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# COLLECTIVE FARMING: AGRI-ENVIRONMENTAL RESOURCES MANAGEMENT BY GROUP OR COLLECTIVE FARMS

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**ABSTRACT**

As the population is growing and rising nuclear family system in rural areas, the land available to per-head is shrinking fast, which result the returns on land to tenants are declining which affects their economic welfare and further deteriorating food security situation. The aim of present paper was to investigate feasibility, organizational structure, and cost comparison of collective farms. In this regard, case study approach was applied to analyze the various issues of collective farm. For organizational structure of collective farms four different case studies (two from developing countries and two from developed countries) were analyzed, whereas for cost comparisons, Farm Machinery Co-operatives a case study by Andrea Harris and Murray Fulton (September 2000) was analyzed. the findings from cost comparison shows that under direct seeding method, collective farms incurred 33 percent less costs as compared individuals farms and under conventional seeding 36 percent costs were less costs under collective farming against o individual farms. The study can provide valuable insights into collective farming system to the policy makers for taking steps to introduce collective farming at large. Collective farming system can help to restrict further deterioration of land fragmentation.

**KEYWORDS:** Collective farming, shrinking fast, economic welfare, feasibility, organizational structure, farm machinery, valuable

## INTRODUCTION

With the growing population and grown cultural of nuclear family system in rural areas, the land-man ratio is shrinking fast. As a result the returns on land to tenants are declining which affects their economic welfare and further deteriorating food security situation. FAO estimated land holding size for 113 across the globe and found that smallest average holdings were prevailing in Asian and African countries with less than 5 hectare of holdings. Bentley (1987) pointed out that land fragmentation is considered as the sources of ineffective agriculture. Similarly, Karouzis (1977) and Blackie and Sadeque (2000) summarized that declining average land holding size is a serious constraint preventing productivity in agricultural sector. The main problems associated with these land holdings are distance between parcels and farmstead: many boundary lines, size and irregular shape of parcels; and lack of access. In particular, when parcels are spatially dispersed, and hence costs in moving labour, machinery etc from one parcel to another parcel increases, with the result the cultivation of these parcels becomes less intensive (Bentley, 1987; Karouzis, 1977; Burton, 1988; Niroula, and Thapa 2005).

It is clear from the above that small land holdings and further fragmentation of land holdings poses serious constraints tot the growth of agricultural sector. To assert control over further fragmentation of land holdings, a range of initiatives can be taken such as to promote legislation regarding aspects that affect land fragmentation so as to prevent an already worsening of the problem, to apply specific land management approaches to tackle certain problems (land consolidation, land funds, voluntary parcel exchange, lands banks and cooperative farming). Cooperative farming involves joint or group cultivation of land by number of farmers (OCED 2013). Such practices were initiated in India during 1970s which suffered negative results due to the reluctance of land owners to enter in joint farming system (Niroula and Thapa, 2005).

Many previous studies (Ostron, 1995; Agarwal, 2001; Mills et al 2011) have identified various key factors for the success of collective farming system. However these studies have not focused on large scale collective farming, which can protect area at an ecologically appropriate scale (Ostron, 1995; Davies et al 2004; Uetake, 2013). In addition, these farms involves diverse participants who makes its management complicated, therefore it requires key steps to be taken for the success (Hodge and Adam, 2013). The various issues that would be analyzed in this study regarding collective farming are:

**I:** Factors, that is conducive for the success of collective farming, for management of natural resources in rural areas.

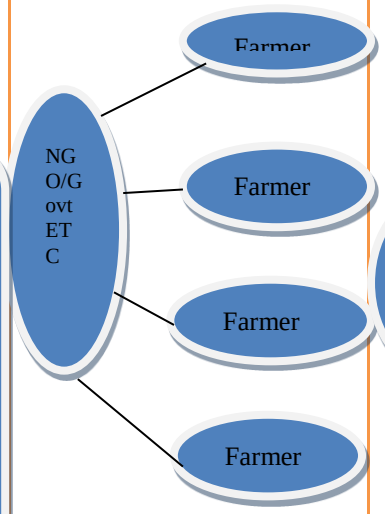
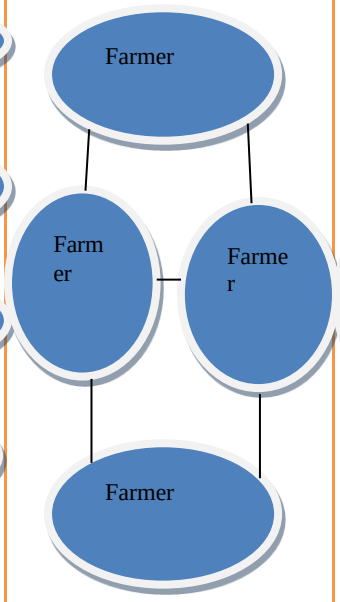
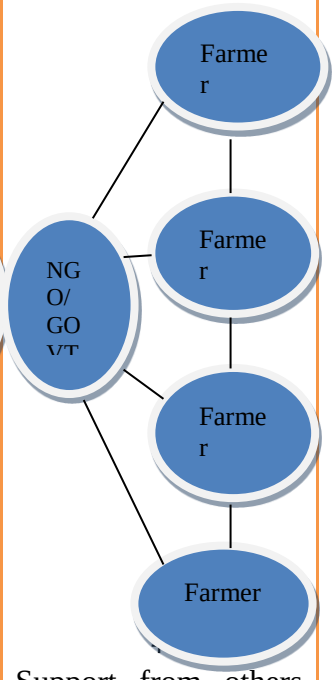
**II:** How can these factors contribute to the development of collective farming?

**III:** comparative analysis of costs of individuals as well as collective farming.

## METHODOLOGY

The present study is based on analysis of previous studies; therefore it forms into a case study. The case study approach was selected since this method is applied when examining how events are managed, when events cannot be controlled by researchers, and when study focuses on contemporary issues (Yin, 2009; Uetake 2013). For this purposes, data, in this study includes those studies which were published between 1996 and 2015. First, selection (case studies) criterion focused on different types of collective farming systems. Using Uetake approach, based on OCED (2013) discussion, following four types of collective farming systems were found, Type I: organization style of collective farming Type II: external agencies led collective farming Type III: non-organization style collective action Type IV: cooperation between external agency and farmers.

**Figure 1: Simple Typology of Collective Farms**

| **Type I: organization style of collective farming** | **Type II: external agencies led collective farming** | **Type III: non-organization style collective action** | **Type IV: cooperation between external agency and farmers** |
|---|---|---|---|
| **Farmers and other participants form organization and act collectively as members to manage organization and governance are very important** | External agencies organizes farmers (usually in the same geographical area) and act collectively. cooperation between farmers is not necessary feature | Farmers collaborate with other farmers (and non-farmers) but do not form independent organization | Combination of type II and III. although external agencies take strong initiatives, cooperation between farmers is essential |
|   |   |   |   |
| + **Support from non-members** | + Support from others (universities) | + Support from others (universities) | Support from others (universities) |

Sources: Uetake 2013

Given these four types of organization, it has been seen that type III farm organization is rarely found. Similarly, Uetake (2013) summarized that usually large collective farms tend to take shape of type III. Thus it is useful to focus on only I II and IV type of collective farm organization. Second, case studies were selected from both developing and developed countries.

Based on these criterions the following four case studies were analyzed in this study: Agri-Environmental Group Planning in Saskatchewan (AEGP) (Canada), Bayindir Izmir collective farming (Turkey) the North Otego Irrigation Company (NOIC) (New Zealand), Inyamvubu Collective Action (South Africa). All four cases aim to represent the collective farming system in developed and developing economies and coordinate the activities to manage natural resources efficiently.

**CASE STUDIES**

**INYAMVUBU COLLECTIVE ACTION**

Inyamvubu cooperative is based at Rietvlie; a farming area located on the outskirts of Mooi River located 40km west of Pietermaritzburg, South Africa. The cooperative is easily accessible as it is closed situated to Greytown Tar road. Most land in Mooi River is owned by commercial farmers, and most households are farm occupants residing on these farms as labour tenants. The land ownership system in the area, Inyamvubu cooperative's farming is carried out on the land belongs to a farmer owning Wood Burn Farm. Inyamvubu collective action has been using organic principle. It started in 2004 with a broader vision of having a vibrant rural development that supports inhabitants and leakage of income out of the area. In 2006 it emerged as a cooperative through introduction of cooperative program by the department of Financial and Economic Development farming began in 2006 following other activities that were out. Inyamvubu Collective action is typically type II organizational structure. It has 72 members with 65 farmers and 7 external members from NGOs and Government. Inyamvubu cooperative strives to achieve its objectives through expanding the cooperative activities (Dlamini 2010).

**BAYINDIR IZMIR COLLECTIVE FARMING**

Bayindir is a district of Izmir province of Turkey and the central town of the district which is situated in the valley of the Küçük Menderes. The district is crossed by the Torbali-tire railway station, with a branch to Ödemiş. It is served by regional trains from/to Izmir. Group farming system in Bayindir County was introduced in 1996 with11 farmers on 30 parcels. This area covered 45 hectares of land. The implementation of the group farming system in Bayindir County provides some efficiency on the pumped water and its instruments and using tractors. According to the audited information, the income of this implementation was distributed by allocation of land and participants of it accordingly (Engindeniz and Kenanoglu, 1996). In the early stages, jointly using machinery was implemented by the Agricultural Credit Cooperatives and Rural

Development Cooperatives. Later on this system declined and at present there are about 16-17 such cooperatives working for grouping farming system. In this collective action type I organizational structure is prevalent.

**AGRI-ENVIRONMENTAL GROUP PLANNING IN SASKATCHEWAN**

Agri-Environmental Group Planning in Saskatchewan is a temperate grassland province in Canada. Saskatchewan farmers use Agri-Environmental risk assessment programs, which provide technical and financial support, to access the environmental risks to their operations and to adopt beneficial management practices (BMPs). AEGP is one of these risk management programs (Steinley and Mowchenko 2011). AEGP addresses issues identified within a geographic area, such as a watershed. Farmers that use AEGP then determine the issues within the watershed and develop a group action plan to address them. Therefore, the group submits a proposal that outlines the issues and plans to address them to the Saskatchewan Ministry of Agricultural. Farmers then develop their individual action plans based on the group action plan and are able to apply to the Canada-Saskatchewan farm Stewardship program for funding to implement BMPs (Gulka, 2009). AEGP is a Type IV collective action. The AEGP process is supported by the Provincial Council of Agriculture Development and Diversification Boards for Saskatchewan (PCAB), a non-profit organisation. Advisors from PCAB actively approach farmers and encourage them to join the program.

**NORTH OTEGO IRRIGATION COMPANY**

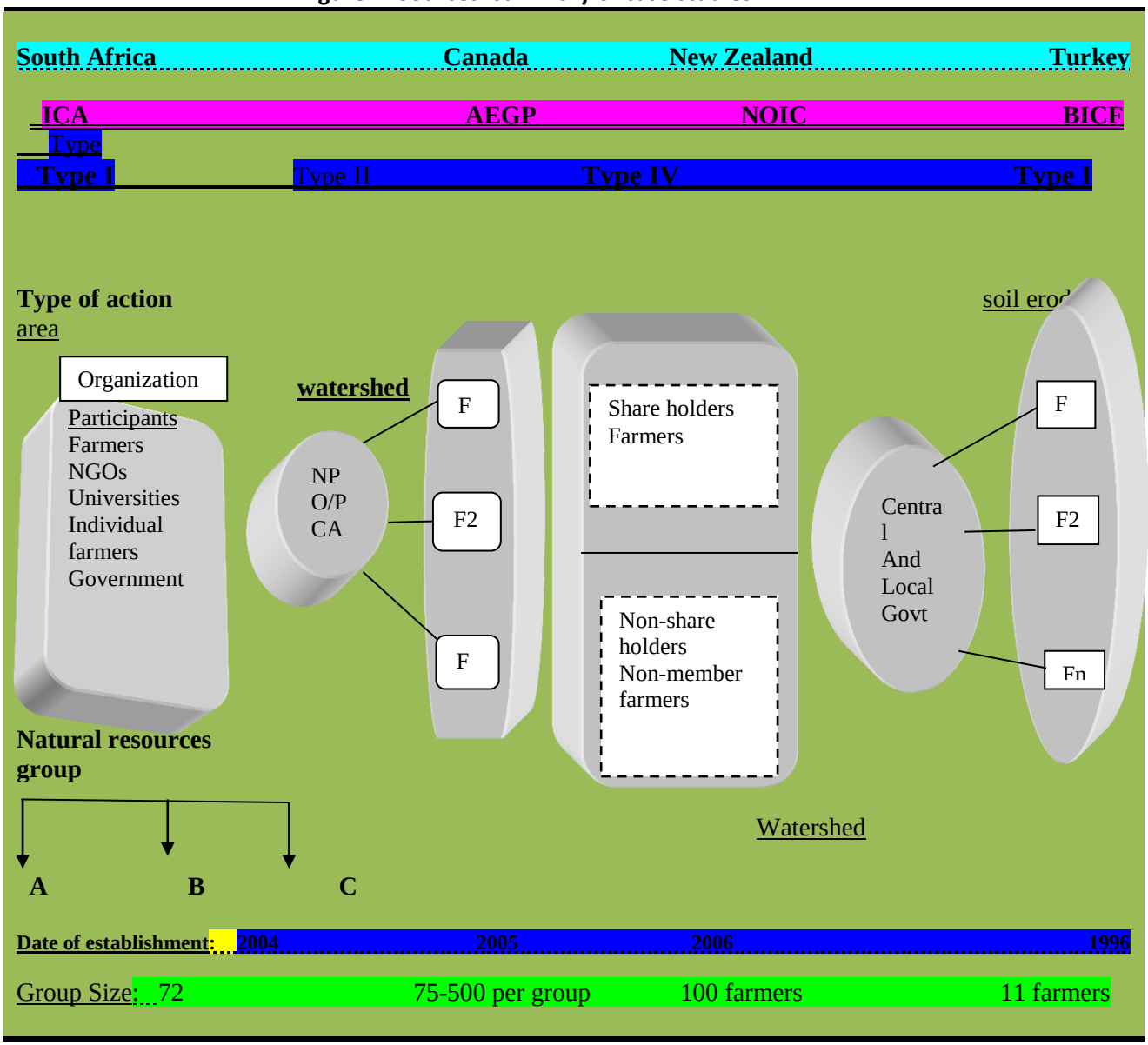
Otego spreads from the east coast to the west coast of South Island, New Zealand. North Otego a sub-region on the east coast, it has extensive dry tussock grassland hills and lowlands that provide an important agricultural base. However, farmers have struggled to access a reliable water sources due to its dry environment and existing allocation pressure on the main rivers in the area. In order to access reliable water, farmers formed NOIC, that started a scheme in 2006 to deliver a large volume of water from the Waitaki River to farmers. The NOIC scheme pumps water from the river to a head pond (Houlbrooke et al. 2006; White and Knight 2007). NOIC, a company owned by the scheme's users (i.e. the farmers), is a Type 1 collective action. In addition to owning shares, farmers also need to improve environmental performance. Hence, they are required to implement BMPs in order to achieve environmentally sustainable farming, while one-third of farms are audited annually to verify this implementation.

**FACTORS FOR SUCCESSFUL OPERATION OF COLLECTIVE FARMING**

Economists have identified a number of key factors for successful collective farming system. These factors differ in each study, depending on the finding of the studies and little agreement exists on which factors are actually conducive to successful collective action (Poteet and Ostron

2004). Given these disagreements among the researchers, this study compares key factors identified in these four studies examined herein with the key success factors by Ostron (1990), the most widely used set of such factors (Uetake 2013). She identified 8 key factors for success of collective action and noted multi-layers of nested enterprises such as local, regional and national level organization is critical for collective farming system (Uetake 2013). . Majority of the eight key factors identified by Ostrom (1990) are related to managing collective action, which are always necessary for collective action success However these factors differ depending on the findings of their studies and little agreements exist on which factors are actually conducive to successful collective action (Poteete and Ostrom, 2004). This study had found five key factors namely sharing common resources, accurate information, leadership, and support from government and non-government organization.

**Figure 2: Sources: summary of case studies**



**STAGE 1: IDENTIFYING ISSUES**

**SHARING COMMON RESOURCE ISSUES AND SOCIAL LEARNING**

To develop collective action, it is important to identify the issues that may arise at the time of farming an organization. Even if they have farmed in their regions for a long time, they do not necessarily understand the importance of natural resource management. Understanding and sharing issues related with natural resources is first and foremost step to begin collective action. Social learning among the group members helps this process (Reed et al, 2010). The importance of social learning for natural resource management is widely recognized (e.g. Keen and Mahanty 2006; Pahl-Wostl et al. 2007; Mostert et al. 2007. through successful understanding of social learning, it becomes possible to mange collective farms. this factor is key for success in all four case.

**Appropriate Boundaries**: In order to address the recognized issues, participants and the activity fields of a certain cooperative action need to be based on natural resource borders. These collective action boundaries, particularly those promoted by governments, can be based on administrative jurisdictions; natural resources can easily cross these artificial borders. Thus, cooperative action requires covering the appropriate ecological areas, and includes the farmers and concerned others in those areas in order to manage natural resources successfully. All four cases have clear geographical boundaries of activities (e.g. wetlands) based on the boundaries of natural resources (see Figure 2).

**Congruence between appropriation and provision rules and local conditions**: Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local situation and to provision rules requiring labor, material, and/or money. Congruence between appropriation and provision rules and local conditions is normally expressed in the negotiated CE (conservation easement) contract. CE terms often identify appropriation and provision activities within the resource system, such as timber harvesting, resource extraction, or residential development. Rules may require for the maintenance of the parcel's land cover type (e.g., forest, meadow) and/or allowance of activities deemed suitable to an area (e.g., farming, tourism, timber harvesting, and natural gas extraction). Local land trusts are distinctively positioned to ensure correspondence between local conditions and land use/management on CE protected parcels, i.e. a socio-ecological fit. ). Ostrom (2005 :) describes this aspect as follows: "When the rules related to the distribution of benefits are made broadly consistent (and fair) with the distribution of costs, participants are more willing to pitch in to keep a resource well-maintained and sustainable."

**STAGE 2: DEVELOPING COLLECTIVE ACTION LEADERSHIP**

Once farmers and concerned others understand the issues and recognize the importance of a certain collective action, specific drivers are necessary to move this action forward. Leadership is one of the most significant key drivers, as it draws together the main people or organisations to facilitate discussion and guide group activities. In the cases of BICF and NOIC (Type 1), members formed independent organisations in order to manage their natural resources, guide members, and agree on group actions. In the cases of AEGP (Type 4) and ICA (Type 2), by contrast, external agencies initiated large-scale collective action.

**Government Support:** Farmer's behaviour is affected by not only economic factors, but also non-economic factors such as behavior, cognitions, and norms, holistic approaches such as the combination of extension services and financial incentives are essential for undertaking collective action (OECD 2012, 2013). The technical support and extension services provided by governments influence a farmer's motivation to undertake collective action as well as help them develop action plans and put into practice good farming practices. Likewise, agricultural extension services can improve social learning, network structure, and innovation (Leeuwis 2004).

Monetary incentives are one of the most key factors for farmers joining a certain collective action because these funds can cover the costs related with staff and continuing activities. Managing collective farms means more funds are required than small scale individuals actions. Regulatory measures can be also force farmers to undertake collective action, particularly when problems are severe.

**Support from NGOs**: non-government bodies also provide farmers with crucial technical and financial support in all case studies. For example while farmers develop AEGP schemes through support programs facilitators and non-profit organization and NOIC provides reliable water and monitors the environmental performance of local farmers.

**STAGE 3: MANAGING COLLECTIVE ACTION**

**Rules and Autonomy**: once collective action is initiated by the farmers, they need rules to manage their on-going activities. Clearly and fairly defined set rules and regulation are necessary to enable member to collective activities to collaborate (Hodge and Adam, 2013). These rules must be adjusted to the local resources conditions, because every natural resource has different features and the people involved have different backgrounds. Moreover, local knowledge is essential to implement any type of collective action. Therefore these rules must consider local situation, with local government and participants playing a key role in adjusting them in this regard. By the contrast autonomy is not always necessary if external agencies lead the certain collective action as in case of AEGP.

**Monitoring and sanctions**: the necessity for monitoring and sanctions depends on the characteristics of the resources and the background of each group. in NOIC the water supply is exclusive to members, some coercive system are necessary for this restricted services. Therefore monitoring and sanctions are necessary in this case. By contrast AEGP have not implemented systematic sanctions systems. In AEGP, farmers have developed group programs and members of this collective action may voluntarily apply for funding to introduce BMPs.

**Conflict resolution system**: given the different features of natural resources and participants background, conflict resolution system is necessary. for example collective actions that manages common pool resources (CPRs) may need such systems since, CPRs are good characterized by rivalry and non-excludability; thus in order to prevent over-exploitation, a system that allows participants to discuss solutions for natural resources management is required (Ostrom, 1990).

**THE DECISION-MAKING FLOW OF THE FARMER AND COLLECTIVE FARMING-SYSTEM**

Decision-making is central to farm management. Each decision has an impact on the farm and on the farm house. Even deciding to do nothing is a decision and has an impact. The more a farmer is aware of the decision-making process that affecting farm and household, the more sustainable the enterprises will be and more likely it will be profitable and sustainable. When decision-making process is assumed to be a succession of decisions to make, it follows that farmers are able to integrate new information about the environment at each stage and adapt to possible changes occurring between two stages. Farmers are to anticipate all possible states of the shock (changes) to which they will have to react. Decision-making entities defined in this study is based on individual farmhouse, individual farming-system, and integrated farming-system which the assumed management agency composed some small size farming-systems. Figure 3 is the conceptual diagram of the decision-making entity in agent based simulation model for agricultural planning (ASMAP), and the decision-making flow of them is shown Figure 4

**Figure 3: the conceptual diagram of the decision-making entity in ASMAP**

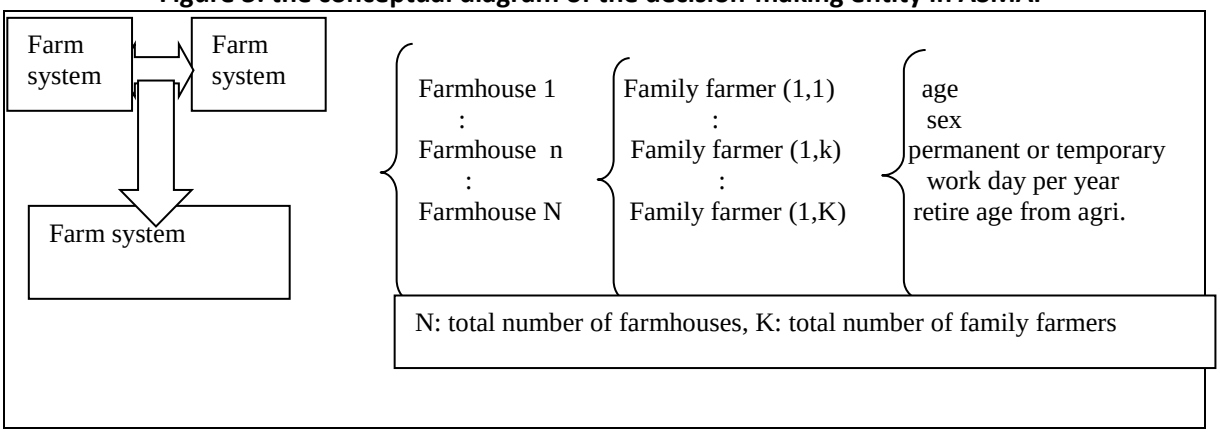
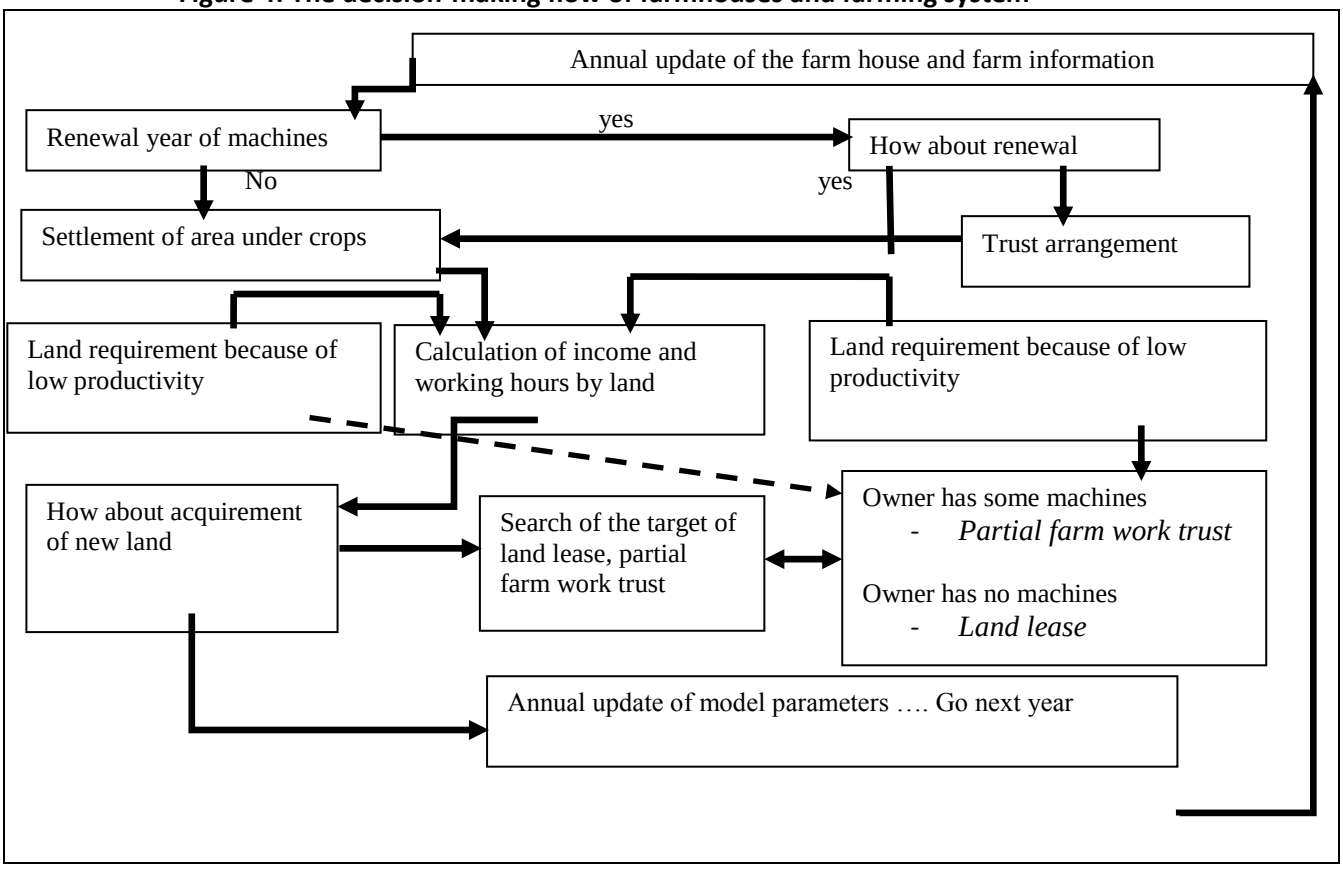


**Figure 4: The decision-making flow of farmhouses and farming system**




Adopted from Yamashita and Hoshino (2005, 2006)

It is also apparent that positive behaviour towards the environment do not equate with Agri-environment uptake or pro-environmental behaviour. Exploring other probable areas of association in farmers' behaviour, including farm size, profitability, and farmers' age, the literature overall indicates that there are no clear correlations between Agri-environment uptake and variables including farm type, demographics, educational background, and value judgments (Cymru, 2011). Instead, Agri-environment decisions are seen as a complex combination of contextual variables, which are best summarized as a balance of capacity, willingness and engagement.

In these complex conditions, segmentation through the construction of farmer typologies is accepted as a constructive instrument for policy makers to efficiently target these differentiated audiences, at the same time as accommodating the variety in their behavioral motivations (Cymru, 2011).

From the analysis of literature, it can be concluded that a number of ambiguities surrounding farmers' economic priorities and how their business decisions are made. With mixed messages evident about the extent to which, and ways in which, farmers' are seen to be business and profit orientated. Further it can be said that data related to farmers' attitudes is not sufficient in

determining their behaviour. Rather, needs to consider social norms and self-identity as key factors should be considered alongside attitudes (Burton 2004). Similarly Burton et.al (2008) suggests that social capital and questions of self-perception and identity are critical to understanding whether conservation conflicts with how farmers' perceive their role.

Equally, it is evident that questions around what is meant by 'environment' are not fully explored in surveys, leading to analytical discrepancies, and conflating the extent to which farmers are actually engaged with environmental concerns. From the literature it is evident that there are no simple patterns of correlation in Agri-environment uptake and a more in-depth understanding of decision making processes is needed which addresses questions of identity and social influences (Cymru, 2011).

**CASE STUDY OF COSTS COMPARISON**

Farm Machinery Co-operatives a case study by Andrea Harris and Murray Fulton (September 2000) It is "Simple financial model developed to compare the costs of selected farm machinery of individual farms withy cooperative farms Saskatchewan Canada" for mixed grain farmers.

Farm machinery is becoming more expensive to purchase and own particularly in developing nations where small land holdings have low returns and high costs. These high cost and low returns make it hard for smaller farm operations to remain economically feasible, to replace major machinery, and to access new farming technologies, which require large investments in machinery and equipment. The movement towards direct seeding requires purchasing specially adapted equipment and substantial capital investment in new farm machinery Harris and Fulton (2000). The combination of increasing machinery costs, low returns and the need for continued modernization of agriculture has motivated many farmers to examine new arrangements for sharing equipment Harris and Fulton (2000). One such arrangement is machinery co-operatives.

Co-operatives are a type of business that is owned and controlled by the people who use the services provided by the business. Farm machinery co-operatives are organized by farmers who wish to reduce the purchasing and operating costs of their equipment. Each member has one vote in the control of the business regardless of how much capital they have invested in the co-operative.

The members of farm machinery co-operative pool their money to buy machinery, and share costs and operating expenses. The co-operative owns the machinery on behalf of its members, while the members retain their land, buildings, and permit books. Some farm machinery co-operatives also pool farm receipts in order to ensure that machinery use is equitable Harris and Fulton (2000). The pooling of farm receipts is optional, however, and depends upon the needs of

the members involved in the co-operative. Sharing farm machinery through machinery co-operatives can provide farmers with a number of benefits, including:

- **Lower costs:** the costs of operating machinery through cooperatives are estimated to be 35% less than the costs associated with individual ownership.
- **Greater efficiency:** by purchasing machinery as a group, members can achieve economies of scale by purchasing larger, more efficient machines.
- **Access to the new technology:** group purchases can provide individuals faster access to the technology they would otherwise be not able to afford.
- **Access to greater pool of knowledge and resources:** the pooling of machinery in an organized manner can also facilitate the pooling of other resources such as labour experience and ideas.

**TYPE OF FARM MACHINERY SET USED IN THIS STUDY**

Andrea Harris and Murry Fulton used two different types of farm machinery sets to analyze the cost differences between individual farms and collective farms. In this study Individual farms cultivated 1500 acres of mixed grain while collective farms cultivated 4500 acres of mixed grain.

**Conventional seeding:** When sowing cultivation with machines, opposite to hydro seeding, conventional seeding is used only in areas which have an arable soil and can be reached easily with various types of agricultural machinery. Before starting conventional seeding, a determination of the soil-pH and the analysis of further phytorelevant parameters may be required to develop an optimal seed mixture. Soil analyses require the knowledge on and use of appropriate methods (e.g. extraction procedures) and corresponding experience in the interpretation of soil-chemical values for plant growth (www.bender-rekultivierungen.de).

**Direct seeding:** Direct seeding refers to farming systems that fertilize and plant directly into undisturbed soil in one field operation, or two separate operations of fertilizing and planting. Only narrow strips of soil are disturbed by the equipment openers used to place fertilizer and seed in the soil without full width tillage (www.directseed.org).

**Machinery set costs – conventional seeding**

| Costs | Individual farmers | Cooperative total | Cooperative member |
|---|---|---|---|
| Total replacement cost ($) | 428,800 | 610,100 | 203,367 |
| Annual fixed costs ($) | 45,996 | 75,325 | 25,108 |
| Annual operating costs ($) | 20,996 | 54,069 | 18,023 |
| Total annual machinery cost ($) | 66,992 | 129,394 | 43,131 |
| Total annual machinery cost per acre ($) | 44.66 | 28.75 | 28.75 |

Sources: Harris and Fulton (2000)

**Machinery set costs – direct seeding**

| Costs | Individual farmers | Cooperative total | Cooperative member |
|---|---|---|---|
| Total replacement cost ($) | 379,900 | 547,600 | 185,533 |
| Annual fixed costs ($) | 40,691 | 68,466 | 22,822 |
| Annual operating costs ($) | 16,207 | 54,669 | 15,223 |
| Total annual machinery cost ($) | 56,898 | 144,135 | 38,045 |
| Total annual machinery cost per acre ($) | 37.93 | 25.36 | 25.36 |

Sources: Harris and Fulton (2000)

Costs that entered in the model are time requirement (hour needed for farm operation), fixed cost, operating cost, total machines costs, rental costs, and compliment costs.

As already mentioned above cost comparison assumes, that the individual farmer operates a mixed grain farm with fifteen hundred cultivated acres. The co-operative is assumed to be made up of three such farmers; i.e., the co-op has forty five hundred cultivated acres. Two key inferences from two tables are:

- Under conventional seeding system, annual fixed costs are 45% lower and operating costs are 14% lower for the cooperative member. As a result, total annual missionary costs are 36% lower for cooperative member as compared to the individual farmer.
- Under direct seeding system the combination of 44% lower fixed costs and 6% less operating costs translates into an estimated overall saving in total annual machinery costs of 33% for a cooperative member as against an individual farmer.

The greater field efficiency of the drawn equipment suitable to the cooperative also translates into lower complement costs per farm for co-op members. Complement costs are defined as the costs of an individual piece of equipment plus the cost of a compatible power unit. In all cases the complement costs per acre were lower for the co-op member than for the individual farmer due to the fewer hours needed to complete each operation.

Under the conventional seeding scenario, complement costs per acre were on average 32 percent lower for the co-op member. Under the direct seeding system, per-acre complement costs of the air seeder were 46 percent lower for the co-op member than the individual farmer, although per-acre complement costs of the sprayer were 23 percent higher for the co-op member, due to the higher costs associated with the tractor used by the cooperative (Harris and Fulton, 2000).

**CONCLUSION**

As the population is growing and rising nuclear family system in rural areas, the land available to per-head is shrinking fast, which result the returns on land to tenants are declining which affects their economic welfare and further deteriorating food security situation. to overcome the problem of decreasing land size, and further fragmentation of land holdings, various measures can be taken such as to promote legislation regarding aspects that affect land fragmentation so as to prevent an already worsening of the problem, to apply specific land management approaches to tackle certain problems (land consolidation, land funds, voluntary parcel exchange, lands banks and cooperative farming or collective farming).

Collective farming involves joint or group cultivation of land by number of farmers (OCED 2013). In this study, various issues such as Factors, that is conducive for the success of collective farming, factors contribute to the development of collective farming, decision-making process, and comparative analysis of costs related to collective farming were analyzed through case studies. The case study approach was chosen since this method is applied when examining how events are managed, when events cannot be controlled by researchers, and when study focuses on contemporary issues (Yin, 2009; Uetake 2013).

From organizational point of view four different typology of collective are usually found (Uetake 2013). However in this study, only three typology of organization structure was found in four case studies. These four case studies were selected from both developed (Canada and New Zealand) and developing (South Africa and Turkey) nations. These typologies includes Organization style of collective farming (Inyamvubu Collective Action and Bayindir Izmir collective farming), external agencies led collective farming (Agri-Environmental Group Planning in Saskatchewan) and cooperation between external agency and farmers (North Otego Irrigation Company).

Ostron (1990) is considered is most widely used to identify key factors for success of collective farming. While she found eight key factors for success of collective farming, Uetake (2013) found only three of them were key factors for the success of collective farming in his study and Poteete and Ostron (2004) found five key factors. However these factors differ depending on the findings of their studies and little agreements exist on which factors are actually conducive to successful collective action (Poteete and Ostrom, 2004). From analysis of these case studies, we found Appropriate Boundaries. Congruence between appropriation and provision rules and local conditions, support from government, rules and autonomy, conflict resolution Support from NGOs etc. were key factors for success of these farms.

In the next stage, decision-making process was analyzed. For this purpose Yamashita and Hoshino's (2005, 2006) study was analyzed. awareness of farmers regarding decision-making

process that affects farm and households' sustainability and more likely its profit When decision-making process is assumed to be a succession of decisions to make, it follows that farmers are able to integrate new information about the environment at each stage and adapt to possible changes occurring between two stages. Farmers are to anticipate all possible states of the shock (changes) to which they will have to react.

Finally, cost comparison was carried for individual farms and collective farms based on Harris and Fulton (2000) study. In this regard costs of two distinguished farm machinery sets (conventional seeding and directing seeding) were analyzed. under conventional seeding, total annual machinery costs are 36% lower for cooperative member as compared to the individual farmer, whereas under direct seeding, an estimated overall saving in total annual machinery costs of 33% for a cooperative member as against an individual farmer. apart from lower, greater efficiency, access to new technology, access to greater pool of knowledge and resources are some of main advantages of collective farming.

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