Wither Biodiversity, Whither Food Security? Participatory Analyses of Mixed Cropping Systems With *Adivasi* Communities in India.

By

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ABSTRACT

The research for this thesis utilizes a new participatory research technique called Domain Analysis to understand farmers' knowledge regarding the values of agricultural biodiversity. The Domain Analysis technique is applied toward two case studies featuring the mixed cropping practices of the Kuvi and Korku *Adivasi* tribes of India. The findings of the research indicate that these farmers employ mixed cropping practices because they offer stable and diverse food and economic security by maximizing resiliency against unpredictable ecological conditions despite minimal external inputs. In addition, a comparison of the Domain Analysis exercises of Kuvi and Korku farmers reveal that each has developed their mixed cropping practices along different lines according to their distinct socio-economic and environmental circumstances.

Nonetheless, problems with the application of Domain Analysis exercises result in this research not fully realizing the ideals of "participation". An analysis of these problems concludes that rapport, experience and the flexible use of participatory techniques are necessary to ensure optimal participation and the genuine elicitation of farmers' knowledge.

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Naturally, the Kuvi and Korku participants cannot be overlooked for providing the substance for this thesis. Their conviction to their mixed cropping traditions is inspiring, and their contributions fill up the following pages.

The most difficult challenges throughout this thesis process were overcome only with the support of my wife, Eylie. She patiently pushed, pulled and proof read until a thesis was produced. Finally, anticipating the fast approaching birth of our first child became the deadline I needed to bring everything to completion. Thank you all.

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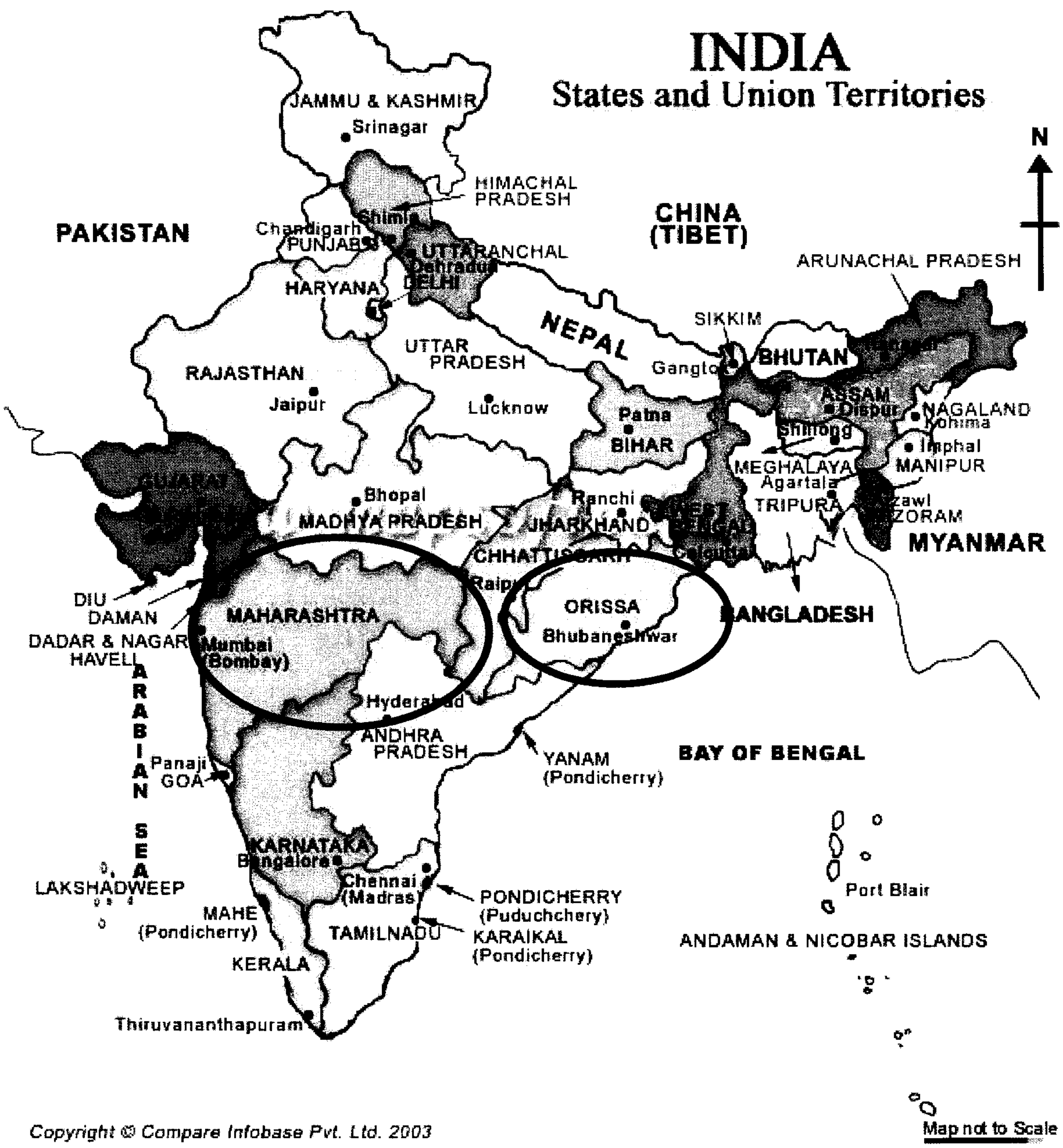
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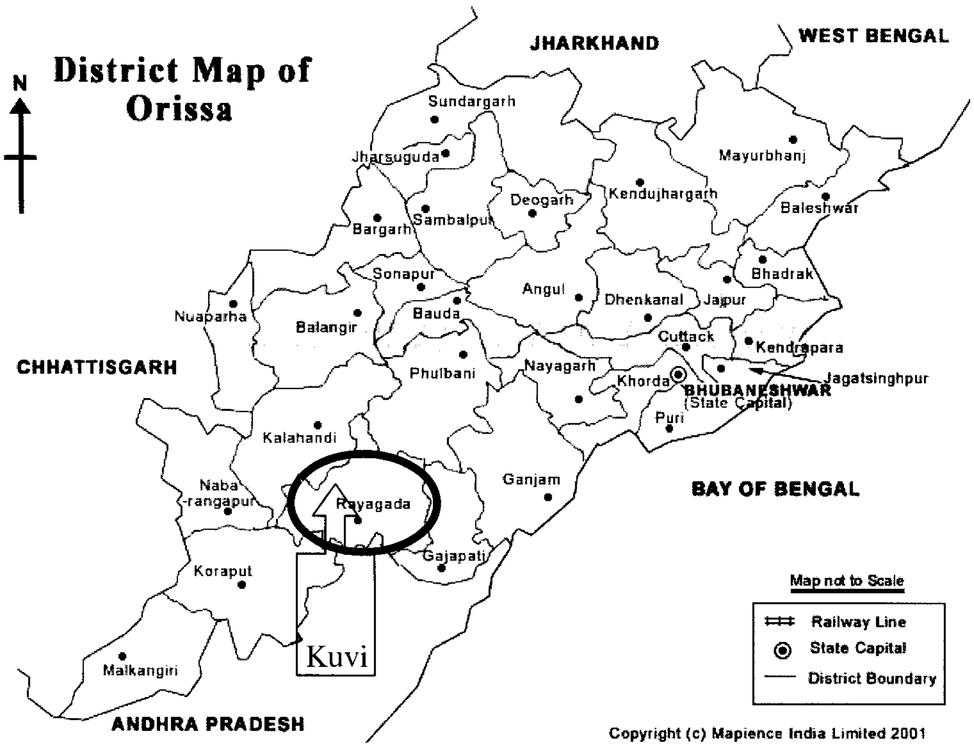

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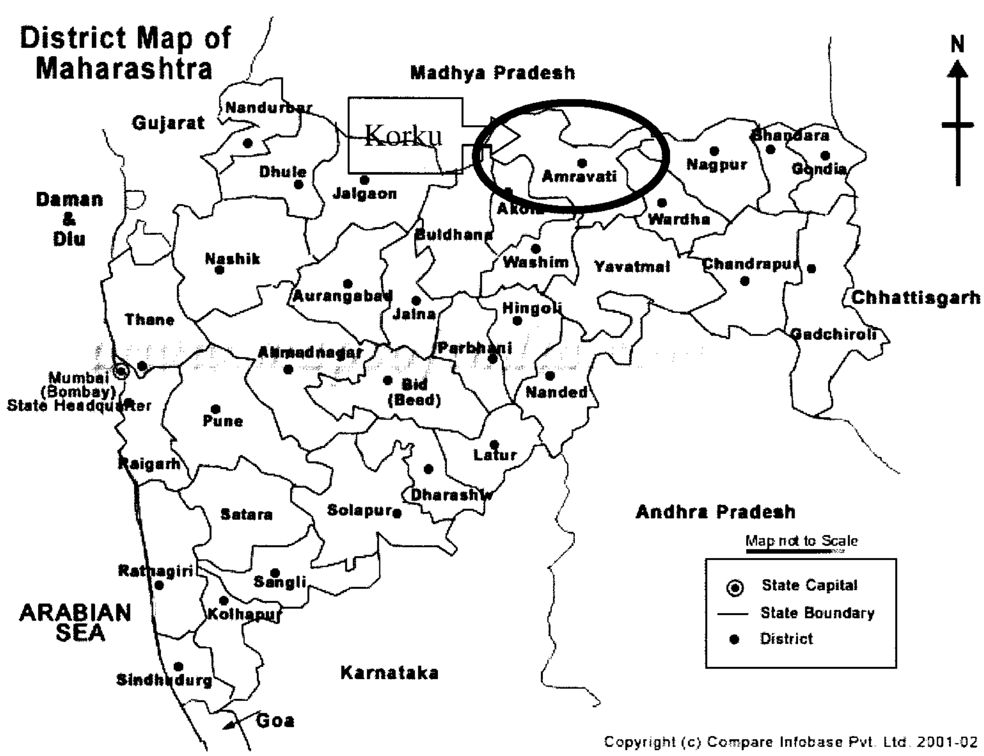

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<u>CHAPTER 1: *ADIVASI* AGRICULTURE AND BIODIVERSITY</u>

Introduction

In recent decades, global agricultural development has been focused on monocropping systems for maximizing yields and cost efficiency in order to produce food for burgeoning urban populations. This industrial agricultural model raises the concern that global food production is becoming increasingly dependent on fewer and fewer crops (Mazhar and Buckles 2000; Mazhar et al; Thrupp 2000). As concern swells, attention is being turned toward preserving agricultural biodiversity. Due to the pervasiveness of industrial monocropping, any significant agricultural biodiversity is maintained only in remote and marginal farms. Such areas are typically considered inappropriate for agriculture among mainstream societies. Nonetheless, marginalized peoples have developed sophisticated farming systems that embody significant diversity and are continually adapting to changing conditions for success (Vasavi 1994: 290).

Farming systems that intentionally employ a wide diversity of crops within a single farm field are called mixed cropping systems. Mixed cropping should be distinguished from intercropping which refers to a system where only two or three crops are sown in alternating sections of a field, as well as from mixed farming which is broader than mixed cropping because it refers to different farm management systems being used at the same time.[1] The opposite extreme to mixed cropping is monocropping, which refers to a farm management system which raises only one type of crop, and sometimes just one variety of a crop, over a large area.

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[1] An example of mixed *farming* would be to combine cropping with livestock, fisheries and forestry.

Recent research by grass roots development workers, social scientists and natural scientists have identified that agricultural biodiversity within mixed cropping systems is integral to food and ecological security for farmers. In particular, mixed cropping systems are by definition genetically diverse. Therefore, they are resilient to and more able to adapt to environmental changes common in marginal areas than less diverse monocropping systems often promoted for agricultural development (Marten 2001: 169-74; see also Shiva 2000: 16; Gell 1997; Cleveland and Murray 1997: 481; Sharma 1994: 143; Altieri et al 1987: 50).

In this thesis I argue that preserving diversity is more than just preserving crop genetic material for posterity. Neither crops, nor mixed cropping systems can be separated from the ecological and cultural context in which they are developed and managed (Brush 1989: 21-6; Mazhar et al: 4). Therefore, biodiversity conservation must also involve the learning and understanding of indigenous farmers' cultural knowledge about crops and how to raise them within particular conditions of marginality. In addition, my aim is to present the values of mixed cropping systems from the perspective of the farmers who practice it. In order to truly understand "indigenous knowledge" regarding mixed cropping, it is necessary to go beyond the limited values cited above that are of concern to western scientific and economic "experts". I use a participatory methodology called Domain Analysis specifically designed to elicit farmers' knowledge according to the values that they deem important, and in their own words, rather than according to the values and terminologies of researchers.

The Domain Analysis participatory technique was used in a field work setting (between December 2004 and March 2005) to learn the knowledge of people from two

Adivasi tribes regarding their distinct practices of mixed cropping. *Adivasi* is the term used to categorize the indigenous populations in India. The term roughly translates to "Original Peoples" in English, but in the Indian political context it is officially translated as "Scheduled Tribes". Some *Adivasi* peoples are locally known for their unique mixed cropping practices, which can employ well over fifty varieties of over thirty different crops. Participants who contributed to this thesis research are Kuvi and Korku *Adivasi*.

General farming practices of two *Adivasi* peoples

Adivasi peoples live on the margins of Indian society. Their populations are relatively small and distinct from each other as well as from the dominant Hindu and Muslim societies. Many *Adivasi* peoples live in remote regions, where their livelihoods are based on their immediate physical surroundings. The plight of *Adivasi* peoples is very similar to those of indigenous peoples worldwide. According to the typical international standards they are poor, uneducated, and exploited. As a result, they are the targets of a surge in development initiatives, which for better or worse, are trying to integrate these peoples into the modern world (Fuchs 1989; Alting von Geusau 1992; Kampe 1992; Cohen 1992; Renaud et al 1998; Mohapatra 1998: 135-6; Garland 1999; Nayak and Soreng 1999: 60-3; Nayak 2000: 10; Li 2002; Elwin 1939).

While the economic pursuits of different *Adivasi* peoples vary widely, both the Kuvi and the Korku peoples are primarily agriculturalists. For each of these peoples, agricultural practices are an integral part of their cultural identity. Agricultural practices are inextricably linked to all facets of their political economy, their interaction with other peoples, their festivals and rituals, and their environment. I am unable to delve into all of these ethnographic issues for this thesis, which is only concerned with farmer knowledge regarding mixed cropping (see Deogaonkar 1990; Fuchs 1988; Nayak et al 1990; 1999 and the journal *Adibasi*). Therefore, I will only briefly summarize their agricultural practices, highlighting practices and knowledge for ensuring the sustainability of their livelihoods (Acharya 1989: 18), and to provide an economic and cultural context for the remainder of the thesis.

Kuvi/Kui:

Dongria and Desai are sub sections of the Kondh tribe who inhabit the subtropical forests in the foothills of the Eastern Ghats (Eastern Mountains) in southern Orissa state. The names Dongria Kondh and Desai Kondh, however, are either Oriya or Telugu (state languages of Orissa and Andhra Pradesh states) terms. The name these people use for themselves, depending on the regional dialect, is Kuvi (for Dongria Kondh) or Kui (for Desai Kondh). The Kuvi live in the Niyamgiri (Niyam Hills) in Bissam Cuttack *Taluka* of Rayagada District, whereas the Kui live in the Kailashpur Hills in Kolanara *Taluka* of Rayagada District (averaging around 2000 metres above sea level).[2] While the Kuvi are more remote than the Kui, neither have regular and consistent interaction with the mainstream Hindu and Muslim society. Since more fieldwork time was spent with the Kuvi people than the Kui people, I generally use the name Kuvi throughout this thesis. When referring to specific information drawn from my time with the Kui, I will cite it as such.

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2 *Taluka* translates to "block". It is a political designation similar to what we would call a township. A "district" would correlate to our "county".

Although clearly related peoples, the Kuvi and the Kui are distinct from each other in many ways. Apart from dialect, their respective geographies and social histories contribute to distinctions between Kuvi and Kui people (Patnaik 1989: 68; Patnaik and Mohanty 1990: 30-2). Again, this is not the place to go into details regarding a cultural comparison between Kuvi and Kui. What is important to state here is that both place immense importance on their tradition of shifting cultivation as their primary (but not sole) economic activity. Furthermore, despite other differences, the specific practices of shifting cultivation, including the crops being grown, are almost identical between the Kuvi and Kui people.

Shifting cultivation practices are as diverse as the different tribes who practice it, and the Kuvi cultivators are no exception. In the Kuvi language, their system of shifting cultivation is called *haru* (Patnaik 1989: 19). It refers to a combined agriculture and forest management system where fields are established by cutting down the forest during the height of the hot dry season (around May). Just before the monsoon rains arrive (June or July) the brush is burned, and the ashes fertilize the soil. Any unburned logs are left on the ground to help decrease the chance of soil erosion when the rains come. With the onset of the monsoon, a mixture of crops is then sown by broadcasting (scattering) seeds into the ashes. Each crop ripens at a different time. The harvest of the first crops start around September and the last crops are harvested in February (Burling 1965: 41-2). As each crop ripens, Kuvi farmers harvest only the seed heads and pods from the plants. All of the stalks, stems and leaves are left in the field to act as mulch, further protecting the soil from erosion. These residues are then burned just prior to the next growing season to return some nutrients back to the soil. Nonetheless, after a few years the soil fertility decreases too much for successfully growing crops, so the field is abandoned and a new section of forest is burned. In the meantime, the forest quickly reclaims the abandoned field.

The Kuvi are "rotational" shifting cultivators, as opposed to "primary" shifting cultivators (see Grandstaff 1980; Schmidt-Vogt 1997). This means that each family has designated fields that they always return to after a sufficient fallow period. Generations ago, the Kuvi ancestors divided the mountains amongst the clans (*mutha*). The head of each clan then doled out lands to each family. Each family has about ten to twenty acres of land situated on two or more hills (*dongar*) which they divide into parcels (Patnaik 1998: 19). During my fieldwork with the Kuvi people, we used the general Oriya term *dongar*, meaning hill, to refer to a parcel of land under cultivation. At any given time two of these *dongar* fields are being cultivated, while the others are at various stages of regeneration (forest fallow). Each *dongar* field is cultivated for a maximum of three years before being allowed to return to forest. Once a field has been fallow for seven to fifteen years (there is no consensus on the length of fallow), or the trunks of new trees reach about six inches in diameter, it will again be cut and burned for cultivation. In addition, a section of a farmer's land is kept as a permanent (or long term) horticulture field for raising fruit trees such as mango, jack, orange, lemon, papaya, banana, guava, fig and litchi. Under the shade of these trees are also grown pineapple, tumeric and ginger. These lands are kept within the family along patrilineal lines. Therefore, families have customary "ownership" of their fields, but unfortunately the government of India does not recognize this ownership and considers this to be forest land.

The Kuvi farmers employ several practices to conserve soil and forest resources. Firstly, not all trees within a *dongar* field are cut down. Older fruit bearing trees such as mango, jack and tamarind are left standing in part because they are too big to cut down with an axe, the Kuvi farmer's main agricultural tool (Patnaik 1989: 20). These trees (which are not heavily damaged by the burning of process) provide not only valuable fruit throughout the year, but also seed stock for helping the forest to regenerate. Secondly, for the trees that are cut down, the roots are not removed, and instead a metre or more of stump is left standing. Besides being difficult to remove, the roots help bind the soil to prevent erosion. The tall stumps provide trellises for the many vining plants grown by Kuvi people to climb on. New sprouts will grow from these stumps, ensuring a quick regeneration of the forest after the field is abandoned. Since both stumps and seeds are the source for forest regeneration, the new forest is made up of trees of different ages and sizes resulting in an uneven forest canopy. This unevenness promotes a more diverse forest ecosystem than would occur in a primary forest that had never been cut (Schmidt-Vogt 1997). Lastly, some forest areas are never cut for the cultivation of crops. Most notably, a section of forest above the village is never cut because this is the abode of the Goddess (Katragumma 2005/01/04). In addition, cutting this area of forest could be dangerous to the village if there was to be a heavy monsoon, since the water and soil run-off would flow straight into the village. Other protective buffer zones where trees are not cut are along creeks, ravines, slopes that are too steep to cultivate and the tops of hills which are too difficult to reach.

Shifting focus from trees to crops, Kuvi farmers also employ sowing practices with the intention of conserving soil and water resources. Most of the roughly thirty Kuvi crops, comprising about fifty varieties of grain, legumes, oilseeds, vegetables, and roots, are first mixed together in a basket and then broadcast over the field. Cattle are not used for preparing soil or sowing seeds for practical reasons as well as because their use would disturb the volatile soil and promote soil erosion on the steep slopes (Mangaraj and Allim 2005/01/15; Patra 2005/01/16; Pattanaik 1998: 116). This method of mixed cropping is called a seed-mix. A few of the larger seeds (and pieces of roots) are dibbled into the soil afterwards to grow in the most opportune areas of the *dongar* field. In this way, all seeds can be sown in one day only. Due to the variation of plants' heights and leaf types, the soil is thoroughly covered, trapping in moisture by blocking the sun and wind, but preventing erosion by slowing the flow of water. This cover prevents significant weed growth, which also helps to reduce labour inputs (Patra 2005/01/16; Mangaraj and Allim 2005/01/15; Sharma 1994: 157; People of the World 2004). Issues surrounding the seed mix will be discussed in greater detail in chapter 3.

Several rites to protect crops and ensure a good harvest are observed throughout the agricultural cycle. Prior to sowing seeds, a chicken is sacrificed to the Goddess, asking her to give them a good harvest. Later, another sacrifice is made to protect the fields from pests, especially wild pigs and elephants, but also insects and disease. Finally, just as the last crop is ready to harvest, there are more festivities and sacrifices to thank the Goddess for her bounty.

On their own, shifting cultivation and horticulture do not provide Kuvi families with all of their subsistence and income needs. The remainder of their economic needs are met by hunting and gathering in the surrounding forest (People of the World 2004; Patnaik 1989: 27; Nayak and Soreng 1999: 87). Therefore, Kuvi people place significant value in maintaining forest resources along with their *dongar* fields. They recognize that the forest is what provides them with their livelihoods, either by hunting and gathering or by cutting and burning it in order to grow crops. Kuvi people refer to the forest and the *dongar* as their "Father and Mother" and therefore feel that they "cannot live without" the traditional livelihood that is provided by them (Katragumma 2005/01/10). In other words, shifting cultivation, hunting and gathering in the forested Eastern Ghats is integral to their cultural identity and their survival (Nayak et al 1990; 1999; Soreng 2001).

However, Kuvi agricultural traditions are threatened. Industry, government and population growth (both natural and immigration) are all competing for natural resources in the Eastern Ghats. The amount of land available for the Kuvi farmers to practice shifting cultivation and for hunting and gathering is ever decreasing. As a result, they are being forced to adopt unsustainable management practices such as reducing the length of their forest fallows. The impact of such changes is that there is less forest regeneration, leading to poorer soil nutrients when burned, which means poorer yields as well as poorer forest regeneration for the next fallow period. These disruptions to the Kuvi peoples' livelihood will tip the delicate economic and ecological balance they have maintained for centuries, leading not only to environmental degradation, but also socio-economic collapse for all Kuvi people (Alting von Geusau 1992; Dove and Kammen 1997: 92-3; Mohanti 1997; Mohapatra 1998; Nayak and Soreng 1999: 92-129; Nayak 2000; Soreng 2001; Pramanik 2000: 125).

Korku:

The geography of the Korku people is dominated by the Satpura Hills and the Tapti River which separates the Indian states of Maharashtra and Madhya Pradesh. The area where my fieldwork took place is on the Maharashtra side of the border, in Dharni *Taluka*, Amaravati District. This general region is also referred to as Melghat and the Vidarbha.

The geopolitical situation for the Korku people is not nearly as extreme as for the Kuvi. While the Satpura Hills are rugged in places, they are more characteristically low and rolling hills. In addition, Korku villages are not remote compared to how Kuvi villages are, although they are considered remote by Maharashtra standards. Kuvi villages are interspersed with villages of other *Adivasi* tribes such as Bhil, Bhilala and Gond as well as Hindu villages. Therefore, it is not uncommon for Korku people to come into regular contact with Hindus and people of other tribes. While this situation has resulted in some acculturation between Korku and neighbouring peoples, the Korku are not assimilated and still maintain a unique cultural identity.[3] One aspect of this identity is that the Korku are believed to be the only people in Maharashtra that employ an elaborate mixed cropping system.

In the Korku system of mixed cropping, farmers grow about fifty varieties of twenty-five crops, mostly grains, legumes and oilseeds (see Appendix). Only eight of these crops are sown as a seed-mix. The rest of the crops are grown as single stands, each in its own section of the field. In addition, most crops are sown during the monsoon, but some are grown during the dry seasons. As a result, most Korku fields are continually cultivated with no fallow period (see Chapter 3).

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3 Some Korku villages are more remote than others, and are thus also less acculturated (Fuchs 1988; Deogaonkar 1990).

Korku farms range in size from about five acres to twenty acres on gently rolling slopes. Unlike for the Kuvi farmers, Korku farmers can use oxen and seed drills to sow their crops in rows, making more efficient use of seed. The fields are prepared just before the monsoon season by several ploughings to turn under last years crop residues and suppress weed growth in the fields. Just as the rains begin to break, around June or July, the Korku farmers begin sowing their seeds in drills with oxen. When the crops are still seedlings, oxen pull a cultivator through the fields to uproot the first flush of weeds. Later, when the crops are taller, the women will move through the entire field hand weeding the second, and if there is time, the third flush of weeds. The harvest season starts around September or October and lasts until January or February. The crops are cut near their base and brought to a threshing floor near the middle of the field to separate the grain from the straw. The straw is kept as fodder to feed cattle and goats. Cattle and goats are also allowed to graze on the stubble, any scattered seeds, and any weeds from newly harvested fields. Therefore little food goes to waste. In addition, the animals help to fertilize the field for the winter (dry) season sowing.

Although Fuchs (1989: 5, 14, 92) and Deogaonkar (1990: 26) suggest that the Korku were once shifting cultivators, all Korku people I interacted with claim that they currently practice mixed cropping using oxen and plough just as their ancestors have always done. If ever they were shifting cultivators, it must have been very long ago, since Korku farmers honour their oxen, and not the axe, as the technology that provides successful crops. An elaborate ritual features decorating oxen, blessing them with prayers, flowers and incense, and offering them a feast of the finest grain.

The intensive cropping system and numerous ploughing have taken their toll on the soils of Korku farms. Although the hills are not steep or large, the ploughing makes water runoff and soil erosion an issue of significant concern since the disturbance makes already poor become poorer (Fuchs 1988: 75; Deogaonkar 1990: 15-6). To help slow soil erosion, non government organizations (NGO) are helping Korku farmers to form village work teams to collect rocks from the fields to build stone bunds along the contours of the farmland. Otherwise, fertility is returned to the soil through the nitrogen fixation of leguminous plants, the decomposition of crop residue and leaves, a small amount of manure, and chemical fertilizer. Although a lot of manure is collected from the stables behind Korku homes, the difficulty of moving the manure and spreading it on fields makes it impractical. Therefore, this manure is utilized only in kitchen gardens (*bari*)[4] that are also located directly behind the homes.

Korku farmers state that their mixed cropping system offers them food security since their crops are hardy and something will always be harvested despite adverse growing conditions. Still, families are recognizing more and more that it is becoming increasingly difficult to feed themselves. Many farmers are seeking additional wage labour (sometimes migratory) to help them buy more food. Government and NGOs have responded to Korku poverty issues in different ways. NGOs pay farmers in grain for the community conservation activities just mentioned. One response from the government has been to give Korku children a free meal at school. However, these initiatives gloss over the real problem for Korku people. Traditionally, Korku people have supplemented their diets through hunting and collecting food and products for sale from the teak and

[4] In addition to the crops from the fields, kitchen gardens are maintained near the home to raise household vegetables such as cauliflower (*phul gobi*), eggplant (*baigan*) and fenugreek (*meethi*).

bamboo forests that surround their farms. Korku elders criticize the free meal at school program since the meals are reflective of Hindu dietary preferences, and it distracts Korku children from learning how to collect nutritious food from the forest. Unfortunately, in recent years the government has for the most part totally restricted Korku peoples' access to hunt and gather from these forests. The government's aim is to protect the rare tigers (Melghat Tiger Reserve) that live in the forests as well as the valuable teak trees, the latter being a significant source of government revenue (Deogaonkar 1990: 15-6, 115; Fuchs 1988: 94).

Apart from giving food aid and encouraging families to seek seasonal labour to improve food and economic security, there are government initiatives to intensify Korku agriculture. Using "improved" seeds, chemical fertilizers and irrigation, development officials hope that farmers can harvest more from the same amount of land. This can replace the need for hunting and gathering in restricted forests. However, if improperly conceived, development initiatives toward agricultural development can exacerbate food insecurity problems.

The following section will address the debate regarding the two possible directions for agricultural development. On the one hand, there is a technical approach that relies on scientific advances to improve yields. On the other hand is the assumption that due to farmers' extended experiences with their environments, they have developed a mixed cropping management system that may not be as "productive" as "scientific agriculture", but is the best suited system for their environment. The research for this thesis is situated with the latter argument. I argue that promoting farmers' participation in agricultural development ensures relevant, successful and sustainable development, since it is based on farmers' sophisticated knowledge of the agricultural context.

The Green Revolution against agricultural biodiversity

With so many of the world's poorest people being farmers, agriculture is a significant focus for international development initiatives. Increasing yields seems a logical and necessary first step toward improving the livelihoods of poor farmers. Higher yields can mean more food and/or more money for farm families; both outcomes being an impetus to further development (Staatz and Eicher 1998; Dove and Kammen 1997: 93-4). Likewise, for development professionals, the logical first step to improving farmers' yields is to improve the most fundamental and base technology of the farmer: seeds. It is amazing to think that such sophisticated scientific technology is dedicated to the improvement of simple seeds. However, seeds are not as simple as they seem. Tiny seeds harbour the genetic imprint of the plants that they will become. Seeds are the source of life, the embryo from which complex organisms grow, with all of their strengths, weaknesses and unpredictability.

Genetic breakthroughs:

Modern agricultural seeds are associated with scientific advances for developing hybrid high yielding varieties (HYV), and now even genetically engineered (GE or GMO) varieties, capable of significant yield increases.[5] The success of these crops is not only with higher production, but also with greater resistances to other factors that can

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[5] More recent emphases in biotechnology are with improving nutritional qualities of crops, such as golden rice, which is rice that contains a gene to increase its vitamin A content.

reduce yields such as weeds, disease, insects and lodging (when plants fall over). The original advances of the 1970s came from the work within the regional laboratories of the Consultative Group for International Agriculture Research (CGIAR), although more recently large chemical corporations such as Monsanto are becoming significant players in this sort of agricultural development. Due to their startling and immediate success, the technologies were dubbed the Green Revolution in the 1970s. The biotechnology industry has evolved out of the success of the Green Revolution. Biotechnology continues to develop increasingly sophisticated seed and chemical technologies as new scientific breakthroughs are breeched.

Multinational gene banks such as those maintained by CGIAR provide the genetic material for developing new HYV. An extraordinary number of varieties of the most globally important crops are preserved within such banks. These banks make a significant contribution to the conservation of agricultural biodiversity. Without preserving genetic material in banks, sometimes ancient varieties can vanish without a trace due to anything from natural disasters to farmers gradually stopping to grow them. With a globalized pool of genetic material, a new HYV of rice can draw parentage from as many as forty different existing varieties, each native to a different region around the world (DeGregori 2004). In other words, a new variety can embody a level of genetic diversity that would not typically occur through natural cross-pollination on farms. Despite the wide parentage, laboratory pollinating and testing ensures that new varieties are stable and succeed in carrying the desired characteristics from each parent (DeGregori 2004; Moore 2004). The result is reliable new seed varieties that out-perform locally developed landraces because they embody the best qualities from so many other varieties. Of course, HYV are rarely able to perfectly embody the best qualities and overcome the worst shortcomings, but the scientific experiment is ongoing and new and improved HYV are continually being developed.

The successes of the Green Revolution are not only with seed technology. The improvements of modern HYV seeds over local landraces are enhanced with the use of chemical technologies for increasing soil fertility and fighting insects and disease (DeGregori 2004). Furthermore, the contributions of these technologies go beyond simply increasing yields, to also improve the efficiency in which crops are grown and harvested, so that the yields can be achieved at less cost and labour. Seed and chemical technologies complement mechanical technologies by producing “clean”, uniform stands of a single variety of a single crop that can easily be harvested on a large scale using mechanical harvesters, threshers and winnowers (Dove and Kammen 93-4).

This industrial “monoculture” approach to farming has made countries such as India not only grain self-sufficient, but also net exporters of grain; an amazing achievement for a country of about one billion people that only a few decades ago was dependent on international food aid. These benefits have in turn helped India to reduce poverty and hunger, diversify the national economy, and reach other development goals such as improving education and health care (Denning 2004; India 2004).

During the height of the Green Revolution (1970s), scientists claimed that 45 billion people could be fed if the agricultural technology of the time were to be applied to all of the world’s cultivated land (Horton 1991: 221). The assumption was that direct and indirect economic benefits of expensive technology transfers would eventually trickle down, as a sort of domino effect, through large corporations, national governments and local industries to reach even the poorest and most marginal communities. Horton (1991: 221) remembers that the "belief in the efficacy of technology transfer was one of the ideological cornerstones of the Consultative Group on International Agricultural Research." According to Whyte (1991: 10), "it was the responsibility of the professionals to determine what worked best for farmers... and then persuade the farmers to accept the information and ideas of the professionals. In other words, this was a strictly top-down model" (see also Maclure and Bassey 1991: 202; Horton 1991: 220-2). The only challenge left was to adapt the technologies to local conditions and convince the local farmers to adopt the package (Horton 1991: 224; see also Baviskar 1995: 26-7; Dove and Kammen 1997: 94; Shiva 2000).

Ironically, many of the poorest farmers refused to adopt the "technical packages." Assuming that the naïve adherence to traditions was barring development, social scientists were employed by development institutions to identify and overcome any constraints to introducing the new technologies. However, the time and financial resources allotted to social scientists were inadequate for immediately ascertaining the full extent of the social impacts of new technologies and the social factors curbing their adoption (Mosse 1998: 14-15; Horton 1991).[6] Eventually, social scientists would uncover a series of "problems" that were not in fact associated with the "target beneficiaries," but with broader issues of social inequality, current economic and development models (top down), and the technical packages themselves (Baviskar 1995: 26; Sillitoe 1998: 223). "Invariably," state Maclure and Bassey (1991: 202), "[village farmers] become impervious – even resistant to – externally introduced change" because they have

[6] See Horton (1991) for a first hand account of the futile plight of social scientists employed in otherwise "science based" development endeavours during the 1970s and 1980s.

continually "borne the brunt of unanticipated problems and negative effects" of inappropriate technology transfers (see also Shiva 2000; Kammerer 1988; Scott 1998; Altieri et al 1987: 52).

Green Revolution revisited:

The claims of agricultural breakthroughs had only limited validity. The technologies were not scale neutral, but were only effective for large scale agriculture where using machinery was feasible. Relative benefits of any kind reached only wealthy farmers who had large farms of flat high quality land, the means for irrigation, as well as the capital to buy and apply chemical inputs which HYV are dependent on to achieve their success (Whyte 1991: 10-11; Dove and Kammen 1997: 96-7; Shiva 2000: 39-59; Vernooy 2003: 4). Marginal and remote peoples, such as many *Adivasi* farmers (especially on hilly land) were inaccessible for irrigation projects. Likewise mechanization and chemical inputs were too expensive and too difficult to apply. In short, marginal farmers were not as able as large farmers to recreate the ideal conditions of the laboratory and test farms where HYV had been developed (Vernooy 2003: 4; Thrupp 2000: 269; Shiva 2000; Cleveland and Murray 1997: 481; Dove and Kammen 1997; Horton 1991: 224).

At best, many farmers accepted only a part of the Green Revolution packages, in an adapted form and in some parts of their land. In his discussion of Green Revolution technologies for potato production in the Andes, Horton (1991: 225) notes that "farmers had changed many of their practices but that none had adopted the complete packages tested on their farms. Most farmers who were using new practices had modified and adapted them to fit their specific needs and resources." Farmers tend to practice caution when adopting new techniques, experimenting with them before adopting them. Only when farmers see the fit do they adopt the new varieties. Still, they tend to not replace their traditional varieties with HYV, but instead integrate the HYV into their traditional mixed cropping system. Without being able to use many of the inputs and other management approaches associated with Green Revolution packages, farmers adapted them to suit their specific conditions (see below; Altieri et al 1987: 52; Cleveland and Murray 1997: 486; Jewitt 2002: 151-68; Balasubramanan and Thamicoli 2002).

Green Revolution technologies were also based on other narrow assumptions about agriculture that were not agreeable to marginalized farmers. The emphasis of agricultural development was solely on improving incomes by increasing the production of staple and cash crops, such as wheat, maize and rice, many of which are not suitable for growing on marginal farmland (Vernooy 2003; Mazhar and Buckles 2000: 3, 5; Vasavi 1994: 291; Brush 1989: 20-1; Altieri et al 1987: 50). The industrial monoculture model of the Green Revolution had no concern for "minor" crops and "weeds", the diversity of which supply subsistence *Adivasi* farmers with a significant proportion of their nutritional requirements as well as medicines, forage for their animals, building materials for their homes, and raw materials that can be sold for incomes (Srinivas n.d.; Mazhar and Buckles 2000; Mazhar et al; India 2004; Manning 2004; Thrupp 2000: 268, 273; Shiva 2000; Eberlee 1999; Vasavi 1994: 290-1; Brush 1989: 20-1). For *Adivasi* farmers to rely solely on staple cash crops to be sold at distant and fluctuating markets severely limits their abilities to meet food and economic security (Clement 2004; Sampat

1998; Manning 2004; Ghosh 1998; Trebuil 1995: 78-82; Dearden 1995: 116-8; Parayil 2003: 479; Furer-Haimendorf 1982: 104-8; Jha 2004; Brush 1989).

There are many concerns regarding the ecological and economic sustainability of the Green Revolution's narrow perspective regarding agricultural development. Although impressive yield increases are being achieved from staple crops, these new varieties are bred from a precariously narrow genetic base. As new "improved" hybrid varieties are developed from earlier "improved" hybrid varieties, the genetic parentage reaches a bottleneck because more and more varieties have common parentage (i.e. genetic inbreeding). Furthermore, as these new crops become more widely distributed, more farmland around the world is growing crops with the same genetic makeup (Thrupp 2000: 270; Manning 2004; Mazhar and Buckles 2000: 5; Sampat 1998; Cleveland and Murray 1997: 480; Brush 1989; 1993). In Sri Lanka for example, Thrupp (2000: 269-71) claims that only 150 varieties of rice are presently in common use. This is down from over 2000 varieties in use in 1959. More alarming is that out of the present 150 varieties, 75% of them are derived from a common genetic stock! Ironically, some of the genetic makeup for this handful of new varieties probably came from some of the 2000 landrace varieties that may now be extinct. As stated by Brush (1989: 20), "The success of the Green Revolution in several Third World countries seemed to threaten the primary resource base for crop germplasm" (see also Shiva 2000; Trebuil 1995). The eventual ecological consequences of this bottleneck may be catastrophic. Due to the genetic similarity of HYV there is a good chance that they have many weaknesses in common. Due to their wide usage, should conditions arise to expose one of their weaknesses, major crop failures can occur on national and even international proportions. To again cite

Thrupp (2000: 269), "Reduction in diversity often increases vulnerability to climatic and other stresses, raises risks to individual farmers, and can undermine the stability of agriculture." Thrupp recounts several agricultural crises resultant from reliance on a narrow genetic base, some with disastrous impacts, from the Irish Potato famine in 1846 to a mould that recently destroyed most of Zambia's entire crop of HYV maize (see also Brush 1989: 20; Dove and Kammen 1997: 94-6).

Although chemical inputs are designed to address problems such as moulds, insect infestations, poor soil nutrients and diseases, their continuous use only exacerbates the detrimental effects of these phenomena causing a chemical " treadmill" (Thrupp 2000: 273). Many insecticides are indiscriminate, killing not only the target pests, but also a number of other insects, many of which are beneficial either for pollination or for preying on pest insects. Likewise, herbicides destroy all plant life, except for the "desired" crop, disrupting soil quality as well as destroying habitat for beneficial insects and birds. As a result, pest problems become worse than they naturally would be, necessitating more judicious applications of insecticides, especially if pests start to build resistance to the chemicals (Altieri et al 1987: 50-2; Dove and Kammen 1997: 94-6; Thrupp 2000: 272).

The same scenario arises for fertilizer use. Fertilizers are applied to introduce essential plant nutrients to "unproductive" land. The plants grow quickly as they easily take up the available chemical nutrients.[7] However, the heavy dose of chemicals destroys all soil life making it impossible for soil nutrients to naturally regenerate. Therefore, the plants gradually mine the soil of all available nutrients, making soil more susceptible to

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7 The weeds will also quickly respond to the chemical fertilizer, necessitating aggressive herbicide applications.

erosion and salinization, which in turn is countered by even more chemical fertilizer. Eventually the crops become weak and even more susceptible to insects, and so the treadmill continues. The result is that since the early peak of the Green Revolution, crop yields are now decreasing while chemical use is increasing (Thrupp 2000: 269; Dove and Kammen 1997: 94-6). Additional spin-offs related to health and food security include, but are not limited to, the poisoning of water sources for drinking and fishing, impacts of over-exposure to chemicals, and malnutrition from simplified diets (Baviskar 1995: 28; Sampat 1998; Manning 2004). In his essay "Hybrid Times, Hybrid People", Vasavi (1994: 283) describes a dramatic analogy made by local farmers in Karnataka, who link their personal health to ecological health. "Associating the characteristics of hybrid seeds with their current condition, they describe themselves as people who are now, 'weak, delicate, dependent and susceptible to disease.'"

Rediscovering biodiversity:

The Green Revolution undermines the benefits of agrodiversity and farmers' knowledge and perspectives regarding those benefits, especially in marginal areas (Thrupp 2000: 269). Mazhar et al (3-4) attribute the failures of the Green Revolution "as a general symptom of an incorrect concept of agriculture, one based on a factory model of food production."

> A factory typically focuses on the production of a single commodity and relies on an uninterrupted flow of external inputs. Furthermore, it is not capable of recycling its own wastes internally. These limitations do not need to be reproduced in an agricultural system, which can create multiple outputs, generate its own inputs (biomass, seed, new animals) and recycle its own wastes (composting, surface water management, etc.).

Since a farm can be a closed economic system, generating its own inputs and recycling its own wastes, there is little capital cost to the farmer for purchasing seeds, chemicals, irrigation and machines. Wastes also become additional inputs by virtue of being recycled. Therefore soils become progressively healthier, leading to healthier crops, which in turn are more resistant to pests, disease, and drought. Finally, farms can create multiple economic outputs: a diversified farm can produce a variety of food to meet all nutritional needs, plus medicines, fodder for animals, fibre for clothing and ropes, construction materials for homes, and any number of products to sell for income (Mazhar and Buckles 2000; Mazhar et al; Srinivas n.d.; Thrupp 2000: 268; Altieri et al 1987: 50). Some crops also have socio-cultural values such as being preferred for ritual offerings or as feasting food at festivals (Brush 1989: 24). By contrast, the Green Revolution model offers income from only one type of crop. If that crop is cotton or sugarcane, then it cannot even provide a part of a family's nutritional requirements except for what the income from selling the crop can buy. In the event of a crop failure, a family has neither food nor the money to buy food.

Agrodiversity is also an approach to managing risk and unpredictability. Farmers maintain a diversity of crops knowing that some will tolerate different growing conditions than others. This variation between crops ensures that there will always be sufficient harvest of something regardless of drought, insects, and disease. While some crops may succumb to adverse conditions, other crops will be tolerant of them or even be able to thrive in them (Renauld et al 1998: 345; Cleveland and Murray 1997: 481; Sharma 1994: 143; Altieri et al 1987: 50; Chang 1977: 242-8; Jay 1978: 44; Tyler 1978: 38). Using a diversity of traditional crops and varieties may not have as much potential as

HYV for very high yields, but diversity affords adaptability and resilience to ward off the calamitous effects of unpredictable and uncontrollable events that can be fatal if a farmer relies on just one crop variety (Marten 2001: 169-74; Jewitt 2002: 159-68; Thrupp 2000: 268).

Since risk management is a management priority for *Adivasi* farmers, their selection criteria for each crop goes beyond assumptions that "improved" means better yields. "Improved in what sense?" ask Mazhar and Buckles (2000: 5). "In a community landscape [such as with mixed cropping] different plants have different uses. One is not inferior to another." Instead, each crop is valued for its unique qualities which contribute in different ways to farmers' livelihoods. Selection criteria for some crops may not be geared solely toward yield, but other qualities that are deemed economically and even socially important. Mazhar and Buckles (2000: 5) give an example that a variety of rice may produce less grain, but is highly valued for producing an abundance of good quality straw for animal fodder. Likewise, a ten foot tall sorghum variety is not inconvenient for an *Adivasi* farmer practicing mixed cropping since the long stalks are a perfect complement for beans, whose long vines benefit by climbing the tall sorghum stalks. Other criteria important to farmers are "largely based on environmental factors," are "quite different from those used by the national breeding programs," and are "at least as effective as those made by breeders" (Vernooy 2003: 21). These might refer to drought tolerance and soil requirements. With a focus on seed production under ideal conditions (controlled with chemical inputs), HYV often cannot tolerate marginal farming conditions. "Farmers reject the plant breeders' offerings," concludes Vernooy (2003: 4), "because they simply are not designed for marginal farmland – they meet neither farmer's needs nor local preferences." Farmers are aware of the specific and variable environmental conditions in which they are growing crops. Therefore they select and employ crops and varieties that are best suited to those conditions to ensure sustained yields (Altieri et al 1987: 50; Dove and Kammen 1997: 97; Vasavi 1994: 286).[8]

Paying attention to the many factors affecting crops' performance within specific and variable growing conditions, farmers challenge the development industry's faith in the "inherent superiority of modern science" (Horton 1991: 224).[9] The success of farmers' indigenous crops compared to Green Revolution crops reveals that farmers "have their own effective 'science' and resource practices" (Sillitoe 1998: 223). Sillitoe adds that if the efforts of agricultural research and development are to be useful to farmers, "we need to understand something about their management systems." Acknowledging the expertise of farmers has lead to a role reversal within development processes where professionals learn from the farmers both the problems of earlier agricultural development initiatives as well as what the farmers think are the best directions for the future (Whyte 1991: 11). Out of the necessity for this new approach to research and development, "participation" has arisen as a new paradigm to learn and

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8 Continuous adaptation to ever changing environments is an important feature of saving seeds from local varieties. Simply put, the varieties change as the environment around them changes. When the germplasm of these varieties is collected and stored in gene banks, they are locked in time and space. Furthermore, germplasm preserved in banks represent only a seed variety's genetic value in isolation, thus alienating seeds from their socio-cultural, ecological and historical contexts, in which they have developed and evolved. These contexts are informative for knowing specific practices for growing and using specific crops properly (REAP 2001; Shiva 2000; Eberlee 1999; Labond 1999; Vernooy 2003). The technological and financial inaccessibility render *ex situ* gene banks useful *only* to biotechnology companies for the development of new hybrid seed varieties (Agragamee 1998; Altieri et al 1987: 55; Brush 1989: 19-22).

9 At the International Potato Centre (CIP) site of the CGIAR in Peru, Horton (1991: 225) recounts a director's disbelief upon realizing the poor performance of their seed compared to the "common" seed of farmers: "You simply cannot say that those farmers' seed potatoes are as good as our "improved" seed potatoes. It is a contradiction in terms!" See also Maclure and Bassey (1991) for an account describing how engineers in Benin wrongly assumed that loss of maize in storage was due to farmers' traditional storage systems.

understand farmers' own knowledge regarding agrodiversity and agricultural development.

Participatory Learning

The drive to include farmers' participation in research and development recognizes not only that they have specific and valuable knowledge that can inform development initiatives to make them more effective, but also that farmers are affected by development initiatives and thus must have input into how these are designed and administered. This improves the development agenda in two ways. First of all, the agendas are based on local knowledge regarding specific local issues. Secondly, the agendas are more in line with the needs and desires of farmers. As a result, development initiatives are more likely to be successful because they involve the people who are to be affected (based on the identified needs of those people) and they are better tailored to the idiosyncrasies of specific situations (Roy and Chattergee 1993: 349-50; Jewitt 1995: 1011, 1018; Baviskar 1995: 26-7; Davis and Whittington 1998: 74).

The challenge now is for development professionals to learn the farmers' knowledge accurately and sensitively in order to avoid repeating the mistakes of the past. Participatory methodologies are continually being developed to achieve the goals of learning valuable indigenous knowledge and applying it to development situations. While these approaches are significant improvements over the top down paradigm of the Green Revolution, they have achieved only limited success in understanding the natural world as farmers see it. These constraints are largely due to naïve assumptions, on the part of development professionals, regarding farmers' willingness and even ability to participate in agricultural development (Chevalier and Buckles 2005; Kapoor 2002; Pratt 2001; Campbell 2001; Sillitoe 1998; Opp 1998). In particular, participatory researchers fail to realize the influence they have in the participatory process, which impacts local peoples' participation within the process and the knowledge that is elicited from participating farmers.

Chapter 2 will address these issues around participatory methodologies in more detail. I discuss both the principles that claim the superiority of the participatory approach as well as the constraints to fulfilling those goals. I then introduce the Social Analysis Systems^2 (SAS^2) as a new alternative to other participatory methodologies. The potential of SAS^2 lies in its rigorous analyses of local socio-political conditions, its ability to promote collaboration between different stakeholders including farmers, professionals and researchers, and its ability to adjust research techniques to optimally suit the needs of these stakeholders. The last point is integral for getting an accurate understanding of local knowledge since the SAS^2 techniques can elicit knowledge within a local idiom and through traditional channels (Chevalier and Buckles 2005). While SAS^2 is comprised of over fifty complementary techniques, in this research I focus on one of the signature techniques call Domain Analysis (Chevalier 2005; Chevalier and Buckles 2005). Chapter 2 concludes with a discussion of this technique, which uses the principles of constructivism to understand peoples' world views using their own language and lines of reasoning (Chevalier 2005).

Chapter 3 represents the main chapter of this thesis. It describes the information and knowledge about two different mixed cropping systems employed by two distinct *Adivasi* peoples, the Kuvi and the Korku, elicited using the Domain Analysis technique as the primary method for research. During the research process I aimed to learn about the varying reasons why these farmers maintain their unique and distinctive mixed cropping practices, why they mix these specific crops, what the specific relationships between different crops are, and how each crop makes its specific contribution to the mixed cropping system as a whole. The research largely confirms many of the statements made above. In particular, mixed cropping is a strategy for risk management within farming systems. A wider representation of diverse crops ensures a wider set of environmental tolerances. Thus, Kuvi and Korku farmers living in marginal agricultural conditions can be certain that they will reap a successful harvest regardless of the impact of unpredictable environmental factors. In addition, the harvest of a wide variety of crops ensures that farming families will be able to produce all or most of their nutritional and medicinal needs as well as fodder for livestock, regeneration of soil nutrients, and construction materials. Furthermore, many of these crops offer farming families a diversity of economic opportunities, from meeting basic subsistence needs to earning incomes through the trade of other farm products in order to purchase subsistence articles they do not produce themselves.

However, learning the Kuvi and Korku peoples' respective criteria for valuing each crop differently posed a challenge to my research. While the Domain Analysis technique is touted for being able to elicit the subtleties of local knowledge from participants, this research never fully achieved that goal. I do not deny that the Domain Analysis technique has the potential to achieve this goal. However, the depth and success of the technique is largely dependent on the circumstances in which it is applied and the skills of the researchers who employ it. Chapter 4 is an examination of how the behaviours and attitudes of researchers (namely myself and my co-facilitators) during the research process, and their skills in using participatory techniques, impact the participation of *Adivasi* people. The responses of the participants determine the type and quality of knowledge to be gathered. Chapter 4 acts as an addendum to Chapter 3 by analyzing the impact of the research process upon the quality of the research results.

Chapter 5 concludes the thesis by summarizing the contributions that the Domain Analysis research makes to the existing academic and development literature on mixed cropping. In addition, I summarize the Domain Analysis research within the context of the Kuvi and Korku peoples' specific agricultural situation. I argue that each system is appropriately adapted to the specific situation, and finally conclude that more can be learned about how they are adapted through additional, more appropriately applied Domain Analysis research.

CHAPTER 2: PARTICIPATORY METHODOLOGIES AND THE DOMAIN ANALYSIS TECHNIQUE

Commonly, the issue of methodology receives only short mention in Anthropology theses. At best a description of methodological practices is offered in an effort to prove the legitimacy and worth of the research. Yet, *how* methodologies are implemented by researchers has significant impact on both research processes and research results. For the purposes of this thesis, ensuring the participation of Korku and Kuvi farmers is essential for the study of *their* agricultural biodiversity and *their* knowledge about it.

Rather than assume that participatory methodologies will be accepted and understood as a given by readers, I want to problematize the soundness of methodology. While some methodologies are more appropriate in certain situations than others, none are flawless in any situation. This has been an issue of constant concern in the social sciences, particularly with regards to local (and global) economic development. Even today, large-scale technology transfers and top-down initiatives are used for the supposed benefit of poor and marginalized people. However, too often these are misguided projects that not only miss their mark, but also create new problems for the people intended to benefit.

In response to the failures of top-down development, with particular reference to the Green Revolution, a new concept arose around the 1980s to include the intended "beneficiaries" of development as active "participants" in the development process, rather than as passive recipients. Currently, the three most common participatory models are Rapid Rural Appraisal (RRA), Participatory Action Research (PAR) and Participatory Rural Appraisal (PRA). By the 1990s, the effectiveness of participatory approaches was becoming apparent to major actors in development, giving such credence to the approaches that they became widely adopted as standard practice throughout the development process all the way from policy within the major donor agencies to the implementation on the "ground".

Nonetheless, participatory research and development systems contain theoretical and methodological gaps. The impact of these holes is that the methodologies lack sophistication to produce significantly useful information, and yet are complicated enough to be improperly implemented and distracting to participants. Moreover, participatory systems have been unable to harmoniously fit into conventional development project cycles, which have resulted in the systems being pared down and manipulated in order to force a fit. This has reduced their optimum efficacy further.

Aware of the shortfalls of current techniques, new methodologies and approaches are continually being developed and tested. One of these is the Social Analysis System^2 SAS^2, a body of 56 tools and techniques. These tools and techniques are derived from earlier participatory systems as well as other social science disciplines. SAS^2 methods and tools offer significant improvements over other participatory models in that they aim to achieve more effective participation as well as more quality analysis. In addition, SAS^2 proposes new approaches to research, analysis and project implementation to benefit not only participants, but also the institutions involved in implementing development projects. Domain Analysis, a SAS^2 method, is the principle research method for this thesis on Kuvi and Korku *Adivasi* farmers' knowledge about their mixed cropping systems. Therefore, this thesis also represents a recent testing of the Domain Analysis (Chevalier 2005) technique in a real fieldwork situation.

I will begin this chapter by giving a brief account of the current state of participatory research and development to set the theoretical framework for how Domain Analysis was developed as a methodology and how it came to be the central method for my fieldwork. This will be followed by the theoretical and methodological principles that are the foundation of Domain Analysis. I will then describe the process of using the method to develop a matrix (called a repertory grid), which can then be analyzed and interpreted with the help of computer software in order to understand *Adivasi* farmers' knowledge regarding their mixed cropping systems. I will not however, conduct a detailed analysis in this chapter since that will be done in Chapter 3 of this thesis. In Chapter 4, I will introduce the specific research undertaken for this thesis by describing the process as I employed it in my particular field of research. That chapter will include a personal analysis of Domain Analysis as a technique for conducting my research.

The new era of participatory research and development

Since "participation" gained its initial footing in international development, it has evolved and developed conceptually (Pratt 2001; Davis and Whittington 1998: 73). Exactly what participation is, how it is achieved, how it is used, and to what end it is used has been continually redefined over time. The earliest (semi) formalized models, in the 1970s and 1980s, were Participatory Action Research (PAR – itself evolved from "activist participatory research") and Rapid Rural Appraisal (RRA). As participatory theory developed, both of these earlier models eventually gave rise to Participatory Rural Appraisal (PRA), which has become a mainstay of the development vocabulary into the present (Pratt 2001: 13; Gomez 1999: 152; Opp 1998).

The guiding theoretical principles of these participatory approaches are well documented by other scholars. Opp (1998) and Humble (1995) offer particularly good summations of the historical, methodological and theoretical developments of PRA (via PAR and RRA), which has become the dominant participatory model in the development discourse. My discussion herein regarding participatory research and development draws significantly from Opp's and Humble's work, but is not exhaustive. Rather it is intended to set the stage for a detailed discussion of the Social Analysis System^2, and its Domain Analysis technique, which is the principle method of research used for this thesis. The Social Analysis System^2 represents new learning from the earlier experiences of participation research and development. Its Domain Analysis technique is the principle participatory research method used for this thesis to both learn about mixed cropping systems of *Adivasi* farmers in India as well as comment on the experiences of "doing" participatory research (see Chapter 4).

Rapid Rural Appraisal (RRA) perhaps represents the first generation in participatory research. It is a system of research techniques used to help agricultural professionals quickly gain a greater understanding of the specific situations and needs of local farmers to help develop appropriate development initiatives (Campbell 2001: 381). An additional boon is that RRA is a relatively cost effective approach to preliminary social, economic and ecological research in advance of designing and introducing development packages. The quick and effective techniques, involving map making and farm walks, are unpretentious, verbal and visual so that anyone can participate. Therefore, they can easily be taken into remote areas that were previously bypassed since traditional long term research is difficult, expensive and time consuming (Humble 1995:

79-85; Mosse 1994: 517). In principle, development agencies would be able to design development packages that farmers would readily adopt since they are based on information gathered from the farmers. However, the model is extractive in the sense that local people generate knowledge that is removed from them. It is taken to another research institution for analysis, presented to policy makers, who in turn made recommendations, which lead to new technologies to be later introduced back to presumably passive "participant" farmers. Thus the primary intention of RRA processes is to maintain the top-down technology transfer development paradigm, only using participation to better tailor the technology to match the situation and help its adoption into relevant communities (Campbell 2001: 381; Opp 1998: 81-4; Humble 1995: 87).

As the name implies, Participatory Action Research (PAR) is different from RRA because of its emphasis on participation for action stemming from the grass roots rather than extracting data from people in order to design a better project. PAR is geared toward training and empowering local people to solve problems of local concern. It is rooted in the tradition of resistance and struggle against top-down development, and its inherent biases and inequities that result in the maltreatment of local peoples. PAR conceptualizes conventional development discourse as a form of colonialism oppressing the world's poor. PAR techniques intend to build the collective consciousness of oppressed people, spurring them to demand their democratic right to participation in development activities if not to solve development problems on their own (Opp 1998: 50-3; Baviskar 1995; Shiva 2000). PAR is used to empower local people by revealing the virtues of their indigenous knowledge and practices against the follies and injustices of top-down development. Through this "cultural renewal" (White 1999: 40-1), along with shared ownership of research, local participants are initiated into a long-term transformative process to blockade top-down development and begin to help themselves (Maclure and Bassey 1991: 190-1). While RRA is favoured for its contribution to existing development cycles, PAR is more popular within grass roots organizations. However, its highly politicized and revolutionary nature relegates it to the fringes of development industry. Only once depoliticized to more closely resemble RRA can it find favour in the conventional project cycle (see below; Maclure and Bassey 1991: 206; Opp 1998: 50-3, 103; Humble 1995: 81).

Considered a successor to RRA, Participatory Rural Appraisal (PRA) arose as a more formal and sophisticated school of development by the 1990s (Campbell 2001: 381; Pratt 2001: 11-14). PRA draws from the strengths of the other two participatory traditions, while also learning from their faults. Foremost, PRA expands the concept of participation to its fullest, demanding local peoples' input from preliminary information gathering, through to project design, project implementation and even ongoing project management, monitoring and evaluation (Pratt 2001: 25; Whyte 1991: 7). It also strips the authority away from the "expert" researcher, who becomes merely a practitioner facilitating local farmers with using their own expert knowledge (Kapoor 2002: 103-4; Opp 1998: 89-90). According to Kapoor (2002: 103), "PRA is a methodology that is open-ended and continually evolving" (see also Campbell 2001: 382). PRA techniques include in depth observation and information gathering methods borrowed from anthropology, such as semi-structured interviews and participant observation, as well as quick data and analysis techniques such as those used in RRA. Meanwhile the strong advocacy role of PRA maintains the spirit of action and local empowerment drawn from PAR (Kapoor 2002: 103-4; Pratt 2001: 27, 30-5, 40).

Since the 1990s, PRA has proliferated throughout the development field. "Participation" on some level is now a mainstream feature of the majority of projects within the field of international development (Harrison 2002; Ferguson and Gupta 2002; van Rooy and Robinson 1998). The appeal of PRA methodologies can be attributed to three streams of benefits accrued: those to local participants, those to development process, and those to social science research. Of course, there is a certain amount of interdependency because factors that benefit the development process and social research in turn benefit participants.

Benefits to local participants

Participation allows people to identify their own problems and needs for development, and to identify their own solutions and outcomes for best dealing with those needs (Kapoor 2002: 103-4). More specifically, in the PAR and PRA traditions, participants maintain ownership of the information gathered rather than it belonging to the researchers or their affiliated institutions (Pratt 2001: 21; Maclure and Bassey 1991: 190-1). People empowered through ownership over how they are involved with development processes have greater invested interest in achieving project goals (Deb 1993: 335; Jewitt 1995: 1004-7; Poffenberger 1996; Sillitoe 1998: 224-5). Furthermore, their continued involvement in the development process allows information to be validated by the participants to ensure that it is accurate to their situation and that proposed solutions are to their liking.

The PRA process is adaptable toward local conditions, enabling practitioners to go through the proper local channels, such as village or clan leadership, to achieve community trust as well as research and development objectives.[10] Additionally, the group oriented and democratic format of PRA easily resonates with how many "traditional" institutions operate such as community meetings and consensus building (Pratt 2001: 13). Therefore, the newness of the PRA process to participants is aided by being introduced through familiar traditional channels. For many marginalized peoples, these institutions are among the first aspects of cultural tradition to fall victim to socio-economic oppression. In principle, encouraging PRA research and development to work through these institutions goes a long way to revitalizing and even preserving this aspect of cultural identity (Baviskar 1995; Khator 1991).

The PRA process encourages participants to be self-reflective in ways they are otherwise unaccustomed to do. Firstly, by engaging in participatory research exercises people come to realize they can generate expert information and knowledge that they previously thought was the sole domain of "professionals" (Pratt 2001: 30). Moreover, PRA heightens people's awareness of the value of their knowledge, especially regarding traditions, society and nature (Pratt 2001: 30). Combined with empowerment that comes with ownership of research and development, and revitalization of local institutions, peoples' newly discovered awareness of themselves can foster a cultural renaissance in communities (Pratt 2001: 30-1; White 1999: 40-1). Accordingly, PRA searches out diversity between peoples rather than the homogenizing effect of the one-size fits all model of top-down development (Kapoor 2002: 103-4). PRA research recognizes and

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10 It seems "unexceptional" (Sillitoe 1998: 224) but it is a protocol often ignored by conventional top-down development.

legitimizes the knowledge that different peoples have regarding their unique and specific situations, which in turn promotes their equality among other peoples.

Benefits to Development

In addition to how effective participation benefits local people, it also benefits the overall development process. PRA provides necessary preliminary social analysis, without which development projects are likely to miss their intended mark. "Within the project cycle framework," states Garett Pratt (2001: 31), "discussions of social relationships tend to be instrumental to discussions about implementing the project, whether it is aiming to improve natural resource management, services, infrastructure, or livelihoods." When the subtle power structures within communities are ignored, such as the traditional institutions and customary protocols mentioned above, projects can experience obstacles if not outright opposition from local people. Ignorance of social dynamics on the part of planners can also result in the benefits of development being directed toward elites rather than the people really in need (see also Pratt 2001: 45). With full employment of *all* stakeholders in the development process, from inception through implementation to monitoring and evaluation, development goals are more likely to be achieved successfully from the perspectives of all parties involved (Sillitoe 1998: 224).

PRA-based analyses are further valued for their ability to remain focused on issues of relevance to both participants and development agencies, enabling projects to be completed in a timely and cost-effective fashion (Opp 1998: 82*fn*; Pratt 2001: 27, 32). Traditional social research methods such as participant observation have a tendency to digress into incidental and contextual issues. Information gathering, analysis and interpretation, and final reports become prohibitively long and costly and even irrelevant, which is in part why social analysis is rarely considered in large top-down technology transfers (Mosse 1998: 14-15). Furthermore, current decentralization processes within governments, called Structural Adjustment Programs, disable these institutions' abilities to effectively manage development projects (Mosse 1998: 15; Pratt 2001: 11; Opp 1998: 57-8). Therefore, for better or worse, promoting local of development processes, transfers government responsibilities to local communities (see also Staatz and Eicher 1998: 21-8; Opp 1998: 70-1). "Policy initiatives for resource management 'transfer' (i.e. from state to community) place considerable faith in the ability of… community institutions to improve the delivery of services, reduce the costs, and to improve the maintenance and the management of assets" (Mosse 1998: 15; see also Sillitoe 1998: 225; Van Rooy and Robinson 1998; Garland 1999; Ferguson and Gupta 2002).

Participation among project stakeholders, including local people, encourages cooperation that can benefit both the people and the development project (Pratt 2001: 34). The negotiation with local people to establish project goals benefits local people because it can recognize and extend peoples' rights to natural resources so they can continue to meet their subsistence needs through traditional means. There is voluminous literature arguing that shared access to natural resources between local people and governing institutions encourages responsible management of the resources (Primack et al 1998; Jewitt 1995). This not only encourages economically and ecologically sustainable use of resources by local people, but also opens opportunities for employing local knowledge, derived from PRA exercises, toward sustainable resource management and even resource rehabilitation (Renaud et al 1998; Shiva 2000; Schmidt-Voigt 1997; Dearden 1995: 116;

Labond 1999; Zimmerer 2001: 732). Sillitoe (1998: 224) remarks that the "understanding and appreciation of local ideas and practices will further development work is patent to any anthropologist." Employing local people and their knowledge to manage resources greater empowers the people which results in greater overall success of grass roots development initiatives.[11]

Interestingly, PRA acts as a line of communication between people on the grass roots level and the high level policy makers or project designers. PRA facilitators are a trusted link between the two disparate levels of society. Through the PRA process, facilitators can identify the social dynamics, the local knowledge base, and the needs and desires of local people. "[I]nformation generated through PRA" represents the voices of local people presented in a familiar development discourse for "policy advocacy, to affect the high level decisions of government and related agencies" (Pratt 2001: 37).

Benefits to Research

Participatory research and development has had significant impact on social scientists. One of the unique features of PRA focuses on the role of the PRA practitioner/facilitator, either as researcher, professional, official or advocate. First of all, the facilitator is *only* a facilitator: s/he does not impose her/his views on people, but rather facilitates people to do their own research and development (Kapoor 2002: 103-4). Related to this background position, the "attitudes and behaviours" of facilitators toward participants have enormous impacts on research and development in the PRA tradition (Mosse 1994: 516-7; Gomez 1999: 155). Proponents of PRA are adamant that facilitators

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[11] Tania Li (2002) and Sillitoe (1998: 225) challenge the assumption that participatory approaches inherently lead to "low-tech" sustainable management of local resources. See also Baviskar (1995: 9).

embody "attitudes and behaviours" consistent with the principles of participation for research and development (Opp 1998: 85, 80-90; Humble 1995: 88-9, 96-7). This means for example, that facilitators must keep an open mind and behave with respect and equanimity toward all people and their cultural values (Pratt 2001: 48-57). Furthermore, facilitators should foster open expression among participants by valuing their contributions and sharing with them the analysis and interpretation of PRA exercises. Without the right attitudes and behaviour, facilitators fail to build the rapport and trust of the local people. As a result, people may remain ambivalent, refusing to participate in PRA in any meaningful manner, further resulting in inadequate and even inaccurate information (Mosse 1994: 503-4; Maclure and Bassey 1991: 202). Without sufficient information, project designs are mislead, affecting the success of their implementation. Therefore, when facilitators cultivate the right attitudes and behaviours, the results of research are profoundly more genuine, which results in benefits for all parties involved.

Cultivating appropriate attitudes and behaviours for participatory research and development should not be treated as merely a means to an end for social science research. Engaging in participatory research with the right mindset also grants social science *researchers* opportunities for their own betterment. Utilizing participatory methodologies redefines not only the development process, but also the role of social scientists in that process. Participatory tools and techniques have given renewed importance to social analysis in the development process. As one PRA practitioner quoted in Pratt (2001: 45) states, "Maybe it is time to get rid of the name PRA and just call it social analysis... that's what it is all about..." The social analysis aspect of PRA ensures the continued employment of social scientists to undertake that social analysis

(Mosse 1998: 14-15). On a more personal level, following the principles of participation is an opportunity for researchers to overcome the stigma of being oppressive outsiders, pawns of the authorities, stealing the peoples' knowledge so that they can be more thoroughly subjugated. Anthropologists especially have long been suspected and accused of extending the reach of powerful and oppressive institutions (Misra 1978: 1-8; Tyler 1978: 17-22; Furer-Haimendorf 1982: 80; Mehta 1993: 138; Bodley 1990: 74-5; Baviskar 1995: 9-15; Langford 2003). By adopting participatory tools and techniques, as well as accompanying behaviours and attitudes anthropologists can show that they are genuinely supportive of the people.

High level institutions and organizations, from governments to multilateral development agencies, now recognize their ineptitude for successfully designing and implementing development projects (Gomez 1999: 152; Pratt 2001). Meanwhile, grass roots agencies have instead promoted participatory initiatives, bringing the tools, techniques and theoretical principles of participatory research and development to its current maturity. At first participatory approaches such as PRA and PAR were considered "unscientific" and feared as "dangerous and subversive," but they have increasingly proven their value in fieldwork situations (Gomez 1999: 153; see also Sillitoe 1998; White 1999; Shiva 2000). The need and value of participation can no longer be ignored by the major players in development such as the World Bank and the United Nations (Gomez 1999: 153). In fact, it has quickly become recognized by the large institutions as a viable alternative to conventional top-down development, to the point that PRA has even been mainstreamed into the development process to the point where it is a required component for any project (Opp1998; Gomez 1999; Pratt 2001).

The weaknesses of participatory models

Conventional development institutions increasingly recognize the demand for local peoples' participation in research and development processes. This has lead to a broader adoption of participatory systems such as PRA. However, participatory systems in their entirety do not easily conform to the conventional development project cycle in which all details are planned in advance and then implemented to achieve predicted results. Therefore, institutions have forced systems of participatory research and development to adapt to the conventional project cycle, rather than adapting the project cycle to participatory systems. For ardent proponents of participation, this adaptation is viewed more as "a manipulation process going on in the name of participation" (quoted from Gomez 1999: 153). The institutions value the advantages of participatory methodologies for being quick and accurate techniques for gathering information (Campbell 2001: 380), but strips them of their guiding theoretical principles (Pratt 2001; Gomez 1999). Orlando Fals Borda, a long time social activist and pioneer of PAR openly admits that:

> Traditional institutions have no choice but to accept it [PAR], even though they accept it only superficially.... [T]hey end up co-opting the concept of participation, and adopt it only in its most superficial form and formal expression (quoted from Gomez 1999: 153).

"Superficial" acceptance raises concerns among participatory advocates that within the "big organisations" the underlying meaning of participation "is not internalised", and that there is a general "level of rhetoric about PRA and participation that may not be matched in practice" (Pratt 2001: 17; see also Chevalier and Buckles 2005: 7-8; Gomez 1999; Opp 1998: 91).[12]

An emphasis on methodology impacts participants not only because the theoretical principles of participation are abandoned, but also because of inherent flaws in the methodologies themselves. There is a growing body of literature challenging the ability of current participatory methodologies to fulfill their beneficial claims. PRA in particular (because it is the most common participatory system), is criticized for over-simplified social analyses, which impacts the ability to achieve effective participation and to gather accurate knowledge (Chevalier and Buckles 2005; Kapoor 2002; Campbell 2001).

Co-optation of participatory methodology:

Conventional development projects typically follow a management cycle referred to as "Results-Based Management" (RBM) (Chevalier and Buckles 2005b: 1) . The underlying principle of RBM is that pre-defined development goals can be achieved by following a pre-designed development plan. In this management cycle, a project gradually unfolds "as a chain of causes and effects" producing expected outputs from appropriately implemented inputs until a final goal is achieved (Chevalier and Buckes 2005b: 1). "RBM is based on the idea," Chevalier and Buckles (2005b: 6) state, "that people must clarify their goals and plan all major activities in considerable detail before they can actually implement activities."

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12 In identifying the shortfalls of "participation," the following discussion implies that its misuse is commonplace. While there is enough of a problem to warrant critical discussion, it is still an improvement on earlier development models. Moreover, there is still a significant amount of highly successful work being done making legitimate use of effective participation (Opp 1998: 91-2; Gomez 1999; Pratt 2001).

The problem with RBM approaches, add Chevalier and Buckles (2005b: 2), is that the "attempt to simplify and manage by focussing on results end up complicating things enormously because methods and tools are too rigid in situations where complexity prevails." The problem of rigid tools is exacerbated when local people are enlisted to contribute their own goals and objectives to the project (Pratt 2001: 32). For example, a possible response of a development institution regarding increasing child malnutrition problems may be to initiate a crop improvement program, under the premise that better yields will improve incomes if not just nutritional intakes. The institution may intend to employ participatory research to ascertain what crops are in need of improvement and what qualities are weak for those crops. As the research progresses however, it reveals that, due to another institution's mandate to protect watersheds, villagers are being restricted from gathering supplemental food from the forest. Without these uncultivated foods, families are unable to nutritionally balance their children's diets. Therefore, the issue of land rights and access to forest resources are of greater interest to the participants than crop improvement. This new issue raises a plethora of different stakeholder interests. Unable to adapt, the RBM project becomes "destabilized by the complexity of real-life processes and persistent challenges to the correctness of goals or the means to achieve them" (Chevalier and Buckles 2005b: 2).

Since the uncertainty regarding what project goals and objectives participants will set is an integral feature of "participation", it is improbable that RBM oriented institutions could widely adopt participatory research and development. This adoption is made possible by the disconnection between the strict practice of participatory methodologies and the theories that drive the need for participation. Theories refer to politicized notions (popularized in PAR) that encouraging peoples' participation builds a sense of ownership of research and development for people, empowering them to reverse their oppression. Ironically, the source of oppression often comes from development institutions imposing their pre-defined agendas on local peoples (see for example Garland 1999 and Dzingerai 2003). However, these theories are weakly developed, not embedded in the methodologies, and can be treated as optional to the development process (Kapoor 2002: 101-2). By abandoning these theoretical principles, development organizations are able to depoliticize and simplify the participatory process, bypassing many factors within participatory practices that increase complexity and uncertainty.

"Participation" thus becomes reduced to a set of methodological tools, the "apolitical leanings" of which make it "easy for institutions to promote and mainstream [participatory] methods in the field of development" (Chevalier and Buckles 2005: 8). Kapoor (2002: 102) echoes this statement, adding the caveat that development projects continue to be bound by the rigidity of Results-Based Management systems within top-down projects, in which "activities emphasise programme delivery" (see also Harrison 2002; Mosse 1994). By adopting participatory methods into the RBM framework, the methods are forced to conform to principles of predictability. Mosse (1994: 517 emphasis mine) observes that practitioners "go with a *fixed* set of techniques to try out," implying that the techniques and their uses become rigidly standardized, which in turn hinders their innovation for improvement (Opp 1998: 168; Pratt 2001: 18, 25-7, 30-3, 58-9).

The narrow orientation toward achieving set goals with a standard set of techniques foments a fixation to "capture the *outcomes*" (Mosse 1998: 17 emphasis in original) of methodological processes "as if [their] meaning is self-evident" (Campbell

2001: 382), rather than analyzing interim discussions between participants during the process. Mosse (1994: 517) suggests that the "production of visual outputs" from participatory methods (diagrams, maps, matrices and charts) is more beneficial for goal oriented project reports than it is for illiterate participants. He adds that participatory outputs "can give the wrong impression that relevant planning information comes in the form of a set of completed… exercises" (see also Opp 1998: 78, 139). However, not "everyone has an inherent ability for visual literacy" (quoted from Opp 1998: 87). Campbell (2001: 383) suggests that visualizations associated with participatory tools and techniques "impose Western cultural practices and require people to learn new cultural skills" which echoes Mosse's (1994: 505) statement that they "may in fact generate a greater sense of mystification than conventional research." As a result, although participants are valued as knowledgable actors in development practice, the management of their knowledge is still controlled by researchers through the participatory methodological approach. This reinforces the authority of researchers whose expert skills draw the knowledge out of participants (Chevalier and Buckles 2005: 8-9; Kapoor 2002: 105-6; Harrison 2002). Since people may not be able to interpret the outputs, they are barred from truly participating and may become weary of practitioners' own agendas at play (Opp 1998: 136-41, 194; see also Jewitt 1995: 1018; Pratt 2001; Garland 1999; Dzingerai 2003).

According to Kapoor (2002: 102), the institutional love affair with the visual outputs that result from participatory exercises, creates a "practice/theory binary opposition that teeters on the fetishisation of practice and the impoverishment of theory…." The impact of favouring methods without their theoretical underpinnings results in a tendency "to get bogged down in methods and techniques without stopping adequately to consider the initial assumptions or broader issues (eg about the purpose of the techniques)" (Kapoor 102). This is an ironic turn of events since in order to promote participation, methodologies were originally intended to be flexible and creative in how they gather information and analyze it (Chevalier and Buckles 2005: 6).

The longer term implications of adopting participatory methodologies without much thought to the principles of "participation" are twofold. Firstly, the project cycle does not overcome the rigidity of being results-based. Development goals are still set by outsider organizations rather than entrusting local peoples with the ability to identify their own objectives (Dzingerai 2003; Harrison 2002; Garland 1999; Alting von Geusau 1992). As Chevalier and Buckles (2005: 7) state, "Participatory analyses are frequently initiated... with predefined goals and agendas that are not grounded in local processes controlled by the actors targeted by the project or program." So that participatory research does not usurp the project plan, people are instead enlisted to participate at pre-determined stages as the project unfolds. For example, preliminary participatory exercises are "normally carried out at the beginning of a project *followed by the actual business of implementing project plans*" (Chevalier and Buckles 2005: 17 emphasis mine). Such exercises are typically intended to prepare people for the implementation of planned projects, rather than create a learning environment where participants can employ their knowledge for directing a project (Harrison 2002). Since participatory methodologies have the benefit of rapidly gathering detailed but focused information (as discussed earlier), peoples' participation may be required again, but only to push through development goals (Chevalier and Buckles 2005: 7).

> In many cases the exercise is designed to extract information rapidly, with limited concessions to the full engagement of key stakeholders in all phases of the diagnostic process.... Given a limited input of ideas and decisions from all project stakeholders, participatory diagnostics lack grounding in ongoing processes and serve capacity-building and information-gathering agendas defined essentially by outside organizations and researchers (Chevalier and Buckles 2005: 7).

In short, the process maintains its conventional top-down paradigm. The people at the grass roots level, who as stakeholders will be affected by a project, are stripped of their agency for influencing the project. They become mere research tools to collectively provide information to feed the project cycle for quickly achieving required ends, much like they would do in RRA (Campbell 2001: 387; see above).

The second implication from emphasizing methods over principles is that participatory research will lack the rigour and depth necessary to gather accurate knowledge from participants (Campbell 2001; Mosse 1994 498-9; Mosse 1998: 16; Pratt 2001: 32, 38; Jewitt 1995: 1018). Practitioners neglect building rapport and understanding between themselves and local people due to a required emphasis on the "quick-and-easy diagnostics" of participatory analyses (Chevalier and Buckles 2005: 6; Sillitoe 1998: 234). Local people accurately recognize the insincerity in which researchers request their participation. According to Mosse's observation (1994: 504), this is because experience teaches people that "outsiders expressing concern with their affairs do so in order to pursue their own specific interests." Driven by their suspicion, people will withhold knowledge that they fear may "have implications for the future of the community" (Mosse 1994: 509), despite rhetoric "expressed in terms of meeting [peoples'] own need for 'development'." Mosse (1994: 504) further notes that in many cases:

> the scepticism of villagers was only increased by statements from project workers that specific project objectives had not yet been set because villagers would *themselves* determine local development goals. Paradoxically, participatory rhetoric of this sort can be a bar to effective communication when seen by villagers as a devious refusal by outsiders to state their intentions plainly. The participatory approach contradicts experience and usually prompts local inquiry and conjecture as to the project's 'real' motives (emphasis in original).

These impressions will have consequences throughout the project cycle. Participatory methodologies will fail to achieve their optimum research and development potential because participating peoples will not be interested in, if not adverse to, contributing to the process. Even when researchers "espousing the principles of dialogue and participation" fail to establish a relationship of trust with participants, learning the actual needs and desires of participants is unlikely (Maclure and Bassey 1991: 202; see also Kampe 1992; Opp 1998: 159-60; Garland 1999; Dzingerai 2003).[13]

As it turns out, this kind of intuitive distrust of participation among local people cited by Mosse is often well founded. Large institutions, previously notorious for exploitative top-down development projects, merely pay lip service to "participation" in what appears to be an attempt to find more effective ways to impose their agendas on local people. As part of an approach that neglects people's empowerment, the institutional approach to participation abandons the concept of shared ownership of the development process from information gathering through analysis to design and implementation. This means that despite the rhetoric of participation, the development process continues to be extractive without continuing to enlist participation from the people who generated the information for the later stages of development (Opp 1998: 168). "[T]here is no doubt in my mind," Fals Borda muses, "that there is a manipulation

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[13] Although unintentional, the PRA concepts of "optimum ignorance and appropriate imprecision" reinforce assumptions that intimate knowledge of local communities is unnecessary.

process going on in the name of participation" (quoted from Gomez 1999: 153). His suggestion is that "participation" as a term is being used by powerful institutions to improve public relations and to more effectively encourage people to accept their economic and development agendas, which have in fact not changed over the decades (Opp 1998: 43; Gomez 1999: 152-4; Harrison 2002).

Inherent problems with methodological participation:

The above discussion alludes to the weakness of participatory theories and their disconnection from participatory methodologies. This disconnection has lead participatory research and development to be undertaken with disproportionate attention given to practices while theoretical principles are neglected. The effect of this insensitive rhetoric towards participation allows for the continuation of the top-down development paradigm with only a superficial interest in local knowledge. Since projects are still not conceived in concert with local processes, there is little actual opportunity for people to contribute useful knowledge to the project, setting a precedent among local people to regard projects with disdain and ambivalence. The result, as I argue below, is that on occasions when participatory actions are undertaken, they often fail to adequately analyze the social dynamics that impact project implementation, and in turn fail to adequately gather and make use of participants' knowledge. In other words, without theoretical guidance, the methodologies themselves are inadequate as research tools.

Advocates of participatory action tend to idealize exercises where participants come from as wide a representation of stakeholders[14] as possible (Chevalier and Buckles

[14] Stakeholders are a range of individuals and/or groups who are affected by development projects and/or can influence project goals (see Chevalier and Buckles 2005: 11).

2005: 15, 24-5). Practitioners often assume that established informants or (presumed) community leaders will ensure that all potential participants will be informed of, and encouraged to attend, upcoming participatory events. However, "ideals of participation are seldom achieved" (Pain and Francis 2003: 51). Chevalier and Buckles (2005: 13) challenge practitioners who tend to emphasize such naïve definitions of popular involvement that ignore "inherent differences in power and interests operating within and across geographic boundaries" (see also Mosse 1994: 508-13; Li 2002; Kapoor 2002: 105; Harrison 2002; Campbell 2001: 382). Individuals do not fit neatly into predefined stakeholder groups based on clear class distinctions from which predictable positions can be inferred. Instead, they often embody several different stakeholder profiles at the same time, each affecting in different and unpredictable ways the positions individuals take on socio-economic issues (Chevalier and Buckles 2005: 14, 17, 24). Whether intentional or not, these complex social processes, if not long standing power struggles, disagreements, disputes, or even self-interest, can lead to the inclusion of certain groups and the exclusion of others in participatory activities (Mosse 1994: 507-16; Mosse 1998: 16-7; Kapoor 2002: 106; Opp 1998). Regardless, misguided practitioners expect a wide cross section of society, but in reality they reinforce, or even initiate, complex social struggles that their participatory techniques are inadequately equipped to deal with or even identify.

Moreover, exactly what participation involves and to what extent it is utilized is culturally relative (Maclure and Bassey 1991: 202; Harrison 2002). Practitioners promote equal, open and simultaneous exchange of ideas between all stakeholders as participants, including constructive criticism of existing situations. In many socio-cultural contexts where participants represent different stakeholder groups based on age, gender, social status and so on – an ideal cross section of society to many participatory research and development practitioners – candid debate is inappropriate and socially unacceptable behaviour (Maclure and Bassey 1991: 202; Chevalier 2004/11/10; Chevalier 2005/05/13). Encouraging "undiplomatic analyses" among stakeholder groups who differ on development issues "may exacerbate or generate conflict" (Chevalier and Buckles 2005: 26). Under such circumstances, Chevalier and Buckles instead promotes individually based research methods where analyses can be "disclosed to all parties with a good dose of diplomacy and circumspection."

A more likely scenario is simply that "dominant views will tend to dominate" and "minority or deviant views are likely to be suppressed" (Mosse 1994: 508; Campbell 2001: 382). Ironically, suppressed opinions are usually those of the most marginalized people within a community, and hence the people who are supposed to be the priority for development initiatives (Kapoor 2002: 106; Opp 1998: 135-6). This scenario becomes augmented by the fact that participatory exercises are publicly and formally staged social events.[15] They represent opportunities for people to present an "official view" of their community to influential outsiders and even the world. Therefore, there is even a tacit compliance among those people with "deviant views" to uphold the dominant view for the sake of presenting their community as harmonious (Mosse 1994: 508-9; Campbell 2001: 382 Kapoor 2002: 105-6; Chevalier and Buckles 2005: 26).

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15 Participatory practitioners typically try to encourage a relaxed and informal atmosphere to promote broader participation. Ironically, local people interpret participatory exercises quite differently. By virtue of being planned public events, facilitated by outsiders, and with the potential to impact the community in profound ways, these are very formal events (Mosse 1994).

Women are one obvious social group that is often excluded from knowledge generation and decision making exercises. Therefore, women are often targeted as a priority group to engage in participatory exercises. However, the very formal and public appearance of participatory events is just the sort of situation from which women are typically excluded. Firstly, in many cultural contexts women's interaction in public spaces is implicitly or even explicitly limited. Women's activities that do take place in the public realm, such as collecting water from the village well, are usually transient and associated with their domestic (read private) role in society. Furthermore, these activities are often demanding, continuous, and individually oriented, making it difficult for women to be collectively available over long periods in order to take part in participatory exercises (Mosse 1994: 512-3; Opp 1998; Humble 1995).

In addition, public knowledge, which is the kind of knowledge elicited and displayed in participatory activities (see above), is often associated with the realm of men. Even the tools and knowledge outputs (maps, diagrams, and charts) represent an idiom of expression associated with the domain of men's experience. Women, just as likely as men, have knowledge regarding any issues, but the mode of expression formalized in participatory techniques often can not properly reflect women's experience of their world. As a result, if women are included in participatory activities (for example by virtue of privileged social status, age, or egalitarianism), they either must try to "re-encode" their knowledge into the dominant male idiom of public space, or struggle with the process, or simply abandon it in disinterest (Mosse 1994: 514-5; see also Opp 1998: 73, 166-7).

Given the weaknesses of current participatory models for assessing social situations leading up to participatory exercises, it is no surprise that neither the methods, nor the analyses of their outputs, can effectively address the complex social dynamics at play during exercises. Chevalier and Buckles (2005: 37) observe that "participatory social analysis is often confused with techniques to facilitate stakeholder involvement…," leading to the conclusion that exercises "are done socially but with limited attention to the social factors at play" (Chevalier and Buckles 2005: 7). Techniques for social analysis "tend to oversimplify the complexity of social history" (Chevalier and Buckles 2005: 8), resulting in the mere "identification of key stakeholders and a superficial description of their profiles and relations (Chevalier and Buckles 2005: 17). In order to achieve deeper social analysis, researchers have to employ more rigorous methodologies that go beyond the limits of participatory techniques, such as those used in anthropology research (Campbell 2001: 382; Pratt 2001: 25-8; Mosse 1994; Mosse 1998: 15-6; Opp 1998: 93, 143). Unfortunately, these methods do not produce the visual outputs that are valuable to participants and project staff alike, nor can they be undertaken under short-term constraints demanded by development institutions (Mosse 1998: 16-7; Sillitoe 1998: 234; see above).

> "While there may be a place for [RRA and PRA]… in some development contexts (and anthropologists familiar with a region may be able to undertake such work with a fairly reliable return on their efforts), these are not and cannot substitute for anthropologically informed research. It can take several years, not months or weeks, for someone unacquainted with a region to achieve anthropological insight into local knowledge and practices and from this perspective perhaps illuminate technical and other development-related problems" (Sillitoe 1998: 234).

The social dynamics within any community are subtle, and are not easily apparent to outsiders who do not have a long term connection with the community. It is a matter, continues Sillitoe (1998: 234), "of the investment needed to win the trust and confidence of people who frequently have reason to be extremely suspicious of foreigners and their intentions."

The weaknesses of participatory methodologies extend into the gathering and analysis of information for the purposes of helping participants to develop solutions to local problems. The methods tend to be partial to descriptive empirical knowledge such as that regarding the physical environment, economic balances of power within communities, or symptoms of good or bad health. These then get "organized into classes" within a scientific/positivist paradigm (Chevalier and Buckles 2005: 37-8) that can be quantitatively analyzed for scientists, experts, and others for designing development projects (Sillitoe 1998: 229). Sillitoe (238-9) refers to this knowledge as "lexically grounded," and although "imputed to be 'indigenous'," it is "not always recognizable to local people because of [its] radically abstract re-presentation." Sillitoe (1998: 238) continues that "indigenous knowledge reports" of this sort "radically disembody practical bits of proclaimed useful knowledge from the rest of culture in a way which does a profound disservice to its potential importance" (see also Chevalier and Buckles 2005: 9).

The descriptive orientation of participatory techniques may be difficult for participants to engage with if they are not used to discussing their knowledge so openly (Sillitoe 1998: 229).[16] Their own knowledge systems are likely built on generations of experience and embedded into their traditions that are difficult to render into a communicable idiom for development practitioners (Mosse 1994: 19-20; Sillitoe 1998). As a result, participatory methods often fail to delve into and represent the deeper layers

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[16] Sillitoe (1998: 229) argues that knowledge is deeply ingrained, so people know without being readily able to explain how and why they know. In turn, Mosse (1994: 520) warns that researchers should thus be wary if people explain the 'how' and 'why' of complex knowledge in clear language.

of local peoples' knowledge systems (Opp 1998: 179-84; Mosse 1998: 15-6; Mosse 1994: 513, 517).

> On a transect diagram [a RRA and PRA technique]… a tree appears simply as a tree. Whereas in real life the tree (or its removal) may be a symbolic statement about gender relations, a statement about land tenure, or a sign of resistance to agricultural intervention by the state. Moreover, which of these culturally constructed 'hidden' meanings is relevant, will depend upon who you talk to (Mosse 1994: 518).

Mosse adds that "there may well remain large areas of relevant local expertise which are, quite literally, missing from the picture." Sillitoe (1998: 229) attributes this gap to a positivist habit to "constrain understanding by reducing everything into words."

> The problem is not that, as outsiders, we have no access to practical knowledge – clearly under certain circumstances non-linguistic knowledge is 'put into words' – but that we have immediate access to only a part of it, or rather we have access to practical knowledge in a changed form (Mosse 1994: 520).

Therefore, while participatory researchers have lofty desires to learn the knowledge of local people (so that development can better serve them as well as include them), current techniques are unable to bridge the gap between scientific and local knowledge systems (Chevalier and Buckles 2005: 1-2, 8-9; Sillitoe 1998; Anam 1992). On the one hand, methods for extracting and presenting knowledge can be enigmatic for local participants. On the other hand, local knowledge may seem esoteric to outsiders for eluding classification into a scientific idiom.

The result, of course, is that the analyses of participatory exercises are equally weak. As with participatory social analysis, the analysis of knowledge is not integrated into the participatory techniques (Opp 1998: 96, 156). Given the epistemological divide that often exists between practitioners and participants, it is difficult for effective analysis to be carried out collectively. Furthermore, as discussed earlier, the whole process shows only superficial interest in peoples' participation, which reduces their desire to continue contributing (Pain and Francis 2003: 51). Coupled with participants' inability to recognize their knowledge in participatory outputs, it is very difficult for them to transform knowledge into solutions for development problems. Therefore, analyses of participatory exercises typically exclude participants when "making sense of findings for useful purposes (Chevalier and Buckles 2005: 38). Once again, the extractive top-down development paradigm is upheld, throwing into question the validity of the projects being undertaken (Chevalier and Buckles 2005: 19; Opp 1998: 168; Mosse 1994: 517).

The introduction of participation represents a significant innovation for research and development projects. Peoples' inputs into projects have proved both empowering for them as well as effective for the success of the development process. The values of participatory methodologies such as PRA are now acknowledged, leading to them being widely adopted into project cycles. However, participants who have significant influence over project objectives can introduce uncertainties with which the rigidity of RBM project cycles cannot cope. In response, development institutions tend to underplay the guiding theoretical principles of participation. Instead, institutions emphasize only the mechanics of participatory techniques so that they can continue to set their own project goals. This allows superficial participation, which improves capacities for efficiently gathering local information. Yet, without genuine attention afforded to peoples' participation, people recognize that the top-down development paradigm persists, and thus they increasingly limit their further interaction with projects. As a result, when used as stand-alone research methodologies, participatory techniques lack the necessary rigour for effectively understanding social analyses and local knowledge systems. Therefore, while a limited adherence to participation offers some benefits, development projects continue to face many problems regarding their conception, implementation, evaluation as well as commitment from "target" peoples to help carry projects to successful ends.

Social Analysis Systems^2

Recognizing that current participatory models have significant weaknesses, practitioners continue to search out new ways to adapt and improve the systems to address these weaknesses. However, while advocates and researchers alike have theorized the co-optation of participatory methodologies, there has been little success in developing real solutions to this problem. This is perhaps due to the pervasiveness of institutional constraints mentioned above that prohibit more genuine participation. Nonetheless, new and profound innovations are proposed in a current project coordinated by Chevalier, a social anthropologist from Carleton University in Ottawa, with funding from Canada's International Development Research Centre (IDRC). Chevalier is developing an entirely new model for participatory research and development which he calls the Social Analysis Systems^2 (SAS^2).[17] Since 2001, SAS^2 tools and techniques have been designed, tested and honed in many countries throughout the world.

With a repertoire of over 56 techniques and a sound theoretical grounding (Chevalier and Buckles 2005: 2), SAS^2 draws from a diverse set of influences. Many SAS^2 techniques complement and build on the already well established legacies of PAR, RRA, and PRA. In addition, SAS^2 introduces new "concepts and tools for collaborative research and social action" urgently needed in the field of development. These draw

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[17] See the Social Analysis System^2 website, www.sas-pm.com.

inspiration from disciplines as diverse as economics, management, anthropology, sociology and psychology (Chevalier 2006/03/05).

The new techniques within SAS^2 can be applied to a vast array of management situations. In regards to this thesis, SAS^2 adds significant new possibilities in using participatory approaches to learn indigenous knowledge systems for development purposes. Two fundamental concepts within SAS^2 contribute to achieving these possibilities. Firstly, SAS^2 aims to "make participatory methods and tools more rigorous" (Chevalier 2006/03/05), not only to assess the complexity of social processes that affect development projects, but also for collaboratively generating knowledge and extending that knowledge to propose development action (all within a local paradigm) (Chevalier and Buckles 2005: 10). Secondly, rigorous research within a local paradigm is achieved through a flexible approach to social engagement. All SAS^2 techniques can be employed at various levels of complexity and sequenced appropriately to meet the needs and agendas of different stakeholder groups without constraints from rigid project goals.

Flexible use of SAS^2

Earlier I described how participatory methodologies have been manipulated in order to fit them into the conventional Results-Based Management (RBM) approach to development. Although participatory methods may be employed with target stakeholders throughout the project – as part of the plan – the goals are set by an outside institution which has conceived and/or is managing the project. This approach to setting goals assumes that all stakeholders share the same goals and conceive of a development project in the same way (Chevalier and Buckles 2005b: 4). However, in reality, different stakeholders are likely to desire different outcomes, and different ways of achieving outcomes than other stakeholders. Therefore, from the very conception of a project, the plan begins to go awry, resulting in set goals not being achieved, and the project becomes a loss for everyone involved.

Recognizing that "project or program goals, reactions, intervening factors and process results cannot always be predicted," SAS^2 proposes a "continuous planning" approach for managing research and development projects (Chevalier and Buckles 2005b: 5-6). This approach is called "Process Management" (PM). PM mimics how people negotiate their real, every day (and even mundane) actions by constantly analyzing and evaluating situations as they unfold, and adapting to sudden and unpredictable changes in order to achieve desired goals (Chevalier and Buckles 2005b: 3-4). PM is still goal oriented, but flexible regarding how goals are identified and achieved. It also recognizes that projects do not arise out of nowhere, but result from preceding events and social processes. Likewise projects never end, since their impacts resonate in future actions (Chevalier and Buckles 2005: 40; 2005b: 3).

The PM approach is conducive to the principles of "participation" and the uncertainties that arise when using participatory methodologies. Since the responses of participants cannot be predicted, it would be irresponsible to have all goals and plans laid out prior to participatory activities. Instead, "planning must be done at the right time and at the right level of detail…" (Chevalier and Buckles 2005b: 7). Gaps and holes should be left in a project plan, to be filled in only after sufficient knowledge has been obtained to determine what would be the appropriate plan of action. When using participatory techniques (SAS^2 techniques or others), this knowledge does not become apparent until after the project has already been initiated. Furthermore, knowing which participatory techniques to use and at what level of complexity will depend on the results of earlier analyses. Therefore, Chevalier (2006/03/05, emphasis in original) iterates, "*planning is a continuous process* where people choose strategies only when they are ready to do so, based on the results already achieved, the performance of key factors, and stakeholders' interventions."

The flexible logic of PM can also be applied to how each technique is used during field work. All SAS^2 techniques follow a sliding rule principle allowing practitioners to use advanced or simple versions of each technique depending on capabilities of the participants, time available for research and the level of detail necessary to meet research objectives. This versatility is valuable for maximizing resource limitations by allowing practitioners to gather and analyze information only to the level necessary to fulfill participant, practitioner and project needs. More importantly, the versatility of these techniques enables them to be appropriately adapted and employed according to the specific socio-cultural context in which they are being used (Roy and Chattergee 1993: 350-1; Jewitt 1995: 1018). According to Chevalier and Buckles (2005: 38-9), facilitators and participants can make a choice along a scale "between analytic reasoning and narrative account" approaches to participatory techniques. For example, an exercise involving a complex matrix with numbers and indicators may be useful for some stakeholders, but may be a deterrent for the participation of others. In the latter case, it may be better to adjust the technique to fit a local paradigm, such as storytelling rather than using a structured analysis. The impacts of working within participants' preferred paradigm are that they will trust the process and feel less suspicious of it, leading to stronger commitments to collaborate and engage with the techniques, and finally to the production of authentic and genuine knowledge.[18]

Rather than naively assuming all stakeholders have the same objectives and can work together to achieve them, PM recognizes that "stakeholders may pursue different goals and activities even when they collaborate in particular projects and programs" (Chevalier and Buckles 2005b: 4). However, different goals "need to be acknowledged if they are to be openly negotiated" (Chevalier and Buckles 2005b: 5), and if people are to overcome their suspicions regarding others.[19] SAS ^{2} techniques can identify different stakeholder goals openly and positively, initiating a dialogue between competing interests for negotiating a compromise. This is a radical revision of PRA and PAR positions which prioritize the needs of the poorest, and demand that more powerful stakeholders concede to those needs. Naturally the latter will not readily concede, and would be just as likely as anyone to throw obstacles at a project which does not benefit them (Kapoor 2002: 111).

Research and analysis with rigour:

The flexibility of SAS ^{2} techniques and processes has profound implications for the quality of both participation and the research and analysis of information in development projects. For example, acknowledging that it is legitimate for people to have different goals, and utilizing techniques to engage with stakeholders in ways they are most comfortable, helps to increase stakeholders' contributions and commitment to projects. In many ways the flexibility of the techniques is what makes them more

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18 More will be said about moving between the "analytic reasoning" and "narrative account" continuum in the next section, and in chapter 4.

19 Researchers are also stakeholders whose objectives should be made transparent (Chevalier 2004/11/9-11; 2005/05/11-13).

rigorous research tools. By encouraging more intimate involvement from participants, the research will generate more "authentic" information leading to more relevant solutions to practical problems.

SAS [2] techniques are particularly effective for assessing complex social dynamics between stakeholder groups and the impact of these on development cycles. SAS [2] techniques *methodologically* identify and analyze how differences in power, interest, legitimacy, and values, as well as histories of conflict and collaboration between groups influence the positions each takes regarding development project activities (Chevalier 2006/03/05; Chevalier and Buckles 2005: 29-35). Armed with this knowledge, practitioners can facilitate a "strategic and progressive approach to engagement, by focusing on those parties that *can and should* be involved and those that need to be empowered through measures of collaborative thinking and action" (Chevalier and Buckles 2005: 28 emphasis in original). One value of this "strategic engagement" is that knowledge can be generated unencumbered by the "group effect", where dominant views are made to dominate (Campbell 2001: 382). On the other hand, when appropriate, seemingly disparate stakeholders can be brought together to collaboratively negotiate their differing objectives toward positive solutions satisfying to all (Chevalier and Buckles 2005; Kapoor 2002: 106). This is a sharp contrast to the PRA approach to participation, which encourages general participation from all potential stakeholders, which instead stifles participation and the generation of important knowledge (see above; Campbell 2001: 382).

The strategic engagement approach to participation not only adds rigour to the generation of knowledge, but also for utilizing that knowledge to propose solutions, even when negotiated between stakeholders. As mentioned, SAS ^{2} techniques can be used to elicit either a formal and structured analysis (with diagrams and numbers) or an informal narrative approach. Knowledge elicited in one way or another can actually continue to move back and forth between "analytic reasoning" and "narrative accounts." Chevalier and Buckles (2005: 38) state that this can be done "by converting analytic or quantitative assessments into stories that need to be told, or using stories and descriptive accounts to analyze key factors, their characteristics, and relations between them." Therefore, SAS ^{2} techniques become powerful tools for knowledge production that crosses disciplinary boundaries. Indigenous knowledge systems can be elicited from participants in their own language through a facilitator who can re-present this knowledge (on participants' behalf) in a more formal idiom appropriate to other stakeholders such as scientists and policy makers. This sensitive transferring of knowledge between stakeholders is tremendously beneficial for building mutual understandings.

SAS ^{2} techniques are also rigorous tools for going beyond simply generating empirical knowledge and transferring it between stakeholders. Instead, participatory methodological processes can be followed through for analyzing knowledge, and then carrying that knowledge over to establish new learning. SAS^2 recognizes participants have the legitimate "capacity to use and develop their own social knowledge to manage practical problems and project activities" (Chevalier 2006/03/05). These learning experiences occur not only when participants generate knowledge during SAS ^{2} exercises, but also when knowledge is being shared between stakeholder groups. This fosters constructive and controlled negotiation between stakeholders to collaboratively develop solutions for achieving project goals. Additional rigour is added to SAS ^{2} research by sequencing different techniques. Knowledge generated with one technique is made useful by employing it in another technique to develop practical solutions (Chevalier and Buckles 2005: 59). With PRA on the other hand, analysis is *ad hoc*, superficial, and divorced from the original production of knowledge (see above).[20]

The theoretical and methodological underpinnings of SAS^2 address many of the problems associated with other participatory systems. In particular, SAS^2 proposes a flexible approach to project management that makes room for the uncertainties of conducting participatory research. The sense of flexibility carries over to how the techniques are applied in real research situations. Techniques are adaptable to fit appropriately into various social situations, from remote tribal farmers to expert development engineers to government policy makers. The sensitivity of SAS^2 techniques to different social contexts reveals their genuine interest in eliciting authentic local knowledge. Therefore, facilitators employing SAS^2 techniques effectively can overcome the problems alienating participants from the research process, which leads to a failure in establishing good rapport with participants. Only by overcoming these problems can people truly engage in development processes that affect them.

Although there are over 50 techniques in the SAS^2 repertoire, my field research studying farmer knowledge of mixed cropping systems relies almost exclusively on the Domain Analysis technique (Chevalier 2005). Nonetheless, this is an extraordinarily versatile and effective technique. It can be used for drawing out peoples' knowledge systems regarding nature, history and society in order to identify the roots, effects and solutions to their problems (Chevalier 2005: 1-2). The focused discussion of Domain

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20 Nonetheless, as in PRA, SAS^2 rightly encourages facilitators to still observe the participatory process and how people negotiate consensus to learn about social dynamics and knowledge construction.

Analysis that follows should not only be read as a review of that technique, but also as a significant contribution to the discussion of SAS^2 and its values.

Domain Analysis and the Repertory Grid Technique

Domain Analysis uses an adapted form of the Repertory Grid technique, borrowed from Personal Construct Theory (PCT) in Psychology. Domain Analysis adopts most of the theoretical and methodological principles of the Repertory Grid (henceforth called rep grid) technique. However, the PCT approach to rep grids emphasizes personal perspectives, whereas in Domain Analysis the rep grid technique is adapted for collaborative use in social environments. Furthermore, Chevalier (2005: 14-9) builds on the rep grid by adding ten "scenarios" for interpreting common analytical trends within a completed repertory grid. The versatility of Domain Analysis opens up new uses of the rep grid technique for many development purposes. This section of the chapter will review the available literature regarding the Repertory Grid technique to build an understanding of how and why Domain Analysis is an effective participatory tool within SAS^2.

PCT was developed in the 1950s by the psychologist George Kelly. Since then several scholars have continued to build upon Kelly's foundational beginning. To Kelly, each person is his or her own "personal scientist" regarding how he or she interacts in the world. People analyze their present environments, either social, ecological, political, *et cetera*, based on their past experiences within those environments (Walton 1985: 97-100). As patterns emerge people build generalizations, or what Fransella and Bannister (1977: 5) call "implicit theories" allowing them to understand and interpret new experiences based on their previous ones. This can be summed up as their personal "reality." In keeping with the theme of "science", Blowers and O'Connor (1996: 3) state that people "formulate hypotheses, test them against reality (that is, against previous attempts to know the world) and revise them if they turn out to be false or of limited use." This constant experimentation that all people undertake, consciously or not, enables them to act in the world during the present moment and thereby anticipate future moments according to their "implicit theories" drawn from experiences of the past (Denicolo and Pope 2001: 114; Fransella and Bannister 1977: 2).

The statements above evoke the scientific method as a process that each person continually practices as new experiments constantly provide information for sharpening and/or altering theories.[21] "[T]he universe is a domain open to continual revision. [Kelly] sees us as constructivists, taking an active, interpretive view of the world" (Blowers and O'Connor 1996: 2). However, a literal interpretation of "personal scientist" is oxymoronic since the reality that a person learns through experimentation is relevant *mostly* to that person only. "It assumes a subjective realism by which each of us interprets the world according to our construals of its possibilities" (Blowers and O'Connor 1996: 2). There is no positivist reality that can be proven and experienced by all people in all circumstances. Reality is relative to each person and changes according to new experiences (Denicolo and Pope 2001: 57-9; see also Blowers and O'Connor 1996: 90-1; Shaw 1985: 26). However, PCT recognizes that groups of people who interact through very similar experiences, such as all being ethnically related farmers in the same geographical environment, will construe their individual realities similarly (see also

[21] However, Neimeyer (1985: 204) notes that once people established their beliefs about the world – their "reality" – changes in their worldview occur very reluctantly and only after considerable counter-evidence has been experienced.

Shaw's discussion about "P-Individuals" [1985: 27-32]). In the collaborative approach of SAS^2, facilitators can observe how groups of participants interact and negotiate subtle differences in their individual experience to arrive at a consensus toward a particular purpose (Chevalier and Buckles 2005: 40). As David Mosse (1994: 499) states, "Information does not just exist 'out there' waiting to be 'collected' or 'gathered', but is constructed, or created, in specific social contexts for particular purposes."

The Repertory Grid technique is the main vehicle used by researchers for reconstructing and understanding other peoples' *personal approximations of reality* specific to a particular topic of interest for both the researcher and the participant(s). PCT assumes that people organize their experiences of that topic through a finite series of "constructs" that characterize those experiences, and thus their reality. To learn about participants' perceived realities, researchers facilitate the elicitation of mental maps that analyze the relationships within participants' experiences (elements) according to their constructs associated with those experiences. These maps, or matrices, are the rep grids (Jankowicz 2004: 5, 8, 12-4; Blowers and O'Connor 1996: 3).

Theories on how people construct their realities in PCT are based on a long lineage of epistemological debate. Constructs are meaningless on their own and can only be qualified using contrasts rather than absolutes. In other words, in order to understand and value a construct, it must be qualified against its greatest possible opposite. The experience of "happiness," for example, cannot be personally understood without reference to the experience of its greatest opposite, such as "sadness." Furthermore, understanding *the degree of* how much happiness is present in an experience must be qualified by contrasting it with the experiences of both the greatest possible happiness as well as the greatest possible sadness. Therefore, it becomes necessary to discriminate not only between experiences that are alike and different from other experiences, but also regarding *how much* they are similar or different (Fransella and Bannister 1977: 7; Blowers and O'Connor 1996: 3-6; Jankowicz 2004: 11).

A detail that is useful when eliciting repertory grids is that the contrasting experience should be relevant to the topic of the rep grid, without simply being a negation of the original construct. For example, a reality cannot develop by qualifying the experience of "happiness" against everything that is "not happy." This is because everything that is "not happy" can include constructs not related to the domain of emotion such as salty (taste), red (colour), fast (speed), and so forth. These experiences are not relevant to the domain of emotion that happiness relates to. However, neither can "unhappiness" be qualified against "happiness" since "unhappiness" does not provide a meaningful contrasting emotion (Blowers and O'Connor 1996: 3-6; Jankowicz 2004: 11). Therefore, it is important to find an independently descriptive word that is within the domain being discussed. In the case of "happiness", a participant may choose "sadness", "depressing", or "anger" as a possible contrasting pole, depending on what the participant feels to be most appropriate given the context of the exercise.

Constructs and the specific characterizations of their opposites are identified by the participants and therefore expressed in their own preferred paradigm. This means that constructs are personally meaningful to participants, which is important for researchers to better understand "the world of lived experience from the point of view of those who lived it" (Denicolo and Pope 2001: 60; see also Jankowicz 2004: 8; Fransella and Bannister 1977: 5; Tyler 1985: 19). It also follows that the research is highly relevant to the participants, which is essential for maintaining their ownership of it and their interest in it. This allows the rep grid technique to delve deeply into participants' "complex knowledge systems without using predefined concepts" (Chevalier 2005c: 44). Other participatory methodologies rarely achieve the same degree of depth and relevance.

I will now explore the mechanics of how Domain Analyses rep grids are elicited and analyzed. As I describe the rep grid process, I will continue to elaborate on the theoretical aspects of Domain Analysis and rep grids.[22]

Eliciting Knowledge for Building a Repertory Grid:

Research topics and elements for eliciting a Domain Analysis rep grid can be related to any aspect of lived experience such as family members, weather conditions, favourite pastimes, anxieties about an issue, and so on. The topic of the research for this thesis is the comparison of different crops in the mixed cropping systems among Kuvi and Korku *Adivasi* farmers. Participants identify "elements" – objects representative of their experiences – associated to the topic, which in this case are the crops employed in the mixed cropping system. These elements are listed across the top of what will become the grid.[23] There is no strictly prescribed number of elements that is ideal to use, but for best results there should be at least six elements. The maximum number of elements is limited only by time available, desired complexity and their relevance to the topic. Figure 1 shows a rep grid comparing the qualities of different crops (elements) within a mixed cropping system (in red) according to identified constructs/characteristics (in blue).

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[22] The following description is by no means exhaustive, and should not be considered instructions for using the method. To learn how to use the method, see Chevalier (2005) and Jankowicz (2004).

[23] Since most of the *Adivasi* people whom I worked with are illiterate, we simply placed a sample of each seed type along the top of our yet unformed grid.

Figure 1: Repertory Grid about a seed-mix system

	1	2	3	4	5	6	7	8	
domestic 1	6	1	1	5	4	6	4	1	1 market
large yield 2	4	2	1	6	7	5	7	1	2 small yield
most healthy 3	7	1	2	5	4	3	6	1	3 least healthy
poor soil 4	1	7	4	1	6	6	5	7	4 healthy soil
early harvest 5	5	2	1	3	6	7	4	5	5 late harvest
	1	2	3	4	5	6	7	8	

8 Jawar (sorghum)
7 Urid (black gram)
6 Tur (pigeon pea)
5 Moong (green gram)
4 Tilli (sesame)
3 Makka (maize)
2 Dhan (rice)
1 Barbaty (pole bean)

To understand participants' knowledge regarding the crops, it is necessary to identify some of the constructs people use to qualify their crops. While there are several ways for a facilitator to help elicit constructs from participants, the most common is the triadic technique. It involves isolating three elements (crops) at random and asking participants to identify what quality or characteristic makes two of them alike in relation to a key issue or problem. This must be followed by asking what the greatest contrasting quality is between the third element and the other two.[24] The dyadic technique is another and simpler technique, but does not automatically qualify the implicit pole as the triadic method does. In this technique, the facilitator asks participants how two elements, chosen at random, are different from each other. The quality distinguishing the elements is a construct. The participants must then identify the characteristic that represents the greatest contrast. Other possible elicitation techniques are active listening, laddering down, laddering up, and subtraction. To learn more about these techniques, see Jankowicz (2004: 53-64).

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[24] The characteristic that makes two crops similar is the "emergent pole" and the characteristic used as a contrast is the "implicit pole". Strictly speaking, the distinctions are procedurally and analytically important, especially for a psychologist who is concerned with subtle thought processes (see Jankowicz 2004: 47-8). However, identifying emergent and implicit poles is not essential for the purposes of the research described herein.

Eliciting constructs from participants is valuable because they are identified in participants' preferred local idiom of expression and thus are personally meaningful to them. However, Fransella and Bannister (1977: 19, 106) admit that there are several situations when supplied constructs are useful, and offer evidence that these constructs can be perfectly meaningful to participants. In particular, they suggest that the elicitation process may fail to introduce certain constructs that the facilitator feels are "important for a more complete understanding" of the situation being analyzed (Fransella and Bannister 1977: 106; see also Jankowicz 2004: 28). This is an implicit recognition that by providing some constructs, facilitators can include their own research objectives along with those of participants into rep grid analysis.Yet for provided constructs to be most useful, preliminary groundwork and research is essential to carefully determine appropriate constructs based on the specific situation (see also Denicolo and Pope 2001: 72-3).

Jankowicz (2004: 28) develops this concept further to add that facilitators and participants can identify constructs together as "a wonderful way to engage in collaborative research." Likewise, within the principles of SAS [2], Chevalier (2005/05/11-13) acknowledges the influence that facilitators have on the research process, and that researchers may even be key stakeholders in that process. Therefore, he views open collaboration between facilitators and participants to define constructs as a legitimate negotiation of terms among different stakeholders, each with their own research objectives, all of which can be met during a single exercise.

Another approach to the rep grid technique is for facilitators to have a list of possible constructs to propose to participants. After performing necessary preliminary research (see above), facilitators suggest well informed construct sets to participants.

Participants can then agree or disagree to include those constructs into the grid, or they can negotiate alterations to the constructs until they are satisfied enough to include them. Again, this is useful when facilitators have particular aspects of knowledge which they wish to tap from participants. Furthermore, supplying constructs in this way helps when researchers want to compare several grids since the grids will have similar, if not the same, constructs. For example, facilitators may wish to compare how and why different stakeholders value the same issues and experiences differently. Also, since the rep grid essentially captures participants' knowledge during a single point in time, the exercise can be repeated with the same participants at a later date to compare how their experience (and knowledge) has changed over time (Jankowicz 2004: 56). In both cases, it may be important to have a consistent set of constructs to compare over a series of grids. Finally, as I experienced with my research for this thesis, having facilitators supply constructs may be necessary to develop a grid more quickly if participants do not have much time to offer, or if participants show difficulty and frustration with the elicitation process (see Chapter 4).

However, in general the PCT literature argues that providing constructs is a generally inferior approach to eliciting a rep grid. By providing constructs, the participants are alienated from an integral part of the research process as the constructs no longer conform to the participants' local language. Supplied constructs are more a reflection of the facilitator's reality and theoretical biases rather than that of the participants. In addition, it cannot be assumed that the participants will interpret the constructs the way that the facilitator intends. In fact the constructs may not be meaningful at all to the participants (Jankowicz 2004: 11-2, 27-35, 43). Such an outcome can be a deterrent to effectively engaging participants in the process and to gathering useful knowledge toward achieving practical goals (see Chapters 3 and 4). Constructs elicited from participants on the other hand are directly related to their experiences and are based upon the participants' own theoretical assumptions (Blowers and O'Connor 1996: 16), thus forcing the facilitator to leave his or her own theoretical biases behind (Denicolo and Pope 2001: 64).

As each construct set is identified, all elements (crops) are compared by rating them according to how that construct applies to them. As new criteria for comparison are added, participants are encouraged to reflect more deeply upon their knowledge in ways they may not do on a daily basis. This deep reflection draws out subtle paths of reasoning within the knowledge system elicited (Chevalier 2005). Typically, a numbered scale is used to compare elements, but it is also possible to use stones or beans, cards with shades between white and black, or other objects to indicate a valuation along a scale. The size of the scale can vary depending on time available and the level of detail desired. A 2 point scale dichotomizes elements as belonging to either one pole or another. A 3 point scale provides a mid point rating indicating either both or neither poles apply to an element. Scales up to 5 and 7 provide room for more subtle discrimination between elements and encourage more mid range ratings rather than polarizing the elements into one of two camps. It is possible to increase the scale further, but that may be asking people "to make finer discriminations than they can accurately express in a consistent way across the whole grid" (Jankowicz 2004: 36). The rating for each element (crops for instance) qualifies it along a scale between the two extremities which are the constructs.

Since the ratings represent participants' knowledge about their experiences, they should be treated as factual and real. Sometimes facilitators may notice that ratings for one construct contradict those for another. Apparent discrepancies such as these should be discussed with participants without placing judgement upon them. There is no right and wrong when learning someone else's construct system. The participants may agree with the discrepancy and adjust their ratings accordingly, or they may confirm their ratings and explain their reasoning for them. This provides an excellent opportunity for facilitators to leave their assumptions behind and learn the subtleties of the participants' knowledge system.

Ratings can be changed, provided participants wish or agree, at any time during the exercise (Jankowicz 2004: 48-9). Furthermore, construct systems between people will likely be different and even an individual's construct system will change if s/he completes a grid on the same topic at different times. This is because each person's experience is subjective and unique, and a single person's experiences change as they apprehend new experiences or if they have assumed a different social role with different values (Shaw 1985: 27-32; Blowers and O'Connor 1996: 9-10; Chevalier 2006/03/05). This should not imply though that similarities between grids cannot be identified; only that the *exact* same grid is not likely to be repeated.

So far I have described the flexible structure of a repertory grid and its three main parts: the elements, the constructs and the ratings. Facilitators and participants can limit the number of elements and constructs if they consider a smaller grid to be sufficient to fulfill their research needs. Furthermore, the rating scale can be reduced or extended to reflect the level of complexity and detail desired by the facilitator and the participants.

Although the rep grid is very structured and formal, there is even flexibility in how it is used, if it is even used at all. Some people cannot follow the procedure well, or find it contrived and irrelevant. PCT acknowledges that the grid technique does not work for every one. "The grid becomes a specialized form of dialogue – a technique for directing attention during a social encounter – rather than a procedure which has to be completed to be enlightening" (Jankowicz 2004: 77). In other words, the process of eliciting knowledge can be enlightening, even if the process fails to meet its final objective (see above; Mosse 1994: 517). Even when eliciting a formal grid, it is important to pay attention to sideline discussions. It is important for the facilitator to observe how participants negotiate the identification of the constructs and the ratings used, and pay attention to incidental discussions and behaviours amongst participants. These observations can be very informative and yet they are not recorded in the elements, constructs and ratings of the grid itself (Jankowicz 2004: 77). Additionally, facilitators can just as effectively follow the general rep grid procedures to guide an informal interview or discussion without having to actually build a grid (Denicolo and Pope 2001: 89-90; Easterby-Smith 1985: 16-7; Fransella and Bannister 1977: 4). Thus the technique very easily moves between the "analytical reasoning" of a structured matrix, and the "narrative account" which may be a more comfortable idiom for participants.

Analyzing Repertory Grids:

The analysis of rep grids offers as much flexibility as the process of elicitation. Depending on the complexity of the grid, the depth of analysis necessary and the time available with participants, analyses can be conducted quickly and simply or given more time and complex processes for a more sophisticated analysis. A small grid such as the one illustrated in Figure 1 can be given a rough analysis with participants immediately after completion by comparing the ratings between columns and between rows. The number used in each rating has real value. Therefore, if crops are given the same rating for a specific construct, then they are considered the same in that respect, according to participants. If crops are rated differently, then the difference in value between their ratings indicates just how different they are: so that a rating difference of three suggests greater dissimilarity than a rating difference of one. Looking at the columns in Figure 1, the participants' ratings indicate that the elements sorghum and rice are very similar due to their similar ratings. The only significant difference between the two crops is that sorghum is harvested much later than rice (a rating of 5 versus a rating of 2).[25] On the other hand, pole bean and maize are very different from each other, with ratings for each construct being quite different. Constructs can also be compared. Looking at the ratings in each row, the constructs sets "domestic/market" and "most healthy/least healthy" are very similar. This indicates that participants consistently prefer to save their most healthy crops for domestic consumption and allow less healthy crops to be sold at the market.

More sophisticated comparisons between constructs and between crops can be achieved by following some basic mathematics. The precise similarities and differences between crops and between constructs can be calculated by comparing the average similarity/differences between ratings of crops or constructs. This is useful, for example, if several crops or constructs appear similar in a rough analysis, but you wish to know which are the most similar and which are slightly different. In short, to calculate the

[25] Other differences between sorghum and rice are only slight. For example sorghum yields slightly more than rice and sorghum also needs slightly less fertilizer than rice.

difference in average scores between two crops or two constructs, it is necessary to divide the subtracted difference of their scores by the maximum total difference possible and then multiply by 100. Looking at the ratings of rice and sorghum in Figure 1, three construct have different ratings, with a total rating difference of 5. Divide this number by 36, which is the maximum difference possible.[26] Multiply this by 100 to get a percentage value, which in this case is a 13.8% difference between rice and sorghum (or an 86.2% similarity). Maize, however, is as much as 63.8% different from pole bean by using the same equation [(23/36) x 100]. A more thorough explanation of these mathematical processes are available from Chevalier (2005) and Jankowicz (2004: 95-118).

For more complex grids, or if a more complex analysis is required, there is computer software available to help with the analysis. The software that is used in this thesis is Rep IV. Rep IV provides two analytical diagrams, called Focus and PrinGrid, which are derived from the original rep grid data.[27] Some users find the Focus diagram easiest to read and use it as a reference point when examining the PrinGrid diagram. The Focus diagram is basically an instantaneous representation of the mathematical process described above. In addition, the program reorganizes the elements and constructs so that the most similar ones are placed next to each other in the table. Finally, lines outside of the table, dendograms, connect the elements or constructs according to the percentage of their similarity. These lines are used to form elements or constructs into groups or clusters. Therefore, this type of analysis is also called "Cluster Analysis". It allows the researcher to identify if certain groups or constructs are very similar or different. When

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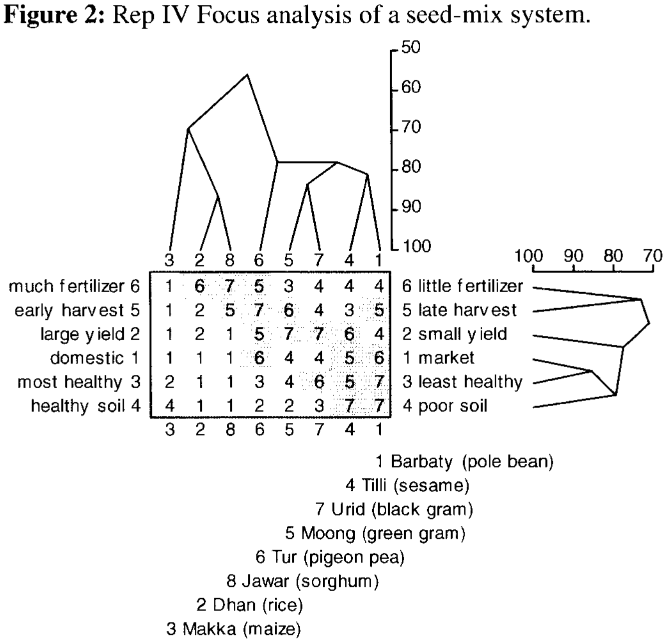
26 Subtract the number of ratings within the scale and multiply by the number of elements or constructs rated: (7-1) x 30.

27 For an extensive account of how to analyze and interpret rep grids and Focus and PrinGrid diagrams, see Jankowicz (2004: 95-138). See also Blowers and O'Connor (1996) and Chevalier (2005).

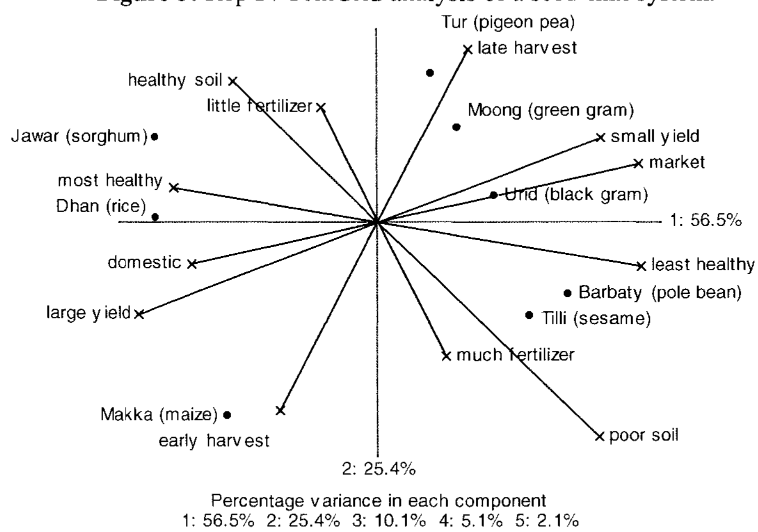
constructs are closely related, researchers can infer that there is a significant relationship between them. For example, they may simply be very similar to each other, or one may be the cause of the other, or one may often be present when the other is also present. The Focus diagram for the rep grid above is illustrated below in Figure 2. Notice that rice and sorghum have been placed next to each other and the dendogram above their respective columns indicates that they are 86.2% similar. Likewise, an 85.5% level of similarity confirms that domestic crops are also more healthy crops and that less healthy crops are more sold at the market (see above).

Figure 2: Rep IV Focus analysis of a seed-mix system.



Although interpreting the PrinGrid diagram is more complicated than it is for the Focus diagram, it can also be more informative. The PrinGrid function uses "Principal Component Analysis" to analyze the base information given by participants. The software searches for patterns in the participants' ratings. The pattern that accounts for the greatest variability among construct ratings represents the first principal component. The pattern that accounts for the next greatest variability among ratings is the second principal component. The program repeats the process for any remaining patterns, but the first two are the most significant (Jankowicz 2004: 127-38; Blowers and O'Connor 1996: 107-119). These two principal components become axes on a graph and are used to plot constructs and elements within the graph. If the percentage variance of the two components is very high (above 80%), the graph captures much of the participants' knowledge system of the topic being discussed. Furthermore, constructs that are plotted very close to the principal component are key constructs that are instrumental in how participants understand the part of their worldview that is being discussed (Jankowicz 2004: 127-38). Other interpretations are drawn from examining the proximity, and therefore relationships, between constructs, between elements (crops in this thesis), and between constructs and elements. If any are close to each other, then there is a relationship worth examining. On the other hand, elements and/or constructs are not closely associated if they are plotted distant from each other on the graph. The length of construct lines and the distance of constructs and crops from the centre of the graph are also informative since a great distance indicates extreme ratings by participants and a small distance indicates mid range ratings. An example of a PrinGrid diagram is in Figure 3.

Figure 3: Rep IV PrinGrid analysis of a seed-mix system.



Chevalier (2005: 14-9) describes ten possible "interpretive scenarios" derived from trends identifiable in a rep grid and the impacts of such scenarios. Each scenario represents a "learning opportunity", or a window through which participants' past knowledge can be extended into learning new knowledge. Relevant to this thesis research are the trends of "fragmentation" and "polarization" (called a "loose" grid and a "tight" grid respectively in Blowers and O'Connor [1996: 46-7]). Fragmentation occurs when constructs and elements are spread out with little relation to each other (Chevalier 2005: 15). Blowers and O'Connor (1996: 46-7) suggest that participants with complex, articulate knowledge of a particular area produce a fragmented rep grid. In addition, they add that such knowledge systems are more flexible and open to change. On the other hand, polarization occurs when many constructs are closely related and elements are associated with one polarity or the other in the construct set. This suggests a knowledge system that is resistant to change (Blowers and O'Connor 1996: 47; Chevalier 2005: 15). The rep grid represented in Figures 1 to 3 is moderately polarized. It will be analyzed in greater detail in Chapter 3, in comparison to a different rep grid which is fragmented.

The analytical value of rep grids to participation:

While Blowers and O'Connor (1996: 107-19) tend to favour a very quantitative approach to analysis, Denicolo and Pope (2001: 90) warn against a tendency toward statistics that reify the numeric values of the ratings at the expense of the qualitative value of participants' constructs. Too much attention paid to numbers, they say, distracts the researcher from the inherent value of the participants' information. Jankowicz (2004: 71-2) concurs that the numbers have value and importance for understanding to what degree elements and constructs are unique or similar. However, he admits that it is not necessary to understand the complex and voluminous mathematical processes used to develop Focus and PrinGrid diagrams in order to understand the diagrams. He also implores the researcher to remain focused on the participants' original ratings and their explicit meaning. This will prevent the tendency to over-analyze and over-interpret the rep grid to the point where it no longer represents the participants' own knowledge (Jankowicz 2004).

Jankowicz is motivated to keep analysis simple and qualitative so that participants can easily continue to participate in the analytical process. The simple analyses, as described above, can be done with participants as an immediate continuation of the methodological process. There are several advantages that follow from this inclusiveness. Firstly, participants can see the inter-relationships between different aspects of their knowledge in ways that they may have previously taken for granted or did not realize existed. In this way, the rep grid helps them to understand the strengths of their knowledge for understanding the world around them, ultimately shedding light on their own culture.

Secondly, participants are given opportunity to validate or invalidate analysis and interpretations depending on whether they agree or not that their world view has been properly represented in the rep grid (Jankowicz 2004: 72-3; Denicolo and Pope 2001: 40-1; Blowers and O'Connor 1996: 101). "If the views are invalidated," Chevalier and Buckles (2005: 41) write, "participants can use the opportunity to develop new relationships among elements and their characteristics. Rather than simply describing people's perceptions of reality, the analysis can thus reveal opportunities to overcome obstacles to learning." Interacting with the research in this way enables participants to draw new learning experiences from their existing knowledge for solving practical problems. Another approach to building new knowledge is to add new constructs to the rep grid that probe participants to anticipate "what if" scenarios based on their present knowledge. An example from the rep grid given above may be to add a construct differentiating between manure based fertilizer and chemical fertilizer. The process can probe into participants' knowledge about the effect of different fertilizers on crops. The resultant ratings may prompt participants to manage fertilizer use more closely, or even to develop a village wide composting system to free themselves from dependence on chemical fertilizer.

Finally, it can be a very empowering exercise for people to participate in the analysis process. By "engaging in this dynamic assessment of their own social reality," states Chevalier (2005c: 44), participants "retain full ownership of the process." As is the case when the research is undertaken in an idiom preferred by participants, feeling ownership for the research is very motivating for participants. If the participants feel good about the research process, they will contribute in a more meaningful way, which can positively affect the outcomes of the research. Furthermore, empowerment contributes to peoples' sense of self-worth, and their motivation to develop and control development initiatives that affect their lives.

The Rep IV software has an advantage of producing very sophisticated analyses of rep grids very quickly. To maintain ownership for participants, it is important to take the time to share the software outputs with them. Interpreting the outputs together can help participants and researchers to understand more subtle relationships within the participants' knowledge system. Furthermore, by familiarizing participants with the software outputs, they can better understand how their knowledge may be translated to other relevant stakeholders. Additionally, explaining the software outputs can be a springboard for further discussions, offering more learning opportunities for researchers and participants alike. Indeed, even if researchers use the software to analyze rep grids without the participants, they can return to the participants to engage in discussions and interviews based on findings from the rep grids, either to validate the interpretations, or to continue the learning process.

Interpreting the analysis of a rep grid using the Rep IV software tool enables a researcher to draw a surprising amount of information, even from a seemingly simple grid. However, Rep IV outputs are foreign and complex to many people, which can potentially make the analyses difficult for participants to understand (Pratt 2001: 19). If researchers rely on the software for analyses, they may end up disconnecting and potentially alienating participants from the analysis process and even from the raw data that participants generated. "As soon as you move away from the grid interview as a social encounter," Jankowicz (2004: 132) warns researchers,

> you move away from the direct meaning offered to you by the interviewee, and into a realm in which your own interpretations condition, influence, and possibly distort the information in the original grid.... Any complex analysis... requires you to make assumptions when you interpret the original grid.... They are less easily described to your interviewee..., and, unless the interviewee has some grounding in statistics, your interpretations take on the flavour of 'because I, the expert, say so.' When this happens, you have less scope for negotiating a meaning with your interviewee (and especially, for checking your understanding of the interviewee)....

The final judgements that facilitators makes about a grid are reflected in their own construing of the participants' construing (i.e. the original repertory grid) (Jankowicz 2004: 75, 131-2; Fransella and Bannister 1977: 8). Researchers/facilitators are armed with theories regarding the issues being researched that may not be shared or even known by participants. These theories give researchers their own reasons for initiating grid exercises (Jankowicz 2004: 74-6). If, as described regarding other participatory systems, these reasons are not openly disclosed, the process may foster the exploitation of peoples' participation.

The influence that researchers have on participatory exercises and their analysis and interpretation is well recognized by participatory practitioners (Pratt 2001: Mosse 1994). Researchers can never be fully detached from the research process. In the principles of SAS^2 this reality is acknowledged but not denounced. Instead, SAS^2 techniques such as Domain Analysis suggest that researchers literally include themselves as stakeholder participants in the exercises, to convey both equality with participants and transparency regarding research intentions (see Mosse 1994: 504). By employing their own expertise and theoretical background, researchers can in fact contribute to the understanding of the participants' world for the participants themselves (Jankowicz 2004: 74-6, 132). Participants may not realize the significance of their knowledge to others since they take it for granted as part of their everyday lived experience. Nonetheless, it is crucial that researchers do not *misrepresent* the participants completely (Jankowicz 2004: 75). This is why it is important for researchers to communicate their intentions and their interpretations to the participants as much as possible. As described above, this can be done as part of the Domain Analysis exercises. However, if researchers are relying on sophisticated Rep IV software outputs, it is important that they uphold the right "behaviours and attitudes" by doing their best to share and validate that information with participants. If there are disagreements, misunderstandings or discrepancies, these can be worked out collaboratively.

Conclusions

Research and development has undergone many alterations over the past fifty years or more. More recently, the introduction of local "participation" was a conceptual revolution affecting the conventional research and development framework. As effective as participatory tools and techniques have been for improving the ways in which development initiatives are conceived and managed, there remain many theoretical and methodological gaps. These have allowed the concept of "participation" to be co-opted into an unchanged top-down RBM development paradigm. In turn, many weaknesses of current participatory research and development systems have been exposed, inciting much criticism upon them as well as calls to introduce improvements. For example, Chevalier and Buckles (2005: 9 emphasis in original) argue that development processes using participatory methods such as PRA rarely go “beyond recipes that simply mix the objective or "**etic**" analyses generated by experts with a good dose of subjective or "**emic**" views obtained through participatory methods.”

The Social Analysis System ^{2} has in many ways addressed the problems with earlier participatory systems such as PAR, RRA, and PRA. On its broadest level, SAS ^{2} introduces Process Management as a new and realistic way of engaging in research and development. It is sensitive to the uncertainty and unpredictability of participatory processes by allowing for continuous planning of projects as new information is gathered. Such and approach to research and development can help to make better use of participatory techniques along all stages of the project cycle.

SAS ^{2} has also made significant headway into social analysis aspects of research and development, particularly with respect to situations where different stakeholders are competing to meet their own differing objectives. SAS ^{2} tools and techniques improve the quality of participatory research, allowing researchers to better understand how different stakeholder groups influence and impact development processes. Finally, SAS ^{2} tools and techniques provide a new dimension to participatory research by going beyond just the collection of information into the creation of new knowledge which can be used to initiate action and solutions to problems which people may face. This can have profound impacts on how development initiatives are identified and administered.

The value and power of SAS^2 techniques lies in their ability to elicit knowledge and develop solutions using the language and words of participants. Likewise, the techniques are flexible enough to be transferred across cultural and disciplinary boundaries. This answers the call of Mazhar et al (5), who well understands the effect of miscommunication between stakeholders in development policy.

> Research on economic policy-making in practice needs to develop a language that can be understood and used by farmers, ensuring an effective dialogue between farming communities and other actors. This is needed not only to build agreement on the performance indicators farmers and policy makers want to see measured and taken into account but also to enhance the capacity of farmers to assess their own agriculture and its inherent strengths.

Using SAS^2 techniques, knowledge elicited from farmers using an informal "narrative approach" can be rendered into a more "analytical" idiom useful to development professionals (diagrams and reports) without forsaking the original expression of participants. This leads to a better understanding of local people's perspectives by outsiders, and thus sensitivity toward their value systems

In this thesis, I focus mainly on the Domain Analysis technique, with its accompanying Rep IV software tool. Domain Analysis is an "all purpose technique", enabling it to be used in a diversity of specific research situations. In this thesis, I use it for understanding how indigenous knowledge among Kuvi and Korku *Adivasi* farmers, informs how they manage their agricultural seed resources.

Although simplified, a Domain Analysis rep grid is a negotiated representation of the *present* reality of participants based upon their *past* experiences. Armed with this knowledge, participants can use the technique to make predictions for *future* opportunities, once armed with past experiences and present realities. When the participants' knowledge is embedded in the grid and analyzed, further facilitation can help participants determine which opportunities should be actualized (Denicolo and Pope 2001: 114; Tyler 1985: 18; Shaw 1985: 26-7). This means that participation, and thus ownership, is maintained consistently beyond the initial stages of gathering information and into the stages of analysis, interpretation and new learning opportunities of future action (Chevalier 2006/03/05; 2005). When marginalized peoples are allowed to determine future development strategies based on their knowledge and understanding of present situations, there is greater chance that development goals will be achieved and that stakeholders will benefit from the outcomes. Furthermore, participants' knowledge of current situations can determine that development interventions could be unnecessary and even counter-productive if allowed to continue.

Nonetheless, Domain Analysis and other SAS ^{2} techniques do not overcome all of the weaknesses associated with other participatory methodologies. The above discussion iterates the flexibility of the techniques. However, flexibility towards providing constructs and interpretative license allows the process and the results to be alienated from participants to the point where it may no longer reflect their views. It is even possible for participants to be misrepresented by interpretations of their grid, and the information offered by them could be manipulated to their disadvantage if that is advantageous to other stakeholders. In addition, while the techniques make it possible for research to remain within local processes and language, they do not necessarily succeed in achieving this ideal. Therefore, while SAS^2 techniques have the potential for greatly improving the quality of participatory research and development, they are still open to manipulation and co-optation, as other participatory methodologies are, if practitioners (intentionally or not) use them to serve outside interests.

Malicious intentions aside, the grid technique requires considerable skill on the part of the facilitator and effort on the part of participants. Even with the best intentioned researchers, variability in these factors as well as time, rapport, politicization of the topic, literacy, and so on can have innumerable impacts on how ideally the rep grid elicitation process is undertaken. These concerns are most relevant to this thesis research. The Domain Analysis research methodology was wrought with unpredicted challenges. Most theses tend to avoid discussing the mechanics of research and admitting imperfections in how methodologies were employed. Therefore, for the sake of transparency, Chapter 4 offers a separate analysis of my experiences with Domain Analysis during field research in India. This chapter will be complementary to, and follow directly after, the next chapter which offers the main analyses and interpretations of the repertory grid data gathered from Korku and Kuvi *Adivasi* farmers regarding their mixed cropping system.

CHAPTER 3:
TWO MIXED CROPPING SYSTEMS BETWEEN TWO *ADIVASI* PEOPLES

The Kuvi and Korku *Adivasi* peoples are marginalized farmers. They draw their livelihoods from rain fed (non-irrigated) farms with poor soils in remote areas and rarely experience, nor can they create, ideal growing conditions. Thus the Kuvi and Korku say they rely on agricultural diversity from mixed cropping systems to achieve economic and food/nutritional security. First, by maintaining many different crops, a family can better fulfill its subsistence needs based on a diverse and healthy diet. Families trade some crops at the market so they can acquire the few necessities they do not produce themselves. Secondly, a wide diversity of crops builds resilience into the farming system against unpredictable changes in ecological conditions. By growing many different crops with different qualities, conditions negatively affecting certain crops will have a positive effect on other crops. Thirdly, mixed cropping techniques save farmer's labour inputs by allowing them to sow many crops at the same time, and once germinated, the density of crops with differing growth habits reduces weed pressure. In addition, the mixing of leguminous crops with cereal grains and other crops helps to improve soil quality.[28] The nitrogen fixing activity of legumes reduces the farmers' need to invest labour and money into the applications of chemical fertilizers and herbicides. Therefore, diversity exemplifies how all crops can contribute to a reliable and predictable agricultural system even when growing conditions themselves are neither reliable nor predictable.

The Kuvi and Korku people speak about their mixed cropping systems in contrast to mono-cropping farm systems practiced by the dominant Hindu society that occupies the more fertile plains. Large scale mono-crops such as rice and cotton are economically

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28 Legume crops such as beans, peas and lentils fix nitrogen from the atmosphere and store it in their roots. This is then released from the roots into the soil providing a natural fertilizer.

lucrative where there is access to fertile soil and markets, but the trade-off is that they require extensive inputs of labour and chemicals to maximize production. Furthermore, the occurrence of unpredictable events from drought, pest infestation, and collapse in market value can ruin a family that depends on only one or two crops to achieve economic security. In other words, mono-cropping may only be lucrative when ideal conditions can be controlled.

Although Kuvi and Korku farmers share motivations justifying their employment of mixed cropping systems, each has a unique system of mixed cropping practices. Different socio-economic and ecological factors influence not only the structure of the two mixed cropping systems and the methods of employing them, but also the diversity of crops being grown by each *Adivasi* people. Kuvi shifting cultivators utilize an extraordinarily diverse "seed-mix" method of mixed cropping. Kuvi farmers first mix the seeds of about twenty-five distinct crops together and then broadcast (scatter by throwing) these seeds throughout their fields. The seemingly random method of sowing seeds gives the effect that the fields are natural extensions of the surrounding sub-tropical forest ecosystem. The steep mountain topography and poor sub-tropical soils occupied by the Kuvi are conducive to shifting cultivation traditions of mixed cropping since few economic alternatives are possible (e.g. Pratap 2000; Dove and Kammen 1997; Forsyth 1996; Vasavi 1994; Sharma 1994: 154-8; Acharya 1989: 18; Furor-Haimendorf 1982: 75-6). Furthermore, the Kuvi peoples' remote and mountainous homeland protects them from the influence and interests of outsiders. Until very recently, the Kuvi maintained significant autonomy, controlling and curtailing their interactions with mainstream Indian social, political and economic institutions (see Vandergeest and Peluso 1995; Li 2001).

Their relative isolation has enabled the Kuvi to develop and continue their traditions of shifting cultivation and seed-mixing free from external pressures.

Contrary to the Kuvi, the Korku live in much closer geographic, political, social and economic proximity to dominant Hindu society. Therefore, they have a long history of contact with other societies (Fuchs 1988). Willingly or not, the Korku have adopted selected traditions from surrounding peoples, which have then been adapted and mixed into their own traditions to embody a unique Korku culture.[29] Likewise, the economies of neighbouring peoples, including mono-cropping and cash based agricultural systems, have influenced Korku agriculture. The Korku have intensified their land use and improved their yields per hectare by utilizing oxen, plough and seed drill to prepare their fields and sow their seeds in rows. The Korku employ a seed-mix but it is highly specialized, reduced to only eight specific crops. All other crops, about a dozen different types, have been removed from the seed-mix. Korku farmers have learned that yields improve by growing these crops separately in isolated plots. Additionally, with access to local, national and even international markets, the Korku have adopted new cash crops to supplement their traditional subsistence crops. Since the Korku manage a multifarious system of mixed cropping, I call it an "integrated" mixed cropping system.

As described above, significant influences from neighbours on Korku mixed cropping contribute to a more "planned" agricultural system compared to the seemingly "random" Kuvi broadcasted "seed-mix." The sophistication of the Korku system balances agricultural diversity with techniques to increase farm output. However, the following

[29] Both Fuchs (1988) and Deogaonkar (1990) claim that in the past Korku people practiced "primitive" shifting cultivation. If the claim is true, a transition must have occurred a very long time ago. None of the Korku people I interacted with have any memory of shifting cultivation. They all state that their current agricultural practices have been their tradition since time immemorial.

analysis shows that while Korku farms remain more diverse than those of their neighbour's, their farms are less diverse than those of the Kuvi. "Improvements" in the Korku system are advantageous only when growing conditions are also improved, such as with organic or chemical fertilizers, pesticides, irrigation and technology. When ideal conditions cannot be met, it follows that the Korku integrated system is less resilient to external forces and therefore also offers less economic and food/nutritional security. Alternatively, the Kuvi seed-mix is less influenced by neighbouring people, but is more diverse, more resilient and finally more secure.

The analyses and interpretations that follow in this chapter emphasize the variable diversity of the two mixed cropping systems represented by each *Adivasi* tribe. I discuss each system in separate sections, beginning with the Kuvi "seed-mix" system, and then the Korku "integrated" system. Both sections follow the same narrative pattern. I first describe distinctive features of the cropping system in more detail. This is followed by an outline of the Domain Analysis repertory grid elicited from participating Kuvi or Korku farmers. The Domain Analysis rep grids provide the basis for subsequent analyses and interpretations of the mixed cropping systems being discussed. The grid analyses show that all crops are unique, but patterns in the participants' ratings allow certain crops to be grouped into families. For each mixed cropping system, the number of crop families, the similarity among crops within each family, and the relationship between families reveals the diversity of the system. While the discussion appears to focus on the varying diversity of Kuvi and Korku farmers along "biological" definitions of "diversity", the interpretations go much further. The benefits of "diversity" must also be addressed in terms of ecological, social, and economic contexts of Kuvi and Korku peoples.

Additional knowledge learned through interviews with Kuvi and Korku people contributes further to the discussion. Therefore, as much as possible, the analyses and interpretations are drawn from Kuvi and Korku farmers' own knowledge and experience about their mixed cropping systems.

Kuvi/Kui (Dongria/Desai Kondh)

The "seed-mix" system of the Kuvi/Kui is most extraordinary for those of us accustomed to neatly laid out farm or garden plots, each containing rows of one specific crop. In the Kuvi seed-mix system, seeds from most crops are first mixed together, and then broadcast across a newly burned swidden field (commonly called *dongar* in Orissa). This means that about twenty-five crops are sown at the same time over the same area; and since most crops have two or three varieties, about fifty varieties of seeds can be seen growing in a single glance (see Appendix). Most crops, but not all, are randomly dispersed throughout the fields in this way. Some crops have characteristics requiring them to be dibbled deeper into the soil in particularly appropriate areas of a field (these characteristics are described in more detail in the discussion below). The Kuvi seed-mix system discussed in this thesis is consistent among Kuvi farmers throughout the Eastern Ghats. Not only the seed-mixing system, but also the crops used in the seed-mix system are Kuvi tradition and thus integral to their cultural identity.

Although developing the "perfect" crop may be the ultimate goal for plant biologists, geneticists and development agencies, it is not necessarily a possible or desirable goal. This is especially true because growing conditions are always changing. On the other hand, by employing a seed-mix system, Kuvi farmers acknowledge that there is neither a perfect crop, nor perfect growing conditions. Growing many different crops together allows the "imperfections" of one crop can be offset by the advantages of others (depending on growing conditions). As the following discussion shows, the Domain Analysis technique can be used to uncover the precise qualities of each crop, from what conditions expose the weakness of a crop to how other crops' advantages compensate for that weakness. Therefore, the goal of the seed-mix system is not to find the perfect crop under a given set of growing conditions, but to ensure good harvests for food security, irrespective of growing conditions.

Rep IV software analyzes the Domain Analysis rep grid by searching for patterns in the ratings given to crops and constructs by Kuvi participants. The patterns are then interpreted, enabling the researcher to make conclusions about the agricultural system. The case of the Kuvi seed-mix system is an example of "fragmentation" (Chevalier 2005: 15). This is a result in there being many divergent patterns in participants' ratings during the Domain Analysis exercise. This in turn results in there being no general pattern that enables the constructs and crops to be used to define the system. In terms of mixed cropping analysis, fragmentation equates to immense diversity, which offers significant food security to Kuvi farmers. Diversity not only brings a varied diet to the Kuvi kitchen, but also brings resiliency to the fields to ensure that Kuvi farms are productive under any circumstances.

The repertory grid for the Kuvi "seed-mix":

The crops of the Kuvi seed-mix system, in the order of first harvested to last, are cucumber (*karkuri*), pumpkin (*boitalu*), gourd (*jhoni*), pole bean (*judongar*), taro (*saru*), cassava (*similikanda*), pearl millet (*gantia*), foxtail millet (*kangu*), common millet (*kosala*), finger millet (*madia*), safflower (*allsi*), bean (*koting*), sorghum (*janna*), broad bean (*jhuta*), pea (*baili*), sweet potato (*kandamulao*), and yam (*matualu*).[30] The crops comprise the elements of the Domain Analysis repertory grid analyzed in this section of the thesis. At the time of my fieldwork with the Kuvi (January 2005), most crops had already been harvested from the seed-mix. Farmers were gradually harvesting pigeon pea (*kandulo*) and castor (*joda*), the last crops to be harvested from their "seed-mix" *dongar* fields.[31]

Many of the Kuvi seed-mix crops have two or more varieties, but these are not isolated from each other. Thus, Kuvi farmers do not distinguish between them other than their visual differences. For example, foxtail millet has three varieties: white, red and black. However, these are always kept mixed together when sowing, when harvesting and when eating. Therefore, there is little opportunity to know how these varieties may be different.[32] Therefore, I am unable to address varietal distinctions of crops within this thesis. Several additional crops are also included in the Kuvi seed-mix, but not given much attention in this analysis. They were not brought to my attention until after we had conducted the seed-mix repertory grid exercise. These are *hirakuna* and *patnagillikuna* (roots that are both similar to yam), two types of millet (*suan* and *kolatha*), gram (*biri*),

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30 I use English names for Kuvi crops as much as I can. However some crops do not have English names known to me. Names written in italics are Oriya, the state language of Orissa state, since these are consistently recognized by all participants as well as my Oriya co-facilitators (see Appendix). All crops also have local Kuvi names, and in some cases a crop may have several local names.

31 This was the beginning of a period that focused on maintenance activities as well as when male bachelors travel to other villages, singing and dancing, in hopes of meeting their future spouse. Otherwise, in horticulture fields people were harvesting tumeric (*haldi*), an important cash crop. Papaya (*papita*), banana and some roots were also being harvested as desired. However, discussion of the dozen or so horticultural crops, managed separately from the seed-mix crops, is beyond the scope of this research.

32 The only exception is common millet (*kosala*) which has four varieties (see Appendix). In a given year, each family only grows one variety, since to mix varieties of common millet "would not look good" (Tunia and Mandro 2005/01/08) meaning that they will cross-pollinate and hybridize. For the following year, seeds of one variety are swapped with a family who grew another variety.

hibiscus (*kolkati*), eggplant (*baigan*), and chilli (*mirchi*) (the latter two being adopted by the Kui rather recently into the seed-mix).

As part of the Domain Analysis technique, it is necessary to identify characteristics that can be used to comparatively rate all crops. Ideally, these characteristics (constructs) are elicited from the participants themselves. However, this proved to be challenging for the participants as well as for myself and the co-facilitator/translator. We collectively decided that in order to complete the repertory grid exercise it would be better for me to supply constructs to participants, which they would use to rate the different crops. The implications of this facilitation strategy, both beneficial and adverse, are discussed in the next chapter (see also Jankowicz 2004). At present, I will simply admit that the constructs used in the Kuvi rep grid reflect what I consider to be important characteristics and factors about the abilities of mixed cropping to achieve food security for farmers.

Several of these constructs focus on the socio-economic value of crops for the Kuvi people. These constructs ask which crops are "least healthy" (1) or "most healthy" (7);[33] which crops are "most sown" (1) or "least sown" (7); which crops require "most labour" (1) or "least labour" (7); whether crops are traded at the "market" (1) or kept for "domestic" use (7); and whether crops play a role in "many festivals" (1) or "no festivals" (7). Several other constructs reflect the ecological characteristics of crops. Using these constructs, Kuvi participants rated crops according to whether they were "late harvest" (1) or "early harvest" (7); whether crops required "more rain" (1) or "less rain" (7); whether crops suffered from an "insect problem" (1) or were "insect resistant"

[33] Regarding healthiness, the symbol "~" is used for castor instead of a numerical rating because the construct does not apply. Castor seeds are harvested for their oil which is not edible.

(7); and whether crops performed best in an "old *dongar*" (7) or a "young *dongar*" (1). This last construct set refers to how soil quality impacts the performance of crops by asking how long a swidden/*dongar* field has been under cultivation. For example, a rating of 7 indicates a crop that performs best in the nutrient rich soil of a newly established field, whereas a rating a 1 indicates a crop that continues to perform well even in the depleted soil of a three old field. After three years, the soil is considered too exhausted and the field is abandoned to allow the forest, and the soil, to regenerate. Many of my supplied constructs assume that environmental factors such as rain, insects and soil determine the success of crops in the seed-mix. Therefore, I added the construct set "guaranteed" (1) or "uncertain" (7) to give a reliable harvest as an "overall summary" aimed at testing my assumptions (Jankowicz 2004: 56, 171). If the rating pattern for the overall summary construct is very similar to any or all of the ecologically inspired constructs, then it can be confirmed that these constructs reflect crop characteristics that have an impact on the success of crops.

Although constructs are by definition polarized, I deliberately focused on sets that would not result in one pole being judged as better than another. For example, a crop that needs less rain is best only during a year when the monsoons are poor. Yet heavy monsoons also occur, so crops that need more rain are just as important. Likewise, crops that are early harvested, late harvested or harvested anytime in between are all equally important. A long and varied harvest season reduces the need for elaborate storage facilities since crops are harvested in small amounts, eaten by families, and as the stores deplete, new crops are brought in to nourish for the next months. This also ensures a diverse diet and sustained subsistence over a long period of time (Pattnaik 1998:99).[34]

I chose to have the crops rated according to the constructs along a scale of 1 to 7. Using such a large rating spectrum normally demands that the participants make minute distinctions between crops compared to a 1 to 3 scale which only offers an "either", "or" or "both" analysis. Since there were as many as 19 crops to be analyzed in the grid, it was necessary to use a wide rating spectrum in order to avoid the same rating being repeated too many times. However, I limited the maximum rating to seven so that some repetition of ratings according to each construct set was inevitable. In short, my aim was to be able to use the full breadth of the rating spectrum to emphasize diversity between *all* crops, while at the same time forcing some repetition of ratings to emphasize any similarities between *groups* of crops (Jankowicz 2004: 36).

Analyzing and understanding the Kuvi seed-mix system:

The Rep IV software searches for patterns in participants' ratings, groups together similarly rated crops and constructs, and illustrates these groupings in the Focus and PrinGrid diagrams (see Figures 4 and 5). In the Kuvi rep grid exercise, several crops are classified into families that can be explained according to the constructs. I have identified these families (on the diagrams) as the Cucurbits, the Roots, the Minor Millets, and the Legumes families. However, the Kuvi rep grid is particularly interesting because although there are some groupings of crops, upon closer examination of the diagrams, it becomes apparent that crops within each family are only loosely affiliated to each other.

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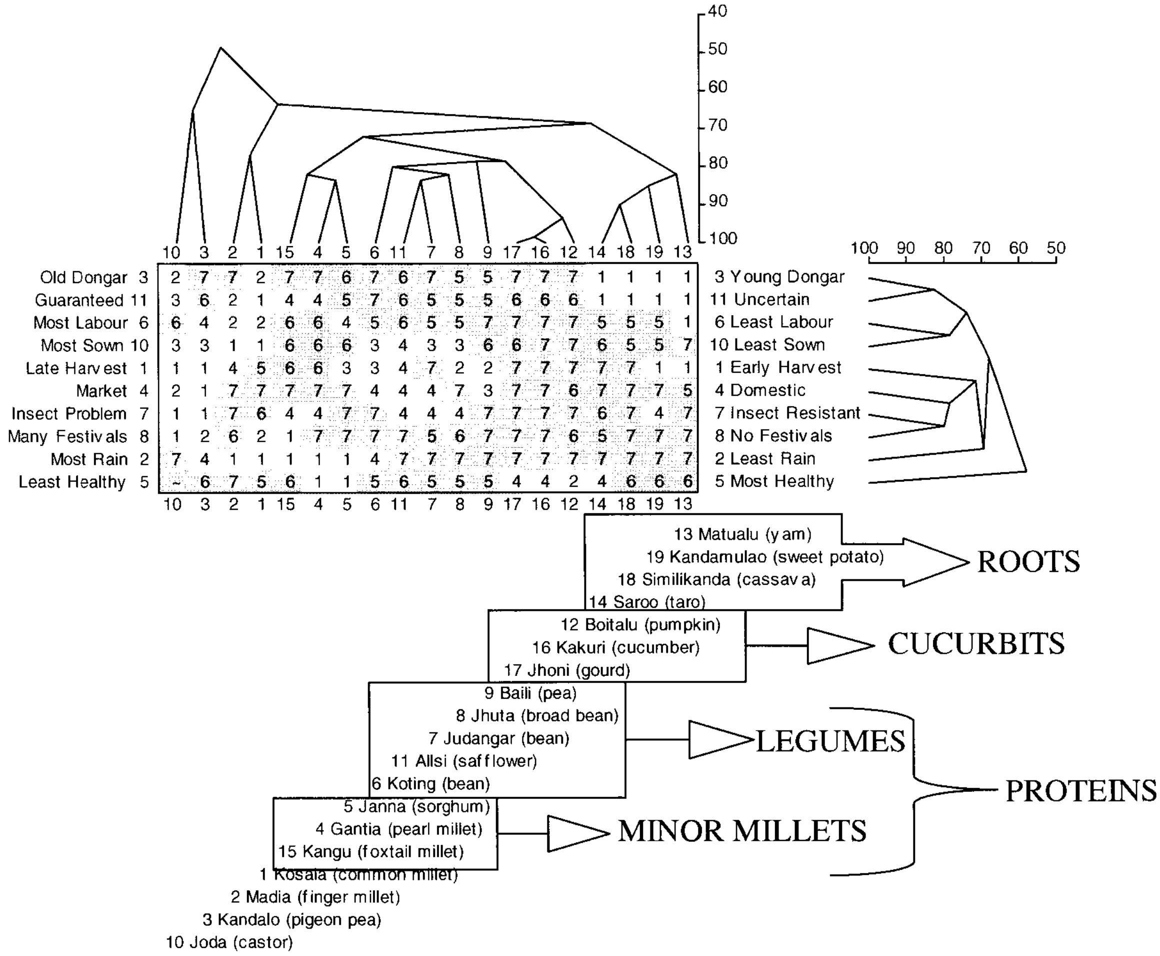
[34] According to Pattnaik (1998: 99), an extended harvest season also enables Kuvi people to avoid migratory labour between growing seasons, which has become a major socio-economic problem across India.

Therefore, the greatest overall trend in the Kuvi seed-mix is that all crops are unique and avoid any type of familial patterning. This implies that the diversity of the Kuvi seed-mix is even more expansive than the diagrams immediately suggest. Nonetheless, I uphold the crop families for the time being since they have at least some validity through their identification in the diagrams. Additionally, using crop families to speak about such a widely diverse mixed cropping system enables a more streamlined and coherent presentation of the analysis, rather than if every crop is discussed individually.

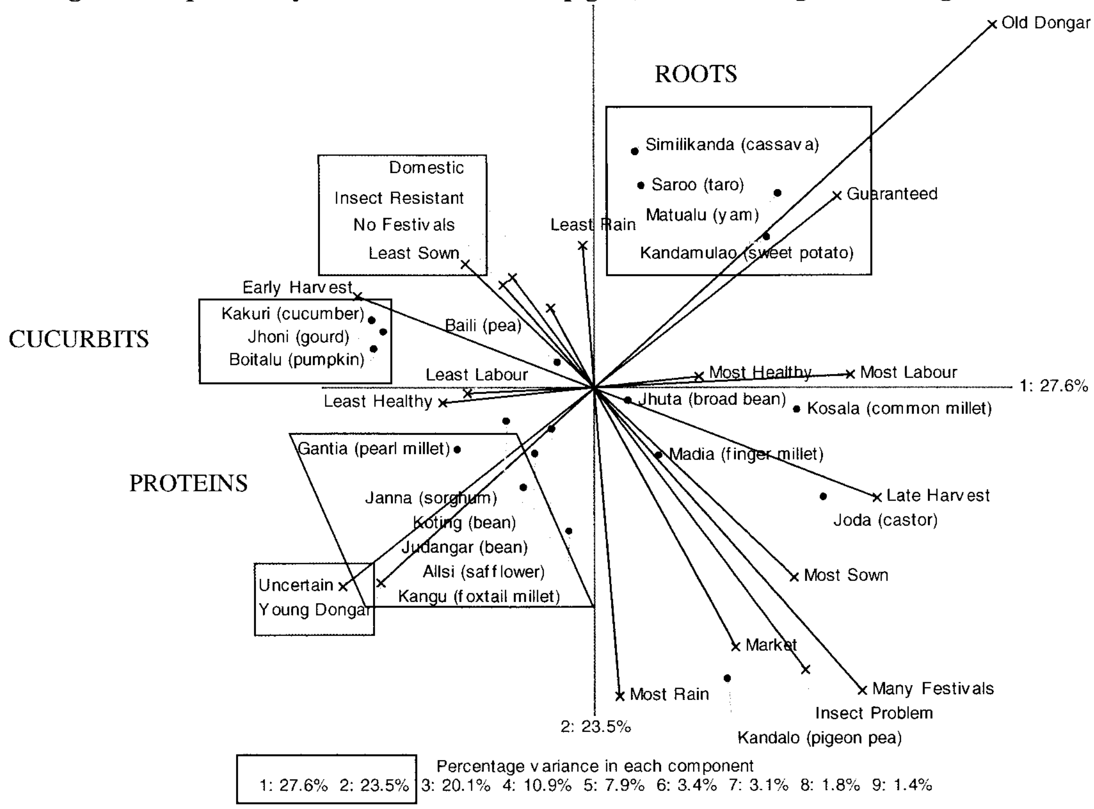
In this section, I discuss each crop family separately, describing its features and characteristics using the construct ratings from the Kuvi participants' rep grid. Domain Analysis goes beyond simply stating the Kuvi seed-mix is diverse. The technique enables Kuvi farmers' to express *how* it is diverse through their knowledge of similarities and differences among crops according to specific characteristics. Domain Analysis also illuminates the value of agricultural diversity and the ways in which it promotes a secure food system. Other aspects of mixed cropping knowledge disclosed by farmers during discussions outside the formal Domain Analysis exercise supplement the interpretations of the rep grid diagrams. As each new family is presented, I emphasize both its similarities and its differences to other families. Additionally, the crops finger millet (*madia*), common millet (*kosala*), castor (*joda*) and pigeon pea (*kandulo*) are given special attention because they are rated uniquely by Kuvi participants, thus eluding placement in any family. Finally, I extend the analysis to show how the crop families belie the true diversity of the Kuvi seed-mix system.

Figure 4: Rep IV analysis of Kuvi seed-mix rep grid, Focus diagram (Katragumma 2005/01/04).



The strongest, most identifiable family in the Kuvi rep grid exercise consists of cucumber (*kakuri*), pumpkin (*boitalu*) and gourd (*jhoni*). Kuvi participants' ratings for these three crops are almost identical, showing 95% similarity between them. I have named these combined crops the "Cucurbit" family since botanists also recognize these crops as being similar and have categorized them as members of the *"cucurbitaceae"* botanical family. However, while the Kuvi participants have rated cucumber, pumpkin and gourd similarly according to the constructs in the rep grid exercise, botanists base their conclusions on biological qualities different from those used in the rep grids.

Figure 5: Rep IV analysis of Kuvi seed-mix rep grid, PrinGrid diagram (Katragumma 2005/01/04).



Apart from being rated very similarly by Kuvi participants, the Cucurbits' characteristics are all extreme, shown as ratings of 6 and 7 in the Focus diagram of Figure 4. This means that Cucurbits are strongly identified with one pole within a construct set. The extremity of the Cucurbits' qualities can be viewed in the PrinGrid diagram (Figure 5) by the spatial distance of their plotting from the centre of the diagram. Extreme construct ratings associated with Cucurbits means not only that Cucurbits have strong advantages, but also that their shortcomings are strong. For example, like many other crops, Cucurbits are completely drought resistant, requiring very "little rain" (7), as well as "insect resistant" (7). Cucurbits also require "little labour" (7), making them easy and carefree to grow. Most uniquely, the Cucurbits are the "earliest" crops to harvest (7) making them an important early source of nutrition when not much is available given that the previous year's stores are usually exhausted by this time. However, Kuvi farmers rate the Cucurbits as performing well only in the nutrient rich soil of a "young *dongar*" (7). In the second and third year of cultivation in a *dongar* field, soil quality deteriorates contributing to Kuvi farmers' consideration that Cucurbits are very "uncertain" (6) to give a reliable harvest. Lastly, the Cucurbits actually did not receive a consistently extreme rating regarding their healthiness. While pumpkin is indeed among the "least healthy" crops (2), participants rated cucumber and gourd as only moderately healthy (4). These shortcomings may factor into why these crops are "less sown" (6-7). The Cucurbits are likely intended to supplement the Kuvi peoples' food system rather than be dietary staples.

The other most obvious grouping consists of yam (*matualu*), sweet potato (*kanamulao*), cassava (*similikanda*) and taro (*saru*), which I have named the "Roots" family of crops. Apart from the four roots mentioned in the above diagrams, I was later introduced to two other roots also grown by Kuvi farmers. These are called *Patnagillikuna* and *Hirakuna*, and are closely related to yam. Unlike the Cucurbits, the Roots crop family is not classified in botanical terms, since each is from distinct botanical families.[35] Instead, the similarities between ratings of these crops stem from the main edible part of these crops being their large starchy roots.

Like the Cucurbits, the Roots also have extreme characteristics being rated 1 or 7 for many construct sets. However, the Roots are slightly less extreme than the Cucurbits, with some Root crops being rated with 4, 5 or 6 for some constructs. There is also slight variation within the Roots family, resulting in a crop family that is less closely knit

[35] Yam (family *Dioscoreaceae*); sweet potato (family *Convulvulaceae*); cassava (family *Euphorbiaceae*); taro (family *Araceae*).

compared to the Cucurbits. For example, sweet potato has a moderate "insect problem" (4), taro has a slight insect problem (6) and yam and cassava are insect free (7). Similarity rates between Roots range between 82% and 90%, whereas for Cucurbits, similarities range between 92% and 98%.

While the Cucurbits' profile consists of a balance between advantageous qualities and shortfalls, the Roots' qualities are almost all beneficial. Like the Cucurbits, the Roots thrive with very little rain (7), and are fairly "insect resistant" (4, 6 and 7). They are also largely for "domestic" consumption (5 and 7). As an improvement over the Cucurbits, the Roots are all very healthy crops (6). Perhaps most importantly, they are easily "guaranteed" crops (1) – able to produce well under any growing conditions including in the exhausted soil of a three year "old *dongar*" (1). Overall the Roots are extremely beneficial crops of immense value for food security and are thus highly regarded by Kuvi people. In many respects, Roots have qualities that resemble staple grains such as finger millet (*madia*) and common millet (*kosala*), which are discussed more below.[36] As the Kuvi participants' ratings indicate, the Roots even have added advantages over these grains. Unlike the Grains crops (see below), the Roots are more tolerant of the old soil in an "old *dongar*"; they require less rain, and they are more shade tolerant (Patra 2005/01/16).

The contribution that Roots make toward food security due to their immense tolerance of various growing conditions intrigued me enough to delve more deeply into Kuvi knowledge about them. I was particularly curious regarding why these valuable crops are much "less sown" (5 to 7) than other crops. In order to learn more, discussions

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36 Notice in the PrinGrid diagram how finger millet and common millet are the nearest crops plotted to the Roots, in effect bridging the qualities of the Roots and the qualities of all other crops.

and Domain Analysis exercises focusing solely on Root crops, including *Patnagillikuna* and *Hirakuna,* were employed in two different Kuvi hamlets (Tunia and Mandro 2005/01/08; Hutesi 2005/01/09). For space and simplicity, I cannot illustrate all details of the grids and discussions. However, the experience and knowledge of Roots is remarkably consistent between the two different sets of participants. The repertory grids that each produced are similar by 85%, indicating not only that the value of Roots is common knowledge amongst Kuvi people, but also that the conclusions I make about Roots in this thesis are valid.

During discussions about Roots, Kuvi people honed their distinctions between different root crops. This process helped to reveal further diversity even this crop family as explain why they are sown less. For example, although Roots are generally hardy against poor soil, drought and insects, sweet potato and taro are slightly more vulnerable than the yams and cassava. Furthermore, while most Roots are healthy, taro is not as healthy as other roots and not even as well liked as a food. The apparent disadvantages of taro somewhat explain why it is sown less, but I was curious to know why farmers continue to grow it at all. People responded by stating that since taro roots do not grow deep into the ground, they will successfully grow in shallow and stony soil. Taro also demands little labour from Kuvi farmers, needing only to be sown and then harvested with little other effort. Since it is little additional effort to grow taro, and it grows in specific conditions that few other crops can thrive in, there is value in maintaining it as part of seed-mix system, even if in just small amounts.

As a contrast to taro, yams seem to have many things going for them. They are nutritious, hardy in all kinds of growing conditions and people simply like to eat them

(Tunia and Mandro 2005/01/08; Hutesi 2005/01/09), so why are they not sown more? It is because the massive roots of yams can reach more than one metre below the soil surface and can weigh in at one hundred kilograms. In other words, the yams are very prolific, producing a large harvest when only a little is sown. In addition, yams require not only very deep soil, but also demand a lot of labour for their harvest. A single yam may take several hours to dig out. People say that sowing more would take too much time and energy to harvest. Sweet potatoes exhibit the proliferation of Roots crops even more. Kuvi participants explained to me that as the sweet potato vine sprawls along the ground, it will root at every point where the stems meet the soil. They say that a single plant, grown from a single *piece* of root, can produce up to two hundred new roots (Tunia and Mandro 2005/01/08).[37] Since Roots are so prolific, Kuvi people admitted to me that they neither need to, nor want to sow more Roots. Being nutritionally dense and fulfilling, Roots easily satisfy hunger and meet nutritional requirements without having to eat a lot (Patra 2005/01/16). Furthermore, for all of the good qualities of these crops, it would not be enjoyable for people to have their entire diet dominated by Roots, just as they would not like to have their diet dominated by millet or rice (Hutesi 2005/01/09). Therefore from the perspective of participants, achieving and enjoying a diversity of foods directly from their own farms are also factors promoting mixed cropping.

Roots contribute further to diversity by broadening the Kuvi economy beyond basic subsistence provisioning. Given how productive Roots are, it is no surprise that at least a little is taken to market for sale and barter. Yet there must be a demand for a crop for it to be valuable at the market. Yam (excluding *patnagillikuna* and *hirakuna*), taro and

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[37] An ecological benefit to this is that sweet potato plants effectively bind up the soil over a large area to prevent soil loss from heavy rains and winds on the steep *dongar* slopes (Mahapatra 2005/01/16).

sweet potato are Roots crops that have market value. In Domain Analysis exercises (Tunia and Mandro 2005/01/08; Hutesi 2005/01/09) I found there to be a significant correlation between marketability of a Root crop and the versatility of a root's culinary use. All Roots crops can be roasted or boiled, but yam, taro and sweet potato can also be used to make "curry." In other words, these three crops can be prepared in the traditional way of people in the plains, and thus plains people will pay for these crops at the local market.

I will finish the discussion of the roots with a unique and valuable point that I feel is very significant regarding the contribution that Roots make to Kuvi food security. During grid exercises, there was some confusion regarding when Roots crops are harvested compared to each other and to other crops. This is because Roots can generally be harvested whenever they are needed. Once a plant is harvested, small pieces of the roots are immediately replanted in the ground (or in the case of taro, the crown where the leaves grow from is replanted) (Hutesi 2005/01/09). Here it will re-root to be harvested again after several months. The significance of this is that Roots are always growing, or at least waiting dormant and protected, in the ground. In the middle of the monsoon rains when the crops in storage are almost gone and the new crops have not yet ripened, or even if there is sweeping crop failure, nutritious food can still be found underground. Additionally, since Roots can be harvested from the ground when needed, they do not require storage facilities. In fact, Roots store best in the ground. Grains and Legumes on the other hand, must be harvested when ripe and stored in a barn or shed, or in the rafters or *khoti* (large grain bin made from packed mud) in the home. Storage facilities demand space, money, labour, time and resources to build and upkeep. Ideal storage conditions are difficult to maintain, and crops can become vulnerable to moulds, insects and rodents that can usurp already precarious food security (Nag 1994: 192-3). Therefore, the fewer crops that need to be stored in controlled conditions the better.

Returning to the grid exercise analyzing all seed-mix crops, several other crops form a third distinct group, which I call the "Proteins." This family is actually a conglomeration of the sub-families "Minor Millets" and "Pulses" identified more easily in the Focus diagram of Figure 4. The Minor Millets consist of sorghum (*janna*), pearl millet (*gantia*) and foxtail millet (*kangu*), but exclude the major millets finger millet (*madia*) and common millet (*kosala*) which are discussed later. The Pulses are represented by the peas and beans (*baili, koting, jhudongar, jhuta*), but exclude pigeon pea. Interestingly, each subfamily also conforms to botanical distinctions as occurred with the Cucurbit family. The Millets are all from the *poaceae* botanical family and the Legumes are all from the *fabaceae* family. While not actually a grain or pulse, the oilseed niger/safflower (*allsi*) shares characteristics with these sub-families, especially with the Pulses.

All of the Proteins family crops occupy the central areas of both the Focus and PrinGrid diagrams. This is due to their overall more moderate rating pattern by the Kuvi participants (i.e. less extreme than the ratings for Cucurbits and Roots). For these crops, 42.5% of the ratings are between 3 and 5, the mid range of the rating scale. Most of these crops experience some "insect problems" (4, 7), but not enough to be a major concern for participants. While the Proteins perform best in a "young *dongar*" (5-7), they will continue to yield moderately well into the second year. However, their success in an older *dongar* is "uncertain" (4-7). Overall, the Proteins crops are not likely to fail completely in adverse conditions, but factors such as soil and insects can curtail a bumper harvest.

For several other construct sets, Pulses continue to be given moderate ratings, but Minor Millets receive extreme ratings, thus revealing clearer distinctions between the two sub-families as well as setting the Pulses apart from the Cucurbits and Roots. One unique characteristic is that the Pulses are "more sown" (3-6) than any crops yet discussed. This could be to compensate for acknowledged yield reductions under adverse conditions as just mentioned. However, if the growing conditions are good, sowing more can lead to harvesting more than is needed for subsistence. Therefore, Kuvi people expand their economy by taking extra yield to the local "market" (3-7) for cash or trade. Taking some harvest to market during a good season is also understandable and advantageous since the Protein crops are available throughout the main harvest season ("early harvest/late harvest" ratings from 2-7), a time when food for subsistence is generally plentiful. The only consistently extreme rating given to the Pulses is that, like the Cucurbits and the Roots, they require very "little rain" (7 excepting *koting* bean). Therefore, although Pulses are uncertain to harvest well if the soil is poor or if there are insect problem, they can be relied on in times of drought.

The Minor Millets on the other hand are even more vulnerable than the Pulses because they require the "most rain" (1) of any crops. Determining whether a crop needs more rain or less rain, though, is not intended to impose a good or bad judgement upon the crop. Shortages of rain are expected, but excessive rains do also occur. Therefore, the Minor Millets are well suited for those unpredictable monsoons that bring too much rain for the Pulses to thrive in. Additionally, the amount of rain Minor Millets need is only with reference to the crops in the Kuvi seed-mix. Kuvi farmers noted to me that the rains were short this past year (2004), but despite the rice yield in the valley being very poor, they still had good yields from all of their crops in their *dongar* (Anonymous 2005/01/20; Rassalu 2005/02/08). Nonetheless, the Minor Millets are still amongst the "least sown" crops (6), perhaps because they are neither "marketable" (7), nor "healthy" (7; with the notable exception of foxtail millet which is very healthy). In fact, Kuvi participants added that pearl millet is "difficult to digest" causing intestinal discomfort (Katragumma 2005/01/04). As is the case with the Cucurbits, the Minor Millets are probably supplementary crops, valuable for contributing diversity to the Kuvi farm and diet. Furthermore, constructs for this Kuvi seed-mix repertory grid are mostly supplied by me, and therefore this grid is by no means a complete representation of Kuvi peoples' total knowledge of the seed-mix system. Kuvi farmers would have additional knowledge that, once added as constructs in the rep grid, could suggest important reasons to maintain the Minor Millets, even if just in smaller amounts.

So far I have described how construct analysis enables Kuvi participants to identify families of similarly rated crops. Furthermore, I have discussed how the profiles of each family are unique from each other. However, in comparing the characteristics of their seed-mix crops, Kuvi participants have also identified several crops that cannot be grouped into any of the already established families or into a new family. These crops are finger millet (*madia*), common millet (*kosala*), castor (*joda*) and pigeon pea (*kandulo*). The ratings of these crops show that they are very important elements in the Kuvi seed-mix because of the unique characteristics of each. Each of these crops contributes in its own way to food security, either as household staples, being sold at the market, or even as a spiritual offering to the Goddess for the protection of all crops.

I will first introduce the main staple grains for the Kuvi, finger millet (*madia*) and common millet (*kosala*). These two crops are ripe for collection in the heart of the harvest season with the shorter finger millet being harvested ("early harvest/late harvest" rating of 4) immediately after the taller common millet ("early harvest/late harvest rating of 5). Finger millet and common millet have some characteristics in common with the Minor Millets discussed above, and yet each has other characteristics that set it apart from the rest. Firstly, all millets are fairly "insect resistant" (4 to 7). Foxtail millet and pearl millet have slight "insect problems" (4), but it is not enough to raise concern from participants. A most notable similarity is that out of the entire seed-mix system, all millets are identified by Kuvi participants as requiring the "most rain" (1) in order to grow best. Needless to say, although millets will not yield bumper crops if the rains are poor, participants added that finger millet and common millet especially will still give adequate yields (Katragumma 2005/01/04; see below). The other common characteristic among all millets (and also in common with Cucurbits) is that they are solely utilized for "domestic" subsistence (7), and none of their harvest is taken to market. In fact, Kuvi people would not be able to sell their millet even if they wanted to since people in the plains consider millets "coarse" compared to their preferred grains of rice and wheat.

However, finger millet and common millet are very unique as domestic crops. Earlier I established that the relegation of the Minor Millets and Cucurbits to the domestic sphere results in these crops being less sown. I also suggested that the Pulses are sown more to counteract their uncertainty to harvest well in adverse growing conditions. Neither of these statements can be applied to finger millet and common millet. Even though these two crops are exclusively for "domestic" (7) consumption, they are the "most sown" (1) of all crops in the seed-mix system. Increasing their sowing rate is not to compensate for uncertain yields either, since unlike most other crops, both millets are amongst the most "guaranteed" (1-2) to yield successfully. Being the most sown crops and among the most guaranteed crops, it is no surprise that finger millet and common millet also require "more labour" (2) than most other crops a lot of each is harvested each year.

Overall, the qualities of finger millet and common millet clearly identify them as staple grains, the building blocks of food security. However, each also has a single quality that individually contributes to food security and sets them apart from most other crops. Common millet is the only Protein crop that will thrive even in an "old *dongar*" (2). Lastly, while most crops are above the median in terms of being healthy (5 and 6), finger millet is the single "most healthy" (7) crop of the entire Kuvi seed-mix system.

The last two crops to mention in the Kuvi seed-mix system are castor (*joda*) and pigeon peas (*kandulo*). They are unique in part because they are the "last harvested" (1) during the winter months of January and February. While these two crops have other traits in common with each other, I will discuss them separately. The most interesting feature about castor is that it is not a subsistence crop let alone a food crop. Its seeds are processed into non-edible oil. Hence it cannot be rated according to the construct set "most healthy/least healthy" (~). Kuvi participants stated the oil is used by themselves and the general plains Hindu population in lamps for providing both light, and offerings at *puja* (religious ceremonies) (Katragumma 2005/01/04). Since oil lamps are a major part of daily life, whether for mundane or spiritual reasons, castor is a very important crop for earning cash. Selling crops for cash is integral for Kuvi food and economic security. It is naïve to assume that even a subsistence based society such as the Kuvi is completely self-reliant for all their needs. Although Kuvi people try to maintain a degree of isolation from the plains, they also maintain limited and controlled interactions with the plains at weekly markets. At these markets, Kuvi people trade castor for the necessary products they can not produce themselves.[38] These include essentials such as cloth, metal, and a Kuvi favourite, dried fish. Unfortunately, another necessity that they must buy is the processed castor oil. It is only the raw material, the seeds, that they sell at market and the Kuvi people must buy back the finished product to use in their lamps and at *puja*. With its broad and important usage, castor is a commodity that makes an essential contribution to not only the Kuvi economy, but also that of the general surrounding population.

Several other characteristics greatly increase castor's value as part of the Kuvi mixed cropping system. The castor plant, which grows in size to be a small tree, is extraordinarily hardy, productive and easy to grow. Although castor is often afflicted with an "insect problem" (1), any insect damage must be inconsequential since the Kuvi participants also rated castor as one of the most "guaranteed" (3) crops. For example, castor thrives with "less rain" (7) as well as in an "old *dongar*" (2). Even after an "old *dongar*" field has been abandoned due to soil exhaustion, the castor "trees" will continue to grow and produce as short lived perennials as the forest regenerates. Furthermore, only during a young *dongar's* first year of cultivation do castor seeds actually need to be

[38] Other crops also contribute to Kuvi market transactions. In decreasing order of importance, these are tumeric, other horticultural crops, and pigeon pea.

sown. New plants are continuously sprouting as seeds that inevitably scattered before being harvested easily germinate in old and even abandoned fields (Amina 2005/01/08). In short, the production of castor continues beyond the three years of cultivation in a *dongar* with little labour input, as if it were a wild plant.

As with castor, pigeon pea (*kandulo*) is a late harvest crop, but pigeon pea is also a very "healthy" crop (6). Being healthy and harvested late gives pigeon pea value as a subsistence crop by providing a new food source through the summer months (April and May) when nothing else is growing and the stores of earlier harvested crops are depleted. Pigeon pea is also very important as a "market" cash crop (1) because it is highly valued by the plains Hindu population. Although there are new dwarf and hybrid varieties of pigeon pea available in the plains, most people agree that the mountain varieties grown by Kuvi are superior (Sathapathy 2005/01/11). The integral value of trading at the local market has already been mentioned above. As with some of the Protein crops, having a market value may give reason to why pigeon pea, and castor, are "more sown" (3). Nonetheless, I have already noted how finger millet and common millet are even "more sown" (1), suggesting that subsistence is priority even though cash crops are also valued.

Pigeon pea is the only Kuvi crop that is considered to have enough of an "insect problem" (1) to be at least some concern to Kuvi farmers. I believe that this characteristic in pigeon pea is directly related to being "late to harvest" (1). The correlation between these characteristics is reflected in the agricultural cycle including the burning of *dongar* fields in preparation for a new growing season. One advantage of the burning process in the fields before sowing is that it kills insect populations at most stages of their life cycle. However, burning the fields does not permanently rid the farms of insect problems. Since pigeon pea and castor are so late to develop, insect populations would be rebounding by the time these crops are setting seed. Insects are a problem for these crops simply because they are late to ripen. Most other crops are harvested early and thus take advantage of the disrupted breeding cycle of insect pests. Being harvested mid-season, a few other pulses have a slight insect problem (4), but all other crops are free of insect damage (7).

Pigeon pea and castor not only add an economic element to the Kuvi seed-mix, but also an element of religious importance in Kuvi culture. The significance of pigeon pea and castor being harvested late and suffering from insects may also explain why they are the only crops associated with religious "festivals" (2).[39] Castor is ritually important only because it enables the production of light in lamps that is a necessary offering for all *puja*. Pigeon pea on the other hand is the focal point of an entire festival called *Bedjenipuja*, which represents a ritually offering of the pigeon pea harvest to the Goddess. This takes place once pigeon pea is ready to be taken out of the fields, and it is strictly forbidden to bring any pigeon pea from the fields to the village prior to *Bedjenipuja*. No other crop is associated with any other *puja* the way pigeon pea is with *Bedjenipuja* (Hutesi 2005/01/09; Laxmipur 2005/01/18). One interpretation of this association is that since pigeon pea is so late to harvest, it is also more "uncertain" to harvest well (7), especially under the threat of insects, but also from too little rain or depleted soil. Therefore, pigeon pea is the focus of *Bedjenipuja* to thank the Goddess for protecting it against its weaknesses and to request continued protection.[40] Additionally, since pigeon pea is the last of a long series of crops to be harvested, it represents the

[39] Common millet and foxtail millet's "many festivals" ratings are 1 and 2 because these are preferred feast crops, but there is no significance with this preference.

[40] Despite being the crop most afflicted with insects, the damage to pigeon pea is never so severe that farmers even consider breaking with tradition to use insecticide on their crops (Laxmipur SHG 2005/01/14).

culmination of all crops harvested before it too. Its offering at *Bedjenipuja* symbolizes a general thanksgiving toward the Goddess for all crops grown in the Kuvi seed-mix, especially against the unpredictable conditions that can cause crop failures. By linking the diversity of crops grown by the Kuvi with the Goddess through religious practice, seed-mixing becomes fixed as an integral aspect of Kuvi culture. Any threat to the Kuvi seed-mix system as a whole is a threat to Kuvi peoples' sense of their own cultural identity. Furthermore, the Goddess becomes an actor in the seed-mix system, contributing to the achievement of food and economic security for Kuvi farmers (see also Nayak and Soreng 1999). Again, from the perspective of Kuvi farmers, any significant alteration to the system can have serious repercussions if the Goddess is neglected or angered.

The Rep IV analysis of Kuvi participants' knowledge regarding seed-mixing, as expressed in a Domain Analysis repertory grid, establishes that many of the Kuvi seed-mix crops can be grouped into crop families. Crops with traits roughly in common are placed into families. Different crop families may share certain characteristics, but none share the exact same profile. The Cucurbits family shares some qualities with the Roots family, but not with the Proteins family. Likewise, there are qualities in the Cucurbits family that are shared with the Proteins family, but not by the Roots. Additionally, the crops finger millet (*madia*), common millet (*kosala*), castor (*joda*) and pigeon pea (*kandulo*) are unique and elude placement in any family. These individual crops share some qualities with other crop families, but once again they also have unique qualities unto themselves. The variability between crops and crop families is important for the support and success of seed-mix systems because when all crop families with their varying profiles are combined in one growing area, all qualities are embodied that area. If crops or crop families are separated into different sections, only a few qualities are embodied in specific areas that may not have compatible qualities. Then, if factors arise causing those crops to fail, that section would be left empty, unproductive, and thus susceptible to erosion on the steep slopes. This diversity ensures the successful harvest of a variety of crops regardless of unpredictable factors that can cause certain crops to fail while also contributing to a reduction in labour inputs. Therefore, seed-mixing is a holistic approach to food cultivation. While there is no single "perfect crop", all seed-mix crops interact and combine their qualities to offer the nearest possible equivalent to a "perfect crop" for ensuring food and economic security for Kuvi people.

Deconstructing to show more diversity:

Discussing the crops of the Kuvi seed-mix as members of families is useful for describing the diversity of the system. This allows the analysis to be simplified and streamlined by referring to groups of crops as families rather than going through each crop separately. However, caution needs to be exercised against reifying the existence of the families that I have identified. Relegating crops into families implies patterns in the Kuvi ratings that correlate different crops together. However, there is no clear pattern that distinguishes each family from the others and several crops do not fit into any families at all. It is also apparent from the discussion above that as each family is presented, it becomes increasingly difficult to give a definitive profile to that family. The variation between crops in a given family, particularly the Roots and Proteins families, is wide enough that it can be argued they are not legitimate families at all. In other words, the weak correlations between crops within each of these families compromises the very integrity of each family to reveal a greater level of fragmentation and thus also diversity.

In the Kuvi seed-mix repertory grid, most crops are actually well dispersed throughout the PrinGrid diagram. In his manual for conducting Domain Analysis exercises, Chevalier (2005) describes this phenomenon as "fragmentation." "You know there is fragmentation when very few constructs are closely matched. There is no pattern in the system. Each element is entirely different" (Chevalier 2005). Although this is one of several "problems" interpreted by analyzing Domain Analysis rep grids, Chevalier acknowledges that in certain research situations fragmentation is not necessarily a problem. When doing an analysis of mixed cropping and agricultural biodiversity in the Kuvi context, fragmentation instead bears witness to the immense diversity of their farming system. In this section, I describe fragmentation in relation to the weak affiliations between crops within the families identified in Figures 4 and 5. Factoring in that several crops cannot be grouped into any family, and that the members of families are only loosely correlated, the individual qualities of each crop becomes more apparent, thus increasing the evidence of diversity (fragmentation). This description is followed by a closer examination of the principal component analysis illustrated in the PrinGrid diagram of Figure 5, which reveals the fragmentation of the Kuvi rep grid to be even greater than initially implied.

Although the Cucurbits family is closely knit, the members of other crop families in the Kuvi seed-mix rep grid show significant variation. There are several instances where crop family members have traits that are not shared by the other members in the family, putting into question the validity of the family. In the PrinGrid diagram the Roots crops are the sole occupants of the top right quadrant, indicating the uniqueness of this family, but they are also widely separated from each other within that space. The Focus diagram dendograms show 81% to 90% similarity between the four Roots crops; significant correlation but much less than for the Cucurbits (92% to 98%). Taro stands out as less healthy than other Roots, and even compared with many other crops. Sweet potatoes stand out because they have some problems with insects. Yams are unique from other Roots because they involve so much labour to harvest, but are also more valuable at the market. There is also particularly wide variation in terms of when Roots are harvested (discussed above). Overall, there are common threads running through the Roots crops, but there are also several characteristics in which one crop is unique from the others.

The crops that comprise the Minor Millets family and the Legumes family are even more loosely affiliated to each other, showing only 80% to 83% similarity between members. The variations between crops in each of these two families are subtle, but occur in *all* constructs. Whereas the Minor Millets and Legumes families are distinct from each other in the Focus diagram, with only 72% similarity between them, the PrinGrid diagram intermixes them into a single family I call the Proteins family. Nonetheless, the diagram still reveals the Proteins family crops as quite loosely related to each other by spreading them over a wide area of the bottom left quadrant. *Baili* pea and *jhuta* bean are even clearly plotted in different quadrants than their kin. Furthermore, *jhuta* bean is closer to the unique crop finger millet than to other members of the Proteins "family." An option could be to include finger millet into the Proteins family, but then it would be necessary to pull in common millet and maybe even pigeon pea and castor and so on. Obviously this would result not only in wide and even contradictory variation within a single family, but also in glossing over the Kuvi farmers' knowledge that subtly distinguishes the different qualities between all crops. Instead it might be better to dismantle the families to acknowledge that Kuvi farmers have given each crop a unique combination of ratings during the rep grid exercise.

The same interpretative approach applied to crop families can be applied to the construct groups. Constructs in the Kuvi rep grid form only loose groupings and matches occur most only in pairs (see PrinGrid diagram Figure 5). For example, "most healthy" crops tend to also require the "most labour" (and vice versa), and crops that thrive only in a "young *dongar*" tend to be more "uncertain" to yield well in general (and vice versa). A larger construct pattern identifies that "domestic" crops are more "insect resistant" while also being "less sown" and "not used in festivals" (and vice versa). However, none of these construct matches represent the exclusive profile of a crop family in part because no construct groups are plotted close to a crop family. Also, the construct group "most healthy/least healthy" and "most labour/least labour" is the only one plotted near a principal component axis. This means that this is the only construct group that follows a major rating pattern in the Kuvi farmers' ratings. Yet since this component represents only 27.6% of variance, it is not a highly representative trend within the entire rep grid. Furthermore, the trends implied by construct matches are not actually representative of all situations. That is, the presence of one characteristic cannot be predicted based on the possession of any one other characteristic because there are too many contradictions. For example, the crops most "uncertain" (vulnerable) to yield are *generally* those same crops that succeed only in a "young *dongar*" (confirmed by 82% correlation in Focus diagram Figure 4). Finger millet is one crop identified as thriving only in a "young *dongar*" (rated by participants as 7), yet out of all of the crops in the mixed system it is one of the ones most likely to "guarantee" (rated as 2) a good yield. To a lesser extent this is also true for pearl millet and foxtail millet as well as somewhat with *jhudongar* bean. Such contradictions to the general trend show the benefits of mixed cropping by proving that each crop has characteristics that make it unique from most other crops, and even from crops that are otherwise identified as being in the same family.

Examining another analytical dimension of the PrinGrid diagram unveils that the Kuvi seed-mix is even more fragmented (diverse) than I have so far suggested. Crops and constructs are plotted on the PrinGrid diagram using the analysis of the two principal components, which comprise the "*x*" and "*y*" axes on the diagram. Recall from the Chapter 2 that the principal components represent the two most opposing patterns within the participants' ratings as well as accounting for the widest variability in ratings (Shaw 1980; Jankowicz 2003: 127-37). To be confident that the PrinGrid diagram shows a complete picture of the repertory grid, the principal components should encompass over 80% of the total variance within the grid (Jankowicz 2003: 127-37). However, the principal components in the Kuvi rep grid add up to a mere 51.1% (27.6% + 23.5%) of total variance. Though the principal components give some credence to the crop families discussed since they do represent the greatest variance within the grid, they do not overwhelmingly represent all patterns in Kuvi participants' ratings. In other words, the legitimacy of the crop families is thrown into doubt since the PrinGrid diagram in Figure 5 is only a partial representation of the Kuvi seed-mix rep grid.[41]

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41 Low representation could suggest inadequacy, on the part of the researcher/facilitator, to elicit constructs that are meaningful to the participants regarding the elements and the topic of research (see next chapter).

As many as seven other rating patterns (components) are also identified from the grid, accounting for 48.6% of variance. The third and forth components alone encompass 31% of all variance, not much less than the two principal components. When using any of the seven other components to analyze the grid, the crops and constructs freely shift around the PrinGrid diagram, dissolving the families they were earlier associated with.

Figure 6: PrinGrid diagram of Kuvi seed-mix, components 1 and 3 (Katragumma 2005/01/04).

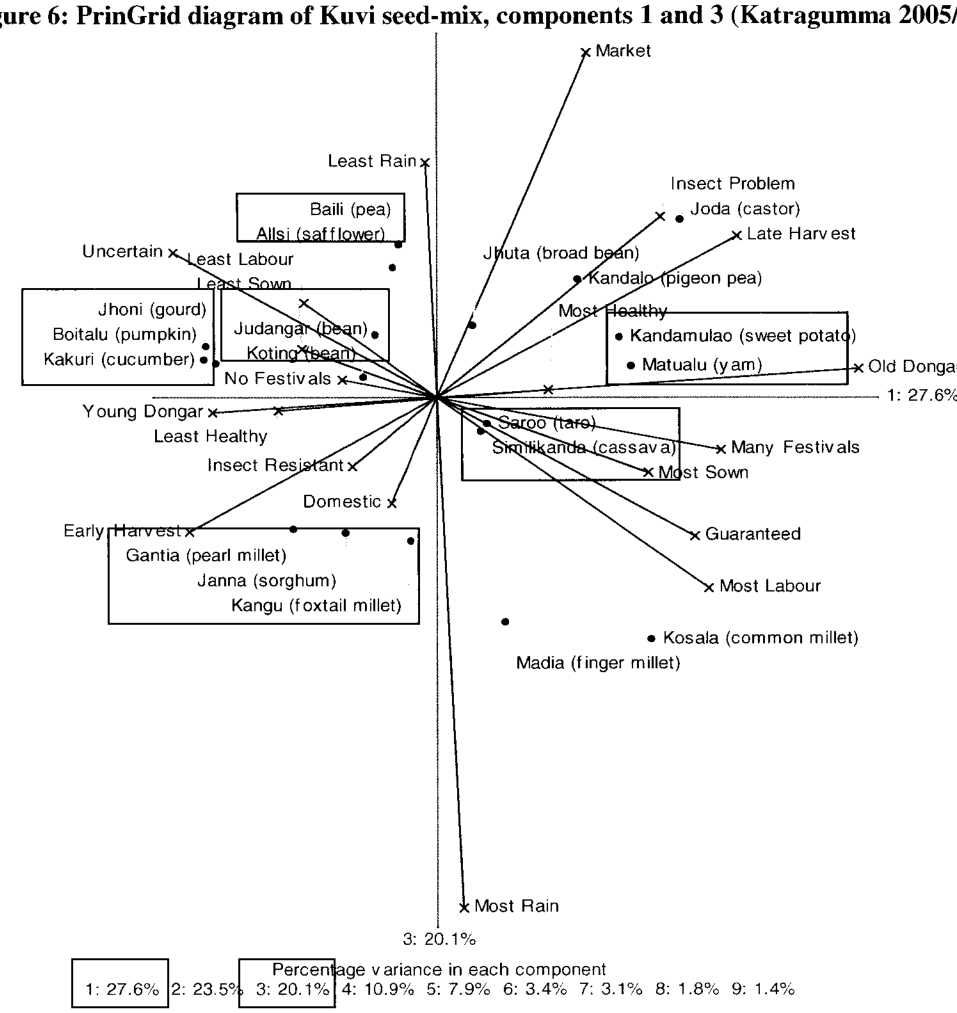
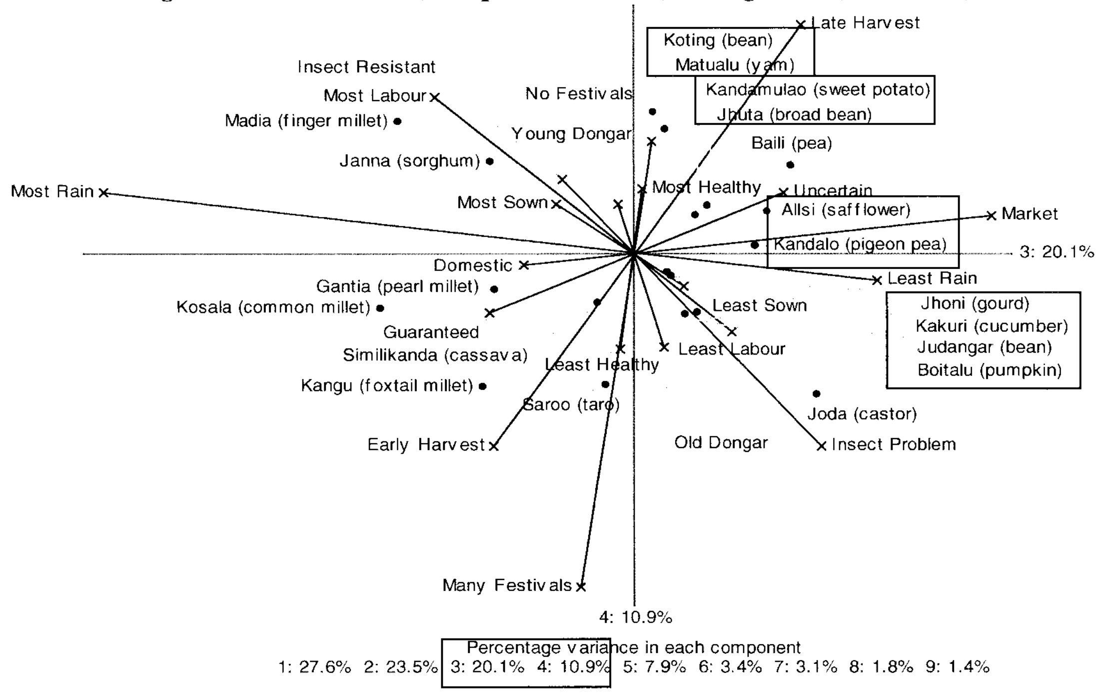


Figure 7: PrinGrid diagram of Kuvi seed-mix, components 2 and 3, Katragumma (2005/01/04).



This attests to how few direct correlations can be made between crops and between constructs. In Figure 6 for example, the PrinGrid diagram uses components 1 and 3 to reveal new patterns, particularly the dividing of crops into pairs. However, the PrinGrid diagram in Figure 7 uses components 3 and 4 and paints a vastly different picture by dispersing crops and constructs even more throughout the diagram. In fact, so many different patterns arise from using different component combinations that no single pattern can be established as dominant. In other words, almost each crop is associated with a different rating pattern, revealing that almost every crop is unique from all other crops. With no single pattern identified as definitive for the Kuvi seed-mix system, the conclusion that the system is fragmented and diverse is further augmented.

Apart from the Kuvi crop families each being unique from each other, there is even a large amount of variation present among crops within the same family. Specific crops in the Roots, Minor Millet, and Legumes families have characteristics that are different from other crops within their family. This shows the propensity toward "fragmentation" in the Kuvi seed-mix system. The weak correlations between crops within the same family are exemplified by the low percentage variance represented in the PrinGrid diagram. With only 51.1% of variance, the families illustrated in the PrinGrid diagram easily break apart when other components are used in the analysis. Therefore, not only does each crop family have needs and uses that are different from other crop families, but also the crops within each family show significant variation regarding their needs and uses. This means that under any given circumstance, the Kuvi people are always able to draw from a diversity of crops to maintain some reliability and stability in their economy, for both subsistence and cash.

The compromise of diversity:

Mixed cropping systems take advantage of varying qualities of many crops to better realize food security, but it does not make for a "perfect" agricultural system. Agronomists argue that seed-mixing as practiced by the Kuvi randomly employs too many types of plants with conflicting growth requirements and habits. As a result, plants compete with each other for light, soil and water resources. Some crops can even damage others through their aggressive growth habits. As plants struggle to survive under these conditions in the *dongar* field, they are unable to achieve their full potential and their ultimate output is reduced (Patra 2005/01/16; Mahapatra 2005/01/16). From the agronomist point of view, reduced yields from an inefficient use of land area is a major obstacle in achieving greater food security for the Kuvi people. Therefore, some agronomists advocate that the Kuvi farmers change the cropping system to focus on the production of one or two of the "most important" crops, supplemented by minor production of a few other crops. Furthermore, from this handful of crops, each crop should be sown separately in altering strips of land that follow the contours of the *dongar* field. Agronomists state that contoured strips of each crop will help to curb soil erosion during the monsoon, while the isolation of each crop will prevent competition between crops to improve the output efficiency each. With an improved yield, farmers would have more of their most important crops for both subsistence, and presumably to purchase other foodstuffs no longer grown by them. However, by maintaining a small amount of diversity from a handful of crops, the agronomists claim there will remain at least *some* benefits of risk management and a varied subsistence diet (Mangaraj and Allim 2005/01/15; Patra 2005/01/16; Mahapatra 2005/01/16).

From the above analysis regarding the uniqueness of each crop however, it is difficult to imagine that just one or two crops in the Kuiv seed-mix can be identified as exceeding all others in importance. This concept marginalizes the multiple inherent values of a host of other crops, whether socially, economically or ecologically. Within the rep grid, indications are that every crop is important due to its specific qualities, denouncing the "misleading notion that agricultural communities are based solely on the production and consumption of a few "staple" foods" (Mazhar and Buckles 2000: 3). I challenged a Kuvi farmer about whether it would be better to cultivate each crop separately to improve yields as suggested by the agronomists. He responded by asking, "Am I supposed to have one *dongar* for each crop? No! So we mix crop" (Tunia 2005/01/05). Clearly, to him having a separate crop on each hill was a preposterous idea involving cutting down more forest than his family can manage let alone more than even exists. The farmer could hardly conceive of growing fewer crops let alone sowing them separately rather than as a seed-mix. When I explained that I meant growing all crops in one *dongar* but isolated into separate plots, he explained that maybe it would be possible, but apart from involving more labour, it would go against their traditions.[42]

As much as agronomists and I would like to analyze the pragmatism of the Kuvi seed-mix system, we must not forget that as a tradition it is an integral part of the Kuvi ethnic identity (see also Pramanik 2000: 125; Soreng 2001: 44, 50-4; Nayak 2000: 10; Nayak and Soreng 1999: 59-61; Nayak, Boal and Soreng 1990: 61, 67; Bahura 1992: 15-6; Daspatnaik 1984: 26, 28). Kuvi farmers rarely make mention of either the benefits or the concerns of seed-mixing. It appeared to me that the Kuvi people placed little priority on the details of indigenous knowledge, preferring to defer most aspects of seed-mixing to the traditions of their ancestors. My inclinations were echoed by Sathapathy, director of an NGO working with the Kuvi people. He states that the Kuvi ancestors passed on their traditions, but not their knowledge that supports the traditions. To question the ancestor's wisdom regarding traditions such as seed-mixing is to cast doubt on their authority and thus all of Kuvi cultural identity (Sathapathy 2005/01/11). However, I also have little doubt that Kuvi people referred to their ancestors because they were not yet ready to tell me more. Towards the end of my stay with the Kuvi people, I learned that they have acute knowledge of how crops in the seed-mix interact with each other. They employ several adaptive strategies in their seed-mix to lessen the effects of conflict between specific crops based on specific characteristics. In particular, farmers plant certain crops at specific locations that not only benefit the growth of that crop, but also

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[42] On another occasion, a Kui man expressed that it would be possible to use chemical fertilizer to improve production, but apart from the difficulties in applying fertilizer in the steep hills, he added that it was against their tradition to use fertilizer (Laxmipur SHG 2005/01/14).

reduce its negative impact on other crops. Moreover, Kuvi people revealed to me significant knowledge regarding how specific traits of some crops are complementary to traits of other crops. Therefore, farmers create an ecological and economic mix that makes sense to them – based on their experience and knowledge – for improving the quality and quantity of all crops inter-mixed.

While the Kuvi mix and broadcast most of their seeds, some seeds are more deliberately sown in specific locations. Kuvi participants stated to me that Cucurbits are not broadcast with the other seeds, but dibbled into the soil afterwards because they grow into large, heavy vines that can easily smother other crops. Instead, they are sown specifically near trees stumps left in the fields as well as next to stone boundary walls where they can climb and make use of otherwise wasted space (Katragumma 2005/01/04; Kurli 2005/01/23; see also Patra 2005/01/16).[43] Kuvi people established several other reasons why growing cucurbits vertically was advantageous. If allowed to spread along the ground, they would not only smother and damage other crops, but at every point where the vine comes into contact with the soil, the plant will develop roots there. As described earlier, this phenomenon is advantageous for increasing the production of sweet potato. However, this is a disadvantage for fruiting plants such as the Cucurbits. Being allowed to set root in many places pilfers nutrients from the soil that can be used by other plants. The extra nutrient absorption into the Cucurbit plant promotes excessive leaf growth, which in turn causes a reduced fruit development. Furthermore, when allowed to grow vertically, the vines exposure to light increases, encouraging flowering and thus increasing fruit production (Kurli 2005/01/23).

[43] Sometimes I even saw pumpkins sown just below the rooflines of houses so that fruits can develop and ripen on the roofs.

Another adaptive strategy to reduce the negative effects of seed-mixing is to adjust the seed-mix combination as well as the amount of each seed being planted. During a discussion with a Kui self-help group (Laxmipur SHG 2005/01/14), it was stated that during a *dongar's* first year of cultivation some families grow only finger millet (*madia*), foxtail millet (*kangu*) and pigeon pea (*kandulo*). Referring to the previous discussions and the Focus diagram in Figure 4, recall that these three crops have very important values to the Kuvi for achieving food security. By growing only these three important crops during the first year, farming families are able to maximize their yields to fulfill both subsistence needs and market earnings. Fewer crops in the seed-mix means there are fewer possibilities for crops to be competing with each other. Additionally, Kui farmers sow these three crops knowing they will be taking advantage of the fresh, rich soil of a new *dongar*. However, also note that all three of these crops do not yield well in an "old *dongar*" (7). As the quality of the soil deteriorates in subsequent years, it becomes increasingly possible that these crops could fail, severely threatening the food security for Kuvi families. Therefore, in the second year of a *dongar's* cultivation, farmers add the twenty-odd other crops to the seed mix, including more hardy types, to build resilience against declining soil quality (see also Bahura 1990: 2). Even though adding more crops in the mixture intensifies the competition between crops, it also improves the chances that there will be enough of a variety of crops to harvest, even if some crops do poorly or fail. It should be reiterated though that this is not a general practice, and participants only referred to it as a management technique employed by some families. Nonetheless, the headman for several Kuvi hamlets stated that it is not uncommon in the second year of a *dongar's* cultivation to reduce the amount of finger millet sown and replace it with common millet (Tunia 2005/01/05).

Apart from the above practices intended to reduce the negative effect of specific crops upon other crops, there are other crops that act as companions with each other, so that growing together actually provides a benefit. Two Kuvi individuals, an older man from Kurli and a young man from Hutesi, explained to me that as they harvest common millet, they tie together several finger millet plants in preparation for harvesting them. They said that this practice helps prevent the ripe finger millet seeds from scattering as well as making it easier when they come around again for the finger millet harvest (Kurli 2005/01/23). These two farmers also explained to me how the strong, binding roots of finger millet help to anchor down and keep upright common millet plants that are otherwise prone to lodge since they have long stems and weak roots (Kurli 2005/01/23). This logic was carried over into all crops in general. The deep taproots of legumes (except for *koting* bean which is weak from having a very shallow taproot) and root crops bind the soil to prevent erosion as well as anchoring the shallow rooted crops. Furthermore, root and legume crops require "less rain" (rated 7, again except for *koting*), and because of the depth of their roots, they draw their water from the subsoil. The other shallower rooted crops draw from nearer the soil's surface. Therefore, these plants are considered rather good companions to be mixed together in the *dongar* field.

Another significant companion relationship is between the leguminous vines (peas and beans) with the tall stalks of pearl millet (*gantia*), sorghum (*janna*) and castor (*joda*), which can reach over ten feet in height. The vines use these other plants' stalks as natural trellises to grow on. This prevents the vines from growing along the ground where they are deprived of light needed for proper growth and flowering. Seeds that do develop are difficult to harvest when they are close to the ground, but they have likely rot from contact with moist soil. Growing vertically has the added advantage giving maximum exposure of light to the vines for maximizing flower production and thus seed production (A similar argument was made earlier for the "Cucurbit" family). The quality of acting as a trellis is so important that new dwarf hybrid varieties of sorghum are not even being considered by Kuvi people for their fields for their inappropriate growth habits (Patra 2005/01/15; Mahapatra 2005/01/16).

Finally, although competitive attributes within a seed-mix increases competition amongst crops to reduce overall yields, Kuvi people say the same attributes reduce weed growth while also conserving ecological resources. The dense growth of crops which vary widely in height and spread creates a canopy that protects the soil surface in the same way that a tropical forest canopy does. This prevents both heavy rains and direct sunlight from hitting the soil directly. The results are that soil is less easily washed away by rain, soil moisture is less easily evapourated by sunlight, and weeds are unable to germinate and thrive without proper space and light (Mangaraj and Allim 2005/01/15; Patra 2005/01/16). Kuvi farmers weed their seed-mix field just once a year. Therefore, contrary to critics' claims regarding shifting cultivation and seed-mixing, the system is perfectly adapted to the monsoonal climate and mountainous landscape (e.g. Grandstaff 1980). Kuvi farmers prefer long term conservation of soil, water and labour resources over the cost of short term gains in yields. Alternatively, in the valleys, multiple ploughings followed by mono-crops leave soil exposed to sun and wind allowing weeds to germinate while soil and water erode. Furthermore, major capital investments are required for cattle, tools, their maintenance and fertilizer.

Admitting that seed-mixing results in a reduction in overall crop yields, Kuvi farmers consider this a small price to pay for the benefits of diversity. The labour saved by growing all crops together enables people to make more efficient use of their time when sowing and weeding - a value that is lost when sowing mono-crops in rows. While growing many crops together may cause them to interfere with each other, they also interfere with the growth of weeds. Furthermore, the impact of seed-mixing on overall yields is not a black and white debate. Some crops benefit by being grown mixed with other crops, and others even depend on it in order to grow properly. The yields of these crops may increase as a result of being included in the seed-mix. However, food security is not necessarily achieved through techniques to improve yield per hectare efficiency. Having surpluses of a few types of crops does not benefit Kuvi families since they are not able to sell those surpluses, nor purchase other nutritious food. Therefore, for remote Kuvi farmers, yield efficiency is actually of secondary importance compared to yield diversity.

Conclusions about the Kuvi seed-mix:

The vast seed-mix system of the Kuvi people in a sense mimics the sub-tropical forests and mountains that surround them: diverse and chaotic (see also Dove and Kammen 1997). The method of management, mixing seeds and then broadcasting them throughout the field, contributes to the sense of chaos since all crops grow randomly amongst each other. Nonetheless, Kuvi farmers reveal a body of knowledge surrounding this chaotic diversity. In the above discussion, I draw interpretations from Kuvi farmers' own analyses of their seed-mix system through the use of the Domain Analysis participatory methodology. Engaging in a joint analysis with Kuvi farmers is valuable because having many crops in a seed-mix does not alone prove that the system is actually diverse. Instead it is the knowledge that the Kuvi farmers have about their many crops that reveals the real diversity. Apart from being biologically diverse, Kuvi crops have a variety of ecological and socio-economic characteristics. According to these characteristics, or constructs, many of the crops can be loosely affiliated into one of four distinct families. However, closer examination of the rep grid (Figures 4 and 5) reveals that similarities between crops are limited and overall most crops are given unique profiles by participating farmers. Focusing on the differences between crops, it is conclusive that the Kuvi seed-mix system results in farms that are extraordinarily diverse in terms of how they contribute to food security considering farmers' social, economic, political and ecological marginality.

Although the resiliency of a diverse system offers reliable harvests for food security, this is countered by less efficient production due to inter-crop competition. Agronomists therefore advocate that Kuvi people specialize their farming practices by sowing fewer crops with a focus on markets. However, Kuvi people are reluctant to alter their sowing practices for several reasons. Firstly, the seed-mix system employed by Kuvi farmers is a tradition established by their ancestors. The importance of tradition to Kuvi people has enabled their agricultural practices to persist for generations with little significant disturbance or alteration. Other reasons attest to the economic and ecological advantages to seed-mixing. It is misguided to focus on high yields of a few crops for income generation since markets are neither easily accessible nor can they offer food as nutritious as what the Kuvi farmers already grow. Moreover, several crops depend on the complementary traits of other crops in order to properly grow and produce. Kuvi farmers are also more concerned about conserving soil and water resources as well as efficient use of labour, than in maximizing yields.

Probably the most important value in seed-mixes, though, is the resilience that they provide against ever changing and uncertain ecological and economic conditions. Kuvi farmers are able to increase their control over the factors affecting successful production by ensuring that some crops will thrive under conditions that would risk the failure of other crops. Even the agronomists recognize this value (Mangaraj and Allim 2005/01/15; Mahapatra 2005/01/16). For example, pigeon pea is one of the healthiest crops, but it is susceptible to insect attack. Sorghum is considered the least healthy, yet it has value for being insect free. Thus it is a good idea to incorporate both crops in a farming system. This is likewise true if a crop needs a lot of water or is drought tolerant where the monsoon rains can be anything from torrential flooding to non-existent. If either extreme occurs, some crops will fail, but others will thrive. If neither extreme occurs, than all crops will yield reasonably well. A diversity of crops also embodies a diversity of uses so that Kuvi farmers can adjust to fluctuating markets. Depending on the situations, families may decide to hold their pigeon pea for domestic use only, or they may find it most advantageous to take more of it to market than they ordinarily would to increase their profits. Therefore, a diversity of successfully yielding crops in the *dongar* fields ensure that Kuvi families will always be able to acquire what they need for both economic and food security.

As I stated before, no crop has a perfect set of qualities for all conditions. Yet holistically speaking, when combined all crops succeed in meeting all qualities. The Kuvi seed-mix exemplifies how different crops with different qualities can all contribute to a stable and reliable subsistence food system. This speaks to the importance of the mixed cropping system in its totality as a means to meet all economic and nutritional requirements in all possible environmental conditions. Since most crops in the Kuvi seed-mix are drought and insect resistant, there is a good chance that there will be a variety of nutritious food available every year, especially since most crops are also healthy. However, since many crops are uncertain to yield well when a *dongar* field is in its second or third year of cultivation, the insurance of having many crops to fall back on is essential. Kuvi participants clearly stated to me that any total crop failure is beyond memory, if it has ever happened at all. They also say that if the rains are good the yields are good in both the *dongar* field and the rice fields in the valley. On the other hand, if the rains are poor the valley's rice crop will surely fail, but there will still be a decent harvest from the *dongar* fields.

Korku

The management features of the Korku "integrated" mixed cropping system are indicative of the general features of their social and physical environment, including more extensive contact than Kuvi farmers do with other societies and the central Indian government (Vandergeest and Peluso 1995; Li 2001). Not far from the Korku villages are productive plains where mainstream farmers grow large stands of one or any combination of a few crops such as cotton, sugar cane, wheat, chickpea, and pigeon pea. The cropping system in the plains specializes in a few crops to achieve maximum yield efficiency and thus maximum profits in the national economy. Interaction with mainstream valley agriculture has affected Korku farmers' experience of mixed cropping, influencing them to reflect differently upon their practices. Seeing the economic advantages of mono-cropping Korku farmers have adapted their mixed cropping strategies. This has in turn prompted them to develop a sophisticated and acute knowledge of their agricultural practices as a whole.

As a result, the Korku "integrated" mixed farming system illustrates a medium between the intensive mono-cropping of the plains with the very diverse seed-mix system of the Kuvi just discussed. Mono-cropping is planned and specialized to maximize yields per hectare ratios, while the Kuvi seed-mix is almost random, sacrificing high overall yields for maximum resiliency against unpredictable changes. Korku farmers grow about twenty crops in their fields, amounting to approximately fifty varieties,[44] nearly as many crops as the Kuvi grow. However, Korku farmers divide their land into sections, growing most crops separately, carefully matching the needs of each crop with the conditions offered in each section. This management style is a form of inter-cropping, where different crops are sown in different sections of a single field. In addition, the crops grown in sections follow a seasonal rotation based on their climatic needs. Some crops are sown at the beginning of the rainy (monsoon) season around June or July, while others are sown in November at the beginning of the cool dry winter. The monsoon crops and the winter crops are sown in succession, so that after the monsoon crops are

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[44] This does not include a few vegetables such as eggplant (*baigan*) and cauliflower (*phul gobi*) grown in kitchen gardens behind their homes. Likewise, the size of landholding affects which crops are grown overall. Families with little or poor quality land tend to grow fewer crops, reducing overall farm diversity.

harvested, the fields are ploughed again and the winter crops are sown into the same plots. Nonetheless, all Korku farmers also reserve a section of their field for a seed-mix, but the Korku seed-mix is highly specialized compared to that of the Kuvi people. Out of more than twenty crops, only eight specific crops are employed in the seed-mix. While the seeds are mixed together prior to sowing, they are subsequently sown buried in rows using oxen and seed-drill.[45] As I will discuss below, the prominence of the seed-mix within each farm family's landholding depends on the wealth of the family and their proximity to the dominant and mainstream economy of the plains. Therefore, Korku farmers "integrate" seed-mixing with sections of land partitioned for inter-cropping other crops which are sown successively throughout the year.

One intended outcome of adopting strategies of specialization and intensification (i.e. a few crops in a seed-mix, several in single stands, and all drilled in rows) is to improve food security by improving yields, compared to broadcasting a large variety of seeds over a single area. This means more food harvested for subsistence as well as more cash earned from the market for purchasing what is not produced on the farm. However, in order to maintain high efficiency these strategies limit how much diversity can be sustained on a farm. The overall diversity of the Korku farms is less than that of the Kuvi farms in order to prevent crop competition from negatively affecting yields. On the one hand the Korku seed-mix is less diverse simply because it employs only eight different crops. On the other hand, although the entire Korku mixed copping system employs almost as many crops as the Kuvi system, analysis of the system reveals that there is less variation between crops, and thus less diversity. This conclusion is reflected in the Domain Analysis repertory grids discussed below. Whereas the diversity of the Kuvi

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45 For illustrations of Korku ploughs and seed-drills, see Fuchs (1988).

seed-mix system is illustrated in the "fragmentation" pattern within the repertory grid, the Korku repertory grids illustrate "polarization" (Chevalier 2005: 15). Polarization results from Korku participants' ratings identifying just two distinct crop families with opposing profiles from each other. The polarized grid puts a strain on food security because crop diversity is reduced to an "either/or" scenario. Opposing profiles mean that either one crop family will thrive under one set of conditions or the other crop family will thrive in another set of conditions. Since it is unlikely that both sets of conditions can be met at one time, only one family will thrive. If neither set of conditions arise, then the whole system threatens to collapse.

Nonetheless, while the Korku farmers employ some cropping strategies derived from farmers in the plains, they consciously refuse to convert their farms entirely over to mono-cropping or even inter-cropping for economic gain (Takarkheda 2004/12/24; Bethekar 2004/12/25). The Korku people may be more influenced by other societies than the Kuvi people are, but they are still relatively marginalized and remote. Since Korku farmers cannot easily access the economic and technological infrastructure that makes mono-cropping profitable, mixed cropping remains a distinctive feature of Korku agriculture for achieving food security (Charal et al 1997). They insist on maintaining at least some degree of mixed-cropping and especially seed-mixing because they claim, as Kuvi farmers do, that employing a diversity of crops ensures that unpredictable ecological factors will not leave them suffering from sweeping crop failures. Therefore, while I argue that the Korku system is less diverse than the Kuvi system, I maintain that it is still more diverse than with the plains agriculturalists. After all, it is plains agriculture that Korku people compare themselves to when they speak about their agricultural diversity. In addition, the Korku mixed cropping system is economically more diverse than either the Kuvi system or the mono-cropping of the plains because they more thoroughly "integrate" cash cropping with subsistence agriculture (see Charal et al 1997).

This section of the chapter focuses on repertory grids developed with farmers at two different Korku villages, Bulumgavhan and Takarkheda. I begin with a Domain Analysis of the Korku seed-mix. A detailed discussion of Korku farmers' knowledge about the interactions between seed-mix crops follows. For this I employed a different participatory technique called Causal Dynamics (Chevalier 2005b), also drawn from the Social Analysis System[2] repertoire. Finally, I discuss the inter-cropping feature of the Korku "integrated" mixed cropping system. The grids reveal that the Korku mixed cropping system is less diverse than that of the Kuvi people. Less diversity suggests less resilience and thus less food security. However, the Korku system is also built upon more detailed knowledge of farming techniques intended to improve yields. Greater yields then may offset the risk of having less diversity.

Korku version of "seed-mixing":

I begin the Korku mixed cropping discussion by focusing on the characteristics of their seed-mix (Bulumgavhan 2004/12/07). All Korku families insist on maintaining this cropping tradition in at least part of their farmland. The crops in the Korku seed-mix system according to the order of their harvest from earliest to latest are maize (*makka*), rice (*dhan*), sesame (*tilli*), black gram (*urad*), sorghum (*jawar*), pole bean (*barbaty*), green gram (*moong*) and pigeon pea (*tur*). As with the Kuvi seed-mix, the Korku seed-mix has all the benefits of a long and varied harvest of subsistence crops and cash crops.

At the time of my research with the Korku (December 2004), green gram was mostly harvested. Pigeon peas were still ripening, but some were being harvested for casual eating.[46] Several uncultivated plants were also being harvested from the seed-mix plots. These "weeds" are allowed to grow at this late stage of the seed-mix growing cycle. They are little threat to the almost ripe pigeon peas. Furthermore some are used for their fibre to make ropes and ties (*hibiscus*) or as forage for livestock (*celosia*) (Bethekar 2005/02/04).

Although uncultivated crops are beneficial and important, the discussion of the Korku seed-mix system will focus only on the eight cultivated crops mentioned above. These eight crops represent the elements in the repertory grid analyses diagrams illustrated in Figures 8 and 9. Five construct sets are used to characterize and analyze the crops. As with the Kuvi people, Korku participants had difficulty with participating in the process of construct elicitation. At first, I attempted different construct elicitation techniques, but eventually participants and my co-facilitator agreed that I should provide the constructs. I tried as much as possible to introduce constructs drawn from casual statements made by farmers during discussions with me. However, once again the constructs reflect more on my perceptions of valuable criteria for rating crops. Constructs ask if the crops are "early harvested" (1) or "late harvested" (7), to what degree crops are for "domestic" (1) use or are taken to "market" (7), which crops give "large yields" (1) or

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46 Korku people with whom I stayed remembered a sorghum variety called "Nilya" that was high yielding and preferred for making bread (*chapati*) flour. They also said that "Nilya" needed good soil and lots of rain because it was late ripening (just before pigeon pea). They say their hilly soil is now too poor and their rains too short to continue cultivating "Nilya". It is the only one of their traditional crops that they no longer grow (Bulumgavhan 2004/12/06; Bulumgavhan women 2004/12/08). I saw, however, that "Nilya" is still being cultivated by Korku people living deeper in the valleys (Salwarkheda) where the soil is still good enough. At the time of my research, these farmers were trying to protect "Nilya" from birds since it was almost ripe to harvest.

"small yields" (7), which are "more healthy" (1) or "less healthy" (7), which need "good soil" (1) to yield well and which still yield well in "poor soil" (7).

I use a rating scale of 1 to 7, but in retrospect I could have used a rating scale of 1 to 5 since the Korku seed-mix utilizes only eight different crops. This reduced scale would have decreased the complexity and "spurious precision" (Jankowicz 2004: 55) of the diagram by using fewer rating possibilities. Nonetheless, a rating of 1 to 5 would still allow participants to identify subtle differences between crops compared to a limited either/or scenario when using a scale of 1 to 2 or 3. Interestingly, as the repertory grid process unfolded using a 1 to 7 rating scale, participants often gave the same ratings to different crops. This resulted in several rating possibilities not being used at all for certain construct sets. I was certain to confirm with the participants that by giving the same rating they are saying that one crop is identical to another according to the construct set being applied. We would then either readjust the ratings accordingly to the participants' satisfaction or they would assure me that it was correct that these crops were the same in this respect and that it was also correct to not use certain rating options at all.

Figure 8: Rep IV analysis of Korku seed-mix repertory grid, Focus diagram (Bulumgavhan 2004/12/07).

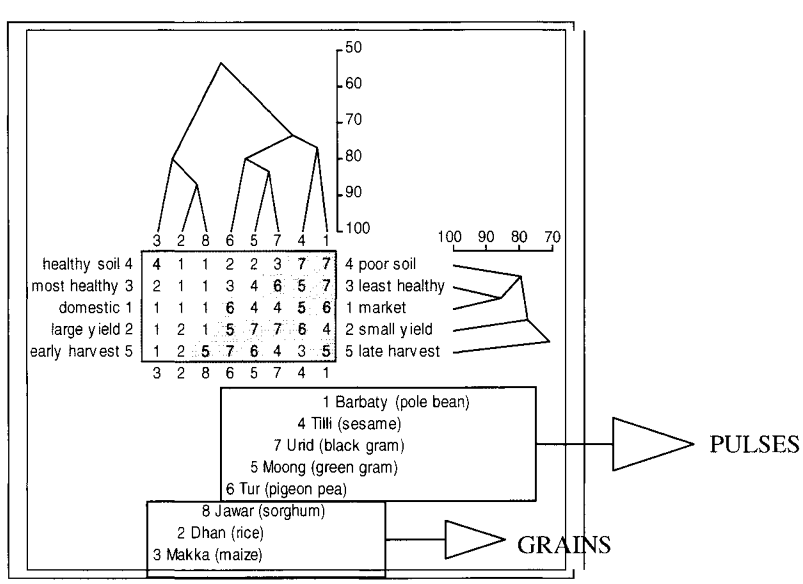
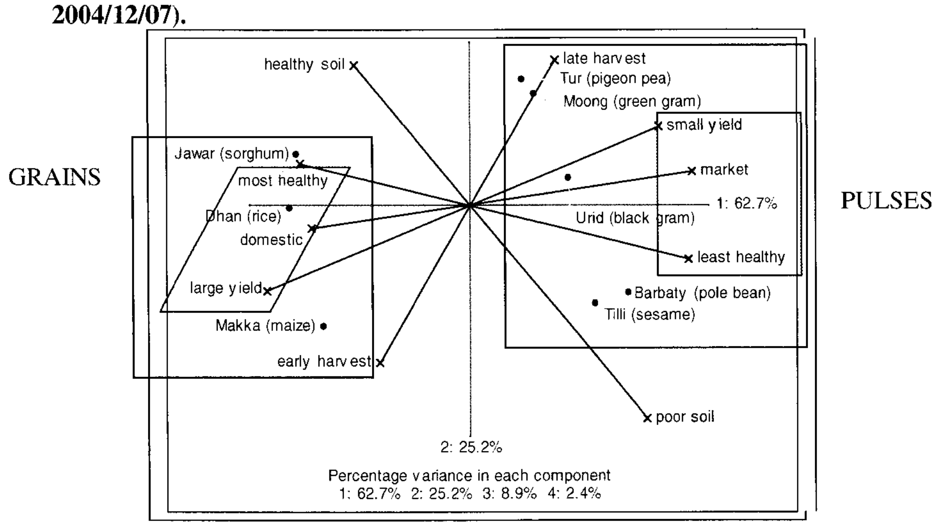


Figure 9: Rep IV analysis of Korku seed-mix repertory grid, PrinGrid diagram (Bulumgavhan 2004/12/07).



Prior to discussing the crop families, construct groups and their ratings, I will comment on the principal components analysis of the Korku seed-mix rep grid. In the Kuvi section above, the low percentage variance of the PrinGrid diagram indicated the weakness of the family correlations, thus enforcing the argument that the Kuvi seed-mix is fragmented and diverse. In the PrinGrid for the Korku seed-mix (Figure 9), the two principal components represent 87.9% of total variance. Therefore, the PrinGrid diagram encompasses the vast majority of the patterns identified from the Korku participants' ratings of crops and constructs. In other words the diagram is highly representative of the Korku seed-mix and the farmers' knowledge of it. There are two other components which represent only 11.3% variance, bearing little relevance to the overall interpretation of the grid. When either of these components is used to form a PrinGrid diagram, the plotting of crops and constructs do not change nor do the relationships between them. This means that analyses and interpretations are drawn from the diagrams with confidence.

The Domain Analysis repertory grid of the Korku seed-mix (Bulumgavhan 2004/12/07) is particularly polarized, distinctly identifying two crop families, illustrated by the two main "branches" of the Focus diagram dendograms (Figure 8). The families are the "Grains" family comprising maize (*makka*), rice (*dhan*) and sorghum (*jawar*); and the "Pulses"[47] family comprising pigeon pea (*tur*), black gram (*urad*), green gram (*mung*), pole bean (*barbaty*), and sesame (*tilli*).[48] Unlike the many families in the Kuvi seed-mix, there are no shared characteristics between the Grains and the Pulses of the Korku seed-mix. Instead, Korku farmers' ratings indicate only 55% similarity between the two families, categorizing the seed-mix crops into either one set of characteristics or the opposite set of characteristics. Three construct sets in particular contribute to the polarized profiling of the Grains and the Pulses crop families. These construct sets are "most healthy/least healthy", "domestic/market" and "large yield/small yield". Looking at the PrinGrid diagram in Figure 9, these three construct sets closely straddle the first (horizontal) principal component. This indicates that they roughly conform to the same rating pattern used to establish the first principal component. Since the principal component is highly representative of the entire rep grid, accounting for 62.7% of total variance, the three constructs can be confidently used to profile the crop families.

As seen in Figures 8 and 9, Grains family crops are clustered to the left hand side of the Focus diagram, as well as plotted to the far left hand side of the PrinGrid diagram.

47 "Pulses" and "Legumes" are synonymous, both referring to peas, beans and lentils. I use "Pulses" as a crop family name in the Korku repertory grids to avoid confusion with the "Legumes" family in the Kuvi seed-mix rep grid.

48 The family names given to the crops by me correlate to botanical classifications. Grains are in the botanical family of *poaceae* and Pulses are in the botanical family of *fabaceae*. Botanists classify crops in to families based on physical characteristics. Although I note that Korku farmers' ratings identify the same crop families, they did so according to empirical criteria represented as the constructs in a Domain Analysis grid. With the limited number of constructs used in this rep grid, Korku farmers have classified the oilseed sesame as part of the Pulses family even though botanists list it as *pedaliaceae*.

This position results from the extreme ratings Korku farmers gave the Grains according to the constructs; 87% of all ratings for the Grains crops are 1 or 2. These extreme ratings contribute to the definitive profiling of the Grains family crops along one pole of the three constructs just discussed. The Grains crops are strongly identified as "most healthy" (1 to 2), "domestic" (1) and "large yield" (1 to 2). The similarity of ratings for these constructs is not a coincidence, but evidence of the importance Korku farmers place on subsistence for their food security. A cause and effect relationship summarizes how these three constructs profile the Grains crops. The Grains crops are the most harvested crops in the Korku seed-mix, yet these are not marketable crops. There is no commercial value for the non-irrigated brown, black and red varieties of Korku rice. Instead, Korku farmers knowingly grow large amounts of the Grains because these crops are most healthy, and families desire to reserve as much as possible for domestic consumption to contribute to their food security.

The two construct sets "healthy soil/poor soil" and "early harvest/late harvest" also contribute to the Grains profile, but perhaps less significantly due to specific exceptions. These exceptions alter the general pattern of the Korku seed-mix rep grid, greatly impacting the overall analysis of the grid. For example, the Grains crops generally need "healthy soil" (1) to yield well, but maize is an exception by being tolerant of average quality soil (4). Likewise, the Grains are generally "early harvested" (1 and 2), but this time with the exception of sorghum which is much "later harvested" (5). While these exceptions do not negate the general trend that Grains crops need healthy soil and are harvested early, they do establish new patterns in the Korku participants' ratings, different from the pattern used to plot the three most definitive constructs first discussed.

The impact of the exceptions is very telling in the Focus diagram of Figure 8. Looking at the dendograms, the Grains crops are rated as 80% similar. However, the similarity between Grains would be much greater if it were not for the fact that maize tolerates poorer soils and that sorghum is harvested later in the season. Therefore, the two exceptions insert at least a small level of diversity within an otherwise homogenous crop family. This diversity contributes to the level of food security the Korku seed-mix offers. Even if the soil is fairly poor, a large yield of healthy maize is ensured from the seed-mix because of its soil tolerance. Furthermore, drawing a large harvest of sorghum late in the season ensures that Korku families will continue to have healthy grain to eat throughout the year.

The exceptions posed by maize and sorghum add a small degree of diversity to the Grains family, which diminishes the level of polarization in the Korku seed-mix. In the PrinGrid diagram of Figure 9, the different rating patterns for the constructs "healthy soil/poor soil" and "early harvest/late harvest" result in these constructs being plotted away from the principal components, and away from the other constructs. Polarization is diminished within the seed-mix by imagining that maize's tolerance of poorer soils pulls that construct slightly toward the Grains family and away from the Pulses family. Likewise, sorghum's later harvest time pulls that construct slightly away from the Pulses family toward the Grains family. Therefore, even in poor soils farmers will at least get an early harvest of maize to complement their Pulses harvests, and farmers will be able to eat their late pigeon pea and green gram harvest with *chapatti* (flat bread) made with sorghum flour. As a result the constructs in the diagram are more spread out than if maize and sorghum conformed to the general pattern of polarization. Without the exceptions in maize's and sorghum's ratings, the Grains family would be even more homogenous and extreme in its characteristics, thus intensifying the overall polarization of the seed-mix to only 45% similarity between the two families. The exceptions save the Korku from near crop failures from all Grains should the soil quality be poor.

The Pulses crop family embodies the opposite profile as the Grains crop family, acting as a counter balance to the extremity of the Grains crops. Therefore, the opposite poles of the same constructs are invoked when describing the Pulses family. Korku farmers harvest only a "small yield" (4 to 7) from each Pulses crop, and some of that yield is taken to "market" (4 to 6) for cash and/or trade. The relative undesirability to grow more of the Pulses crops and reserve them for domestic consumption may be because these crops are considered "less healthy" (3 to7). More likely, a smaller yield from each Pulses crop still amounts to enough for subsistence needs since the yield is drawn from five crops, compared to only three crops in the Grains family. Secondly, the marketability of Pulses crops makes a major contribution to food security by allowing Korku farmers to purchase the necessities that they do not produce themselves. Korku farmers neither depend entirely on subsistence nor trade, but instead diversify their economy by integrating both (Charal et al 1997). It must be noted however, that subsistence still receives priority in the Korku seed-mix. None of the Pulses crops are rated 7 for the market construct, which means that none are taken exclusively to market. Korku families first reserve what harvest they want for themselves before allocating what will be taken to market. A group of Korku women expounded on the flexibility that the marketability of Pulses crops offers their families. They told me that if the pole bean harvest is small, they prefer to keep all for domestic use rather than take any to market

(Bulumgavhan women 2004/12/08). Nonetheless, if it were more opportune, they could most of the pole bean harvest to market so that they could buy other foods. Lastly, while the Pulses are rated as less healthy, and pole bean being the "least healthy" (7), none are considered to be *un*healthy.

Polarization in the Korku seed-mix is illustrated by confining the Pulses crops to the right side of the PrinGrid diagram (Figure 9). However, the Pulses are neither as far off to the side as the Grains crops are nor as rigidly defined as the Grains crops. Instead, the Pulses are spread out within this section of the diagram, including some being plotted toward the centre of the principal component axis. This is because the Pulses crops received less extreme and more varied ratings within each construct, especially the three most representative constructs already discussed. Varied ratings mean that there is diversity within how the Pulses crops embody each characteristic. For example pigeon pea (3) is considerably healthier than black gram (6), but it is less healthy than any of the Grains which are all rated 1. Likewise, more of the pole bean (6) harvest than the green gram (4) harvest is taken to market by farmers, perhaps because the pole bean yield (4) is larger from the seed-mix field than the green gram yield is (7). A few Pulses crops have extreme ratings of 6 or 7 for some constructs, but overall most ratings range between 4 and 7. This variability can be contrasted with the Grains crops' ratings which are mostly limited to 1.

The ambiguities in the Pulses family's profile indicate diversity within the family, which in turn further diminishes the extremity of polarization in the Korku seed-mix system. Softening of the polarization is exemplified not only in the three main constructs, but also in the construct sets "healthy soil/poor soil" and "early harvest/late harvest." If maize's tolerance of "poorer soil" (4) pushed the bar representing "healthy soil" away from the Grains crops, the dependency of pigeon pea, green gram and black gram on "healthy soil" (2 to 3) further pulls that construct towards the Pulses crops. Although in general these Pulses family crops tolerate slightly poorer soil than the Grains crops, they are not as tolerant as maize is said to be. Thankfully, sesame and pole bean thrive even in the "poorest soil" (7), increasing the overall resilience of the whole seed-mix system. The Pulses are identified as a family because they generally have related ratings according to the constructs.

The extremity of sesame's and pole bean's tolerance of poor soil not only maintains the polarization between the Pulses and the Grains, but also creates a divide amongst the Pulses family into two sub-families (see dendograms in Figure 8). Sesame and pole bean differ greatly from both the Grains and the other Pulses in that they have minimal soil requirements in order to produce well. Although they therefore contribute greatly to the resilience of the Korku seed-mix, it means that most seed-mix crops, including the seemingly most important ones, are relatively vulnerable to failure in poor soils. Therefore, despite pole bean being less healthy and predominantly for market, tolerating poor soils shows how essential it still is to the seed-mix system and food security.

All crops have specific values that encourage their maintenance in the Korku system regardless of weaknesses. Domain Analysis is a particularly effective tool for identifying the strengths of certain crops that offset the potential weaknesses of other crops, which could be useful for appropriate agricultural development. With respect to the Korku seed-mix rep grid, an opportunity to add more constructs to the Korku seed-mix rep grid could reveal additional valuable qualities of crops such as pole bean that at first appear "weak".

The polarization of the Korku seed-mix is not as extreme as it could be thanks to variation within the Pulses family and exceptions within the Grains family. It is not a wide margin of variability, but there is at least some diversity in the Korku seed-mix to support farmers' claims of its advantages over the mono-cropping systems in the plains. If ecological conditions are such that some crops fail, Korku farmers claim that those conditions would be suitable for other crops to thrive. In the plains near the Korku villages, many farms are dominated by cotton and sugarcane.[49] Neither of these crops, of course, can be subsistence crops. Should conditions be such that these crops do not produce well, or the family cannot afford chemical inputs, or even if bumper yields drive down market values, farm families may find themselves destitute. Korku farmers' diversity offers some protection against these threats. However, the overall polarization of the Korku seed-mix rep grid suggests that this reliability is more dubious than in the Kuvi system. The diversity is not as extensive as in the Kuvi mixed cropping system, and thus neither is the protection as extensive.

Interactions between seed-mix crops:

As it is with the Kuvi seed-mix, the benefits of seed-mixing offered to Korku farmers comes at the cost of negative crop interaction and competition between crops. Competition between crops can reduce yields, resulting in less food and less income from farmland. However, Korku farmers do not grow all of their crops together in a seed-mix as the Kuvi people do. Instead, the Korku seed-mix system involves only eight crops

49 Large stand of wheat, pigeon pea, or chickpea are also common.

comprising two distinct crop families in a polarized relationship. The Korku seed-mix is only moderately diverse, so there is also less opportunity for competition than in a fragmented system. Nonetheless, a Causal Dynamics (Chevalier 2005b) exercise conducted with Korku farmers from Bulumgavhan (2005/02/04) reveals that competition can still be a problem in the seed-mix. Therefore, Korku farmers use their knowledge of each crop's growing habits to adjust the density of each crop in the seed-mix. These adjustments act to further reduce competition in the seed-mix system.

Recall that when speaking about the Kuvi seed-mix, Dr. Patra (2005/01/16) expresses concern that the immense diversity of growth habits and needs between all crops prevents yields from reaching their full potential. He instead advises a seed-mix that employs only the most important grains and pulses/legumes, claiming that these two types of crops are compatible without being competitive. Interestingly, the two crop families in the Korku seed-mix are Grains and Pulses. Therefore, Korku farmers' experience as expressed in the Korku seed-mix rep grid can be used to support Dr. Patra's claim (Bulumgavhan 2004/12/07; see Figures 8 and 9) above). The polarization of the Korku seed-mix into two opposing types of crops overcomes the potential for crops to compete with each other.[50] On the one hand, since the two crop families are opposite to each other, their conditions for success are also opposite. Therefore, the different crop families do not compete for the same resources, and thus they are compatible when grown together. As an example, Bethekar (2005/02/03) noted that some crops "catch

[50] Korku farmers' knowledge also substantiates Dr. Patra's claim that growing grains and pulses together is effective for smothering weed pressure without having the two crops compete with each other. Farmers say that the seed-mix areas need weeding just once or twice before August. After this time, the weeds are not considered to pose any problem to ripening crops. This is a significant saving in labour inputs compared to crops of single stands which need almost constant weeding right up until harvest (Bethekar 2005/02/04).

deep water" (i.e. from the subsoil) while others "take only short water" (i.e. from rainfall). On the other hand, the relative homogeneity of crops within a single family suggests that those crops have shared requirements as well as shared habits. Therefore, they are not likely to damage each other as they grow, and so are also compatible.

However, the Domain Analysis technique alone does not reveal specific farmer knowledge regarding how all of the different crops in the seed-mix interact with each other. Bethekar's comment cited above was elicited during a Causal Dynamics exercise, another participatory technique from the SAS^2 repertoire. Causal Dynamics (Chevalier 2005b) is a structured way to learn Korku farmers' knowledge regarding the specific relationships between seed-mix crops in terms of how they interact with each other. The Causal Dynamics exercise conducted with Korku participants (Bulumgavhan 2005/02/03) confirms the above statement that the Korku seed-mix is specially designed to be non-competitive, but only to a degree. The exercise also reveals not only that there are still several crops that negatively affect each other, but also that Korku farmers have taken conscious measures to reduce the competition between crops without further reducing the number of crops. Unfortunately, I employed the Causal Dynamics technique with Korku farmers only. I had no knowledge of the technique while I was with the Kuvi people, and thus I was unable to use it with them.

Causal Dynamics uses a grid format similar to Domain Analysis, offering data for analysis while also acting as a structured interview. Instead of having a list of crops across the top of the grid analyzed according to constructs listed on the side (as in the Domain Analysis grid), the Causal Dynamics grid lists the crops on both the top and the side. Therefore, the crops are analyzed according to their direct relationships with other crops rather than with constructs (see Figure 10 below). Participants are asked how the growth of a first crop, named down the side of the grid, "contributes to" (or affects) the growth of a second crop, named along the top of the grid. A rating is given and placed where the row drawn from the first crop intersects with the column under the second crop. They are then asked how the growth of the first crop is "affected by" that of the second. This time the rating is placed where the column under the first crop intersects with the row drawn from the second crop. The process is repeated until all crops have been analyzed according to how they either contribute to, or are affected by, all other crops.

The participants use a rating scale of -5 to +5 to summarize how crops contribute to each other. The distinction between negative and positive ratings is essential because crops can have negative, positive, or neutral affects on each other. With each rating, participants are asked to further describe how each crop affects, or is affected by, another crop and give reasons why a relationship is negative, positive, or neutral. In the diagram below (Figure 10) an "X" is used in the areas of the grid where the same crop name intersects with itself because any single crop cannot be rated regarding how it contributes to or is affected by itself. The "contribution to" ratings are added up and averaged for each crop at the end of their row. The "affected by" ratings are added up and averaged for each crop at the bottom of each column. These averages are then used to plot each crop on a graph where the "contribution to" average represents the vertical axis and the "affected by" average represents the horizontal axis. The quadrants formed by the intersecting axes represent the four possible summaries for the crops plotted within the diagram (see below).

Figure 10: Causal Dynamics grid of Korku seed-mix, Bulumgavhan (2005/02/03).

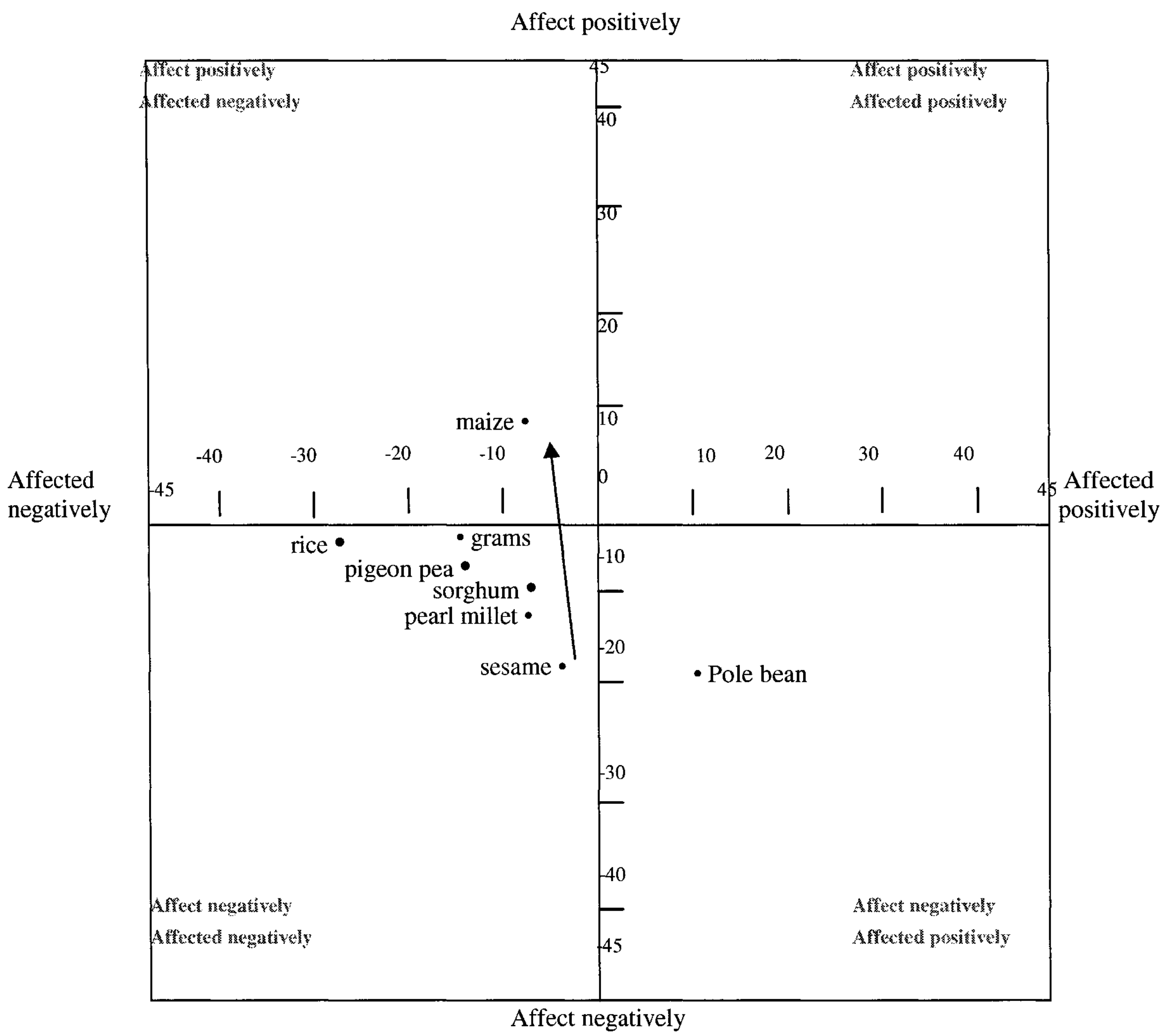
	Rice	Maize	Sorghum	Pole bean	Pearl millet	Black gram	Sesame	Pigeon pea	Green gram	Total Contribution(average)
Rice	x	0	0	0	0	-3	0	0	-3	-6 (-0.75)
Maize	-2	x	0	5	2	0	3	0	0	8 (1.0)
Sorghum	-3	0	X	5	0	-4	0	-4	-4	-10 (-1.25)
Pole bean	-5	-3	0	X	0	-3	-4	-2	-3	-20 (-2.5)
Pearl millet	-4	-5	0	5	x	-3	0	-4	-3	-14 (-1.75)
Black gram	-3	0	0	0	0	x	0	0	0	-3 (-0.37)
Sesame	-5	2	-3	-5	-5	0	x	-1	0	-17 (-2.12)
Pigeon pea	-5	0	-2	4	-2	0	0	x	0	-5 (-0.62)
Green gram	0	0	0	-3	0	0	0	0	x	-3 (-0.37)
Total Dependence (average)	-27 (-3.37)	-6 (-0.75)	-5 (-0.12)	11 (1.37)	-5 (-0.62)	-13 (-1.62)	-1 (-0.12)	-11 (-1.37)	-13 (-1.62)	-70 (-0.97) -17%

Over half (51%) of all of the ratings offered by Korku participants during this exercise are neutral (rated 0). This means that about half of the time, crops in the seed-mix system have no effect, and are not affected by, the other crops in the system. Looking down each column in particular, there are many ratings of "0" below maize, sorghum, pearl millet[51] and sesame (see Figure 10). Therefore, most (but not all) crops have a neutral affect on these crops. This is also shown in the plotted diagram where

[51] Pearl millet (*bajra*) is an addition by the Korku farmers to the seed-mix for the Causal Dynamics. Often, farmers think of pearl millet as a variety of sorghum (*jawar*), which is why they did not separate the two crops in the Domain Analysis grid.

these crops are located near the "0" (neutral) point along the horizontal axis (see Figure 11). Likewise, rice, green gram and black gram have neutral affects on most other crops, and to a lesser extent so do pigeon pea and maize. These crops are plotted near "0" along the vertical axis of the diagram. The dominance of neutral ratings in the Causal Dynamics grid is evidence of the general compatibility (lack of competition) between seed-mix crops.

Figure 11: Causal Dynamics diagram analyzing the information from the grid, Bulumgavhan (2005/02/04).



However, another 38% of the participants' ratings are negative, suggesting that general compatibility does not mean competition between crops is completely non-existent. Most notable is how rice is negatively affected by other crops. This is shown by the many negative ratings in the column below rice (Figure 10) as well as how far to the negative side rice is plotted along the horizontal axis (Figure 11). Crops that have a strongly negative affect on other crops are pole bean, pearl millet and sesame, and to a lesser extent pigeon pea and maize. This is shown by the negative ratings in the row beside their names as well as by their plotting far to the negative side of the vertical axis. Since most ratings that are not neutral are negative, the trend of the Korku seed-mix is that most crops have a slightly negative affect on most other crops, and are also affected by most other crops in a slightly negative way. This is illustrated in the diagram by plotting most crops near the neutral point where the axes intersect, yet in the bottom left quadrant. The summary statement for crops associated with this quadrant is "affect negatively/negatively affected". The scenario when most elements are located in the bottom left quadrant is what Chevalier (2005b: 8) calls "fragmentation".

As with Domain Analysis, "fragmentation" can be a euphemism for "diversity" in the seed-mix. However, it is more difficult to shine a positive light on fragmentation in a Causal Dynamics grid than in a Domain Analysis grid when discussing agricultural diversity. When fragmentation dominates the Causal Dynamics grid Chevalier (2005b: 8) states that "increasing the output of a bottom-left element will not cause the output of other elements to increase." In the case of crop interaction in the Korku seed-mix increasing the output of one crop will actually hinder the output of others. Therefore, the initial interpretation that crop relationships are generally neutral is marred by a strong secondary trend that several crops are in conflict with each other.

The explanations Korku participants gave regarding how crops negatively affected each other are largely related to the physical growth habits of plants. One plant has a negative affect on another because as seedlings they are competing for soil and light resources. As mature plants, one is smothering another due either to its sprawling habit, its height, or its leaves (Bulumgavhan 2005/02/03). The only notable exception to the competition trend identified in the Causal Dynamics grid is that pole bean is positively affected by several other crops. Pole bean is a vine. The tall sturdy stalks of sorghum, pearl millet, maize and pigeon pea provide a natural trellis for pole bean to climb upon. This type of benefit has already been discussed above in the Kuvi analysis. Korku participants have confirmed that vertical growth improves the quantity and quality of pole bean's yield (Bulumgavhan 2005/02/03). Although the height of these sorghum, pearl millet, maize and pigeon pea benefit pole bean, their size is a negative affect upon small and low growing crops such as rice and black gram, which is why these crops remain in the bottom left quadrant of the graph. Again, a single exception is maize, which has some positive contribution to the growth of sesame and pearl millet. Unfortunately, Korku participants were unable to give me an explanation regarding how maize contributes to these other two crops (Bulumgavhan 2005/02/03).

Although Korku participants often could not articulate the details regarding the nature of some crops' relationships with each other, the Causal Dynamics exercise still reveal that Korku farmers have acute knowledge of interaction between crops. Understanding the negative affects that these crops can have on each other, Korku farmers have adjusted the crop ratios in their seed-mix in order to surmount the fragmentation "problem" and reduce competition. If, as the definition of "fragmentation" given above states, increasing the output of one crop will not increase the output of others, then it follows that decreasing the output of specific crops will increase the output of others. As an example, for every fifty kilograms of rice that is sown, only two kilograms of pigeon pea is sown (Bulumgavhan 2005/02/03). Since pigeon pea normally has a very negative impact on rice (-5), Korku participants say that the impact can be neutralized by sowing less pigeon pea and more rice. Given that rice is rated as having a neutral impact on pigeon pea (0), a greater density of rice would in turn have little impact on a sparse density of pigeon pea. Therefore, according to the Korku participants, increasing the seeding rate of rice and decreasing the seeding rate of pigeon pea contributes to a reduction in the conflict between these crops while increasing the output efficiency of the farm. In other words, the seed-mix is part of a sophisticated and planned farming system, not a random throwing down of seeds.

Despite planning, unpredictable natural forces also have an affect on the output of crops, and mixed cropping is important for building resiliency against natural events and managing the risk caused by them. Conditions that cause certain crops to perform poorly will help other crops to thrive (Marten 2001: 167-74). Should there be little rain and rice grows poorly (or completely fails to grow), space is opened for the other crops to grow better. If there is too much rain rice will thrive, but green gram may fail (Bethekar 2005/02/04; Shenware 2004/12/11). Regardless of conditions the seed-mix plot will always be productive. Recalling the Causal Dynamics analysis, increasing the output of one crop does not increase the output of others because the seed-mix is a fragmented system. However, when the output of one crop is *decreased*, due to failure from too little rain as in the example just given, conflict with other crops also decreases and it follows that the outputs of those other crops will increase. If the Korku were to sow all crops in separate plots and poor rains resulted in some crops failing, the Korku would consider the land occupied by failed crops to be wasted since it would be left empty (Bethekar 2005/02/04). For this reason, Korku farmers says that providing irrigation for the seed-mix is bad because the influx of water will cause certain crops, such as green gram, to always fail (Bulumgavhan women 2004/12/08).

Whereas the Kuvi farmers seem to emphasize the companionship between crops in their seed-mix, the Korku farmers find there is little positive interaction between crops in their seed-mix. Instead Korku farmers have a much more acute awareness of the competition between crops. This has fostered a decrease in the number of crops in the seed-mix by separating out several crops (see below). However, this effectively specializes the Korku seed-mix so that it characterizes only two types of crops, shown as polarization in the repertory grid earlier discussed. Two polarized crop families are less diverse and thus potentially less resilient than the fragmented seed-mix of the Kuvi. This threat to Korku food security is counteracted by the fact that the specialized Korku seed-mix reduces the number of crops that could be potentially competing with each other, ultimately resulting in better yields and ease of management. Furthermore, Korku farmers' more subtle knowledge regarding plant competition is taken into account when deciding the optimal seeding rates for each of the remaining seed-mix crops. The adjustments made by Korku farmers promote improved production from their small farms, which of course is good for food and economic security.

The balance struck by the Korku seed-mix between efficiency and diversity has become an integral part of the Korku agricultural tradition. Although I imply that the Korku refined the seed-mix to only eight crops, the occurrence of this process is beyond memory. Farmers stated to me that the seed-mix is their tradition, past on by their ancestors, and they intend to keep this tradition. The strength of the tradition is particularly powerful for families with small and marginal landholdings. These families maintain the seed-mix on most or all their farm. The land could not support a mono-crop that could be profitable enough to pay for a family's needs. The seed-mix enables families to reliably raise most of their subsistence needs from a variety of crops, even off a small parcel of land (Bulumgavhan women 2004/12/08; Bulumgavhan 2004/12/23; Bethekar 2004/12/25).

Inter-cropping the other Korku crops:

Although the Korku people have stated that the seed-mix of eight crops is important only a few farmers manage their entire landholdings with the seed-mix. Most Korku farmers use a seed-mix in one section[52] of their field in combination with inter-cropping in other sections. Inter-cropping refers to small adjacent plots of land each growing a separate crop, or sometimes the land is divided into strips each with alternating crops. An example of inter-cropping is a plot red lentil (*masur*) that is divided into three sections by two narrower strips, one of coriander (*dhaniya*) and another of field peas (*vatana*). As many as twelve additional crops are included in the inter-cropping portion of Korku farm management. These crops are wheat (*gehu*), chickpea (*channa*), red lentil

[52] The proportion of land devoted to seed-mix varies widely, depending on size of landholding, quality of soil, slope and contours of land, and proximity to the market town, Dharni (see above).

(*masur*), amaranth (*rajgeera*), flax (*jagni*), coriander (*dhaniya*), field pea (*vatana*), various millets (*sawrya*, *kutki*, *kodo*, *ladga*), cotton (*kapas*) and soybean.

There are several reasons why Korku farmers employ inter-cropping in addition to the seed-mix. These reasons are related to cultural importance as well as food and economic security. The millet *sawrya* is the only crop identified to me as culturally important to the Korku people. It is an essential food at *Nagpanchmipuja* (Snake festival). This festival is celebrated all over India, but the Korku people are particularly attached to the snake and observe *Nagpanchmipuja* several times each year (Takarkheda 2004/12/11; see also Deogaonkar 1990). During *Nagpanchmipuja* it is forbidden to eat rice and red lentils because they resemble the teeth and eyes respectively of the snake. *Sawrya* is the prescribed grain that replaces rice for the people during this festival (Takarkheda 2004/12/11). Therefore, despite being grown in only small amounts, *sawrya* is an integral part of the Korku mixed cropping system.

In terms of food and economic security, inter-cropping single stands of crops enables farmers to take full advantage of a crop's unique qualities by growing it in the most suitable portion of their fields. *Sawrya* again provides a good example. *Sawrya* will grow and yield well not only in the poorest soils, but also on hilly land, even if the monsoon rains fail to materialize (Takarkheda 2004/12/11). It is also one of the earliest crops to yield after the monsoon and is effortless to grow. Therefore, farmers can sow *sawrya* in the most marginal section of their land where they can forget about it until it is ready to harvest. To contrast, chickpea is usually reserved for a prime location in a farmer's field, often a low lying area where soil nutrients collect, because it requires good, rich soil. Another reason why some crops are not sown with the seed-mix is because they grow best during the winter (December to March) when the temperatures are cooler and the aggressive rains and winds of the monsoon are past. Again, chickpea may need good soil, but it requires virtually no rain and when young is even tolerant of frosts (Takarkheda 2004/12/24). These are essential qualities since virtually no rain falls and nights can get cold during the winter months. Other winter sown crops are red lentil, field pea, wheat, amaranth, coriander and flax.

The yields of *sawyra*, chickpea, and the many other crops that are sown in single stands are greatly increased by this management system. Inter-cropping enables farmers to have many small single stands of crops, each producing larger yields more efficiently than in a seed-mix because competition between crops is eliminated. This means that families will have a greater amount of food to put into their stores each year. Yield efficiency among single stands of crops is also particularly advantageous for profiting from cash crops. The Korku people are less marginalized than the Kuvi people from the national cash-based economy. Therefore there is greater incentive for Korku to participate in this economy rather than depend solely on subsistence. Soybean and cotton (*kapas*) are the only crops grown by the Korku intended exclusively for market (see below).[53] Soybean and cotton are not "traditional" crops and are identified by Korku people as the only crops newly adopted into their agricultural system (see Charal et al 1997). Farmers have stated to me that they are open to adopting new crops and practices *if* they consider these to be profitable and suitable for their farming conditions (Bethekar 2004/12/25). In other words, farmers are willing to experiment with and adapt their farming systems provided the outcomes benefit them according to their needs. Soybean

[53] Korku farmers grow soybeans without even knowing what the seed's intended purpose is. However, the farmers have learned that the chaff from cleaning the beans makes good fodder for their cattle (Shenware 2004/12/24).

and cotton are considered sufficiently profitable as cash crops to receive permanent inclusion into the Korku mixed cropping system. Additionally, farmers have adopted the practice of applying fertilizer to cotton and soybean crops because this further increases their yield and thus profitability.

Adopting crops and practices to increase farm income implies that Korku farmers are following a trend toward globalization, which is often criticized for its homogenizing effect on culture and economy (Shiva 2000; Parayil and Sreekumar 2003: 479; Brush 1989: 20-1; Altieri et al 1987: 50; Sampat 1998; Vasavi 1994: 291). From my experiences with Korku farmers, there appears to be little threat that traditional Korku crops will disappear and that Korku people's food security will become dependent on cash crops and volatile markets. The majority of the crops are still primarily (but not exclusively – see below) for domestic use. Farmers are explicit that they intend to continue to preserve their traditional subsistence crops. Their knowledge and experience is sophisticated enough for them to know what few sections of their land can even support soybean and cotton. Only farmers with good, flat land, with access to irrigation, fertilizer and markets will grow soybean and cotton in substantial amounts (see below; Takarkheda 2004/12/06, 2004/12/24). Soybean can be sown as a monsoon crop in the same plot that will yield wheat or chickpea in the winter, but cotton grows slowly tying up the best land for almost a full year. These conditions exclude most land of most farmers in Bulumgavhan from growing these crops. They have neither appropriate land, nor access to irrigation infrastructure to make the purchasing of seed and fertilizer needed to grow soybean and cotton profitably. Although farmers from Takarkheda take advantage of their better situation to make soybean and cotton important crops in their economy, they too are reluctant to convert too much land over to soybean and cotton. Farmers remain conscious of how vulnerable soybean and cotton are compared to their subsistence crops (including seed-mix crops) which are much more tolerant of poor soil and less rain (Takarkheda 2004/12/24).[54] That fertilizer and irrigation are management techniques to add resiliency against potentially damaging natural events, is not enough to foster confidence in farmers. Therefore they place extra importance and value on their subsistence crops, insisting on maintaining them as economic protection should cotton and soybeans fail to bring benefit. For people in both villages, an emphasis on cash crops would require families to purchase more of their food. Yet the millets favoured by Korku people are not available at markets, and people are concerned about purchasing food that is likely grown with chemical inputs (see below; and Bulumgavhan 2004/12/07; Bulumgavhan women 2004/12/08; Shenware 2004/12/11).

Having crops sown in separate plots not only improves overall yields for Korku farmers, but also adds an additional twelve crops over the eight grown in the seed-mix. All Korku participants have stated to me that there are no traditional crops that they have stopped cultivating (except for the "Nilya" variety of sorghum mentioned above). Farmers insist on preserving their traditional subsistence crops both in the seed-mix and the inter-cropping system, because they are well adapted to the Korku physical and cultural environment (Takarkheda 2004/12/24). Nonetheless, Korku farmers are easing their way into cash cropping when appropriate, preferring it as a way of contributing to

54 Contrary to farmers in Takarkheda, Bulumgavhan farmers rated most seed-mix crops as requiring good soil and plenty of rain (2004/12/07; recall Figures 8 and 9). This discrepancy may be because the remote Bulumgavhan farmers have less experience with cotton and soybean and so cannot use it as a frame of reference for comparing the soil needs of seed-mix crops. Takarkheda farmers on the other hand, have more experience and thus more knowledge of the high soil and water demands of cotton and soybean compared to seed-mix crops.

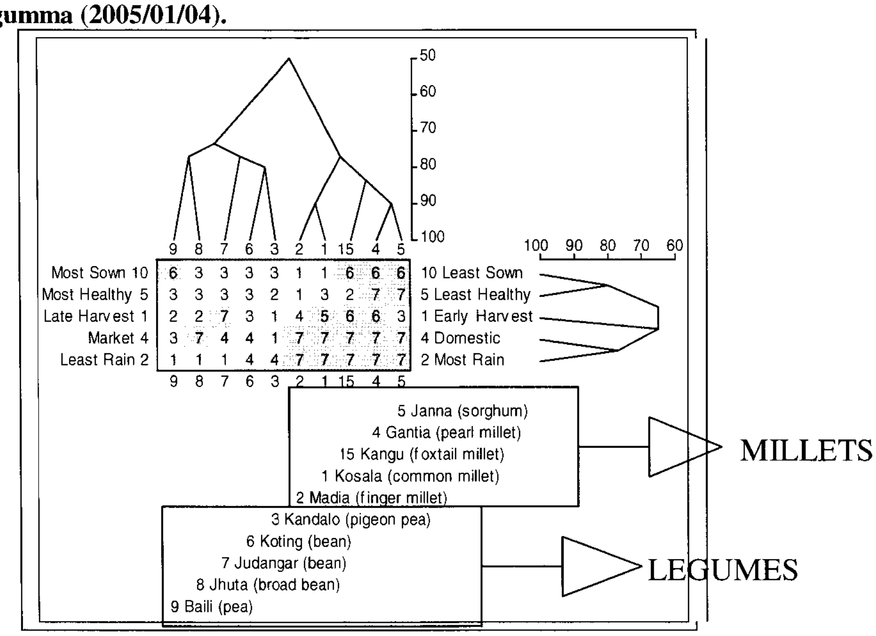
food security as merely a supplement to subsistence farming (Bulumgavhan 2004/12/07; Bulumgavhan women 2004/12/08; Shenware 2004/12/11; Charal et al 1997). The inclusion of cash crops into the inter-cropping system helps to diversify the Korku economy, allowing farmers to benefit from both market transactions and subsistence. Furthermore, it can be argued that the adoption of soybean and cotton has increased agricultural biodiversity since they represent two new crop families being added to the Korku mix of crops (DeGregory 2004: 506-7; Charal et al 1997).

The balance of economic diversity:

In terms of ecology, overall there is significantly less diversity in the Korku system than in the fragmented Kuvi system. At first the lack of diversity appears to be a symptom of a smaller seed-mix using only eight crops compared to twenty crops in the Kuvi seed-mix. Yet a comparison of the Korku and Kuvi rep grids reveals that simply adding more crops to the analysis does not necessarily add to the diversity of the system. Even in an expanded Korku rep grid there is still a trend towards polarization, indicating that the Korku integrated mixed cropping system has limited diversity. Therefore, the Korku system is interpreted to offer only limited support to farmers' claims regarding resiliency since it embodies only a limited level of diversity.

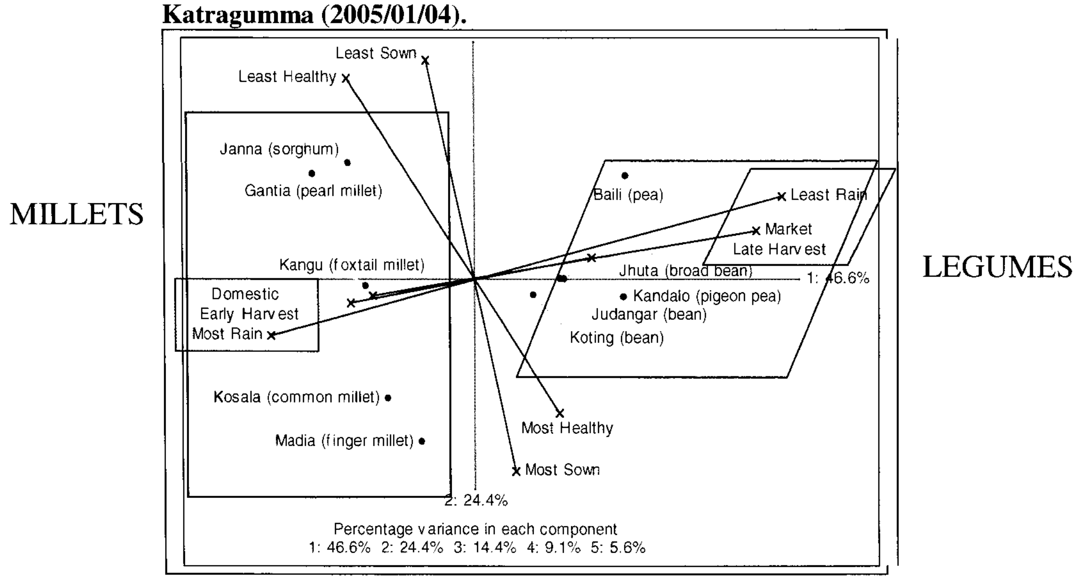
The two polarized crop families identified in the Korku seed-mix, the Grains and Pulses, are also identified in the Kuvi seed-mix, where I call them Minor Millets and Legumes. Isolating the Millets and Legumes from the other crop families in the Kuvi rep grid allows for a better comparison to the Grains and Pulses of the Korku (see Figures 12 and 13). Using roughly common constructs, the patterns illustrated in the Kuvi ratings of the Millets and Legumes are extraordinarily similar to those of the Korku ratings for the Grains and Pulses.[55] Both sets of diagrams show polarization of the two crop families along similar lines. Yet when the Millets and Legumes are examined in the context of the entire Kuvi seed-mix system, they actually appear like related (albeit loosely) crop families (Figures 4 and 5 above). The inclusion of all crops leads to the formation of two additional families (Roots and Cucurbits), as well as several unique crops, that in a sense surround the Millets and Legumes, formulating a system that is fragmented and diverse.

Figure 12: Focus diagram after isolating Millets and Legumes from Kuvi seed-mix rep grid, Katragumma (2005/01/04).



[55] The polarization of the Kuvi Millets and Legumes would be even more extreme if I had not included finger millet and common millet, which are actually fairly unique crops within the whole grid.

Figure 13: PrinGrid diagram after isolating Millet and Legumes from Kuvi seed-mix rep grid, Katragumma (2005/01/04).

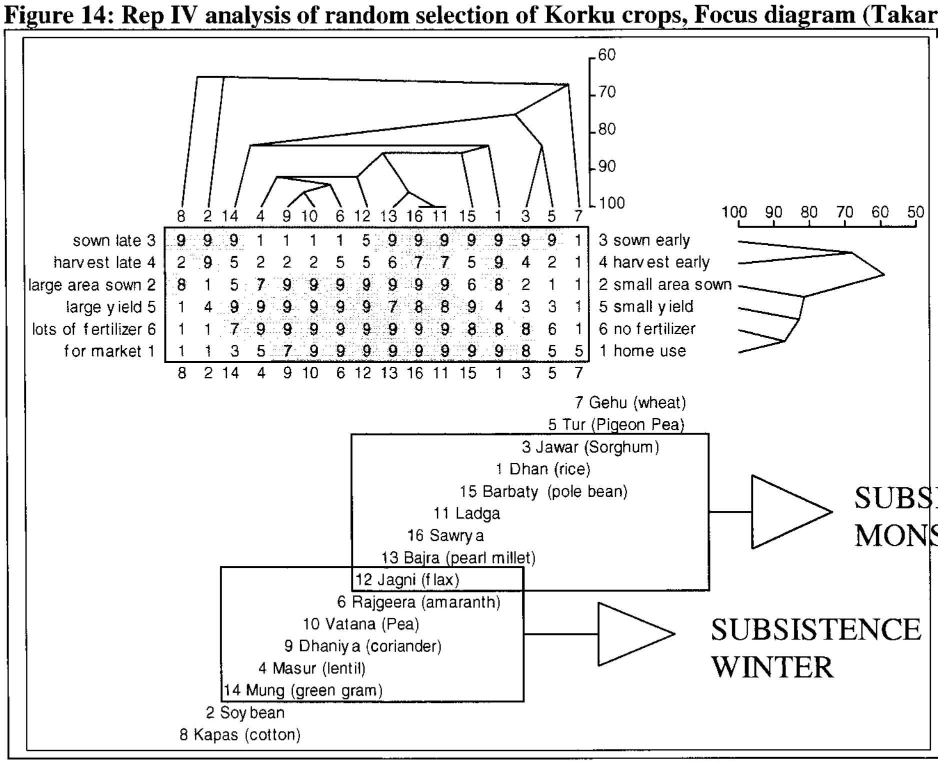


Contrarily, when the Korku mixed cropping system is examined as a whole, the addition of other crops does not have entirely the same effect (Takarkheda 2004/12/06; see Figures 14 and 15). Despite the inclusion of sixteen crops, almost as many as in the Kuvi system, Korku farmers rated all crops as belonging to one of two opposing crop families.[56] These are labelled as "Subsistence" family crops or "Economic Intensive" family crops. Korku participants' ratings establish little variation among any of the "Subsistence" crops. Four constructs that are strongly related to each other provide the main profile for this family. The Subsistence crops are each allotted only a "small area" (6 to 9) of land, and thus only a "small yield" (7 to 9) is obtained by farmers. Nonetheless, most of the yield is reserved for "home use" (5 to 9), hence being named Subsistence crops. Lastly, "no urea (chemical) fertilizer" (8 to 9) is applied to these crops, in part because they do not need it in order to yield well. People also believe

[56] This rep grid includes sixteen Korku crops selected at random. Several crops, namely sesame, chickpea black gram, maize, *kodon*, and *kutki*, are not included. However, extrapolating from discussions and other Domain Analysis exercises, it can be inferred that chickpea would be similar to wheat, black gram would be with green gram, and sesame, maize, *kodon* and *kutki* would be in the Subsistence Monsoon family.

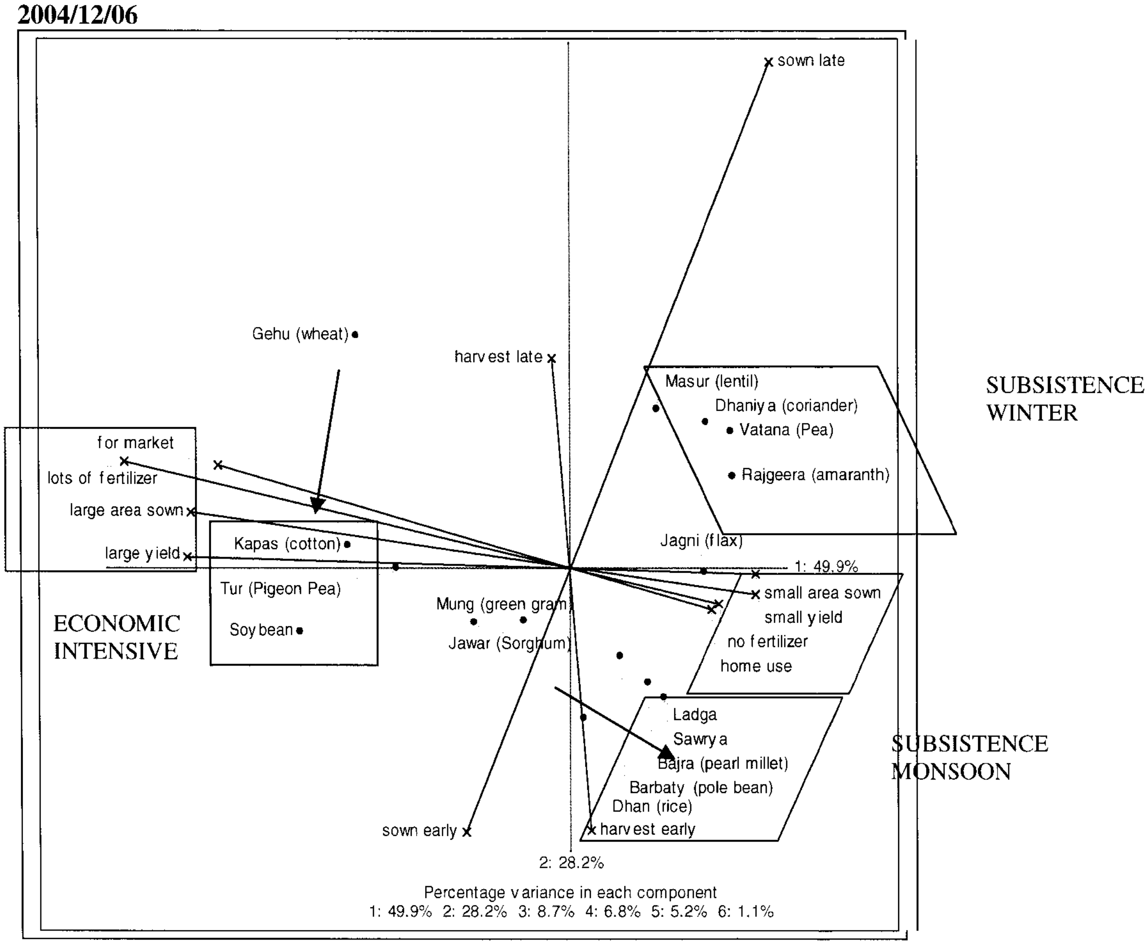
chemical residues remain in crops, and thus eating food grown with chemicals could cause health problems and even death (Shenware 2004/12/11). It is for this reason that people neither apply fertilizer to their domestic crops, nor like to buy food at the market, which may have been grown with chemicals.

Figure 14: Rep IV analysis of random selection of Korku crops, Focus diagram (Takarkheda 2004/12/06).



The two other constructs actually split the Subsistence family into two sub-families. The "Subsistence winter" crops are those that are raised during the dry, cool winter months. In other words they are "sown late" (1) and "harvested late" (2 and 5). The "Subsistence Monsoon" crops are actually the seed-mix crops as well as the minor millets. These are "sown early" (9), just before the monsoon rains, and are generally "harvested early" (5 to 9). Flax (*jagni*), sits between these two sub-families simply because it is sown directly in the middle of the two sowing seasons, and harvested in the middle of the two harvest seasons (5). This widely varied sowing and harvest time ensures that subsistence crops are available to families year round. However, there are otherwise few characteristics that distinguish Subsistence crops from each other. Even though participants had a wide rating scale of 1 to 9, they still gave consistently similar ratings.

Figure 15: Rep IV analysis of random selection of Korku crops, PrinGrid diagram (Takarkheda 2004/12/06



A handful of other crops form the "Economic Intensive" crop family, which has the near opposite profile to the Subsistence crops. These crops receive their name because they are grown intensively for maximum economic gain rather than for their domestic importance and reliability. These crops are sown in "large areas" with the intention of taking their harvest to "market" (1 to 5). Their "large yield" (1 to 4) is not only because they are sown in large single stands, but also because they are grown with "lots of [chemical] fertilizer" (1). Since Economic Intensive crops are not used much at home, farmers are willing to improve yields and thus income with the use of chemical fertilizer (Shenware 2004/12/11). Discussions with Takarkheda farmers outside this repertory grid exercise revealed that Economic Intensive crops also require more water and better soil than the Subsistence crops (Takarkheda 2004/12/24). This means that Economic Intensive crops are only likely to benefit if the growing conditions are ideal or when inputs of fertilizer and irrigation are provided to stabilize unpredictable conditions. Therefore, the diversity added by Economic Intensive crops do not add resiliency to the Korku system, but economic diversification. With these crops, Korku farmers can earn incomes from the market to support their subsistence crops for achieving food security.

A few crops occupy a profile that is effectively between the two polarized families. They are simply crops that have some characteristics shared with the Subsistence crops, while others are shared with the Economic Intensive crops. Pigeon pea diverges from the Economic Intensive crops because half of the harvest is still reserved for domestic use and it does not require inputs of chemical fertilizer. Green gram, on the other hand, shares most characteristics with the subsistence crops except that more of it is sown (5) because of its important market value (3). In the PrinGrid diagram (Figure 15) I have pointed an arrow from sorghum to the Subsistence Monsoon crops because it mostly follows this family's profile. Sorghum is pushed out of the Subsistence family only because it is much more is sown (2) and harvested (3) than other subsistence crops. However, sorghum has these qualities not because it is taken to market, but because it is a primary staple grain. Wheat is separated from the Economic Intensive crops only because it is winter sown (9) and harvested. The bridging qualities of these two crops provide Korku farmers the opportunity to determine how they want to use their crops. These crops can easily be used at home if their market value is low and there is a shortage of subsistence crops. Likewise, if their market value is high, people have year round income generation opportunities to supplement their subsistence as well as purchase what they do not produce themselves.

Despite bringing the total number of crops up to twenty-two, it is dubious whether the single stand crops make significant contribution to actual on-farm diversity. The Korku rep grid representing all crops still indicates a polarized system. However, imagining the Economic Intensive family to not be included in the rep grid diagrams, the Korku mixed cropping system would be even less diverse. The contribution of these crops is not agricultural diversity, but economic diversity (Charal et al 1997). Coupled with techniques to improve yields, Korku farmers can achieve larger harvests to generate more income as well as for household stores. Nonetheless, any increase in yields is likely to be offset by a reduction in resiliency. Therefore, it is questionable that the seemingly sophisticated "integrated" mixed cropping system offers any increase over the seemingly random Kuvi "seed-mix" system for achieving food security.

Conclusions

Both Korku and Kuvi farmers offer the same logic and motivations to justify their systems of mixed cropping. They state that maintaining a diversity of crops is a technique of risk management, intended to build resilience against the potential of crop failures due to uncontrollable changes in growing conditions (Marten 2001: 167-74). Valley or plains dwelling farmers have no such control. Sudden ecological changes can be catastrophic to yields and thus farmers' entire livelihoods, if growing only one or two resource intensive cash crops such as rice or cotton. Even when conditions allow bumper crops, this may drive down market values, preventing families from earning enough income to buy their food security. Therefore, compared to the marginalized *Adivasi* farmer, mono-cropping farmers in the valley or plains have neither food security, nor economic security. However, mixed cropping provides a mechanism to compensate for sudden and unpredictable ecological events that cause some crops to fail by ensuring other crops are present to thrive under those conditions. Assuming the unpredictable to occur, Korku and Kuvi farmers are assured that they will always be able to draw reliably good yields from their land, throughout the year, regardless of what happens. This means that farms will always give either food, money, or both to contribute to the food security of Korku and Kuvi people.

Despite shared motivations between Korku and Kuvi farmers regarding the purpose of mixed cropping, the actual experiences of the two peoples are different. As the above discussion shows, the two *Adivasi* peoples employ different techniques for mixed cropping with different results in terms of achieving food security. These differences can be attributed to the social and geographical contexts of each society. Each tribe's system is appropriately adapted to achieve the greatest level of food security given their specific situation.

For centuries, the Korku people have lived in close proximity to other cultural societies as well as government institutions (Fuchs 1988). These contacts have profoundly influenced Korku economy through access to markets and agricultural available infrastructure to help them to participate in markets. For example, accessibility to markets has made it advantageous for the Korku people to place a heavier emphasis on income generation (Charal et al 1997). Farmers are prompted to sow single stands of cash crops, with the aide of irrigation and fertilizer, to improve agricultural output and thus boost economic gains from market transactions. By entering the market economy, Korku farmers free themselves from total dependence on subsistence production, allowing some of their food security to come from income generation.

Nonetheless, the Korku people are also not fully dependent on cash cropping. Their relative remoteness and the relative vulnerability of cash crops encourage them to maintain their traditional subsistence crops. Several of these crops are managed as a seed-mix. Farmers say that this is a protection measure to ensure a good harvest of many crops regardless of ecological conditions. Many other subsistence crops though, are managed in single stands as cash crops are, but without fertilizer. Therefore, just as intensively grown cash crops help to boost income generation, intensively grown subsistence crops enable more food from less land to be produced for home use.

Whether for market or subsistence production, the goal to improve yields necessarily means limitations in overall farm diversity, and thus also in resiliency against unpredictable forces of nature that can cause some crops to fail. While reduced resiliency compromises the food security of the system, it is made up for by increasing the amount of yield harvested. As a result, the "integrated" mixed cropping system of the Korku people becomes a practicable balance between diversity and resiliency in the seed-mix along with single stands for improving yield efficiency. Furthermore, with some of the yield being sold at the market, farmers integrate both subsistence production and market production to achieve food security. In other words, moderate agricultural diversity and resiliency in Korku farms is supported by a moderately diversified and resilient economy that combines subsistence production with market income.

On the other hand, the Kuvi people are much more remote. There are several reasons why the intensification of just a few crops with the aim of increasing income is not suitable for the Kuvi situation. It is not feasible to introduce irrigation and fertilizer into the steep and rugged mountains occupied by the Kuvi people no matter how much they can help to improve yields. Also, the intensification of production promotes large yields of only a few crops. This makes it necessary for families to trade a significant amount of the harvest at the market in order to acquire the rest of their subsistence needs. However, the only remotely accessible market is an informal affair that occurs once a week. The Kuvi people are neither completely isolated nor completely self-sufficient. When they need to acquire some of the few products they do not produce themselves, such as cloth and metal, they take the few products they have that are marketable for trade. Given this socio-economic and geographical situation, efficient yields and market dependency are not high priorities for achieving economic and food security for the Kuvi people.

Without significant market incomes for economical support, Kuvi farmers aim instead to draw as much of their subsistence needs as possible from their seed-mix system. To maintain food security it is most appropriate for the Kuvi to maximize diversity in order to maximize resiliency. This is done by employing not only many crops, but many crops that are in all ways unique from each other. There are crops with different uses, different nutritional values and different ecological needs. The Kuvi method of mixed cropping by seed-mixing and broadcasting ensures that maximum diversity is represented in every corner of the *dongar* field. While this system means that the Kuvi people have never been affluent, it also means that the people have no memory of ever suffering from severe food shortage either.

Unlike the segregated planning within Korku farms, the somewhat chaotic and random Kuvi system tends to promote competition between crops. The result is that despite consistent yields, they tend to be lower, thus preventing economic gain over basic food security. However, from the Kuvi farmer's perspective, many crops have complementary relationships with each other that overshadow any competitive relationships. Furthermore, intensification methods to reduce competition also have major ecological ramifications. Apart from interfering with the complementary relationships between crops, intensification methods such as reduction in diversity, sowing seeds in drills, and applying fertilizer, impact how the seed-mix system works to conserve soil and water in the steeply sloped mountainsides. These impacts affect the long and short term resiliency of the system since water is scarce and soil nutrients are volatile. Therefore, any competition is a necessary concession to ensure that in the long term there is always a diverse and reliable yield rather than an uncertain but potentially lucrative one.

Finally, even though the Korku and Kuvi people both employ mixed cropping techniques for similar reasons, their specific socio-economic and geographical situations result in system that are unique from each other. Uniqueness is illustrated not only in the different crops and management methods that each uses, but also in the intended outcome for achieving food security. Just as the Korku farmers concede resiliency for efficiency in order to free themselves from dependency on subsistence, Kuvi farmers concede efficiency for resiliency to free themselves from dependency on markets. For each

Adivasi people, these concessions and preferences are most appropriate for each of their respective situations. Therefore, the Korku and Kuvi peoples are ultimately relatively equivalent in their achievements toward food security. Put another way, one system is not more effective than the other for improving people's economic situation, but both are effective at maintaining a stable level of food security.

CHAPTER 4: THE EXPERIENCES OF PARTICIPATORY PROCESSES

Anthropologists are often quick to criticize the development process and the way in which participatory methodologies are employed. Ironically, authors are rarely open about their own research processes and how they might be open to criticism. Even less do authors admit the imperfections of their research process and how that might have affected research results. They tend to assume that the process is smooth, effortless and predictable (Pratt 2001: 28). This ambiguity toward research methods prevents readers and listeners from learning from the experiences of others and appropriating useful new research tools in an effective manner. Therefore, this chapter will go into greater detail about how my research was executed and how that affected the research. By doing so, my experiences will inform readers of some of the challenges they can expect to face as well as allow them to improve their own facilitation skills.

What I convey below is a construal of my own experiences as a facilitator eliciting Domain Analysis repertory grids with Korku and Kuvi *Adivasi* farmers. Although my primary goal in this thesis is to learn *Adivasi* farmers' knowledge about mixed cropping, I am also testing the repertory grid technique as a means to learn their knowledge. Therefore my observations throughout the time I spent with *Adivasi* peoples in India include not only the topic of research – *Adivasi* farmers' knowledge of mixed cropping – but also reflections on the Domain Analysis research process. These reflections can be compared to the claims of SAS[2] and other participatory techniques, as outlined in Chapter 2, to better understand the tension between theory and reality when conducting field research. Of course, the discussion is also self-reflexive since the researcher is not and should not be completely removed from the research (Jankowicz

2004: 75; Clifford 1986). How successful a methodology is in achieving its objectives in many ways depends on the skills of the researchers, a fact not often addressed, if even admitted, by many researchers.

Rationale for this chapter

My intention by offering this chapter is not to criticize the Domain Analysis technique, which I am convinced is a very powerful research tool, but to analyze the context of the process in which that information was gathered. I have several reasons for wanting to engage in this discussion. One is to reconcile discrepancies between what I profess about participatory research using repertory grid technique in Chapter 2, and what my experience was as a facilitator. In short, my field research fails to achieve several ideals of participatory research. The details of these shortcomings are soon to follow, but suffice to say now that ownership of the research and the research process did not remain entirely with participants as I idealistically intended. Therefore, I am including this chapter to recognize this discrepancy and offer the research back to participants.

Related to the issue of ownership of research and the need for validation from participants, I wish to be transparent and forthcoming about my analyses, interpretations and conclusions. Among other factors, time limitations, difficulties in regrouping participants to discuss analyses of their rep grid, and a lack of electricity to show participants Rep IV analyses on my laptop computer, led to participant exclusion in much of the analytical and interpretive process. Therefore, in the previous chapter I assumed considerable interpretive liberties when analyzing rep grids in order to establish my thesis argument and narrative. While I believe I have well represented the views of Kuvi and

Korku participants who contributed to the research, some of my more general interpretations and conclusions derived from the knowledge they provided may extrapolate beyond the realm of their personal experience and knowledge of the topic. In other words, I have made statements about Kuvi and Korku mixed cropping systems that I believe to be accurate, but Kuvi and Korku farmers may not recognize my conclusions as coming from *their own knowledge* (see Jankowicz 2004: 75).

I also want to be forthcoming about the selection of data for analysis in this thesis. Most of the analysis of the previous chapter is focused upon just two Domain Analysis exercises conducted with Kuvi and Korku farmers (see Figures 4, 5, 8 and 9 in chapter). Focusing on these rep grid exercises alone is an exercise in selection and subjectivity – "the making of texts" – that is part of any anthropological writing endeavour (Clifford 1986: 2). Choosing what to include and what not to include in a thesis is the final factor regarding how I, as researcher, influence research outcomes despite everything that was conveyed to me through countless resources including participating people. I feel that the Domain Analysis exercises illustrated in this thesis are the most telling, informative and representative of the people who participated with me, and are sufficiently validated against other research methods such as interviews and secondary research. Including detailed analyses of the other nine Kuvi grids and seven Korku grids elicited would fill the thesis with copious and divergent data, which would confuse and dilute the topic at hand. Nonetheless, almost all of these "other" rep grids contribute to the thesis as a whole and are thus cited throughout.

By selecting information for analysis I am not assuming total homogeneity amongst all Kuvi or all Korku participants and that the rep grids central to this thesis can be used to represent all Kuvi and Korku people. In concert with the assumptions of Personal Construct Theory, each individual apprehends his or her own experiences uniquely and likewise each rep grid is unique from all others (Shaw 1985: 26-7; Jankowicz 2004: 221-2). Still, Personal Construct Theorists recognize that people with a lot in common, including similar social and ecological experiences, are likely to construe their realities similarly (Shaw 1985: 27-32). People belonging to the same tribe share significant similarities. Therefore, it is safe to make generalizations about a tribal community regarding knowledge elicited from select participants without implying "sameness" provided it is understood that these are nothing more than generalizations.

The Domain Analysis process

I identified and entered my fieldwork sites through a long string of fateful contacts. Knowing that I was interested in agricultural biodiversity, Professor Jacques Chevalier (Carleton University) and Dr. Daniel Buckles (Carleton University and International Development Research Centre)[57] connected me with Rajeev Khedkar. Mr. Khedkar was director of the Academy of Development Sciences (ADS), which on behalf of an umbrella organization South Asia Partnership for Food Ecology and Culture (SANFEC), was charged with managing the Using Diversity project funded by IDRC. With Mr. Khedkar's help, I traveled to India and was connected with people from other SANFEC partner organizations, who were conducting research regarding agricultural diversity with funding from IDRC. Finally, through these contacts with non government organizations (NGO), I was introduced to the villagers who then became participants

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[57] Prof Chevalier and Dr. Buckles are two of the three members on my thesis committee for this research.

within this research. My time spent with Kuvi and Korku people conducting Domain Analysis exercises was possible because of a translator/co-facilitator from the NGO working with the respective *Adivasi* tribes with whom I did this research. Satyaranjan[58] from Universal Services Organization (USO) assisted me with the Kuvi people, and Surendra from SARITA assisted me during my time with the Korku people.

The first Domain Analysis session at each research site started with an introduction of myself, my connection to the NGO worker with whom the people were familiar, and an explanation that we wanted to learn about people's knowledge regarding their mixed cropping system. I explained that my intention with this research was to strengthen the mixed cropping tradition and provide information validating mixed cropping as the most suitable, sustainable and important economic venture for the people who rely on it. During exercises, participants often wondered what the benefit of the research was and why their participation in it mattered. In response, I added that it was related to the biodiversity research associated with SANFEC and IDRC that they were presumably familiar with.

Although I wanted to be as open about my intentions as possible, people still seemed to participate with a certain amount of ambivalence. On the one hand I attribute this to a general unfamiliarity among *Adivasi* farmers with the concept of participatory research and development. I do not think that they were used to having an outsider show so much interest in their ecological knowledge. On the other hand, I had arrived at these peoples' villages with a research agenda, and my own interest in agricultural biodiversity. When we gathered to elicit repertory grids, it was on my initiation, and driven by my interest in learning the social and ecological importance of different crops grown by

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[58] Gobardin and Gopal also helped when translation between Kuvi and Oriya was necessary.

farmers, from their perspectives. Therefore, from the very outset participants may have viewed me as an interloper who wanted to learn their knowledge and use it in some way unknown to them, but for my benefit. Perhaps my attempts to describe how I hoped the research to benefit them and their traditions were viewed with some suspicion? Perhaps the idea of contributing to my research involved more effort from them than they were willing to offer? Regardless, I was dictating that the research would start from the domain area of the local mixed cropping system, even though I had no intentions of controlling what type of knowledge was to be generated *within* that domain. Nonetheless, while I felt I was committed to facilitating participatory research, I initiated the research in a non-participatory fashion. This precedent would influence my interaction with people during the remainder of my fieldwork with them.

In short, the Domain Analysis exercises sought to learn the participants' knowledge and perspectives regarding the differences in values of crops in their mixed cropping system. The exercises usually started with participants naming each of the crops in their mixed cropping system and sending the youths present to search for and bring back a sampling of seeds. Seed samples of each crop were thus placed next to each other along the ground, representing the elements for the now commencing Domain Analysis exercise.

However, implementing the Domain Analysis exercises beyond this point was often a very challenging experience for me. These challenges were no doubt shared by participants and translators/co-facilitators as well. As already mentioned in Chapter 2, for the purposes of participatory research, the constructs, or characteristics, used to compare and qualify the crops are ideally determined by the participants (Chevalier 2005: 1;

Jankowicz 2004: 12). Initially I tried to keep true to this ideal and attempted to elicit constructs from the participants. I began by using the triadic method by choosing three crops out of the whole list of elements and asking participants to identify what qualities or characteristics make two of these similar and yet different from the third. I alluded to comparing the crops according to their ecological requirements, but also hoped to learn about the different social values of different crops, as well as any other values that participants would identify. Unfortunately, the participants found it very difficult to understand what I was asking them to do.[59] They literally had nothing to suggest and remained silent. Thinking that the two part question involved in triadic elicitation was either confusing for the participants, or difficult for the co-facilitators to translate, I switched to the dyadic method that simply asks participants to differentiate between two crops. Moving the process along was like pulling teeth. Eventually participants requested that I suggest characteristics for them to use. I agreed hoping that as participants became more familiar with the technique, they would start identifying their own constructs. Unfortunately, every attempt to elicit constructs from the participants resulted with the same confusion and ended with me making more construct suggestions.

Hence, the precedent I set by initiating the research was already snowballing, against my will, into a cycle of gradually alienating the research from the participants, which as this chapter reveals, continued throughout the whole research process. Now that I was supplying the most of the constructs for all rep grids, I was further drawing ownership of the research process away from the participants. By doing so, constructs were expressed in my language and were related to aspects of mixed cropping that I

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[59] Opp (1998: 159-60, 168) and Mosse (1994) also discuss the difficulty in transferring participatory techniques for participants to use.

thought to be important, or at least were important to me (see Mosse 1994: 517). I attempted to compensate for the growing weakness of the research by finding ways to return ownership of it to participants. One of these attempts was to pay attention to auxiliary discussions between participants during Domain Analysis exercises, including their responses to earlier provided constructs as well as to comments made during other interviews. I was actively listening for peoples' informally announced constructs and was able to suggest a few that were indirectly identified by participants in this way. I also introduced each construct as a suggestion, confirming with participants first whether it would be a useful characteristic for rating all the crops in the repertory grid.

With time wasted trying to elicit constructs, I began to think of the advantages of supplying them instead. Rep grids with the same or similar constructs would offer a new analytical dimension by enabling me to more thoroughly compare how different groups experience mixed cropping according to predefined characteristics (Jankowicz 2004: 56). For example, using the same constructs for repertory grids elicited in different Kuvi villages was effective for validating the data. Repertory grids focusing on the Roots family crops elicited from participants in the village of Kurli (Tunia and Mandro 2005/01/08) and the hamlet of Hutesi (2005/01/09) resulted in considerable agreement between participants. Using the same crops and the same constructs, the participants from the two hamlets developed rep grids that were 85% similar. This illustrates that these two groups of participants had shared knowledge, or perceptions, about their Roots crops when using those constructs to express their experiences. Therefore, I could be confident that the two rep grids were accurate representations of that aspect of participants' realities.[60]

On the other hand, if different groups of participants rate similar elements and constructs differently, it could be that they either respond to the constructs differently, or they have different perspective regarding their experiences of those constructs. For example, Korku farmers in Bulumgavhan state that most of their crops in their seed-mix system need healthy soil to perform well (Bulumgavhan 2004/12/07). However, Korku farmers in Takarkheda state that most of these same crops are very tolerant of poor soil (Takarkheda 2004/12/24). The possible reasons for this discrepancy introduce interesting interpretations. One explanation is that perhaps participants in each village understood my provided constructs differently (Denicolo and Pope 2001: 72-3; Fransella and Bannister 1977: 19, 106). The people of Bulumgavhan may have spoken from the point of view that crops always yield better in good soil rather than in poor soil, whereas the people of Takarkheda may have taken the stand that, idyllic conditions aside, the seed-mix crops are more tolerant of poor soil than many other crops. Another explanation for the difference in experience could be because cotton is an important crop in Takarkheda, and this crop must have good soil. Therefore, people in Takarkheda have the experience that seed-mix crops are more tolerant of poor soil than cotton is. People in Bulumgavhan, do not grow cotton, their reality is different, and so they would not have this perspective.

Another advantage to providing constructs was that rep grids could be completed with minimal time commitment and yet with many constructs available for analysis, since

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[60] On the other hand, farmers from the hamlet of Twaguda (2005/01/06) were unable to show agreement with the rep grids elicited in Kurli and Hutesi because they did not understand the meaning of my provided constructs. My co-facilitators attributed this to the fact that there were no elderly experienced farmers in this hamlet; all participants were young and inexperienced.

I already had a pre-designed template. If I was to insist that participants develop their own constructs for a Domain Analysis exercise, the process would go very slow. We would likely run out of time and energy before a suitable number of constructs for analysis could be identified and rated. Thus these rep grid analyses would be even weaker than those with constructs provided by me since the provided template model could at least accommodate a large and broad spectrum of constructs. Nonetheless, my template was flexible enough that if people did make construct suggestions, they could be easily included in the exercise. Furthermore, I was concerned that due to the challenges faced in the early stages of rep grid elicitation, people would lose interest in participating in this research. I hoped that they would tolerate the process if it moved along quickly and did not distract them for too long from other work since they seemed to me to be disinterested and bored with the research.[61]

Interestingly, other aspects of the Domain Analysis process were very easy for people to grasp. Once I confirmed the validity of each construct with participants, they understood the rating process easily. Participants would discuss the constructs amongst themselves with regards to the elements and very quickly arrive at an agreement on the proper ratings. I would frequently reiterate the meanings of their ratings, such as informing Korku participants in Bulumgavhan that by rating maize 1 out of 7 regarding the "domestic/market" construct (Bulumgavhan 2004/12/07; see Figures 8 and 9), participants are saying that maize is never taken to market. Participants would either

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[61] Eventually, Korku participants expressed that they were enjoying the process and even found it interesting to see how the different aspects of their knowledge are inter-related! I gradually came to realize that both the Korku and the Kuvi people are reserved and stoic people, either by nature or to protect themselves from outsiders. This made it difficult for me to "read" their behaviour, which attests to the importance of doing preliminary ethnographic fieldwork before initiating participatory exercises (see Pratt 2001: 38; Mosse 1998: 16; Mosse 1994; 506-7).

confirm my statement or discuss how the rating should be adjusted, which rarely took long. I was even surprised to see that participants rarely looked at previous ratings on the matrix to help them decide how to rate the next elements. Looking at the matrix was definitely more important to me than it was to the participants (Opp 1998: 136; Mosse 1994: 505, 517-8), whereas the participants remained focused on their memories and the oral aspect of the Domain Analysis exercises.

Analytical resources

Usually, participants did not have enough time after completing a Domain Analysis rep grid to do a quick immediate analysis with me on the ground. However, I observed the matrices as they developed and pointed out to participants interesting relationships as I saw them (Chevalier 2005: 13). Although I do not think people were able to *see* the relationships in the rep grid *per se*, they often found my comments very interesting, saying that they had not thought of things in that way before. Other times, participants would confirm the relationships as if they were common knowledge. More often, when a Domain Analysis exercise ended, I copied the repertory grid into my laptop computer as soon as possible in order to benefit from the Rep IV software analysis and draw more sophisticated interpretations. I could then attempt to return a sense of ownership of the rep grid to the participants by reconvening with them to show and discuss the Rep IV outputs. I also hoped to use my interpretations of the Rep IV analyses to inform subsequent discussions with farmers. However, in general participants neither had the interest nor the time for follow up meetings. As suggested above, this could in part be due to the foreignness of "participation", or else since the research was viewed to be mine, people were not as interested in "owning" it as much as advocates for participation assume.

Nonetheless, I hoped that the Rep IV analysis would help me to understand the impacts of participants' ratings. This was especially necessary after the Domain Analysis exercise of the Kuvi seed-mix, which generated a rep grid too big to do a manual analysis. I studied the Focus and PrinGrid diagrams produced by the Rep IV software for as long as I had battery power or access to electricity (which was never very often). I could see some patterns, and make some interpretations, but my overall impressions were often, "so what?" (see Jankowicz 2004: 51, 82).

I anticipated fascinating interpretations to ooze from the data. However, in the end, I decided the value in the rep grid process is as a topic of discussion and a tool for interviewing. I felt that much more interesting data came out of the sideline discussions and personal observations during the rep grid process rather than what was recorded in the rep grid itself (Chevalier 2005: 9; Jankowicz 2004: 79). The interpretations I made from the rep grid data did not seem deep enough on their own. Therefore, I used the simple interpretations drawn from the Focus and PrinGrid diagrams to direct follow up interviews and discussions with people (who may or may not have been the participants for the original rep grid elicitation) for delving more deeply into points that seemed interesting but not yet expounded upon. Eventually, I would stop using the structured and formalized rep grid technique at all. Understanding the technique myself, I simply facilitated informal discussions and interviews that were guided by it. I was still able to learn comparable knowledge about mixed cropping without having to worry about the impact and success of producing rep grid outputs (see below; Jankowicz 2004: 77, 79-

80). For analytical purposes, I was able to take peoples' informally elicited knowledge and transfer it into a rough rep grid for comparative analysis.

In hindsight, I should not have been very surprised by the superficiality of the repertory grid interpretations. With the constructs being supplied by me, they represent the aspects of mixed cropping that I consider important: drought resistance, risk management, nutritional diversity, *et cetera* (Mosse 1994: 517). I was aware of the inherently limited value of my provided constructs, which would be characterized by Jankowicz (2004: 85-8) as "propositional" and "behavioural" because they mundanely describe the crops and their responses to physical growing conditions. Although valid constructs and worthy of analysis, these kinds of constructs tend to elicit "classificatory knowledge systems" from participants, which is more a reflection of my cultural paradigm rooted in "Western" scientific positivism rather than the local knowledge systems of participants (Sillitoe 1998: 239; Chevalier and Buckles 2005: 41). Korku and Kuvi farmers may have different and more telling ideas regarding what is important about mixed cropping. These would be represented as "core", "constellatory", "evaluative" and "attributional" constructs, which are more personally meaningful, subtle and insightful into the local knowledge system than "propositional" and "behavioural" constructs (Jankowicz 2004: 82-9; Sillitoe 1998: 226, 238-9). Without using more personally meaningful constructs, Domain Analysis could not be used to its full potential. The repertory grids remained descriptive and never reached the stage where future opportunities regarding mixed cropping could be discussed (Chevalier 2005; Denicolo and Pope 2001: 114; Tyler 1985: 18; Shaw 1985: 26-7).

The construct set "guaranteed/uncertain" that I suggested toward the end of an exercise with Kuvi participants is an example of a construct that lacked personal meaning for them (see Figures 4 and 5; Katragumma 2005/01/07). I intended this as an "overall summary" construct since several other constructs focus on crops' abilities to cope with environmental challenges (Jankowicz 2004: 113). This construct would confirm that resistances to insects, drought, poor soil, and so forth, are factors that affect the successful yield of crops. My interpretations found this to be generally true, but several exceptions are identified in the rep grid. Recall that Kuvi participants rated Cucurbits Family crops as being drought and insect tolerant, yet they are also rated as being very uncertain, perhaps because they are not tolerant of the tired soil in an old *dongar*. However, finger millet also cannot tolerate the poor soil of an old *dongar* nor too little rain, but it is rated as being a guaranteed crop (Katragumma 2005/01/04). Given that finger millet is guaranteed and Cucurbits crops are not, there must be other factors that affect the successful yields of crops that Kuvi participants did not reveal to me. In other words, the provided constructs had limited value in establishing the factors that affect the yields of crops. Adding and analyzing more constructs, drawn from the participants' own knowledge system of seed-mixing, might have establish new and stronger patterns between crops and constructs to reveal more meaningful explanations than my constructs could provide.

In the time since I have returned from my fieldwork, I have improved my ability to analyze and interpret repertory grids. Having a lot more time to spend intuitively studying the Rep IV outputs as well as reviewing literature on personal construct theory has been instrumental for this. A newly released book by Jankowicz (2004) has been instrumental for learning the intricacies of principal component analysis, characterizing constructs, and honing elicitations skills. Unfortunately this book was not available prior to my departure to India for field work (also in 2004), and there is otherwise little other literature that helps readers to facilitate and interpret participatory techniques. On its own, Jankowicz's book has enabled me to make more thorough interpretations of repertory grid data. As a result, rep grids that initially gave me that "so what" (Jankowicz 2004: 82) impression suddenly have much more to offer. Having gained more experience examining the rep grids and "reading" the Rep IV outputs, I now believe that the Domain Analysis technique is a powerful tool for generating, analyzing and interpreting a lot of information.

However, spending countless hours pouring over the rep grid data once returned home from the field foments a tendency to over-interpret the data (Chevalier 2005: 13; Jankowicz 2004: 132, 135). By taking the repertory grids from India to Canada and continuing my analysis of them, I am stepping away from the context of the original Domain Analysis event, severing my collaborative research partnership with Kuvi and Korku farmers, and once again, effectively alienating them from the research.[62]

> As soon as you move away from the grid interview as a social encounter, and come back to the reasons for which you're conducting the interview, the investigatory or research design which you're following, and the kinds of analysis you're going to make of the interviewee's grid material, then issues of stance, expertise, and communication are raised (Jankowicz 2004: 74).

To be so removed from the interpretations, participants cannot give their additional comments, clarifications, and confirmations of interpretations. They cannot even say if they consider my interpretations to be wrong (see Jankowicz 2004: 136). Therefore,

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62 See Jankowicz (2004) regarding how the "ownership" of a repertory grid transfers from participant to researcher during the analysis process.

while the analyses and interpretations that make up Chapter 3 are based on the information provided to me by participants, they are also influenced by my own theoretical biases, including what I have appropriated from other scholars.

Participant reservations

As part of my own experience of facilitating participatory Domain Analysis exercises, I became quickly became aware of "the cultural ambiguity of participation" (Maclure and Bassey 1991: 202). Ironically, while "participation" is intended as being "for people," the methodologies with their tools may be outside the peoples' experiences, and thus foreign to the people being asked to participate (Jankowicz 2004: 44; Campbell 2001: 383; Pratt 2001: 14, 19, 21; Mosse 1994: 505). People may wonder what participatory research and development is about and why outsiders are so interested in their cultural knowledge. Misgivings regarding the value of participation may lead to potential participants becoming suspicious enough to curtail the depth of the research and even prevent the research from continuing (Mosse 1994: 504). As I describe from my own experiences below, this problem is exacerbated if researchers do not initiate participatory exercises by asking the right question, one that is personally meaningful and directly identified by the participants themselves. Therefore, researchers should start out on the right foot by first establishing a good relationship with - and understanding of - the local people to earn their trust and thus committed participation.

Negotiated consensus building is a significant feature of Korku and Kuvi socio-political life, just as it is a part of participatory research and development. For the Kuvi in particular, informal discussions at a tapped toddy palm tree are a twice daily activity for any man who wants to participate (as well as respected female elders) (Nayak et al 1990: 200-1). More formal village meetings also take place when necessary at the *Sadar*, the public place in the centre of the village where the Goddess is housed. These are relatively democratic fora to discuss village issues and make decisions affecting the village (yet subtle hierarchical distinctions are observed). However, techniques for participatory research and development are very structured and foreign while proposing benefits that are too distant and abstract to be immediately understood and valued by Kuvi people. The repertory grid technique, for example, is mentally difficult and demanding on participants, requiring much effort on their part to reflect upon their experiences in ways that they are not accustomed to do (Jankowicz 2004: 33-5).[63] Despite the interests of outsiders, participants often take their own knowledge for granted, enshrining it as "tradition" without thinking about it critically in the way outsiders ask them to. Both Kuvi and Korku participants repeatedly deferred to tradition and the legacy of their ancestors when I tried to learn more about their agricultural practices. To analyze traditions openly with a researcher risks offending the ancestors from whom the traditions are traced (Sathapathy 2005/01/11).[64]

When people have experience with development strategies, they may only be familiar with top-down approaches that exclude participation (Harrison 2002). Pratt (2001: 14) quotes one PRA practitioner who states that "people still have a hangover of the past, hangover of the top-down bureaucratic type of working style. It is still practiced in many places." Local people respond to this "hangover" in different ways. As an

[63] Pratt (2001: 19) quotes PRA practitioners who note that PRA processes go much more smoothly when people have had previous experiences with PRA and are already familiar with the tools and techniques.

[64] As I describe below, flexible use of Domain Analysis to better match local custom may have improved peoples' willingness to discuss their traditions more openly.

example, the government in India is fiercely motivated to end the practice of shifting cultivation, including among the Kuvi (Mohapatra 1994; Mohanty 2005/01/17; see also Alting von Geusau 1992; Kampe 1992). Since the Kuvi people also traditionally maintain horticultural stands of fruit trees to supplement their shifting cultivation economy, a government agency called the Dongria Kondh Development Agency (DKDA)[65] is giving Kuvi people free high yielding hybrid fruit trees (jack, mango, lemon, pineapple, etc). DKDA is hoping that this will encourage Kuvi people to replace subsistence shifting cultivation practices with horticultural cash crops on permanent fields. However, this development and resource management scheme is driven by government interests without requesting any input from Kuvi participation. Kuvi people adamantly covet their shifting cultivation and seed-mixing traditions which are economically and culturally important to them (see below). Nonetheless, most farmers happily accept the free trees since this also benefits them, and they have even come to expect free benefits.

Despite the fact that DKDA's scheme has failed to replace shifting cultivation, grass roots NGO workers lament that the scheme has created a culture of complacency among Kuvi people. Sathapathy (2005/01/11), director of USO, explained to me why Kuvi farmers were not very enthusiastic about participating with my research. He stated that Kuvi people are now accustomed to receiving free trees from DKDA with no obligation on their part to reciprocate. Although the trees are not a development priority for Kuvi people, they do represent a very tangible benefit at no cost to them. On the other hand, I reasoned that a participatory generation of farmers' knowledge of seed-mixing and its values would help counter the government's pressure to force people to abandon the system. This was maybe only a marginally more important priority for Kuvi farmers,

65 Dongria Kondh is the general name in India for the people who call themselves Kuvi.

but probably too abstract for them to be convinced of its value (after all they did not initiate the research). Therefore, participating in my research would involve commitment and effort from farmers toward an end they felt was dubious (and as stated below, maybe risky). In short, the NGO workers claimed that it will be difficult to encourage Kuvi people to engage in participatory research because they have become so accustomed to passively receiving government hand outs (see also Opp 1998: 127, 140; Pratt 2001: 19).

Especially when research is not based on issues of importance as identified by participants, they may limit their participation in order to protect their own interests. *Adivasi* culture, economy and development are highly politicized issues in India, especially with regards to shifting cultivation (e.g. Scott 1998; Li 2001; Vandergeest and Peluso 1995; Kammerer 1988). Potential participants may fear that exposing too much of themselves and their knowledge about politicized issues will have negative consequences for the future of their community (Jankowicz 2004: 193; Mosse 1994: 504, 509). Jankowicz (2004: 197) comments that in general people have a "tendency to express their attitudes and opinions… in a socially acceptable manner," and have a "reluctance to admit" that they hold "an unpopular belief" within other social circles. Even if people agree to participate, the research will not fulfill its full potential if participants are not forthcoming. Kuvi participants may have resisted offering their own constructs knowing that values promoting seed-mixing and shifting cultivation are unpopular with the authorities, who they feared I might be reporting to. Relying solely on the constructs provided by me, participants were ensured that I would be limited to a superficially descriptive construct system to try and understand a very diverse cropping pattern.

Sadly, many experiences with outsiders are much less benign than the DKDA example just cited. Historically, for tribal people in India contact with outsiders are invariably negative and can involve aggressive top-down development schemes, political interventions, exploitation, intimidation, expropriation and even violent attacks. Apart from receiving free trees from DKDA, Kuvi people only slightly further into the Niyamgiri Mountains are being forcibly displaced to make way for a huge multinationally supported bauxite mine.[66] The impacts of the mine are expansive and complex. The most seriously affected will be *Adivasi* peoples who will lose everything, presumably in the name of national economic development. Kuvi and other *Adivasi* peoples' resistance has been met with terrible aggression, violence and outrageous human rights abuses from authorities in the state of Orissa. Should economic growth and proposed rehabilitation packages materialize, they are a mere token, a bribe, for a few families and will never compensate for the social, cultural, economic and ecological upheaval wrought by the project (Scott 1998; Shiva 2000; Li 2001; Das 2001; Patnaik 2001; Chatterji 2005; Menon 2005).

The anxiety about this crisis was very real to Kuvi people within my research area and shaped how some people interacted with me. Elderly people in particular, refused to participate and even stood on the sidelines of Domain Analysis exercises telling others to not participate. Their belief was that I would gather information that would be used to help foreigners take their land away. As a result, only small core groups of people participated in the exercises. These core people said that they did not believe that I would

[66] The corporation at the centre of this mine is Utkal Alumina, now internationally owned. Apart from Indian corporate owners, the largest shareholders are Alcan (Canada) and Norsk Hydro (Norway).

take their land away from them, but without doubt they still interacted with me cautiously.

A similar scenario occurred among the Korku. Hearing that there was a foreigner within his political riding, the local member of the legislative assembly (Dharni *Taluka*, Amravati District), representing the Hindu nationalist Bharatiya Janata Party, spread rumours within Takarkheda that I was a Christian missionary. The rumours were clearly politically motivated to raise public support for the BJP in the area. Christian missionaries are a common "nuisance" in this area, targeting *Adivasi* peoples who are usually animists. Since Christianity is still associated with foreigners, my presence provided a visible target for the local MLA to foment people's anxieties about Christian missionaries, thereby raising support for the BJP. Despite having worked with me for two weeks by this point, some influential families in Takarkheda suddenly felt threatened by me, and the research came to a sudden stop. Ironically, during my time in Amravati District, I frequently came across Christian missionaries, all of whom were Indian nationals and not foreigners.

In both of the above cases I became acutely aware of the importance of building rapport with people prior to conducting participatory research (or any research for that matter). I originally hoped that the rapport already established by the NGOs working with the Kuvi and Korku peoples would increase the likelihood that people would quickly gain trust in me (Mosse 1994: 498). However, while SARITA had core groups of support in many Korku villages, by no means did I have access to all villagers. USO was obviously still new to the Kuvi people and had not yet earned their trust. Realizing that reversing these setbacks and then building the rapport needed before initiating participatory exercises would involve more time than I could commit, I decided it was best to simply alleviate peoples' anxieties and leave these fieldwork sites.

The role of facilitators

The necessity of building rapport before initiating any kind of research and development cannot be understated. Participatory techniques are no exception. Participatory methods in general, and the repertory grid technique in particular, are touted as being quick ways to learn a lot of information (Jankowicz 2004: 15-6, 197; see also Pratt 2001: 27). Yet this does not mean that researchers armed with participatory techniques can necessarily conduct more effective research in less time (although flexibility of Domain Analysis accounts for short time frames – see below). The techniques do not replace the need to spend time with potential participants building rapport and trust with them before initiating formal research exercises (Pratt 2001: 32; Colverson 1999: 167). During this time, researchers also build their own understanding of the local social circumstances, which will help them with recruiting participants, facilitating exercises, and analyzing social interactions (Pratt 2001: 38; Mosse 1994). Furthermore, time spent building a relationship with people provides opportunities to learn which research issues are priorities for local people so that the researcher can elicit a research question directly from participants. In these ways the facilitator "prepares" participants to participate (White 1999: 47). They gradually become familiar with the researcher, with what participatory research is all about, and finally are able to engage in that research according to a topic that is personally relevant to them. I was aware that my language barrier and the limited time I had for fieldwork would be a problem for establishing rapport with villagers. I hoped that by working alongside NGO workers with whom villagers were familiar would help in this regard, but the NGO workers also appeared to have only limited rapport with people.

Apart from rapport, the researcher must have good facilitation skills if the full potential of participatory methodologies is to be realized. While Jankowicz (2004: 15) states that the repertory grid is "straightforward", and that "there's nothing difficult about it," he admits that "there is a substantial amount of skill involved in obtaining an accurate description of the other person's [*Adivasi* participants'] constructs and values..." (see also Maclure and Bassey 1991: 203-4). Therefore, it was important for me to practice Domain Analysis in a risk free environment to build facilitation skills before entering "the field" (Chevalier 2004/11/9-11; 2005/05/11-13). My several practice rep grids in Canada were helpful for preparing me to facilitate exercises in the field, but in the field I was still a novice. My earlier practice could not anticipate the unique challenges faced in a new and unique cultural environment as with *Adivasi* peoples in India. Therefore, concrete experience is built by using the participatory techniques in *real* fieldwork settings. I imagine that even expert facilitators have to cope with unpredictable challenges, but their experience allows them to anticipate and react to challenges more effectively (Colverson 1999: 167). In addition, researchers who use participatory techniques with confidence, will more easily earn the confidence of participants, and be able to pay closer attention to cultivating the right "behaviours and attitudes" necessary to optimize peoples' trust. This suggestion is echoed by Pratt (2001: 51), who states that by encouraging facilitators to practice, "they will naturally self-improve and learn over time."

> This would suggest that the problem of attitudes and behaviour is likely to be greater with people new to PRA. Perhaps the larger number of people who have very recently started using PRA explains the general perception that attitude and behaviour is a problem – it may be correcting itself as more practitioners all become more experienced, and grow through practice and reflection.

My learning curve in the field was steep. My intentions to facilitate participatory research were sincere, but I lacked the experience needed to be effective as a facilitator. In retrospect, the research for this thesis does not seem complete, but I feel that I could return to the same *Adivasi* communities to continue the research as a much more effective facilitator.

Just as there is a dearth of instructional literature helping researchers to interpret rep grids, there is little that can help them to practice participatory techniques for acquiring facilitation skills (Maclure and Bassey 1991: 203-4; Pratt 2001: 28; Opp 1998: 89). As part of SAS^2, Chevalier (2005) provides a brief instructional manual to help facilitators get started with facilitating, analyzing and interpreting the Domain Analysis technique, but in the strength of its brevity it lacks comprehensiveness.[67] To my awareness, Jankowicz's (2004) "Easy Guide to Repertory Grids" is again the only other resource that thoroughly "trains" a researcher in the art of facilitating, analyzing and interpreting repertory grids. However, as this book was not available at the time of my research, I was unable to take advantage of it for analyzing and interpreting rep grids, and could only use it for retroactively learning from my mistakes made in the field.

Jankowicz anticipates that some construct elicitation techniques may not work with participants, and offers several other techniques that may be more effective in such situations. While I felt like I had a good grasp at the triadic and dyadic techniques (from

[67] Other SAS^2 techniques that utilize repertory grids are Social Domain, Problem Domain, Value Domain and Option Domain (see www.sas-pm.com).

Chevalier 2005), I was at a loss when I ran out of different ways of rewording my explanation of the technique through my translator to help participants get involved. Using other techniques offered by Jankowicz (2004: 52-69), such as "laddering down" (see also Chevalier 2005: 6), may have been more easily understood by participants, and thus would have been invaluable in gaining people's fuller participation. In addition, laddering down may have been a useful technique for deconstructing the "propositional" constructs supplied by me to learn the more "core" constructs of participants.

In retrospect, including a hypothetical "ideal element" into the repertory grid (Jankowicz 2004: 99) is another idea from Jankowicz that would have useful for me. In the case of this research, I could have added the "ideal crop" as an element into the repertory grids. When comparing the ratings of the ideal crop to other real crops, the values of the participants emerge. Perhaps more importantly however, the ideal crop would have enabled me to ask "the right question" to initiate participant identification of constructs. Asking participants, "What are the characteristics of the ideal crop?" would elicit responses that could be used as constructs in the repertory grid to rate all crops.

Gender and social limits to participation

Due to many factors including established links and levels of rapport with communities, the number of participants in each Domain Analysis exercise was generally few, ten people at the most. People would come and go during exercises, but most often I was repeatedly interacting with the same general groups of people. Therefore, there were large numbers of people who were not participating. Even now, I am in no position to speculate why so many people did not participate. A range of reasons can include disinterest, distrust, not knowing about the exercises, not knowing the language,[68] being too busy with other tasks, and even family feuds and being marginalized within the community. Most notably, though, none of the participants were women.

In general, many *Adivasi* societies are very egalitarian compared to the dominant Hindu and Muslim societies. There is no caste distinction, everyone has the same style and size of house, all houses face each other along a main boulevard down the centre of the village, and everyone interacts in all aspects of the local economy (i.e. everyone is a farmer). However, subtle social hierarchies still exist and are enforced in both Kuvi and Korku society. Even during Domain Analysis exercises, hierarchies influenced "how people negotiate their views across social boundaries" (Chevalier 2005: 1). Participation was usually dominated by one or two participants. On one occasion in Bulumgavhan (Korku), discussion was dominated by two elderly men, although the other men present spoke up occasionally to voice their opinions. On another occasion, the Domain Analysis exercise was dominated by a man who, although having only a small farm, was the owner of the village store as well as the forest watch guard for the community. Therefore he was someone with respect and authority. I found that if the group was younger, as during Domain Analysis exercises with Kuvi participants, interaction was more dynamic. However, on one occasion in Hutesi (2005/01/09), an older man spoke up from the sidelines of an exercise, but was criticized by the younger participants, stating that he cannot speak about mixed cropping and shifting cultivation because he never goes to his field and instead stays home and drinks.

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[68] Kuvi and Korku *Adivasi* each have their own distinct language. Women especially, may know only this language and be unable to communicate in the local state languages: Oriya around the Kuvi and Marathi around the Korku. Although my co-facilitators had a good grasp of the local Adivasi language, they were most effective for translating between English and the state language only.

Likewise, the position of women in *Adivasi* societies is also relatively more egalitarian than it is for their Hindu and Muslim counterparts (Thakur and Thakur 1995). *Adivasi* women generally work along side men for many tasks, they have influence and respect in the family and the village, they freely interact with whom they want and marry whomever they want (Du 2000). Nonetheless, women are *not equal* to men in many respects, and certainly distinctions are made between social tasks that are masculine and those that are feminine. Although women are very involved in maintaining agricultural diversity by planting seeds, weeding fields, preparing food and saving seeds for storage, tasks such as preparing food, fetching water, tending to children, and washing clothes make it difficult for them to come together as a group for participatory research exercises (Mosse 1994: 512).

I knew it would be a challenge to conduct Domain Analysis exercises with women participants, especially since I never worked with a woman co-facilitator/translator (see Mosse 1994: 512). Nonetheless, village men in both Katragumma (Kuvi) and Bulumgavhan (Korku) helped arrange for a meeting with village women. In Bulumgavhan an impressive number of about forty women gathered to meet me and Surendra, my co-facilitator. Informed that the women would not have much time, I decided that I would facilitate a discussion with the women based on a Domain Analysis rep grid elicited from the men the day before instead of undertaking a new Domain Analysis. I had already done some quick analyses and interpretations, and would see if the women would confirm or contradict the implicit views of the men made in the rep grid, as well as add some new views of their own. The women generally validated the men's grid in a fairly open discussion, although the event was dominated by two women who were the wives of important men in the village. These women sat at the front of the group, whereas young mothers and women who did not speak Marathi stayed at the back. However, the discussion was not conducive to new contributions of knowledge by women since we never really left the presence of the village men. Throughout the entire discussion a handful of men hovered just outside the discussion space, curious to hear what would transpire. After about forty minutes, requests were made to adjourn the meeting so that the women could return to their daily tasks.

Among the Kuvi of Katragumma, a meeting was planned with the women after the daily tasks were finished (Katragumma women 2005/01/11). This meant that darkness had already fallen, and a Domain Analysis exercise would have to be conducted by light of a single kerosene lamp. I should have taken this as a cue to go the route I did with the Korku women, but I was blindly committed to eliciting at least one rep grid from women participants. Again, the village men looked on, not participating, but also not realizing that they might affect the women's responses. The ten or so Kuvi women were generally young and quiet. Many giggled, and as with the Korku, allowed one woman to speak for them all. I suspect that elder women eschewed the exercise since several informal interviews with older women on other occasions were marked by scepticism and accusations regarding my research intentions. One Kuvi woman even tried to persuade a group of men to stop working with me because I wanted to take their land away. Nonetheless, one very elderly lady was present at the Katragumma Domain Analysis exercise. She kept trying to sell me her hand embroidered shawl, which eventually resulted in her being chastised by one of the men present. The old woman then left, soon followed by the young woman who was acting as spokesperson. Within a few seconds, several other women scooted out, and then a few more, until shortly they had all left. The rep grid exercise was hardly even started.[69]

One lesson from this scenario returns to the issue of rapport and its importance. Perhaps even more so among women, a relationship and environment of trust must be built in order to achieve effective participation. However, I think there are other factors at work. If the men struggled with many aspects of the Domain Analysis exercise, for women it was completely outside their realm of social interaction. I do not think they were comfortable with the structured nature of the technique nor the public atmosphere in which it was conducted since the women were never free from the men's gaze. Luckily, it was very easy to interact informally and spontaneously, and discuss agricultural issues with Kuvi women on a one on one basis (see Mosse 1994: 512-6). Knowledge learned from women (or anyone) in this way can be very similar to what is elicited during a rep grid technique. Therefore, the facilitator can still develop a matrix after the interview to analyze the knowledge garnered from the interviewee (Chevalier and Buckles 2005: 39; 2005d: 38-40).

Flexible use of Domain Analysis

Most issues of rapport and the effective use of the Domain Analysis technique are addressed by SAS^2, both methodologically and within its theoretical underpinnings (Chevalier and Buckles 2005; 2005b). SAS^2 embodies versatility and flexibility, and techniques emphasize a sliding rule principle, enabling practitioners to simplify or

[69] Kuvi women's response to participatory research was strikingly similar to a statement from the 1960s by Edwin Ardener. He concludes that women find it more difficult than men to articulate their knowledge and experience in the way investigators desire. Therefore, the experience of the investigator is that women "giggle when young, snort when old, reject the question, laugh at the topic, and the like" (quoted from Mosse 1994: 511).

advance the techniques and their analysis. The techniques move between "analytic reasoning" and "narrative account" so that they can be used appropriately according to specific socio-cultural situations and research objectives (Chevalier and Buckles 2005: 38). Making use of the appropriate level of complexity for each SAS^2 technique, and knowing all of the facilitation options, is also a skill that comes from both becoming familiar with the techniques and practicing them.

Nonetheless, to choose the right mode along the narrative/analytic continuum according to the current social environment requires facilitators to spend an extended preliminary period at the research site prior to initiating participatory exercises. This enables facilitators to build an understanding of the subtle social dynamics among potential participants, build an understanding of which narrative mode would be optimal given the local socio-cultural context (or previous experience with participatory research), and build a relationship of trust with the people. In addition, several simpler SAS^2 techniques can be used on a basic level for assessing the social environment as well as gradually familiarizing people with SAS^2 techniques in general before undertaking the more sophisticated Domain Analysis technique. However, if facilitators know that they have little time to do both preliminary research and participatory research, they can use simpler, unstructured versions of techniques that can be performed and analyzed in less time and without a lot of "preparation" for the participants.

Above I admitted I had wrongly assumed that the NGO partners linking me with potential *Adivasi* participants were already well established in those villages. I also wrongly assumed that NGO workers had better familiarity with the concept of "participation" and had previously introduced it to villagers. In principle, the structured approach of Domain Analysis allows translators to manage the process as co-facilitators without researchers/facilitators needing a strong grasp of the local language. It is of course helpful if translators also have good facilitation skills, but a basic understanding of the techniques and principles of participatory research suffices in this respect. Translators then need only follow the guidance of researchers. Acting in this way, translators learn through experience the facilitation process for Domain Analysis enabling them to appropriate the technique for other purposes. However, I felt that my co-facilitators had not yet developed the necessary rapport with people, nor did they share my views about the values of "participation" and indigenous knowledge. It appeared to me that "participation" among many Indian NGOs often means that local people come out to meetings with NGO workers, sit on the ground as a sort of audience and listen to what the workers tell them they should do. Furthermore, since I did not understand the local language, I was always uncertain that co-facilitators were properly representing the research and my views, let alone speaking to participants as equals. Again, the discrepancy was more pronounced between USO and the Kuvi people than it was between SARITA and the Korku people. These gaps made it difficult for people to follow the Domain Analysis procedure as I was facilitating it.

By first making use of other SAS[2] techniques, I could have more effectively built up rapport with participants while also conveying the value of participatory research and finally assessing which questions about mixed cropping were of interest to people locally. However, I alternatively compensated for challenges to the Domain Analysis technique by simplifying the elicitation process. Most notably, as described above, I supplied most constructs for rep grids. Also, I learned to embrace the fact that only a few participants sat with me during each exercise. Domain Analysis technique can be used on an individual basis, in small groups, or with many people divided into focus groups. Using the technique more often but with just a few people made facilitation easier for me and the participants, deepened our experience of the technique, and allowed for sophisticated analyses on my part. A more radical facilitation adjustment stems from my experience of using a rep grid elicited with Bulumgavhan men to give direction to an informal discussion with Bulumgavhan women. Eventually, I ceased to elicit the matrix altogether because I repeatedly noticed that participants paid little heed to the matrix forming in front of them. Instead, since I was well acquainted with the rep grid technique, I simply facilitated an informal discussion, asking questions similar to those used for eliciting constructs. Therefore, contrary to other PRA methods, the Domain Analysis technique can still be useful even without producing finished outputs (Jankowicz 2004: 77). Through “narrative accounts” peoples’ responses were recorded in my notes, and used to develop an “unofficial” grid to help me to personally analyze peoples’ knowledge.

When grids were elicited, I tried to do on the spot analyses while I still had the group together. Making note of relationships peoples’ rating pattern as they were rating was the best way to get people to pay attention to the grid. It helped reveal the significance of their knowledge back to the people generating the knowledge, which helped foment interest in the research on the part of the participants. For example whenever I noticed that two or more crops were being rated almost identically, I was able to elicit new constructs or information about those crops by identifying the similarity to the participants and asking them to describe if there is any way in which these crops are different. I also publicly made note of other interesting relationships. Both Kuvi and

Korku people found it interesting that they consistently rated domestic crops as being the healthiest crops. While this correlation ultimately did not surprise the participants, they had not previously realized that the correlation had existed.

Moving slowly through the Domain Analysis exercises and even making little analytical discoveries with the participants were small but vital steps both for my thesis research and for participants. People were familiarized with participatory methodologies for research and development as well as with minute new aspects of their knowledge and the value of mixed cropping. After leaving the field site, I devoted significant time to re-examine the rep grids and analyze them much more thoroughly using the Rep IV software. While this process excluded the participation of people who offered the original data, it was essential for me to develop the data further to contribute more significantly for this thesis. Therefore, the Domain Analysis technique shows versatility in that one exercise can be utilized on different levels and can contribute to different research objectives, those of the participants and those of the researchers.

Conclusions

In this chapter I aim to provide experiential insight into the reality that anthropological research is an endeavour wrought with uncertainty. This reality is exemplified when research involves the unpredictability of participatory tools and techniques. I focus my attention in this regard to the Domain Analysis technique from the Social Analysis System[2]. Analyzing my experience using the Domain Analysis technique contributes to the thesis as a whole by contextualizing the research that comprises the bulk of this thesis. In part, I consider this chapter an evaluation of the Domain Analysis technique against the claims made about it, compared to other participatory systems, in Chapter 2. In addition, I am attempting in this chapter to be transparent regarding the shortcomings of my research experience, and the reliability of the data and analysis. Similarly, I take responsibility for failures not only to utilize the Domain Analysis technique to its full potential, but also to fulfill participatory goals such as empowering participants by facilitating them through new learning experiences, and then keeping ownership of new experiences and research with participants.

At first it appears that I extend several familiar criticisms of other participatory systems to the Domain Analysis technique. I noted how Domain Analysis exercises included small numbers of participants and of those only a few dominated the process. Furthermore, participants struggled throughout the process, finding it confusing and abstract, if not suspicious and threatening. As a result, the repertory grids appeared superficial and weak. Due to this weakness, I felt obliged to deepen the analysis of the rep grids significantly with the Rep IV software after returning to Canada in order to meet my own research objectives. However, in so doing, I have alienated participants from the original knowledge embodied in the rep grids to the point where my analysis may overshadow the knowledge of the *Adivasi* participants.

In actuality, the impacts of these shortcomings are significantly reduced by using the Domain Analysis technique compared to other participatory methods. A significant advantage to Domain Analysis that arises in this research is that it is not mechanistic. It does not need to produce "results" to be useful, and there is no single "right" way to execute the technique in order to be useful. Instead, it is versatile and flexible, allowing it to embrace the unpredictability which is an inherent part of participatory research.

Domain Analysis, and all other SAS^2 techniques, can be scaled up or down to accommodate specific research situations such as the social environment in which they are being used and the needs of the people participating. This flexibility enables research to be conducted in a shorter amount of time if necessary, but this should not be interpreted as a suggestion that preliminary or continuous social research and building rapport can be neglected. Finally, the versatility of Domain Analysis allows it to serve research objectives for different research stakeholders. For example, a rep grid can be used on a basic level for participatory analysis and knowledge sharing among participants for their own benefit, and then be analyzed more thoroughly to meet my objectives for completing this thesis.

Nonetheless, the degrees to which Domain Analysis and other SAS^2 techniques advance the values of "participation" still rely heavily on the quality of researchers and facilitators. Researchers and facilitators must diligently cultivate not only a trusting relationship with potential participants, but also the right "attitudes and behaviours" in order to create a social environment conducive to participatory research and development. Without these qualities, researchers will fail to elicit a research question from the participants and thus meaningful to the participants, continuing the co-optation of "participation". This initial disowning of the research from participants sets a precedent that will have repeated consequences throughout the rest of the research process: the quality of the knowledge generated will be limited due to some aspect of peoples' distance from the original question. For researchers to overcome this weakness two ingredients are necessary: taking the time to build a mutual understanding between researchers and potential participants, and learning the ins and outs of participatory techniques through practice in real situations, where information matters, and uncertainties arise. By building experience, new researchers may make mistakes, but they also will learn how to build rapport, cultivate attitudes and behaviours and take advantage of the breadth of participatory techniques. By expressing my own experiences, I hope that this learning process will be faster and smoother for others.

CHAPTER 5:CONCLUSIONS AND FUTURE OPPORTUNITIES

The economy and ecology of mixed cropping:

This thesis contributes and builds upon the growing support from NGO professionals and social scientists that mixed cropping systems are economically and ecologically important for marginal farmers. The argument is that indigenous mixed cropping system practices are specifically adapted to each farming community's socio-economic and environmental situation. Adaptations are geared toward ensuring that mixed cropping systems are both economically and ecologically sustainable for the farmers who employ them. Firstly, growing a mixture of different crops together results in a variety of growth habits and plant characteristics interacting within a given growing space. The dense and multilevel leaf canopy prevents sunlight and rain from landing directly on the soil surface. This prevents soil from drying out, rain from washing soil away, and the germination of weeds (Mangaraj and Allim 2005/01/15; Patra 2005/01/16). Additionally, mixed cropping offers farmers both resiliency and economic diversification. By employing a diversity of crops within a field, farmers can take advantage of a diversity of plant qualities and tolerances to ensure that their farms will yield successfully regardless of unpredictable forces of nature (Shiva 2000: 16; Gell 1997; Cleveland and Murray 1997: 481; Sharma 1994: 143; Altieri et al 1987: 50). Finally, with so many different crops being harvested, farmers can meet different economic needs, from food to fodder, income generation to medicine, craft materials to construction materials, all directly from their land.

Using the Domain Analysis participatory technique, Kuvi and Korku *Adivasi* farmers reiterated and validated many of the above claims. In addition, Kuvi and Korku contributions go far beyond the generalities of the "experts" to identify their knowledge of specific agricultural situations where mixtures of particular crops with particular characteristics are being grown together. Domain Analysis exercises elicit repertory grids from participants that act as "mental maps" of their mixed cropping knowledge by establishing profiles for each crop according to identified sets of characteristics. Each profile is then compared to all other profiles to identify how each crop contributes its particular qualities to the mixed cropping system as a whole. For example, to what degree is a specific crop drought resistant, and how does that compare to the drought resistance of other crops? Furthermore, Domain Analysis reveals valuable and concrete relationships between crops' characteristics. For example, Kuvi farmers rate crops with insect problems as also being late to harvest, thus revealing their understanding of insect cycles and how they are affected by the annual burning of the *dongar* fields. Therefore, Domain Analysis is an innovative research technique for understanding the specific strengths and weaknesses that each crop contributes to a mixed cropping system, as well as how all crops interact with each other within that system.

Situational comparisons of mixed cropping systems:

The interpretive scenarios offered by the Domain Analysis technique also enable this thesis research to make broader comparisons regarding the mixed cropping knowledge of different groups of participants, either within the same *Adivasi* tribe, or between different tribes. Chapter 3 particularly focuses on comparing the "fragmentation" of the Kuvi seed-mix to the "polarization" of the Korku integrated mixed cropping system. The wide differences between the two systems provide specific insight into how different mixed cropping systems represent adaptations to the different socio-economic and ecological situations experienced by Kuvi and Korku peoples.

The Kuvi people, for example, farm on steep slopes that are too remote to be effectively integrated into the market economy. This situation, largely dependent on self reliance, necessitates that farmers achieve consistent and reliable harvests to meet their subsistence needs since there is little other economic opportunity. In addition, the fragmentation of the Kuvi rep grid indicates that the seed-mix system maximizes resilience in all areas of farmland to ensure that all areas will be productive. Having all areas productive also helps ensure ecological sustainability since it protects soil from being washed down the steep *dongar* slopes. In other words, the Kuvi seed-mix can adapt to almost any changes in ecological conditions during a given season.

Due to its success, and the lack of outside influence, the Kuvi seed-mix has become deeply entrenched in Kuvi tradition and cultural identity (Vasavi 1994: 287-8). However, with emphasis on traditions and ecological resiliency, the Kuvi seed-mix system may be less adaptable to the socio-economic and political changes just beginning to occur at the edge of the Kuvi communities. Sudden interests from government and industry in forest, water and mineral resources within Kuvi areas have increased conflict between different stakeholders' interests (Deb and Malhotra 1993: 330). Kuvi farmers are being vigorously pressured to cease shifting cultivation and thus the seed-mixing traditions associated with it. This will allow government opportunity to annex the hill areas for "preserving" water and forest resources – wrongly assuming that Kuvi agriculture destroys these resources[70] – and for industry to establish lucrative mining

[70] Actually, there is growing evidence that shifting cultivation does not threaten either of these resources, but manages them sustainably, especially compared to resource exploitation by industry and

operations. However, this pressure will also impact the food security of the Kuvi people. Kuvi agriculture would be reduced to a few agro-forestry products such as fruit and wood for pulp and paper (Mathapatra 2005/01/16; Mohanty 2005/01/17; Fairhead 2000; Siva 1995; Sharma 1994: 159-62; Deb and Malhotra 1993: 334; Mohapatra 1992; Sahoo 1992; Behura 1990). This reduced agricultural economy would then be supplemented with labouring in bauxite mines. The economic transition would represent a major socio-cultural upheaval for Kuvi people, alienating them from their culture which has been built on their agricultural traditions (Vasavi 1994: 283-4; Kattakayam 1996; Jha 2004; Nayak and Soreng 1999; Nayak 2000; Soreng 2001; Alting von Geusau 1992). Additional socio-economic consequences stem from the fact that Kuvi people will become more reliant on the market economy (Renaud et al 1998; Alting von Geusau 1992; Kammerer 1989). Their inexperience with market economies, which are still remote and difficult to regularly access, allows them to be easily exploited by merchants, traders and employers (Jha 2004; People of the World 2004; India 2004; Carson et al 2002; Agragamee 1998; Sampat 1998; Ghosh 1998; Deb and Malhotra 1993: 329-30).

Unlike the fragmentation of the Kuvi system, the interpretive trend of the Korku mixed cropping system leans more towards polarization. Polarization in Korku rep grids mean that all Korku crops tend to fall into one of two crop families, each with opposite profiles. In terms of ecological factors, this means that the Korku mixed cropping system has only limited resilience against ecological changes. Nonetheless, farmers' access to flatter land as well as markets allows them to take advantage of a diversity of income opportunities instead of depending almost entirely on a subsistence based system where

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exploding lowland populations (Schmidt-Vogt 1997; Poffenberger and Stone 1996; Forsyth 1996; Sharma 1994: 109; Alting von Geusau 1992: 182-4; Behura 1990: 3; India 2004; Furer-Haimendorf 1982: 77-80).

resiliency from crop diversity is more important. Likewise, Korku farmers also have limited access to agricultural infrastructure and technology (irrigation, fertilizer, seed drill), enabling them some control over ecological factors, once again rather than having to depend on the resiliency of a diversity of crops to maintain food security. Therefore, while the Korku mixed cropping system may be less resilient to ecological changes than the Kuvi system, it is more adaptable to changing economic conditions.

This thesis clearly demonstrates how the Kuvi and Korku systems are different, and speculates why there are differences. However, according to Mazhar and Buckles (2000: 6), “the relations of material ‘exchange’ in nature and the ‘metabolic’ social interactions of money and numbers are not easily measured.” Therefore, determining if one mixed cropping system is more effective than another for achieving food and economic security is difficult to calculate. My inclination is to suggest that each is equally effective, appropriately adapted to the situation in which it is employed.

Future possibilities from past experiences:

The Domain Analysis technique validates the stated claims of NGO workers and social scientists while also contributing specific farmers’ knowledge from the Kuvi and Korku case studies. However, as a participatory technique, I did not succeed in using Domain Analysis to its full potential due to a general inexperience with using this technique in a fieldwork setting and to issues of weak rapport with participants. While many factors can be attributed to the shortfalls of the research, the root may be the fact that the research was initiated based on my interest in learning about farmers’ mixed cropping system. By alienating Kuvi and Korku farmers from the research process, they either became ambivalent toward it since they felt it was more for my benefit and not theirs, or struggled to follow and understand a participatory process that was delivered to them in a paradigm not their own.

As a result, many aspects of the research reflect more my own assumptions about mixed cropping (coming from a Western scientific cultural bias) rather than those of the participants. For example, participants offered their knowledge for Domain Analysis exercises, but I provided the constructs with which participants analyzed the crops. In addition, conclusions comparing fragmentation and polarization in Kuvi and Korku mixed cropping systems represent my interpretations of the knowledge participants contributed rather than being their own interpretations of their own knowledge.

Although my conclusions regarding maximum resiliency with minimum labour inputs are expressly important to Kuvi and Korku farmers, and also contribute to general research on mixed cropping, they likely do not represent the full body of participant knowledge of the topic. There may be additional, more culturally embedded knowledge motivating Kuvi and Korku farmers to maintain their agricultural biodiversity that Domain Analysis exercises for this research may have failed to elicit from participants. This shortfall is less a problem with Domain Analysis as it is with the actions of facilitators who initiate the exercises (see Pratt 2001; Mosse 1994). Therefore, the research for this thesis, which I consider incomplete and preliminary, can and should be extended to better understand Kuvi and Korku farmers' knowledge from their own perspective (Jankowicz 2004: 83-6).

In order to attempt to identify this knowledge, the full flexibility of the Domain Analysis technique must be utilized to appropriately adapt to local socio-cultural conditions (Chevalier 2005; 2005c). Furthermore, it is crucial to build rapport and trust with farmers so that they are inspired to not only participate with research, but also to initiate it. With a more appropriate and effective research process in place, new Domain Analysis exercises can elicit farmers' own "core" constructs in addition to the constructs already supplied by me for this thesis (which can be updated and adjusted as necessary to account for changes over time and/or between different communities).

"Improved" Domain Analysis rep grids can then embody a combination of constructs important to the ecological and economic aspects of mixed cropping valued from a Western framework as well as core constructs that are culturally relevant to the participants. Participatory analysis of rep grids with both kinds of constructs can lead to entirely new sets of relationships between crops, constructs and between crops and constructs. On the one hand, the relationships established in this research may be reinforced and even made more significant if new constructs join those relationships. On the other hand, the inclusion of core constructs from participants may reveal the limits of the relationships that I found in participants' contributions to instead identify new and very important relationships that have otherwise escaped researchers' notice. These new relationships may necessitate revising the "fragmentation" and "polarization" interpretive scenarios discussed in this thesis as well as how I argue the socio-cultural specificity of different mixed cropping systems.

Most importantly however, the contributions of core constructs provide an intimate glimpse into the experience and knowledge of farmers who practice mixed cropping systems. Therefore, the Domain Analysis is a technique for marginalized *Adivasi* farmers themselves to express their knowledge regarding the multitude of characteristics embodied in each of their crops, and the myriad ways in which these contribute holistically to their unique cultures, societies, environments and economic livelihoods.

APPENDIX

Kuvi/Kui seed mix crops (excludes horticultural crops)

ENGLISH	ORIYA	KUVI/KUI	VARIETIES
ROOTS			
Cassava	Similikanda	Lekakona	
Yam	Matualu	Ouhkona	
Sweet Potato	Kandamulao	Ranikona	
Taro/Eddo	Saru	Hapo	
?	Cherokanda	Hirakona	
?	?	Patnagillikona	
LEGUMES			
Bean	Koting	Kating	2
Bean	Jhudangar	Jhun'yu	2
Pigeon Pea	Kandalo	Kanga	2 - 6
Bean	Jhuta	Hembi	2
Pea	Baili	Balnga	2
Gram	Biri	Biring	black and green
GRAINS			
Finger Millet	Mandia/Katinga	Kaelika	Langrajengu, Mudhamande, maybe a third variety
Pearl Millet	Gantia	Ku'e/Gathe	
Common Millet	Kosala	Kuseli	Samralonga, Korukodu, Sidingtore, Lingitkonda
Foxtail Millet	Kangu	Arka	red, white, black
Sorghum	Janna	Janjalanga	
Millet	Suan	?	Suan, Gudji
Millet	Kolatha	?	2
VEGATABLES			
Pumpkin	Boitalu	?	
Cucumber	Kakuri	?	
Gourd	Jhoni	?	
Eggplant/Aubergine	Baigan	?	
Hot Pepper	Mirchi	?	
Hibiscus	Kolkati	?	
OIL SEEDS			
Niger/Safflower	Allsi	Rasika	
Sesame	Tilli/Rasi	?	
Castor	Joda	?	

Korku Crops

ENGLISH	MARATHI	VARIETIES	
GRAIN			
Maize	Makka	3	seed-mix
Sorghum	Jawar	4	seed-mix
Rice	Dhan	3	seed-mix
Millet	Sawrya/Sawa	2	monsoon
Common Millet	Kutki	1	monsoon
Millet	Ladga		monsoon
Millet	Kodo	2	monsoon
Amaranth	Rajgeera	2	monsoon
Wheat	Gehu	2	winter
LEGUMES			
Green Gram	Moong	2	seed-mix
Black Gram	Urad / Gadmul	2	seed-mix
Pigeon Pea	Tur	4	seed-mix through winter
Chickpea	Channa	5	winter
Lentil	Masur	1	winter
Field pea	Vatana	2	winter
Soy	Soy	2	monsoon
Bean	Barbaty	4	seed-mix
OILSEEDS			
Sesame	Tilli	2	seed-mix
Flax	Jagni		
OTHER			
small melon	Kheera		seed-mix
Coriander	Dhaniya		winter
Cotton	Kapas	"many"	monsoon through winter
Chilli	Mirchi		monsoon
Tomato	Tomatar		monsoon

REFERENCES

Acharya, Manoranjan. 1989. "Changing Ecosystems of the Tribals with Special Reference to Deforestation and Forest Policy." Adibasi. 29(2): 17-22.

"Agragamee: The Struggle for Life and Light." Race and Class. 39(3): 61-70.

Altieri, Miguel A; Anderson, M.K; Merrick, Laura C. 1987. "Peasant Agriculture and the Conservation of Crop and Wild Plant Resources." Conservation Biology. 1(1): 49-58.

Alting von Geusau, Leo. 1992. "Akha: Ten Years Later." Asia Pacific Viewpoint. 33(2): 178-84.

Amina. 2005/01/08. Personal interview in Kuvi village of Kurli.

Anam, Polthanee. 1992. "Farmer as Scientist: Bringing Farmer Knowledge to Research." Asia Pacific Viewpoint. 53(2): 145-50.

Anan, Ganjanapan. 1998. "The Politics of Conservation and the Complexity of Local Control of Forests in the Northern Thai Highlands." Mountain Research and Development. 18(1): 71-82.

Anonymous. 2005/01/20. Interview with two elderly men in Laxmipur.

Bahura, NK. 1990. "Shifting Cultivation: A Cause for Environmental Degradation." Adibasi. 30(4): 1-7.

---. 1992. "Tribes and the Forest – An Overview." Adibasi. 32(1): 15-9.

Balasubramanan, K; Thamicoli, P, eds. 2002. Seed Village: Promoting Partnership Between Private Sector Seed Industry and Rural Women. Chennai: MS Swaminathan Research Foundation. www.mssrf.org. Last visited September 22, 2004.

Baviskar, Amita. 1995. In the Belly of the River: Tribal Conflicts Over Development in the Narmada Valley. Bombay: Oxford University Press.

Bethekar. 2004/12/25. Personal interview in Korku village of Bulumgavhan.

Bethekar. 2005/02/04. Personal Interview in Korku village of Bulumgavhan.

Blowers, Geoffrey; O'Connor Kieron. 1996. Personal Construct Psychology in the Clinical Context. Ottawa: University of Ottawa Press.

Bodley, John H.1990. Victims of Progress: Third Edition. Mountain View, CA: Mayfield Publishing Company.

Brush, Stephen. 1989. "Rethinking Crop Genetic Resource Conservation." Conservation Biology. 3(1): 19-29.

---. 1993. "Indigenous Knowledge and Biological Resources and Indigenous Property Rights: The Role of Anthropology." American Anthropologist. 95(3): 653-71.

Bulumgavhan. 2004/12/06. Domain Analysis exercise on varieties of sorghum, and group interview in Korku village of Bulumgavhan.

Bulumgavhan. 2004/12/07. Domain Analysis exercise on seed-mix, and group interview in Korku village of Bulumgavhan.

Bulumgavhan. 2004/12/23. Problem Domain exercise and group interview in Korku village of Bulumgavhan.

Bulumgavhan. 2005/02/03. Causal Dynamics exercise on seed-mix, and group interview in Korku village of Bulumgavhan.

Bulumgavhan women. 2004/12/08. Group interview with women in Korku village of Bulumgavhan.

Burling, Robbins. 1965. Hill Farms and Padi Fields: Life in Mainland Southeast Asia. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Campbell, John. 2001. "Participatory Rural Appraisal as Qualitative Research: Distinguishing Methodological Issues from Participatory Claims." Human Organization. 60(4): 380-9.

Carson, David K; Chowdury, Aparajita; Choudury, Reeta; Carson, Cecyle K 2002. "Competancy and Family Support of Vulnerable and Invulnerable Adolescents Representing Scheduled Tribes and Scheduled Castes in India." Journal of Contemporary Family Studies. 33(2): 249-70.

Chang, Jen-hu. 1977. "Tropical Agriculture: Crop Diversity and Crop Yields." Economic Geography. 53(3): 241-54.

Charal Thong-Nam; Benahaphun Shinawatra; Healy, Sean; Trebuil, Guy. 1997. "Resource Management and Decision-Making in the Thai Highlands." Journal of Contemporary Asia. 27(2): 179-97.

Chatterji, Angana. 2005. "State Tyranny in Orissa." Sikh Spectrum. Number 19. http://www.sikhspectrum.com/022005/orissa.htm.

Chevalier, Jacques. 2004/11/9-11 SAS[2] Introductory Workshop. Ottawa: Carleton Centre for Community Innovation (Carleton University).

---. 2005/05/11-13. SAS[2] Advanced Practitioner Workshop. Ottawa.

---. 2005. "SAS[2] 1.0: Domain Analysis." The Social Analysis Systems[2]. www.sas-pm.com/.

---. 2005b. "SAS[2] 1.0: Dynamics." The Social Analysis Systems[2]. www.sas-pm.com.

Chevalier, Jacques; Buckles, Daniel. 2005. "SAS[2]: 1.0: Social Analysis Systems[2] Theory." The Social Analysis Systems[2]. www.sas-pm.com.

---. 2005b. "SAS[2]: 1.0: Process Management." Social Analysis Systems[2]. www.sas-pm.com.

---. Last visited 2006/03/05. "Principles." Social Analysis Systems[2]: Guidelines. www.sas-pm.com/guidelines/guideline_principles.htm.

Clement, Matthew. 2004. "Rice Imperialism: The Agribusiness Threat to the Third World Rice Production." Monthly Review. 55(9): 15-22.

Cleveland, David; Murray, Stephen. 1997. "The World's Crop Genetic Resources and the Rights of Indigenous Farmers." Current Anthropology. 39(4): 477-515.

Clifford, James, 1986. "Introduction: Partial Truths." Pp 1-26, in Clifford and Marcus (eds).

Clifford, James; Marcus, George E, eds. 1986. Writing Culture: The Poetics and Politics of Ethnography. Berkeley: University of California Press.

Cohen, Erik. 1992. "The Growing Gap: Hill Tribe Image and Reality." Pacific Viewpoint. 33(2): 165-9.

Comaroff, John L; Comaroff, Jean (eds). 1999. Civil Society and the Political Imagination in Africa: Critical Perspectives. Chicago: University of Chicago Press.

Colverson, Kathleen. 1999. "Women in Agriculture: Participation and Access." Pp 160-74, in White (ed).

Das, Vindhya. 2001/07/14. "Orissa: Mining Bauxite, Maiming People." EPW Community. www.saanet.org/kashipur/articles/vindhyadas.htm.

Daspatnaik, PS. 1984. "Ownership Pattern, Land Survey, and Settlement and its Impacts on the Dongria Kondh of Orissa." Adivasi. 23(3): 23-32.

Davis, Jennifer; Whittington, Dale. 1998: "'Participatory' Research and Development Projects: A Comparison of the Community Meeting and Household Survey Techniques." Economic Development and Cultural Change. 47(1): 73-94.

Dearden, Philip. 1995. "Development, the Environment, and Social Differentiation in Northern Thailand." Pp 111-30 in Jonathan Rigg (ed).

Deb, DP; Malhotra, Kailash. 1993. "Peoples' Participation: The Evolution of Joint Forest Management in Southwest Bengal." Pp 329-42, in Roy and Ghosh (eds).

DeGregori, Thomas. 2004. "Green Revolution Myths and Agricultural Reality." Journal of Economic Issues. 38(2): 503-8.

Denicolo, P; Pope, Maureen. 2001. Transformative Professional Practice: Personal Construct Approaches to Education and Research. London: Whurr Publishers.

Deogaonkar, SG. 1990. The Korku Tribals. New Delhi: Concept Publishing Company.

Dove, Michael R; Kammen, Daniel M. 1997. "The Epistemology of Sustainable Resource Use: Managing Forest Products, Swiddens and High-Yielding Variety of Crops." Human Organization. 56(1): 91-101.

Du, Shanshan. 2000. "Husband and Wife Do It Together: Sex/Gender Allocation of Labor Among the Zhawzhat Lahu of Lancang, Southwest China." American Anthropologist. 102(3): 520-37.

Dzingerai, Vupenyu. 2003. "The New Scramble for the African Countryside." Development and Change. 34(2): 243-63.

Easterby-Smith, M 1981. "The Design, Analysis and Interpretation of Repertory Grids." Pp 9-30, in Mildred LG Shaw (ed).

Eberlee, John. 1999. "Assessing the Role of Uncultivated Foods in Bangladesh." International Development Research Centre: Reports. http://web.idrc.ca/en/ev-5212-201-1-DO_TOPIC.html. Last visited November 7, 2004.

Eicher, Carl K; Staatz, John M. (eds). 1998. International Agricultural Development: Third Edition. Baltimore: Johns Hopkins University Press.

Elwin, Verrier. 1939. The Baiga. London: Murray.

Epting, Franz; Landfield, Alvin (eds). 1985. Anticipating Personal Construct Psychology. Lincoln: University of Nebraska Press.

Ferguson, James; Gupta, Akhil. 2002. "Spatializing States: Toward an Ethnography of Neoliberal Governmentality." American Ethnologist. 29(4): 981-1002.

Forsyth, Timothy. 1996. "Science, Myth and Knowledge: Testing Himalayan Environmental Degradation in Thailand." Geoforum. 27(3): 375-92.

Fransella, Fay; Bannister, Don. 1977. A Manual for Repertory Grid Technique. London: Academic Press.

Fuchs, Stephen. 1988. The Korku of the Vindhya Hills. New Delhi: Inter-India Publications.

Furer-Haimendorf, Christoph von. 1982. Tribes of India: The Struggle for Survival. Berkeley: University of California Press.

Garland, Elizabeth. 1999. "Developing Bushmen: Building Civil(ized) Society in the Kalahari and Beyond." Pp 72-103 in Comaroff and Comaroff (eds).

Gell, Alfred. 1997. "Exalting the King and Obstructing the State: A Political Interpretation of Royal Ritual in Bastar District, Central India." Journal of the Royal Anthropological Institute. 3: 433-50.

Ghosh, Madhusudan. 1988. "Agrarian Structure and Rural Poverty in India." Journal of Contemporary Asia. 28(2): 175-84.

Gomez, Ricardo. 1999. "Facilitating Participatory Action Research: Looking Into the Future With Orlando Fals Borda." Pp 151-9, in White (ed).

Grandstaff, Terry. 1980. Shifting Cultivation in Northern Thailand: Possibilities for Development. Tokyo: United Nations University.

Guidieri, Remo; Pellizzi, Francesco; Tambiah, Stanely J. eds. 1988. Ethnicities and Nations: Processes of Inter-ethnic Relations in Latin America, Southeast Asia and the Pacific. Austin: University of Texas Press.

Harrison, Elizabeth. 2002. "The Problem with the Locals': Partnership and Participation in Ethiopia." Development and Change. 33(4): 587-610.

Horton, Douglas E. 1991. "Social Scientists in International Agricultural Research: Ensuring Relevance and Contributing to the Knowledge Base." Pp 218-36, in Whyte (ed).

Humble, Morag Elizabeth. 1995. Implementing Gender and Development Theory: Assessing Participatory Rural Appraisal as a GAD Technique. Ottawa: Carleton University (MA Thesis).

Hutesi 2005/01/09. Domain Analysis exercise on Roots crops, and group interview in Kuvi hamlet of Hutesi.

India. 2004. "Tribes." www.countrystudies.us/india/70. Last visited September 22, 2004.

---. "Agriculture." www.countrystudies.us/india/102. Last visited September 22, 2004.

---. "Green Revolution." www.countrystudies.us/india.104. Last visited September 22, 2004.

Jankowicz, Devi 2004. The Easy Guide to Repertory Grids. West Sussex: John Wiley and Sons, Ltd.

Jay, Edward J., 1978. "A Comparison of Tribal and Peasant Villages." Pp 39-69 in Surajit Sinha (ed).

Jewitt, Sarah 1995. "Voluntary and 'Official' Forest Protection Committees in Bihar: Solutions to India's Deforestation?" Journal of Biogeography. 22(6): 1003-21.

---. 2002. Environmental Knowledge and Gender: Local Development in India's Jharkand. Hampshire: Ashgate.

Jha, Ashwini Kant. Nd. "Prospects of Value Addition of Forest Produce in Tribal Areas." Agro-Economic Research Centre for Bihar and Jharkhand. www.aercbhagalpur.org/Download/executive4.doc. Last visited September 21, 2004.

Kammerer, Cornelia Ann. 1988. "Territorial Imperatives: Akha Ethnic Identity and Thailand's National Integration." Pp 259-92 in Guidieri et al (eds).

Kampe, Ken. 1992. "Development, Bureaucracy and Life on the Margins." Pacific Viewpoint. 33(2): 159-64.

Kapoor, Ilan. 2002. "The Devil's in the Theory: A Critical Assessment of Robert Chamber's work on Participatory Development." Third World Quarterly. 23(1): 101-17.

Katragumma. 2005/01/04. Domain Analysis exercise on seed-mix, and group interview in the Kuvi hamlet of Katragumma.

Katragumma. 2005/01/10. Problem Domain exercise in the Kuvi hamlet of Katragumma.

Katragumma women. 2005/01/11. Domain Analysis exercise on seed-mix legumes in hamlet of Katragumma.

Kattakayam, Jacob John. 1996. "Marriage and Family Among the Tribals of Kerala: A Study of Mannans of Idduky District." Journal of Comparative Family Studies. 27: 545-58.

Khator, Ruce. 1991. Environment, Development, and Politics in India. New York: University Press of America.

Kurli 2005/01/23. Group interview in Kuvi village of Kurli.

Labond, Curt. 1999. "Promoting Sustainable Agro-forestry in Nagaland." International Development Research Centre: Reports. http://web.idrc.ca/en/ev-5154-201-1-DO_TOPIC.html. Last visited November 7, 2004.

Langford, Jean M. 2003. "Traces of Folk Medicine." Cultural Anthropology. 18(3): 271-303.

Laxmipur 2005/01/18. Group discussion in Kui village of Laxmipur.

Laxmipur SHG. 2005/01/14. Group interview with Self Help Group (SHG) in Kui village of Laxmipur.

Li, Tania Murray. 1999. "Compromising Power: Development, Culture and Rule in Indonesia." Cultural Anthropology. 14(3): 295-322.

---. 2001. "Relational Histories and the Production of Difference on Sulawesi's Upland Frontier." The Journal of Asian Studies. 60(1): 41-66.

---. 2002. "Engaging Simplifications: Community-Based Resource Management, Market Processes and State Agendas in Upland Southeast Asia." World Development. 30(2): 265-83.

Maclure, Richard; Bassey, Michael. 1991. "Participatory Action Research in Togo: An Inquiry into Maize Storage Systems." Pp 190-209, in Whyte (ed).

Mahapatra, PK. 2005/01/16. Personal Interview, Orissa University of Agriculture and Technology, Bhubaneswar.

Mangaraj, Ashok; Allim, MD. 2005/01/15. Personal Interview, Bhubaneswar.

Manning, Richard. 2004. "Against the Grain." The American Scholar. 73(1): 13-35.

Marten, Gerald G. 2001. *Human* Ecology: Basic Concepts for Sustainable Development. London: Earthscan Publications Ltd.

Mazhar, F; Buckles, D. 2000. "Cultivating the Landscape: Enhancing the Context for Plant Improvement." Paper presented at the International Symposium on

Participatory Plant Breeding and Participatory Plant Genetic Resources Enhancement, Pokhara, Nepal, May 1-5, 2000.

Mazhar, F; Buckles, D; Satheesh, PV; Akhter, F; In Press. Food Sovereignty and Uncultivated Biodiversity in South Asia. Essays on the Policy of Poverty and Wealth of the Social Landscape. (Economics Chapter) New Delhi/Ottawa: Academic Foundation/IDRC.

Menon, Meena. 2005/04/20. "Battle for Bauxite in Orissa." The Hindu. http://www.hindu.com/2005/04/20/stories/2005042009861100.htm.

Misra, PK. 1978. "Anthropological Fieldwork: Some Awkward Questions." Pp 1-8 in Sinha (ed).

Mohanti, Neeti. 1997. "Theme Paper." Pp 29-35, in Sinh and Mohanti (eds).

Mohanty, B. 2005/01/17. Personal Interview Tribal Research and Training Institute, Bhubaneswar.

Mohanty, RP. 1991. "Deforestation in the Eastern Ghats and its Bio-social Impact on Tribal People of Orissa." Adibasi. 31(¾): 45-51.

---. 2001. "Deforestation in the Eastern Ghats and its Socio-economic and Cultural Limit on Bondu Tribes of Orissa." 4th World: Journal of the Marginalized People.

Mohapatra, CR 1992. "Podu: An Ecological Hazard." Adibasi. 32(1): 20-3.

Mohapatra, LK. 1994. "Shifting Cultivation in Orissa." Pp 202-220 in Thakur and Thakur (eds).

---. 1998. "Parameters of Forest Policy." Pp 147-67, in Padhy (ed).

Moore, Patrick. 2004. "The Green Case for Biotech: Resisting the Anti-science Anti-human Obstructions of Environmentalists." The American Enterprise. 15(2): 24-7.

Mosse, David. 1994. "Authority, Gender and Knowledge: Theoretical Reflections on the Practice of Participatory Rural Appraisal." Development and Change. 25: 497-526.

Mosse, David. 1998. "Process Oriented Approaches to Development Practice and Social Research." Pp 3-30, in Mosse et al (eds).

Mosse, David; Farrington, John; Rew, Alan (eds). 1998. Development as Process: Concepts and Methods for Working with Complexity. London: Routledge.

Nag, DS. 1994. "Shifting Cultivation of the Baiga." Pp 192-200, in Thakur and Thakur (eds).

Nayak, R.; Boal, Barbara; Soreng, Nabor. 1990. The Kondh: A Handbook for Development. New Dehli: Indian Social Institute.

Nayak, Radhakant; Soreng, Nabor. 1999. Kuvi Kondh: A Handbook for Development. Bhubaneswar: NISWASS.

Nayak, R. 2000. "Basic Problems of Tribal Communities: Focus on Orissa." 4th World: Journal of the Marginalized People. 12: 1-18.

Neimeyer, Greg. 1985. "Personal Constructs in the Counselling of Couples." Pp 201-15, in Epting and Landfield (eds).

Opp, Robert. 1998. "Those Who Are Silent Have Something to Say": Participatory Rural Appraisal and the Discourses of Development. Ottawa: Carleton University (MA Thesis).

Padhy, Kishore C (ed). 1998. Economic Development of Tribals: Approach, Method and Strategy. New Delhi: Sarys and Sons.

Pain, Rachel; Francis, Peter. 2003: "Reflections on Participatory Research." Area. 35(1): 46-54.

Parayil, Govinda; Sreekumar, TT. 2003. "Kerala's Experience of Development and Change." Journal of Contemporary Asia. 33(4): 465-92.

Patnaik, Ali Krishore. 2001. "Profits Over People." The Hindu. 18(1). http://www.saanet.org/kashipur/articles/pop.htm.

Patnaik, N (ed). 1989. The Kondh. Bhubaneswar: Tribal and Harijan Research and Training Institute.

---. 1998. "Subsistence System of Different Societies and Strategies for Their Development." Pp 113-22, in Padhy (ed).

Patnaik, PS; Mohanty, BB. 1990. "Dongria Kondh of Orissa: Then and Now." Adibasi. 30(2/3): 29-41.

Patra, HK. 2005/01/16. Personal Interview, Orissa University of Agriculture and Technology, Bhubaneswar.

Pattanaik, N. 1998. "Shifting Cultivation in Orissa." In Padhy (ed), 96-112.

Peoples of the World. Last visited 2004/09/22. "People: the Samantha." www.peoplesoftheworld.org/hosted/samantha/index.jsp.

Peoples of the World. Last visited 2004/09/22. "People: The Koya." www.peoplesoftheworld.org/hosted/koya.

Poffenberger, Mark; Stone, Roger D. 1996. "Hidden Faces in the Forest: A Twenty-first Century Challenge for Tropical Asia." SAIS Review. 16: 203-19.

Pramanik, Satya Prakash 2000. "Impact of Development on the Tribal People of India." 4th World: Journal of the Marginalized Peope. 11: 23-9.

Pratt, Garett. 2001. Practitioners' Critical Reflections on PRA and Participation in Nepal. Brighton: IDS Publications Office.

Primack, Richard; Bray, David; Galletti, Hugo A.; Ponciano, Ismael. Eds. 1998. Timber, Tourists and Temples: Conservation and Development in the Maya Forest in Belize, Guatemala, and Mexico. Washington DC: Island Press.

Rassalu. 2005/02/08. Personal interview in Baiga village of Kandabari.

REAP-Canada. www.reap-canada.com.

Renaud, F; Bechstedt, H.D.; Udomchai Na Nakorn. 1998. "Farming Systems and Soil-Conservation Practices in a Study Area of Northern Thailand." Mountain Research and Development. 18(4): 345-56.

Rigg, Jonathan (ed). 1995. Counting the Costs: Economic Growth and Environmental Change in Thailand. Singapore: Institute of Southeast Asian Studies.

Roy, SB; Ghosh, Asok, eds. 1993. People of India: Bio-cultural Dimensions. New Delhi: Inter-India Publishers.

Roy, SB; Chattergee, Mitali. 1993. "People for Forest Protection: Experiments and Results from West Bengal." Pp 343-54, in Roy and Ghosh (eds).

Sahoo, AC. 1992. "Shifting Cultivation to Horticulture: A Case Study of the Dongria Kondh Development Agency (Kurli), Chatikona." Adibasi. 32(1): 1-5.

Sampat, Payal. 1998. "What Does India Want?" World Watch. 11(4): 30-8.

Sathapathy, Pravat. 2005/01/11. Private Interview. Universal Services Organization: Rayagada, Orissa.

Schmidt-Vogt, Dietrich. 1997. "Forest and Trees in the Cultural Landscape of Lawa Swidden Farmers in Northern Thailand." In Seeland (ed).

---. 1998. "Defining Degradation: The Impacts of Swidden on Forests in Northern Thailand." Mountain Research and Development. 18(2): 135-49.

Scott, James C. 1998. Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed. New Haven: Yale University Press.

Seeland, Klaus (ed). 1997. Nature is Culture: Indigenous Knowledge and Socio-cultural Aspects of Trees and Forests in Non-European Cultures. London: Intermediate Technology Publications.

Sharma, Suresh. 1994. Tribal Identity and the Modern World. Tokyo: United Nations University Press.

Shaw, Mildred LG. 1980. On Becoming a Personal Scientist: Interactive Computer Elicitation of Personal Models of the World. London: Academic Press.

Shaw, Mildred LG (ed). 1981. Recent Advances in Personal Construct Technology. London: Academic Press.

---. 1985. "Communities of Knowledge." Pp 25-35, in Epting and Landfield (eds).

Shenware. 2004/12/11. Personal interview in Korku village of Takarkheda.

Shenware. 2004/12/24. Personal discussion in Korku village of Takarkheda.

Shih, Chih-yu. 2002. Negotiating Ethnicity in China: Citizenship as a Response to the State. London: Routledge.

Shiva, Vandana 2000 [1993]. "Monocultures of the Mind." Pp 9-64 in Monocultures of the Mind: Perspectives on Biodiversity and Biotechnology. London: Zed Books.

Sillitoe, Paul. 1998. "The Development of Indigenous Knowledge: A New Applied Anthropology." Current Anthropology. 39(2): 223-52.

Sinha, Surajit (ed). 1978. Field Studies on the People of India: Methods and Perspectives. Calcutta: Indian Anthropological Society.

Sinh, Bhupinder; Mohanti, Neeti (eds). 1997. Intellectual Property Rights and the Tribals: Tribal Studies of India Series. New Dehli: Inter-India Publications.

Siva, Ramakrishnan K. 1995. "Colonialism and Forestsry: Imagining the Past in Present Policies." Comparative Studies in Society and History. 37(1): 3-40.

Social Analysis System. www.sas-pm.com.

Soreng, Nabor 2001. "Tribals and Their Changing Identity: A Chitapur Scenario." 4th World: Journal of the Marginalized People. 14: 43-56.

Srinivas, Ch. n.d. Economics of Ecological Agriculture: A Manual of Research Methods and Tools. Hyderabad: Glocal Research and Consultancy Services (commissioned by IDRC: Ottawa).

Staatz, John M; Eicher, Carl K. 1998. "Agricultural Development Ideas in Historical Perspective." Pp 8-38, in Eicher and Staatz (eds).

Sturgeon, Janet. 1997. "Claiming and Naming Resources on the Border of the State: Akha Strategies in China and Thailand." Asia Pacific Viewpoint. 38(2): 131-44.

Takarkheda. 2004/12/06. Domain Analysis exercise on random selection of crops in Korku village of Takarkheda.

Takarkheda. 2004/12/11. Group discussion in Korku village of Takarkheda.

Takarkheda. 2004/12/24. Domain Analysis exercise on all crops, and group interview in Korku village of Takarkheda.

Thakur, D; Thakur, DN (eds). 1994. Tribal Life in India: Volume 3 – Tribal Agriculture and Animal Husbandry. New Dehli: Deep and Deep Publishing.

---. 1995. Tribal Women. New Delhi: Deep and Deep Publishing.

Thrupp, Lori Ann. 2000. "Linking Agricultural Biodiversity and Food Security: The Valuable Role of Agrobiodiversity for Sustainable Agriculture." International Affairs. 76(2): 265-81.

Trebuil, Guy. 1995. "Pioneer Agriculture, Green Revolution and Environmental Degredation in Thailand." Pp 67-89 in Rigg (ed).

Tunia 2005/01/05. Personal interview in Kuvi village of Kurli.

Tunia and Mandro. 2005/01/08. Domain Analysis exercise on Roots crops and personal interview in Kuvi village of Kurli.

Twaguda. 2005/01/06. Domain Analysis exercise on all mixed crops in the Kuvi hamlet of Twaguda (Incomplete).

Tyler, Leonce. 1985. "Personal Construct Theory and the Rest of Psychology." Pp 15-24, in Epting and Landfield (eds).

Tyler, Stephen. 1978. "Fields are for Planting: Swidden Agriculture Among the Koyas of South India." Pp 17-38 in Surajit Sinha (ed).

Vandergeest, Peter; Peluso, Nancy. 1995. "Territorialization and State Power in Thailand." Theory and Society. 24(3): 385-426.

Van Rooy, Alison (ed). 1999. Civil Society and the Aid Industry. London: Earthscan.

Van Rooy, Alison; Robinson, Mark. 1999. "Out of the Ivory Tower: Civil Society and the Aid System." Pp 31-70 in Van Rooy (ed).

Vasavi, A.R. 1994. "'Hybrid Times, Hybrid People': Culture and Agriculture in South India." Man. 29: 283-300.

Vernooy, Ronnie. 2003. Seeds that Give: Participatory Plant Breeding. Ottawa: International Development Research Centre.

Walton, Eric. 1985. "Personal Construct Theory and Management." Pp 95-108, in Epting and Landfield (eds).

White, Shirley A. (ed). 1999. The Art of Facilitating Participation: Releasing the Power of Grassroots Communication. New Delhi: Sage Publicationsd.

White, Shirley A. 1999. "The Catalyst Communicator: Facilitation Without Fear." Pp 35-56, in White (ed).

Whyte, William Foote (ed). 1991. Participatory Action Research. Newbury Park: Sage Publications.

---. 1991. "Introduction." Pp 7-15, in Whyte (ed).

Zimmerer, Karl S. 2001. "Report on Geography and the New Ethnobiology." Geographical Review. 91(4): 725-34.