Store capacity	40 MT	40 MT	40 MT	40 MT
Activeness	Inactive	Inactive	Inactive	Active
Amount produced at project period	12-15 MT	60-70 MT	15-20 MT	45-55 MT
Current production	-	-	-	46 MT
Seed multiplied till	2000	2001	1999	Till now
Members	17	25	25	25
Women in groups	0	0	1	3
Elections	Every 2 years	Every 2 years	Every 2 years	Every 2 years
Last election	2003	2005	1999	2011
Regular	1999	2000	1999	Present

Descriptions	Name of ARC			
	Machhagad	Khairapur	Bankatawa	Betahani
meetings organised				
Last meeting of group	2008	2007	2004	2011 August
Fund development	NRs. 125,000.00	NRs 100,000.00	NRs 90,000.00	NRs 150,000.00
Cause of disputes	Privilege by land donor		Financial infidelity and political fractions	No dispute
Reason for collapse	1. Dispute 2. Financial infidelity	1. Reduced support after project 2. Marketing difficulties	1. Dispute 2. Murder of DADO staff	
Follow up support provided	Reduced after transfer of supervising staff after 2 years of project termination	Reduced after project	Stopped after murder of DADO staff	Reduced , but continued
Supervision by chief of DADO	No	No	No	Yes
Affiliations	No	No	No	With local cooperatives

(Source: Own fieldwork)

As depicted in Table 11, three ARCs were established in same year, and ARC Betahani was established one year later than others. Supporting groups or sub –groups were also formed in various numbers (5-7) in command area of each ARC. The rules and regulations were prepared on mutual understanding, so they can be amended as required by group. The regulations were abided by members during the project period in all ARCs. However, In ARC Machhagad and Bankatawa, some dispute emerged in relation to privilege demanded by land donors, financial cheating and political fractions. These disputes could not handle properly by the leaders on right moment, it grew up. As a result, attendance of members gradually became low in meetings, and finally meetings could not organise. In ARC Khairapur, there were no disputes but farmers were demotivated to grow seed crop due less external support available and selling constraints after project termination. So, members get uninterested to participate in meeting also, because there was no seed multiplication after two year of project termination. In ARC Betahani, meetings were continuously organised with good level of attendance of members.

The leaders were giving enough time for group work, and were setting the agendas for discussion in meetings. But unfortunately, they were not able to handle the dispute in time. Their contact with stakeholders seems limited except in ARC Betahani.

Programme planning was on monthly and seasonal basis, members were assigned with related responsibilities to accomplish the planning. All ARC have developed their welfare fund, ARC Betahani has developed the largest amount NRs 150,000.00. ARC Machhagad has developed NRs 125,000.00 which is highest among inactive ARCs.

Elections were found regularly organised in every 2 years; it is still continue in ARC Betahani. While the election process was stopped after 2 year after in ARC Bankatawa, and other inactive ARCs later on. Elections and meetings were found to be organised even after collapse of seed production programme. ARC have prepared for registering as cooperatives, some new members were invited to make 25 members to be eligible for registering as cooperatives. Though all ARC were planning to graduate as cooperatives. But the rest 3 could not graduate due to internal conflict and reduced motivation. If we see the participation of women, it is very less in groups, 2 ARC do not have women members; rest two have women members but in very low number i.e. 1 and 3.

5.7. The external environment of ARC

5.7.1 Task environment

The actors in task environment of ARCs as described in table 12.

Table 12. Actors in task environment of ARCs

Roles	Actors	
	Inactive ARCs (Case of past)	Active ARC (Present situation)
Suppliers	DADO	DADO, Input traders (Agro vets)
Supporters/regulators	DADO, DOA	DADO, DOA, NGOs
Costumers	Local farmers, DADO,	Local farmers, Input traders, NGO, DADO, NSC, GATE Nepal
Competitors	National seed Company	Input traders, National seed Company (NSC)
Financiers	DADO	DADO

Source: Own Fieldwork

It is seen in Table 12 that a single actor is performing more than one job; DADO is performing four kinds of job in task environment of all ARCs. The numbers of actors were less in inactive ARCs, some additional actors now existing in task environment of active ARC.

i. Suppliers

Previously only DADO was supplier of inputs, but nowadays there are input traders also to supply the inputs. DADO had provided skill development services, subsidy on store construction, machine and equipment. In addition, DADO provided 50% subsidy on seed, bio-fertilizers were compulsorily provided during the project. Skill development activities were basically focusing on technical part of seed production. Mr. Bishwa Nath Yadav of ARC Khairapur thinks that the quality of chemical fertilizer was good in past, but nowadays it is of very low quality. He further claims that fertilizer is not readily available in market.

Some changes are noticed in activities of supplier after the project. Subsidy in seed was reduced from 50% to 25%. Supply of bio fertilizer got totally stopped. Spares of existing machines were not supplied. The number of minikits was also reduced. Farmers are unhappy about the supply situation of chemical fertilizers in market which is irregular. As result, low quality fertiliser is smuggled from cross-border. DADO is the sole financier for them. ARC Betahani is getting revolving fund from DADO. Group welfare fund is a fulfilling the financial requirement of ARC to some extent

ii. Supporters

DOA is regulator for ARC, as they make support policies for seed producers. DADO, and NGOs are supporter for ARC at present, while DADO was only one supporter in past. The support service get reduced after termination of project; severely in 3 ARCs (who are now inactive) and mildly in one which is now active in seed business (Table 5.7).

iii. Customers

DADO and local farmers were the customers in past for ARCs, who were buying 60% and 40% of total seed produced by ARCs respectively. NGOs and NSC and private seed company (GATE Nepal) are additional new customer at present. The customers are satisfied with ARC seed in past and at present also. As describe earlier, the price of seed set by ARC is generally lower than the market price. DADO and NGOs are the preferred customer of ARC, who do not bargain in price. ARC Betahani has sold its product 40% to DADO, input traders 20%, local farmers 20%, and NGO 20% in year 2010.

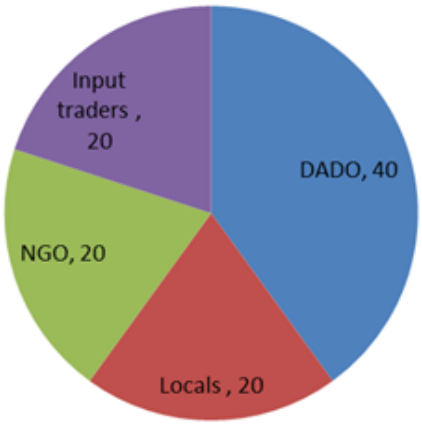

Figure 9. Customers of ARC Betahani (2010)

iv. Competitors

Some of the input traders who import the same crops seed and NSC seem to be competitors for ARC. There are no other seed producing cooperative or farmers group in nearby area of ARC Betahani. ARC members estimated that the seed buying farmers do not exceed the 10% of total farmers in local area. Most farmers get improved variety seed through exchange of seeds with their fellows. The interviewed farmers showed their acquaintance about the need of replacing seed in every 3 – 4 years. However, It is found that some farmers are growing the same variety of lentil by using own seed since 12 years which was distribute during SCDP period.

5.7.2. External environment

i. Policies towards seed supply

Subsidies are available on source seeds, equipment and pesticides for seed crops. There is provision of revolving fund for seed producing group, the amount ranges from NRs 5000.00 to NRs 60,000.00 based upon the area of seed crop grown by farmers. Current seed policies allow the selling of truthfully labelled seed. New varieties can only be imported after registering them with National Seed Board.

ii. Economic environment

During the field study it is found that there no substantial change in farming activities in study area, however small changes are noticed. Three of seed growers have started to grow vegetable instead of seed multiplication in ARC Betahani. The small changes are noticed, but not to the extent to minimize the requirement of seeds.

It is found that the area of chick pea has been drastically reduced in command area of three inactive ARCs the area of lentil is also decreased, but in less intensity compared to chickpea. The area of rice is intact, and wheat area is increasing instead of pulses. Chickpea and lentil is grown in comparatively more area in ARC Betahani, however according to farmer, the reduction in area of these crops is true for them also, and the area under these crops was more during SCDP period.

iii. Physical environment

In study area farmers stated that the soil productivity has been significantly reduced over the period. Mr. ManaHarka Baral, at ARC Bankatawa, said that he produced 2.5- 3 MT/ha chickpea during project period, but now it is reduced to 1-1.5 MT/Ha. Farmers in all discussions agreed that the productivity of lentil, chickpea and rapeseeds has been decreased drastically. Farmers stated that the occurrences of pod borer is causing serious problem in chickpea cultivation. As the area has been limited in few patches only, the crop is further prone to uprooting by group children for fresh pod consumption; they would spread everywhere if the area was big, and not causing serious loss.

Farmers in ARC Machhagad mentioned that the construction of irrigation scheme has created high moisture during winter which is not favourable for lentil cultivation. A great dam in *Rapti* River is constructed by Indian Government in Command area of ARC Betahani which causes submergences in Nepalese side during summer. Dhanahi Yadav, supervising staff of DADO, thinks that the submerged area becomes suitable for pulse growing due to availability of residual moisture during winter.

iv. Social movements

Nepal has suffered with decade long Maoist war. The ARCs were found affected by the war. ARCs were found to be affected in two ways. 1. Capture or threat, 2. Bad working environment.

ARC Betahani comes under the first type of effect. The store cum office building was captured by Maoists during war time, so all activities related to seed production and selling were seriously affected during that period. This ARC has been revived after end of war since last 4 years.

The rest three ARC comes under second category. Transportation blockage and environment of fear has demotivated them to carry out the seed farming and selling activities. One of DADO staff who was diligent worker in ARC Bankatawa was killed in war time. This was one of the key causes of failure of ARC Bankatawa. DADO could not depute any staff up to 3 year after his death in that area.

v. Technological changes

It is found that the use of hybrid varieties of rice and maize is increasing in study area. *Mr. Chuda Mani Tiwari* (seed trades) estimated that about 100 Mt of hybrid rice seed is sold by traders of Nepalgunj city in year 2011. Farmers in ARC *Betahani* estimated that about 10% of area is covered with hybrid rice. However, there is still great demand of OP rice varieties like *Radha 4*, and *Ramdhan*. OP maize variety *Arun 2* is still favoured by farmers in hill and plain. Hybrid varieties are not in use for wheat, lentil, chickpea, and rapeseeds, of which the ARC multiplies seeds.

CHAPTER 6 : ANALYSIS AND DISCUSSION

This chapter includes the analysis of result. Comparisons are made with previous findings and suggestion by made other authors in seed sector as far as possible.

6.1 Seed production planning

Seed of secondary crops like lentil, chickpea, and rapeseed were extensively produced (ADB, 1999). These are secondary crops in Nepal, and are targeted by project to maximize the production (ADB, 1999). So, it is obvious that seed that the seed crops were selected based on project objectives. Rice was non-target crop, but it was multiplied by farmers because it is known crop for them and being the major crop, demand of rice seed is also high.

Shrestha and Wullf (2007) reported that that unavailability of source seed is an obstacle for seed companies and entrepreneurs for commercial seed production of new varieties, but it is found that ARCs have not faced the problem of scarcity of foundation seeds. Public agencies are supplying the source seed adequately for ARCs. Connectedness of ARC, DADOs and RARS in foundation seed supply mechanism seems the main reason for regularity in supply. The source seed requirement of ARCs is not as big as of private seed companies, so it is easily fulfilled at present by public sector. During the project period, some foundation seeds were imported from India and supplied to ARCs (Annex- B).

Louwaars (1995) reported that women plays major role for selecting the seed for family consumption, while male dominates if the seed are grown for markets. The similar situation is also found in ARCs. Male are making the decisions regarding crop selections, input purchase, and seed selling. Women do not have access to information, so they are dominated by male.

Farmers use the mineral fertilizer only on seed crops, not in grain crops. It shows the importance given by them for seed crop, and their awareness to produce high quality seed. The Rhizobium inoculums are not available now in local market, so they are not able to use it. The productivity loss of chick pea and lentil seems to be accentuated by discontinued use not using of Rhizobium inoculums.

6.2. Quality control

Seed quality is key factor for success in seed business (Devkota, et al., 2008). Making proper isolation is a difficult in smallholder seed enterprise (Sahlu, et al., 2008.). Farmers are practicing ‘clustering’ of land for seed production. They select a cluster based on suitability for seed multiplication at village. Members of farmers group are mainly involved in seed multiplication. However, non-member farmers get requested to go for seed production if their land is adjacent to already selected seed production cluster. In this way, farmers maintain isolation and purity. Sahlu, et al., (2008) describes that clustering was difficult among smallholders in Ethiopia, however the farmers in ARC are managing to maintain isolation by clustering.

Sahlu, et al., (2008) has highlighted the need of continuous monitoring in smallholder seed production programme. Supervision was regularly made in ARCs by DADO and project team during project period. At present, supervision of seed crop is being made by DADO and RSTL. Germination testing is coordinated by DADO, samples are tested in RSTL. Guei

(2010) has mentioned need of responsibility sharing with farmers for quality control seed, but such practices has yet to be realised in Nepal.

6.3. Marketing of seed

Demand collection by seed producers was explained one of key element for comfortable selling of seed by Poudel, et al., (2003). But this is lacking in ARCs; they did not collect demand from customers. As a result, the cases of “unsold seeds” are reported in ARC Betahani, they could not sell 4 MT of rice seed out of 20 MT in 2010. Devkota, et al., (2008) has mentioned that the seed producer group in Chitwan district of Nepal became able to sell their seed themselves in second year of group formation by collecting the demand from customer.

"We waited for customers; nobody came to buy our rice seed except few local farmers and DADO till end of planting time. Later, we used the unsold 4 MT seed as grain".

-Jaahir Khan, Treasurer of ARC, Betahani

Witcombe, et al., (2003) has described the demand for particular crop or variety as a key to successful seed enterprise. Ibrahim (2008) has suggested adopting the business model to make local seed production program more viable with proper adoption of marketing parameter like demand forecasting, and product promotion to boost demand. However, there is no systematic way of demand forecasting in ARCs, they have limited contact with formal and informal sector.

The size of seed bag seems ideal for transportation. ARC were selling from single outlet in past during the project and it is still unchanged, which is a weak point. Medhi and Gebeyehu (n.d) had viewed the few sales centres and no retailers as a weak point of seed producers in Ethiopia. Similarly, they described Ineffective sales promotion and marketing as other weaknesses there.

But regarding the timeliness, it is found that that seed are supplied in advance of cropping season by ARC, and the same was done in past also. Seed sale to DADO has reduced from 60% to 40%, but still DADO is the big customer for ARC.

ARCs are found weak in marketing promotional activities. Devkota, et al., (2008) have described the marketing promotional activities, for example, pamphlets, advertising by FM radios, and stall making in fairs and exhibitions were carried out by seed producer in Chitwan district of Nepal. Likewise Sahlu, et al., (2008) also mentioned such the examples in Ethiopia. However, ARCs never advertised about their product. A number of media were available, but ARCs was not making use of them for promoting seed sale and establishing the brand.

There might be several ways of sale promotion e.g. advertising by local FM, selling through district cooperatives at major cities, and making selling outlets in cities by ARC itself. Less support in entrepreneurship skill development and marketing promotion for ARCs from the beginning to till the date seems the reason for their weak marketing capacities.

6.4. Economic benefits from seed multiplication

6.4.1. Price setting

A transition was found that previously the price of cleaned seed used to be determined in consultation with DADO; but the active ARC became able to set price of raw and cleaned seed themselves at present. Sahlu, et al., (2008) has mentioned that cooperatives were offering 15% premium on raw seed in Ethiopia, but the premium offered in ARC Betahani is more than this, the premium was 23% in rice seed in 2010. ARC seems able to pay a good premium to farmers. ARC add all cost involved in seed processing, treatment, transport, storage and packaging in price of cleaned seed along with some profit for them. Interestingly, if we see the price of cleaned seeds (Table 7) in market, ARC was offering the rice seed in lowest price. The price was lower for other crop seeds also (Annex- D). Interest on capital investment is very low for them because store and machines were provided by supporters. In addition, DADO provides revolving fund to them without interest. All these support are helpful for ARCs to set lower price than others.

6.4.2. Addition cost of seed production and processing

Cost of foundation seed, fertilizers and additional labour involved are major variable costs incurred in seed production. The additional variable cost incurred in rice seed production is NRs 8250.00 (Table 8). Likewise, grading costs, weight loss during store, labour charges, transport cost, treatment cost, packaging costs and physical damages might be the processing cost for ARCs. Fixed costs are not calculated here, ARCs have not invested on capital assets except small agriculture tools and sprayers.

6.4.3. Profit

Based on variable cost calculation and potential yield (Table 8 and 9), the seed business was found profitable for farmers and ARCs as well. Farmers were getting around NRs 17000.00 additional revenue from seed production. During the discussion, seed producer in all ARCs were agreed that seed production was profitable for them over the grain production. Profit for ARCs was made by putting 10-15% profit margin after adding all cost involved (weight loss, damage of seed, losses during cleaning, transportation, treatment, packaging and selling) in final price of cleaned seed. The same way of price setting by seed producers are reported by Devkota ,et al., (2008) in Chitwan district of Nepal.

6.5. Physical facilities and its utilization

One of the land donor was found seeking compensation for the donated land at ARC Machhagad. In the same way, land donor in ARC Bankatawa is resisting to handover the store building to local cooperatives. So, land seems one of the causes of disputes in ARCs. The production of seed in three ARCs seems below than the actual capacity of store. The production was more in ARC Khairapur in project period, but due to water leakage from roof, they did not store in ARC go down, farmers stored their seed at own home. The roof of store is made up of GI sheets which are thrown away several times by wind in all ARCs. The buildings are still intact, but roof is not well maintained except in Betahani. Water leaks inside from roof in rest 3 ARCs; stored gunny bags were spoiled in store due to water leakage in ARC Khairapur in 1996. The GI sheet roof does not seem ideal for local windy situations.

The machines distributed by project were partially utilised. Project merely introduced machines, but not repair and maintenances technology; it was difficult for ARC to find a

mechanics to repair the machines, so machine were used for short period only (Table 10). In the absence of machine, seed was graded manually, which invariably added cost for them. ARC charges additional fees for non-members for store and processing cost which is a way arranging financial resources for ARCs.

Racks and balances were enough for them. There is need of additional space for ARC Betahani to accommodate new grading machine, this year they purchased a new one. Uphoff (1988) has mentioned the maintenance of physical structure as one of the important and key activity by farmers group. The repair of grading machine was not possible due to lack of mechanics and GI sheet roof repair was costlier for them.

Project had provided big capital supports for newly formed seed production group, but they paid little attention to build the capacity of group to ensure the utilization of these physical assets. As a result, a large investment became useless; farmers could not make use of it. It is just like wastage of resources. Viewing the case of ARCs, it can be said that the big capital supports should be provided when the sense of ownership is developed in group. Group management and enterprise development skill should come at first in groups.

6.6. Internal attributes of management body in relation to seed business

The rules and regulations of ARCs were not binding; there was flexibility of amending the rules and regulations by majority of members. Abaru et al (2006) has described the preparation of constitutions and rule that are understandable to all members as an indicator of maturity. He emphasised the need of strong rules to make farmers' organization stable. Unfortunately, the rules and regulation of ARCs were non- binding and having no any legal status, members violated the rules in ARC Machhagad and Bankatawa. According to present arrangements, rules and regulations of ARC did not keep any legal stand unless registered as cooperatives or community based organization (CBO). ABTRACO (2007) has observed the obedience of rules by members as a key element in outstanding farmer groups.

Acceptance of responsibility by individual is an indicator of maturity in group (Abaru et al, 2006). Reduced attendances in meetings, low recovery of loan after the project termination gives the sign of non-acceptances of role by member and immaturity in ARC Machhagad, Bankatawa and Khairapur. The age of group has no influence on its performance (ABTRACO, 2007), the maturity comes through good leadership and participation of members. During the discussion with ARC members, it is seen that every people expressed their superiority in groups, no one has accepted weakness of himself; they always questioned about other. This type of behaviour in group is also described by Uphoff (1988). People are not valuing other's views, which is not a good attitude for group work.

Conflict management is one of the key elements among '**9 processes'** of organization (Crabbe, n.d.). Conflict management is important one of the major tasks for managers (VHLUAS, 2011). The two inactive ARCs (Machhagad and Bankatawa) have tangled in everlasting disputes related to land ownership and financial cheating by some of board

> "We were doing very well, people r from ADB impressed by us. Financial cheating by some members was the main cause of our failure. At the same time, political division of members and death of DADO staff has demoralised all members".
>
> - Mr. Bhadra Bahadur Thapa , Member and local political leader

members. Land donor demanded privilege in one ARC (Machhagad), which was the root of dispute there. It shows the less efficiency of leadership in handling the disputes, though the involvement of leaders in group activities was good. Similar findings are reported by Abaru, et al., (2006) in Uganda where unhealthy competition was a reason for failure of common interest groups (CIG).

Members were given the responsibility individually or in team. For simple tasks like repair and maintenance, individuals were given the responsibility. Tasks like purchase of raw seeds, selling of cleaned seeds were given for team.

"ARC was very useful for us; the land related dispute created by some of our fellows has devastated the whole system. I don't like to take the land again, but the other guy wants compensation. The ARC can be functional if some other big organisation takes the management responsibility".

-Mr. Tulachan Thakuri, ex-chairman, ARC Machhagad

They had very little contact with stakeholders, like seed traders, input suppliers (National seed company and agriculture input corporation) and NGOs in past. The active ARC is now developing the contact with those stakeholders, but still not well established. Their limitation in stakeholder consultation in past and present as well, had lead for limited production and marketing opportunities.

ARCs were found to developing seasonal plans in the past. The same is reported in case of active ARC at present also. Similar finding were reported by ABTRACO (2007) for other farmer group in Nepal who were making the seasonal plans; longer plans are rarely made. How much seed to produce, who will cultivate the seed crop and how much and when to start selling are elements of planning. Plans are made in monthly meetings. Some ARCs had developed monitoring subcommittee (e.g. in Betahani) with responsibility of monitoring the implementation status of group decision and plans.

Financial resource is one of important resources for organization (Online Resource Centre, 2011). ARCs have their welfare fund deposition; this fund was developed through compulsory contribution by members, deposition of meeting allowances by members during project and profit made by selling of seeds. Fund is used for paying the price of raw seed, input purchase (fertilizers, sprayers) and repair and maintenance of machine and equipment. The fund development has made the seed procurement process easier for ARCs. ARCs have utilised their fund in group work and lending loan for members. Mishandling and cheating of group fund is reported in ARC Machhagad and Bankatawa. Loan recovery was not good in ARC Khairapur also. Hence, mishandling of financial resources seems a key cause of dispute in two ARCs (Machhagad and Bankatawa).

Written and verbal methods of communications are used in ARCs. Uphoff (1988) reported that communication in group is essential for solidarity. Communication can be made through discussion and exchange of ideas in group. Communication gap was not reported among members in ARCs. Letters were rarely sent to members, most information was shared verbally. For outside communication, written methods were adopted. Decisions are made in meetings, which become known to every member. Financial and administrative records can

be accessed by members if required. The fund collection record is maintained in a register, which is briefed for members during monthly meetings.

ABTRACO (2007) has mentioned the need to timely elections in group for energizing the group activities. Accordingly, it is found that elections are held regularly in every two years in all ARCs; however, in one ARC voting had been influenced by affiliations of candidates with political parties. This has caused political fractions, and led for eroded motivation in defeated parties. At the same time, winner could not get support of defeated ones. Abaru, et al., (2006) has described the similar experiences in Uganda where the groups could not work smoothly due to factions. Decisions are made by consensus in meetings, if there are contradicting views, then voting or 'picking of balls' method is followed to reach final point. In case of emergencies, decisions are made by executives, and these are later informed to members in monthly meetings.

Organizational capacity and linkage development are key characteristics of successful farmers groups (Uphoff, 1988). However, it is found that ARCs operated in very small span of contact and affiliations. The objective behind ARCs was to upgrade them in self-sustaining FOs. The project team was highly influenced with the success of private seed growers in India (see Annex-B). The three inactive ARCs did not have any affiliations with other FOs like cooperatives or networks. Only the active ARC (Betahani) has affiliation with cooperative at village level since 2006. Up-scaling in legal status, membership or network is a step of development for farmers' organization (ABTRACO, 2007). NGOs and GOs prefer to work with cooperative than small groups, so such affiliations seem useful for ARC to get additional external support and to enhance marketing capacity as well. There need to strengthen the linkage of ARC to mass media, district cooperatives, and informal seed sector for market promotion and business viability (Figure 10 and 11). Two of ARCs (Machhagad and Bankatawa) have drafted by-laws and regulations to be registering as cooperatives, but none of them could succeed to go for further development amidst the dispute therein.

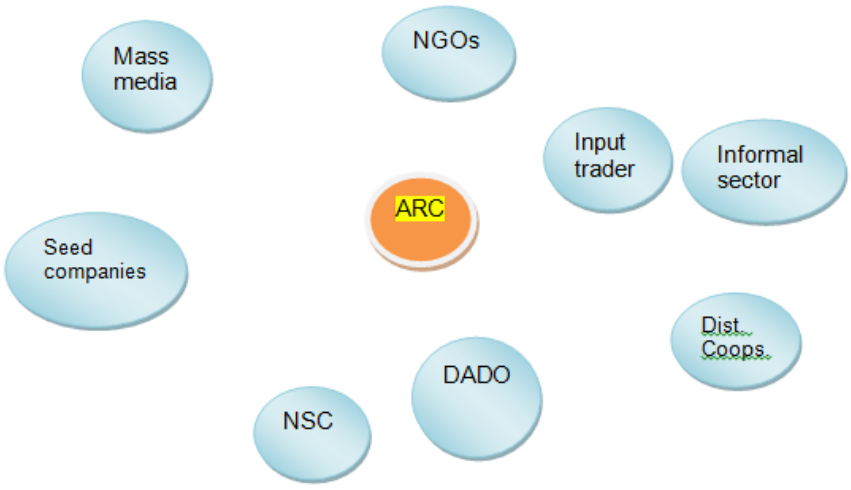

Figure 10. Present network of ARC (Betahani)

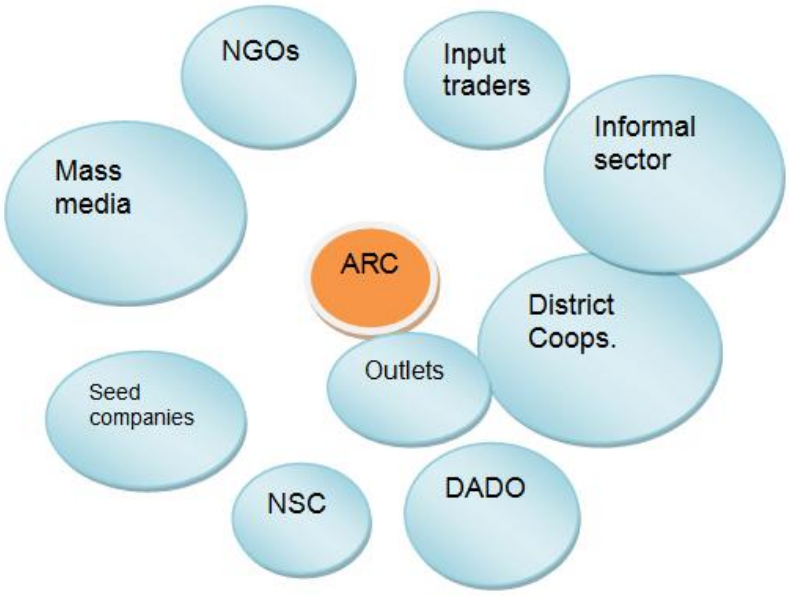

Figure 11. Desired network of ARCs (for all ARCs)

The role of women was not understood in seed business in ARCs. Though women participation was encouraged by project in skill development activities, their participation remained very low in ARC management bodies. Later, upon the requirement of project, women sub group was formed in ARCs. Ethnic group participation was not mandatory at that time; however, their participation found good in FGs. Social inclusion does not seem a priority issue at the time of ARC formation.

6.7 External environment of ARC

6.7.1 Specific or task environment

i. Suppliers

Chakraborty and Schroeder (1995) have described the need of continuous supply of improved variety seed for seed producers in rural areas to make the business viable. It is found that, DADO is providing the source seed in required amount for ARC. But farmers are unhappy about the supply situation of chemical fertilizers even though the number of input supplier has increased in recent years (Table 2). Fertiliser supply is not regular in market, so the low quality fertilizer from open boarder is smuggled, and farmers are compelled to use such fertilizers.

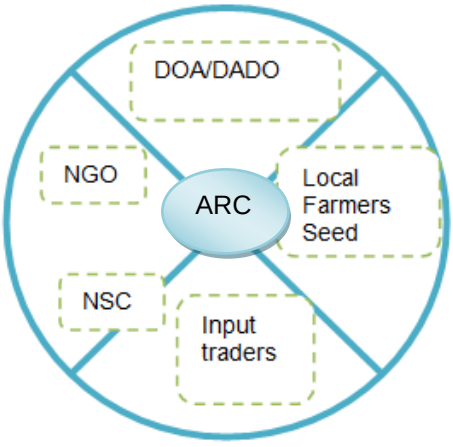

Figure 12 Task environment of ARCs

There is no change in financier from project period to till the date. ARC is currently not taking the loans from formal sector. The members are not felt the need of loan, and they still do not know the procedure to take a loan for group from formal sector.

ii. Supporters and regulator

DOA at central makes the policy regarding the support services to be provided for its clients including seed producer. Seed laws and regulation are generally prepared by MOAC, and sometimes by DOA. DADO at district level priorities the programmes, and provide the supports to farmers. There are some other supporters also in addition to DADO, like NGOs.

Witcombe, et al., (2010) have described the need of business support service for smallholder seed producer group to make their business viable. They further mentioned that the seed multiplication is not merely a technical job, but it a business. Nevertheless, it is found that ARCs were provided with technical skills for seed production, but they were getting very little entrepreneurial skills from beginning to till the date. It is evident that Input supply and seed marketing part of ARC was coordinated by DADO during project period, so their marketing capacity could not develop. Due to lack of business skill, ARC Khairapur could not continue its production after 2 year of project termination. Only the ARC Betahani could became able to set the price in own effort, and now they are trying to find customer in own effort. Formation of cooperative at local level has helped them for seed selling.

"The group started running; not only running but was flying during project period, seed production increased every year. But later on, reduced support and marketing difficulties made the villagers uninterested in seed multiplication".

- Bishwa Nath Yadav, Land donor, ARC Khairapur

If we see the nature of support provided by public agencies for seed producers, it is still mostly related to production dimensions. Technical training on production and processing, input subsidy, financial and machinery support are major types of services being provided for seed producers in Nepal (CDD, 2010). Public agencies were only the supporter in past, but NGOs are becoming supporters and partners for seed producers in recent years. FORWARD, a local NGO is supporting ARC Betahani since two years, they provided financial support to buy grading machine. However, the role of NGOs in study area was not obvious to provide marketing promotion support. RARS has a seed multiplication programme in collaboration with the local cooperatives, of which ARC Betahani is member. NSC has produced maize seed on contractual basis with the same cooperative. In the new context, it can be said the there are now more supporters and partners than project period, which have helped to create a conducive environment for seed growers in study districts.

Seed producers have got extensive support service during SCDP period (ADB, 1999). DADOs were made responsible to provide the support service for them after project termination. However, there was reduction in support provided to ARCs after that. Subsidy on source seed was reduced from 50% to 25%, and Rhizobium inoculums could not become available. Similarly, frequency of supervision also got reduced. Sahlu, et al., (2008) mentioned the requirement of continuous monitoring of seed production, particularly when it is done by smallholder farmers with limited experience. In contrary, it is found that

supervision has been reduced drastically in three ARCs which are inactive nowadays, while it was mildly reduced in ARC Betahani. Betahani is close to district headquarter, the same staff remained working from project period, (one staff himself was involved in seed trading from ARC), and so they got some what regular support from DADO. The financial support is provided in the form of revolving fund by project and DADO.

iii. Customers

Some of new customer like NSC and GATE Nepal are there, but they are not regular customer. Price offered by input traders for cleaned seed is comparatively low. Though there are several customers, but still there is situation of uncertainty for selling of seeds. Farmers generally buy seed from ARC if new varieties are available. Local farmers evaluate the new seed in terms of its germination capacity and visible quality of seeds (like uniformity physical purity, size, and shape). Seed of ARC is tested for germination and is good in appearance. In addition, they know each other, and can complain with ARC if something goes wrong with their seeds. So, local farmers prefer to buy seed from ARC. The other customers (input traders, NGOs) are found happy with quality of seed produced by ARC.

As the number of input traders has increased over the period (Table.2), it can be said that more seed would be sold from these increased outsets to farming communities. It could be an opportunity for ARC to supply the seed for them. After cleaning and treatment, ARC starts to sell their seed from store house. However the seed price set by ARC is lower than market price, it still sounds expensive to local people who think that the seed price should be similar to that of grain.

ARCs seemed to be working under formal seed system. There are opportunities to supply the seed in informal system also. There are around 400 farmers groups in Banke district, and 350 Bardiya (MOAC, 2009b), some of these group can be linked to seed supply system of ARC so that more seed can be supplied in farmers system. Selection and growing of farmers' varieties like *Shyam Jeera* and *Kalanamak* of rice can be a way to work with informal seed system. Guei (2010) suggests that the seed producer groups can be linking pin to connect formal and informal seed sector.

iv. Competitors

Competitors are those who produce similar product or provide similar kind of service (VHLUAS, 2011). The seed producer groups, seed traders and national seed company seem to be possible competitors for ARCs in formal sector. But in reality none of these are at level to compete with ARC at present, ARC itself has diverse range of crops and varieties being multiplied for seed. Guei (2010) has mentioned that diversity in product range is an important criterion for viability of seed business in rural area. The price and quality of ARC seed is very competitive at market.

The unseen competition is with farm saved seeds. Sahlu, et al., (2008) describes the experience of Ethiopia that farmers showed little interest in buying seed multiplied within their vicinities because they could get the same seed from fellow farmers through informal exchange or local purchase. Such behaviour of farmers is also reported in command area ARC Betahani.

6.8. General environment

6.8.1. Policies towards seed supply

FAO describes the conducive policy environment as a key element for success of seed enterprise. Production, processing and market regulations, minimum standards, quality control responsibility, plant breeders right, financial supports are described as components of seed policy environment (Guei, 2010). Seed laws in Nepal have defined quality control requirements, minimum standards, and breeder's right (Shrestha and Wullf, 2007). There are subsidies in source seeds, equipment and pesticides for seed crops (CDD, 2010). Provision of revolving fund for seed producing groups has fulfilled the initial financial requirement to some extent (ibid).

Provision of truthfully levelling has created flexibility in seed supply to some extent, but it is known to few input traders and farmers, not at mass level in study area. The seed rules are basically for formal sector, the requirements of informal sector is not addressed by these rules. Based on field study, it can be said that the present seed policies are conducive for ARCs, however there is un regulated import of seeds from outside, both the private and public sector are violating seed import regulations (GON and ADB, 2010) which might create bad impact on local seed business. Farmers are feeling that unregulated import of lentil and rice seed is causing less demand of seed produced by ARC

6.8.2. Economic environment

The increased income and population growth has caused the increased demand of high value agriculture commodities like fresh vegetables, fruits, and meat (NPC, 2011.). There is increasing trend of fruit and vegetable cultivation in study districts (MOAC, 2009). During the field study it is found that there were no substantial change in farming activities in study area, however small changes are noticed. Three of seed growers have started to grow vegetable instead of seed multiplication in ARC Betahani. Though some small changes are noticed, but not to the extent to minimize the requirement of seeds. The requirement of improved seeds is still prominent (Shrestha and Wulf, 2007).

The construction of new irrigation system has favoured the cultivation wheat instead of lentil in the command of ARC Machhagad. Moreover, according to Mr. Shreedhar Gyawali, an input trader at Nepalgunj; lentil was fetching very good price (NRs 63 /Kg in 2008) when it was exported, but since 2 year the price get lowered (NRs 42/Kg in 2011). So farmers are less interested to grow lentil in study area.

6.8.3. Physical environment

Agriculture production has direct relationship of agriculture with components of physical environment like temperature, soil productivity, pest occurrence and rainfall (Sutton, 2004). Members in all ARCs described the reduced productivity of lentil and chickpea as a major reason for its declining cultivation. Discontinued use of bio-fertilizers and unavailability of improved quality seed seem the reasons for lowered productivity. Pulses are the potential crop to grow in fallow after rice in winter (DFID, n.d.), but it is found in study are that pulses cultivation is declining. Farmers mentioned that the occurrences of pod borer is causing serious problem in chickpea cultivation, the same problem was reported in other parts of country also (DFID, n.d).

6.8.4. Social movements

Nepal has suffered from decade long Maoist war. This war has brought changes in social structure, norms and values (Rijal, 2010). The overall economic activities in country were

seriously affected due to decade long internal war (NPC, 2011). ARC were also affected either physical or in psychological way. The death of DADO staff at Bankatawa and capture of store at Betahani are the major incidents of ARCs that are connected with Maoist war.

6.8.5. Technological changes

Technological improvements can bring changes in farming activities. Though the big changes are not reported in study area, the use of hybrid varieties of rice and maize is increased. Similar increments are reported at national level also (CDD, 2010). However, there is still great demand of OP varieties.

6.9 SWOT analysis

The SWOT analysis of active and inactive analysis is made separately.

6.9.1. The SWOT analysis of inactive ARCs

Internal	External
Strengths	Opportunities
• Physical assets (store, Balances, machines) • Technical skill for seed multiplication • Welfare fund	• High requirement of seeds • Increasing number of seed traders • New supporters e.g. NGOs, and seed companies • Subsidies available • Informal seed sector
Weakness	Threats
• Non-binding rules • Less ownership • Weak leadership • Low recovery of loan • Weak entrepreneurial skills • Dependency on supporters • Women participation very low	• Reduction in support • Un-regulated import of seed • New seed growers in command area • Political instability

6.9.2. SWOT for active ARC

Internal	External
Strengths • Physical assets (store, Balances, machines) • Technical skill for seed multiplication • Welfare fund • Affiliation to local cooperatives • Linkage with NGOs and input traders • Wide range of crop seed produced	Opportunities • High requirement of seeds • Increasing number of seed traders • New supporters e.g. NGOs, and seed companies • Subsidies available • Informal seed sector
Weakness • Non-binding rules • Weak market promotion skills	Threats • Reduction in support • Un-regulated import of seed • Technological change e.g. Hybrid varieties in some crops • Political instability

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

This chapter deals with the conclusions based on findings of research. In addition, recommendations are drawn up for policy implications.

7.1 Conclusions

The study showed that the majority of ARCs are non-functional at present. They were very actively producing seed during project period. But later on, seed production started diminishing and finally stopped in three ARCs, it was continued only in ARC Betahani which produced 46 MT seed in 2010.

Initially the crops for seed production were selected based on project objectives. But farmers started to grow other crop seeds based on demand in local market. DADO provided them source seed in adequate quantity. However, the supply of Rhizobium inoculums was stopped after project termination, which had caused yield reduction of pulses. Farmers were found aware about quality control practices; plot clustering was practiced by them. Ministry staffs were providing adequate technical service for quality control.

They do not still have organized way of demand forecasting; the sale of current season forms the basis for production in upcoming season. Marketing promotional activities were not carried out by ARCs in past and present as well; linkage development with other organizations still seemed weak.

Seed selling was mediated by DADO during project period for all ARCs, very few effort were made to develop their marketing capacity by SCDP/DADO. Marketing problem was one of leading reason for collapse of ARC Khairapur. However, ARC Betahani was selling seed in own effort at present.

Seed business was found economically beneficial for seed producers and ARCs as well. Good productivity and premium on raw seed was making profit on part of producer farmers, while the profit margin kept by ARC in cleaned seed and capital support received were the reasons for profit on part of ARC. The farmers in inactive ARC were also found interested to revive seed business.

The store house and grading machines could not fully utilize. Leakage of water was the problem associated with store use. The project merely introduced grading machine but not maintenance technology, as result these machines could not utilised for longer time.

Public agencies were not buying land for development or construction work. The land had to be obtained free of cost, this trend is still persisting. All ARCs have got land donated by local farmers. Land donor's bargaining for privilege and compensation was found a root cause of dispute in ARC Machhagad.

Financial cheating and infidelity by some board members was noticed to be a major reason of dispute in ARC Bankatawa. Such irregularities were noticed in ARC Machhagad also. These two ARCs get tangled in dispute, but leadership was not able to manage the disputes and find a solution for problem. Their managerial capacity was not well developed. The lack of obligatory binding rules aggravated the situation; members were crossing the mutually agreed regulations; so maturity could not develop. In rest two ARC, persisting disputes were not noticed.

The fund collection and its use in raw seed purchase was a strong point of all ARCs. Fund was developed by monthly contribution of members, profit on seed sale, and deposition of meeting allowances (allowances were available only during project period).

The supporters were found to provide skills and materials with focus on technical dimensions of seed production; very less importance was given for business skill development. The trend was unchanged since beginning of ARC formation to till the date. Some NGOs were supporting the active ARC in addition to DADO at present.

The supports and supervision get reduced after termination of project, the reduction was noticed severe in ARC Machhagad, Bankatawa and Khairapur, as a result they collapsed within 3 years after the project termination. However, the support and "coaching" get mildly reduced, but remained continued in ARC Betahani, which is active still.

Maoist war had affected the seed business in ARCs. Reduced supervision in ARC Bankatawa, and restricted use of store in ARC Betahani has connections with this war, which has negatively affected the overall seed business in those two ARCs.

The ARCs seemed to be developed as the extension of formal seed system. They were selling certified seeds of national standards. They know little about truthfully labelled seed, and were not selling those seeds.

ARCs and seed producer group can serve as linking pins between formal and informal seed system. Linking with informal seed sector would give new market opportunities for seed producers. In addition, the supply of improved quality seed can be expanded in rural area through this linkage.

7.2 Recommendations

Based on the findings of the study, following recommendations are made, which can be useful to policy makers in GOs and NGOs; and other agencies who are directly or indirectly involved in promoting seed business at community level.

- The groups should be promoted with development of business skills, in addition to technical skill of seed production. They need entrepreneurial skill from the beginning. DADOs need to amend their training curriculum accordingly. The supporting policy should focus on business part, not only on technical part of seed production.

- Mutually agreed rules were not found enough for always. There is need of some obligatory rules to be abided; this will make seed producer groups more stable. The large capital supports should only be provided after legalizing the groups through registering as cooperatives or CBO. Initial supports should be small, bigger capital supports need only after maturity and ownership is developed in group. Otherwise, it could become wastage of resources.

- There is need of flexible policy regarding the purchase of land by public authorities. Present rules are not allowing to buy land, which requires revision. Some flexibility to purchase the land for development works if required. Disputes are often found to pertaining to donated land.

- There is strong need of organising marketing promotional activities like demand collection, advertising by FM radios and pamphlets, and meetings with stakeholders. Supporters and ARC itself need to plan those activities.

- ARC needs to expand selling outlets. The village local cooperative at Betahani is member of district cooperatives board. This network can be utilized for market promotion of seed.

- ARCs need to start the truthful labelling of seeds. This system will allow them to expand seed business by reducing cost. Moreover, there is need of supporting the seed producers groups to adopt integrated way of seed supply. Multiplication of farmers varieties, agreements with common interest group (farmers group or community), and seed exchange programme can be implemented at ARC level to link them with informal system. The seed regulations should be flexible to allow the integration strategies, it should be reformed accordingly.

- Reorganisation of management bodies in participation of stakeholders in three inactive ARCs seemed an option for revitalization. There are still chances of operating the ARC by merging with existing local cooperative at Bankatawa. ARC Machhagad and Khairapur can be revived by reformation of operating committee in full participation of villagers. The revitalization should be facilitated either by DADO, NGOs or other stakeholders.

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Annexes

Annex A. Interview with farmers

Summary of findings

ARC, local seed trades and sometimes the national seed company are the sources of seed for farmers whenever they wanted to buy the seed. ARCs were supplying the improved seed of secondary which are not readily available at local level nowadays, and still there is need to travel to some bigger cities to buy such seeds. Rice seeds are now becoming available locally.

The quality of seed supplied through ARC is good. For known varieties, farmers evaluate the seed in two parameters, i.e. germination and genetic purity. ARCs sell the seed after testing its germination. They are able to maintain genetic purity, by isolation and rogueing. They generally buy seed from ARC if new varieties are available. They prefer to buy from ARCs because they are close to them, know each other, and they can complain if something goes wrong with those seeds.

Annex B. Interview with SCDP staff

Summary of findings

The project team was influenced with success of private seed growers in India. They were successful in producing and selling seeds in market. ARCs were established with the vision of operating them in self-sustaining way, and supplying the improved variety seed smoothly at local level. ARC Bankatawa was the most promising one at that time.

The seed multiplication and related support activities at field level were carried out on participation DADOs, not only by project. The team of DADO was made responsible to provide technical and managerial support service for ARCs. The project team expected that the team of DADO will continue the support services after termination of project. Separate arrangements were not made to supervise them after the project.

Input supply and seed marketing was facilitated by project and DADO. DADO was organising source seeds for them. Foundation seed of new varieties lentil, Rajma, and chickpea was imported from India. Project implemented several activities to promote the market the lentil grains. Seminars with millers and traders and import of new varieties are the examples. However, the linkage for seed marketing could not develop at that time; it was facilitated by project and DADO. The number of seed traders was small, road network was poor than present at that time.

Annex C. Interview with ministry staffs

Summary of findings

The ARCs are being supervised by the field level staffs. The field staffs have to supervise a large area, so are not able to frequently visit the ARCs. DADO staffs discussed with inactive ARCs for resuming the seed business, but they are not in position to re start the seed business. Some of staffs still afraid to go at ARC Bankatawa because one of the staff was killed there in 1999. DADO has implemented other programs in ARC Khairapur and Bankatawa area. Bankatawa area is now pulse production pocket area. The number of farmers group is now 20 at that site. Mission onion and mission oilseed program is being implemented in khairapur where one of ARC is located. Some farmers who were seed growers during SCDP again are growing rapeseed seeds at present.

The nature of support provided to ARC is similar to that of other seed producing group at present. DISSPRO is being implemented in both districts. Subsidy on seed and equipment, revolving fund, skill development support, supervision, are the major services being provided for seed producers at present.

Annex D. Interview with input traders

Summary of findings

The demand of cereal seed is higher than the supply capacity of seed traders in market. It is due to limited scale of seed multiplication. The demand of outstanding new varieties is more, *Raamdhan*, a rice variety, is becoming popular in recent year. For lentil seeds, traders are able to supply as per demand. Demand of chickpea seed has decreased overtime due to infestation of pod borer and pre-harvest losses like uprooting the plant for fresh pods by school children and others.

Some traders are selling source for seed multiplication as well as seeds for grain production. They get Source seed from public and private parties. NARC, the public organization, is availing them source seeds of cereals and pulses; about 40% of total sell they get through NARC. Cooperatives of distant districts like Chitwan, Rupandehi are the other source for them for getting source seeds. This part constitutes 60% of total sale of sources seeds.

Farmers groups and cooperatives within the Banke and Bardiya district are the major sources of improved seeds for grain seeds. They buy seed from ARC Betahani, and the cooperative located in command area of ARC, Bankatawa is also selling seed for him. Lentil, chickpea, and rice seeds are purchased with ARCs. However one of interviewee traders (in Bardiya District) said that he rarely buys seed from local seed growers, because their quality is not reliable, and more over he does not buy from NSC also because they found a lot of physical impurities in lentil seeds. Now he is selling lentil seeds which are imported from India.

The quality of seed from ARC is good and comparable to that of other sources like distant cooperatives. ARCs are availing seeds in well advance before cropping season for traders. Their price is generally 10 to 15% less than the price set by public sector National Cooperative is a public sector seed and

Seed traders are supplying pesticides and agri tools like sprayers. Traders are feeling uncomfortable with the new policy for fertilizer trading which states that fertiliser dealerships can be provided for organizations or corporate sector only. Hybrid seeds of rice are getting popularity in recent years. From Nepalgunj city, 100 MT of hybrid is sold annually. Hybrid rice seed is getting popularity in Bardiya district also. The interviewed trader is selling around 3 MT hybrid rice seed annually at present.

Annex E. Interview with chief of National Seed Company (NSC), Nepalgunj

Summary of findings

Seed production is carried out on contractual basis with individual farmers. Currently, contract is not made with groups. seed production by contracting groups or cooperatives in rarely done. Maize seed production is being carried out since last year with local cooperatives, of which ARC Betahani is member. There are no linkages between seed producers groups formed by DADO and rest 3 ARCs with NSC. Sometimes farmers like to sell the seed in open market, where they can get good price than NSC rates. Farmers groups generally do not like to supply the seed to NSC, because of rate that they can get more in market if they sell themselves.

NSC is multiplying cereals like rice, wheat and maize; pulses like lentil and chickpea, and rapeseeds. The varieties multiplied are for plain regions, hill varieties are multiplied in small amount due to limited supervisory capacity available. They have planned to produce vegetable seeds and hill varieties of their crops in coming days.

The sale of seed by NSC is not promising. They have set target for every year to sale, but for most crops the sale is below the target. Farmers and seed traders are not satisfied with the quality of seed supplied by NSC. The chief of NSC Nepalgunj accepted that the supervision may not be enough due to very fragmented and large number of seed growers. The land holding size is small in study area, so the number of contracted seed growers becomes large; in general the average size of seed plot is 0.5 to 0.67 ha. The sale and target is given in Table E.1

Table E.1: Status of seed sale by NSC, Nepalgunj (Amount in MT)

Crop	Year			
	2008/009		2009/10	
	Target	Sale	Target	Sale
Rice	100	84	100	106.4
Wheat	175	28	100	90
Maize			2.5	0.84
Lentil	10	0.62	2	0.6
Rapeseed	0.6	0.19	1	0.28

Note: Lentil- 6 MT, Maize- 4 MT, Wheat- 120 MT was in stock

(Source: National Seed Company, Nepalgunj)

They have store capacity of 500 MT, and seed grading machines with capacity of 1 MT per hour. Storage facility is exclusively used for own purpose, but the grading machines can be rented by other parties also. Sewing and tagging equipment are available.

Radha 4 variety of rice has great demand; people come from India on bicycle on 2 days travel to buy its seeds. If this variety is multiplied, then market is already assured.

Mr. Ganesh Panthi, Chief, NSC Nepalgunj Branch

Annex F. Interview with RARS staff, Khajura

Summary of findings

Regional Agriculture Research Station (RARS), at Khajura is producing foundation seed of rice, wheat, maize, lentil, chickpea, and some vegetables. Seed production amount is planned on the basis of demand received from DADOs. DADOs collect the demand of all seed producers within the district. So, DADOs are the prioritised customer. If seed is produced in excess amount, NGOs, National Seed Company, and farmers groups comes in subsequent priority.

The price of foundation seed is relatively more than price of certified seeds. The price of foundation seed of rice was is NRs. 40-45 per Kg (depending upon varieties), and lentil NRs. 70-75 per Kg in 2011. RARS is also promoting seed production in out-reach program. There is seed multiplication program in coordination with IRRI at ARC Betahani (with cooperatives). Certified level of seed is produced in outreach sites.

Annex G. Focus group discussion at ARC Machhagad

Summary of findings

The ARC was established in 1993 with the initiatives of SCDP. Initially, it was difficult to get land in appropriate site for construction of store cum office building. Later on, two of locals have granted land for construction of building. They got intensive support from project during project period; Farmers were enthusiastic at that time. Seed production was successful; the total production of seed was 12-15 MT per year. They became able to deposit NRs1, 25,000 (€ 1250) as welfare fund. They won the prize of best seed producers, head of DAO, and ministers visited the Arc due to its success.

Initially there were 21 members in farmer group; this group was an operating group for seed related activities. The same group has worked as operating. Meeting were regular, levies were collected, and seed business was carried out in profitable way. There were 4 sub-groups in command area including g one women sub group. Later on, 4 of them left the group in midway. In addition, three more members were interested to leave, but they were requested to sit by rest fellow members. The operating committee was preparing for registering as cooperatives, draft rules have been prepared. By that time project got terminated, and after that the supervising staffs of DADO was transferred. In new circumstances, supervision and support get reduced.

In the meantime, by the end of project, the land donors showed their keen interest to be in executives. One of them has elected as chairperson, but the next guy was not preferred by members. So, he began to ask for compensation of already granted land, and in one day, he became able to make a decision in meeting that the group will take initiative to give him compensation. Then, the dispute grew up. Financial misuse also appeared. The recovery of invested loan reduced.

Amidst reduced external support and escalated internal dispute, the motivation of rest of members gone away. Maoist war was in climax by that period, it has developed a sense of fear in society. Seed business stared to diminish from 1998 and completely stooped at 2001. Group meetings were organised even after collapse of seed business, however it was not regular and attendance was also not good. Members did not attend even if they are invited by chairperson through written letters. Attendance of members in meeting get slowly decreased, and finally 9 members were expelled from group due to their long time absence in meeting. The group could not be register as cooperatives. Last meeting of group was organised on 2008.

Annex H. Focus group discussion at ARC, Bankatawa

Summary of findings

The ARC was established in 1993, same period as Machhagad. The four ARCs were established in same year. The land of construct was donated by a single family. It is on roadside. There were 22 members in group at beginning. One of the famous Radio artist and agriculturist Ms. Lakshmi Bhusal was present on the day on inauguration, so the name of group was kept as ***Lakshmi Secondary Crop producing Group***. This group worked as operating body for ARC. 3 members left the group in 1998, then 6 new member joined, the number of members now became enough to be registered as cooperatives. There were 6 other groups in command area of ARC. One ARC management committee was formed by representation from all groups, which worked as supporter for Lakshmi group. Lakshmi group had great role in construction of building, so they worked as operating body.

With the project support and visionary guidance of DADO staff Mr krishna Murari Ghimire, seed business was very successfully run in ARC. They have supplied seed to neighbouring and distant districts. Mr. Ghimire has worked with great enthusiasm to establish and develop the ARC in Bankatawa. The ARC was a model at that time. The team from Asian development bank has visited, looking the progress made by ARC, they agreed to extend the project support.

Meeting were regular, profit from seed business and levied of members accumulated the total fund more than NRs 100,000.00 (€1000,00). Draft of regulations has been prepared for registering the group as cooperatives. They had bank account, but money was also kept by members who were assigned the responsibility of raw seed purchase and selling of cleaved seeds.

Elections were held regularly. However, the candidates and supporters aligned according to their affiliation with national political parties of that time. The winning group could not get support of defeated group, defeated one felt biased. Such fractions worked as slow poisons in the group. The actions and behaviour of members get highly influenced by contemporary political negotiations.

The total seed production ranges from 15 to 20 MT during that period. Seed production was carried out by clustering the plots for quality maintenance. Raw seed purchase and selling responsibility was given in team of 2 people, not individually. The members, who were given the responsibility of seed selling, started to make fraud. Put name of imaginary people as buyer, and showed the money to be received from them, but they already received cash from every sale of seed in reality. They made money for oneself. The mishandle bookkeeping aggravated the disputes in group.

The supervising staff of DADO, Mr. Ghimire was killed at 1999. It has connection with Maoist war of that time. His death was a great shock for ARC members. DADO could not depute their staff till 3 year after his death, and so external support was greatly diminished at that time. Due to political fraction and financial misuse within the group and totally blocked external support, seed business get collapsed.

A cooperative is now operating in surroundings of ARC. Some members of ARC are also the members in cooperatives, this cooperatives is involved in marketing of rice seed produced locally. This year, they sold 14 MT of rice seeds. It shows thel great scope of seed business in that area.

Annex I. Focus group discussion at ARC, Khairapur

Summary of findings

The group was established in 1993. Land for building construction was donated by a single family at earthen road head. There were 23 members, with 4 females. The members are from a homogenous community in ethnicity. The land donor was local land lord, and he had a great influence in group activities. The group welfare fund collected was about NRs 130,000.00(€1300, 00). Group meetings were regularly organised till 1998, after that it was irregularly up to 2007, then completely stopped. Some members' withdraw great amount of loan from group in 2007, which is not paid back yet.

They were producing rapeseed and lentil seeds. . Project coordinator have visited them several times, and worked with farmers in their field. Seed production was continuously increased during project period, they have produced 60 -70 MT of seed annually, some of which was stored by farmers themselves. Selling of seed was mediated by DADO/project at that time; ARC and buyer do not have any relations and linkages.

Though the ARC is very near from district headquarter, the supervision and support service get reduced after the termination of project. ARC was producing comparatively large amount of seed, they felt difficulty is selling of seeds. They have to organise transport up to district headquarter, but during project period. The link roads to district headquarter for selling seed, which added cost to them. They did not have to organise such transportation during project period, large part of production was truck loaded from the store, which was mediated by project. Small fraction was sold at local level. As a result, farmers motivated to carry out seed production. Nowadays seed multiplication is carried out, but it is on individual basis. DADO is now implementing promotional programs like Mission Onion and mission rapeseed program in this area. So, some farmers, including the land donor are producing rapeseed seeds at present. The store and equipment are not utilized at present. Land donor has a plan to set a rice mill in compound of ARC and supply the coarse rice in hill areas.

Annex J. Focus group discussion at ARC, Betahani

Summary of findings

Established on 1994, and it is only one active ARC among the 4 ARCs studied. There are 23 m3mbers with 3 women. The group is composed of indigenous Hindus and Muslims. They have regular meetings and saving collection. Till now, the fund is NRs. 150000.00(€ 1500,00). A village level cooperative was established in 2006, the group is member of this cooperative. Since 2006, the cooperative is coordinating the seed business at local level. The building is now operated by the cooperative. Support services like subsidies on seeds and marketing of seed have been lessened after project termination. Supervision and technical support remained continued even after that. The ARC is near from district headquarter. The supervising DADO staffs not changed after project. One of DADO staff was involved in seed selling activities for his own interest. NGOs are now showing interest to support the seed business in ARC. One of NGO (FORWARD) has provided 50% subsidies to buy a seed grading machine this year. These all supported ARC to carry out seed business in continuous way.

Lentil and chickpea seed production reached 20 Ha and 5 Ha respectively during project period. The production of last season by the group is 4 MT of Lentil and 1 MT of Chickpea, 20 MT Rice, 20 MT Wheat, and 1 MT ground nut. The productivity of pulses has been reduced compared to project period. Productivity of lentil was 2 MT, and chickpea was 3 Mt at that time. Rhizobium inoculation was compulsorily provided by project at that time, but is not available nowadays. Lentil productivity is 1.2 MT and chickpea 1.5 MT per ha nowadays.

> This area is suitable of pulse seed production; however marketing capacity of farmers is still very weak; our support is not being adequate for them.
>
> -Mr. Dhanahi Yadav, Agriculture Extension Officer (Supervising staff of DADO)

DADO, local farmers, seed traders, and NGOs are the customer of ARC at present. However, there is no assured market for seed. Last year rice seed was used as grain, because it could not sold in season. The price of raw seed offered by traders is very low. For example, last year the price set by cooperatives was NRs 29 per Kg, and seed traders offered maximum of NRs. 21per Kg. Market promotional activities are not being carried out by ARC at present. They have no other selling outlets, and no advertisement for selling seeds. They do not have contractual agreement with seed trading parties. However, one of the local NGO and a private company Gate Nepal is showing interest to buy seed. Price negotiation is being made with both of them. In summary, farmers do not have problem in producing the seed, but selling of seed is difficult for them.

Annex K. List of Persons contacted for the research

1. List of personnel visited for interview (Key informants)

1.1 List of farmers visited for interview

S.N	Name	Address	Gender	Seed supplying ARC
1	Ms. Chandravati Sharma	Deudhakala -3	F	Machhagad
2	Mr. Chandrika Tharu	Deudhaka-4	M	,,
3	Ms. Kamala Yadav	Gulariya-12	F	Khairapur
4	Mr. Bhanu Bhakta Bhattarai	Gulariya -10	M	,,
5	Ms. Pavitra Shahi	Bankatawa-8	F	Bankatawa
6	Mr. Dil Bahadur Thapa	Bankatawa-9	M	Bankatawa
7	Mr. Sakil Ahamed	Betahani-4	M	Betahani
8	Ms. Sarita Kurmi	Betahani -5	F	Betahani

1.2 List of Project staff visited for interview

S.N	Name	Address	Position in project
1	Mr. Govinda Krishna Shrestha	Nepalgunj	Consultant

1.2 List of ministry staffs visited for interview

S.N	Name	Office	Position
1	Mr. Kishorman Shrestha	DADO, Banke	Acting chief
2	Mr. Shivaraj subedi	DADO, Bardiya	,,

1.4 Input traders visited for interview

S.N	Name	Address	Position
1	Mr. Chudamani Tiwari	Tiwari Krishi Vikash Firm, Nepalgunj (Banke)	Proprietor
2	Mr. Rajesh Rana	Rachana Agro Vet, Gulariya (Bardiya)	Proprietor

1.5. NSC staff visited for interview

S.N	Name	Address	Position
1	Mr. Ganesh Panthi	NSC, Nepalgunj	Chief

1.6. RARS staff visited for interview

S.N	Name	Address	Position
1	Mr. Jeevan Kumar Shrestha	RARS, Khajura	Technical Officer

1.7. ARC executives visited for interview

S.N	Name	Address	Position	ARC
1	Mr. Deip Bahadur Khatri	Deudhakala -3	Ex-chairman	Machhagad
2	Mr. Buddha Prasad Pokhrel	Deudhaka-3	Secretary	,,
3	Mr. Bishwanath Yadav	Gulariya-12	Secretary	Khairapur
4	Mr. Mihilal Yadav	Gulariya -11	Vice-chairman	,,
5	Ms. Tulasi Gyawali	Bankatawa-8	Treasurer	Bankatawa
6	Mr. Bhadra Bahadur Basnet	Bankatawa-9	Secretary	Bankatawa
7	Mr. Jaahir Khan	Betahani-4	Treasurer	Betahani
8	Mr. Ram Prasad Kurmi	Betahani -5	Ex-vice chairman	Betahani

2. List of Personnel visited for focus group discussion

2.1. Persons visited for Focus group discussion in ARC Machhagad (Members of ARC)

S.N.	Name	Address	Gender
1	Mr. Trolochan Subedi	Deudhakal-3	M
2	Mr. Tulachan Thakuri	,,	M
3	Mr. Tara Prasad poudel	,,	M
4	Mr. Krishna Prasad Neupane	,,	M
5	Mr. Bharat Parajuli	,,	M
6	Mr. Kamal Gautam	,,	M

2.2. Persons visited for Focus group discussion at ARC Khairapur (Members of ARC)

S.N.	Name	Address	Gender
1	Mr. Gopal Yadav	Gulariya-12	M
2	Mr. Sadhuram Chaudhary	,,	M
3	Mr. Krishnaram Yadav	,,	M
4	Mr. Mahesh Yadav	,,	M
5	Mr. Pinku Ahir	Gilariya -11	M

2.3. Persons visited for Focus group discussion at ARC Banakatawa (Members of ARC)

S.N.	Name	Address	Gender
1	Mr. Man bahadur Basnet	Bankatawa-9	M
2	Mr. Kul bahadur shahi	,,	M

3	Mr. Nar Bahadur Thapa	,,	M
4	Mr. Rajendra Oli	Banakatawa-8	M
5	Mr. Rabi Baral	Bankatawa-9	M
6	Mr. Manharka Baral	,,	M

2.4. Persons visited for Focus group discussion at ARC Betahani (Members of ARC)

S.N.	Name	Address	Gender
1	Mr. Rijban Khan	Betahani -5	M
2	Mr. Lallu Kurmi	,,	M
3	Mr. Ghanshyam Kurmi	,,	M
4	Mr. Naseer Ali	Betahani-4	M
5	Ms. Parvati Kurmi	Betahani-4	F
6	Mr. Saifuddin Ansari	,,	M

Annex L. List of seed producers in Nepal

SN	Name of Company and address	Processing capacity	Storage capacity	Transaction	Crops dealt
	Public Companies				
1	National seed Company (12 processing units)	17900 M Ton per year	8500 MT	3548 MT (2007)	Self-pollinated
	Private Companies				
2	Lumbini Seed Company, Bhairahawa	2 MT per hour	700 MT	500 MT (2005)	Cereals, legumes, and mustard
3	Universal Seed Company, Bhairahawa	2 MT per Hour	500 MT	320 MT (2005)	Cereals, legumes, and vegetables
4	Kalika Seed Company; Pipariya, Rupandehi	Processing and packaging of 500 MT per year	500 MT	450 MT (2005)	Cereals, legumes, and rapeseeds
5	Malla Seed Suppleirs Pvt. Ltd , Tadi, Chitwan	4 MT per day	400 MT	NA	NA
6	Everest Seed Company Pvt. Ltd. Khumaltar, Lalitpur	1 MT per Day	100 MT		Cereals, pulses, vegetables
Sources: Seed sector Nepal					
7	East West Seed Company, Nepalgunj, Banke	Rice 0.5-0.7 MT per hour, wheat 1-1.2 MT per hour	150 MT	100MT (in 2010)	Rice, Wheat, Maize
8	Global agri tech Nepal, Bankatwa, Banke	2 MT per hour (2 machines) *proposed*	150	100 (in 2010)	Rice, wheat, Mung bean (working for participatory plant breeding)
Sources: Own Fieldwork					

Annex M. Interview questions and topic list for research

1. Topic list and questionnaires for discussion with members and executives of ARCs

1.1. Research Sub question 1: In what way production planning, quality control and marketing of seed was carried out in ARCs ?

I . Production planning

- Which crops and variety for seed multiplication are selected, and why?
- On what basis the production amount is planned, and farmers nominated for production?
- How family decision are made regarding selection of crop and variety for seed production?
- How the farmers obtain source seed? (where, who organises, timeliness, and quality)
- What other inputs are commonly used by farmers in seed multiplication, (fertilizers, pesticides, irrigation)?

II. Quality control

- What are the major quality control measures taken by producer farmers and ARC

(During production, processing and storage)

- How the quality control is supervised by external organization (who, timeliness, regularity)

III. Marketing

- How demand is forecasted? (Current methods)
- How seed are supplied/ sold? (outlets and amount sold, package size, timeliness)
- What about labelling, packaging, and promotion (branding – outreach)?
- How Linkage and network are developed for business purposes? (Nature of linkage, membership of federation).
- What are Main constraints encountered in production and marketing?

1.2. Sub research question 2: Have the farmers economically benefited from the seeds production and marketing business through ARCs?

I. Price setting: How the seed price is fixed? (raw seed, cleaned seeds)
II. Additional Cost: What Additional costs incurred in seed production and marketing?
III. Profit: Was it perceived profitable for producers and coops as well?

1.3. Sub research question 3: How the physical facilities (Store and machines) were utilised and managed in ARC?

I. Are the stores used in full capacity? (capacity and utilization status)
II. Are the machines used in full capacity?
III. How the fee is collected through store and machines, and utilized?
IV. How about the repair and maintenance of store and machines (Who, sources for costs incurred)?
V. Are existing infrastructures adequate for ARC seed business (store, machines, equipment)?

1.4. In what way the internal attributes of farmers' organisation has affected the seed business (seed production and marketing) in ARCs?

I. Set up : brief about when, how and why it was established
II. Regulations: how they are formulated, implemented, and amended? Were they enough?
III. Maturity: how is participation in meetings, regularity of meeting?
IV. Leadership**: (**are the conflicts are managed/dispute handled, monitoring of decision implementation, contacting with stakeholders, time dedication by executives).
V. Programme planning: (how, what types, when)
VI. Fund development: How collected, How much, purpose, utilization
VII. Communication /transparency: how is bookkeeping and information sharing with members?
VIII. Democracy: Method of decision making, timeliness of elections.
IX. Affiliations with other organizations (cooperatives, federation, GOs, etc.)
X. Up-scaling: is there any expansion or up scaling in membership, activities, or legal status?
XI. Social inclusion: How is women participation in management body and other activities?

1.5. In what way the external environment has affected the seed business in ARCs?

1.5.1 Specific Environment (suppliers, partners/supporters, competitors, linkages, customers)

I. Suppliers
- Is there any changes in suppliers (Inputs and Finance) ?

II. Supporters /regulators/partners
- Who are supporters (organization)?
- What kind of support is received from them? (material or service, business development or technical skill)
- Is there any change in support received from supporters after the project?
- If yes, how?

III. Competitors
- Who are competitors and how they affected the seed business of ARCs?

IV. Customers

- Customers' preference on ARC seeds (Traders and farmers): perception regarding quality, timeliness, price, variety, quantity etc.

(Do farmers favour other seed sources than ARC?)

- Which farmers buy seed - how often?

1.5.2. General environment

I. Policies towards Seed supply

- How the government seed policies and laws has affected seed business?

(Subsidies, import, tax, certification standards and procedures etc.)

II. Economic environment

- Are the economic activities and /or farming activities of people in surrounding of ARC changing? If yes, does it have any impact upon seed business?

III. Physical Environmental

- How the relative importance of crop has been affected by environmental factors?

(Rainfall trend, Soil productivity, Pest and disease occurrence etc)

IV. Social Aspects

- Has the social (Maoist) movements have any impact upon seed business, if yes, How?

V. Technological factors

- Do the changes in cropping pattern and introduction of new crop/varieties have any impact upon ARCs? (Hybrids, non-conventional crops etc.)

2. Interview questions with key informants (other than ARC members)

2.1 Farmers (customer of seeds)

I. What are the major sources of seed supply at local level for farmers outside the ARCs?
II. Why farmers buy seed from the cooperatives or take it from other sources?

2.2 Project staffs

I. How the ARCs were visualised by SCDP?
II. What arrangement was set up to supervise the ARCs after termination of project?
III. Had the linkages been developed during project period for input supply and seed marketing?

2.3. Ministry staffs (District Agri. Dev. Office)

I. How the ARCs are being supervised and supported?
II. What kind of support services is being provided to Seed Producer's Groups at present in general?

2.4 Input/seed traders

I. What are major source of seed supply for them?
II. How is the demand and supply of cereals and pulse seeds (crop, variety and difference)?
III. How about the quality, quantity and timeliness of seed supplied through ARCs ?

IV. Are the traders able to supply inputs for farmers (source seeds, fertilizer, pesticides)?

2.5 National Seed Company (NSC)in study area)

I. What crop seeds are multiplied?
II. How many seed producer groups are under the supervision of NSC in district in this year? Are the seed producer groups formed by District Agri Dev. Office linked to NSC also?
III. Do NCS have any linkages with ARCs?
IV. Is NSC able to supply seed according to demand? If not, why?
V. What kind of seed processing and storage facilities are available?

2.6 Regional Agriculture Research Station

I. Who gets the priority in getting foundation seed from research stations?
II. What crop and varieties seeds of foundation level are available at present?

Annex N. Some photos from field

Photo 1: Store cum office building at ARC Machhagad

Photo 2: Store cum office building at ARC Khairapur

Photo 3: Store cum office building at ARC Bankatawa

Photo 4: Store cum office building at ARC Betahani

Photo 5: Old grading machine at ARC Khairapur

Photo 6: Focus group discussion at ARC Betahani

Photo 7: Focus group discussion at ARC Bankatawa

Photo 8: Interview with key informant at ARC Bankatawa

Photo 9: Interview with key informant at ARC Khairapur

Photo 10: Imported seed at Agro Vet, Bardiya district

Photo 11: Office of local cooperative at Betahani on ARC building

Photo 12: Land donors of ARC Machhagad, Khairapur and Bankatawa respectively