



The role of collective action in the marketing of underutilized plant species: Lessons from a case study on minor millets in South India

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ABSTRACT

Underutilized plant species are generally defined by their unexploited economic potential, making them an appropriate focus for market development. This paper analyses the role of collective action in the process of market development for minor millets, an underutilized plant species, in the Kolli Hills of Tamil Nadu, India. Based on a series of focus group discussions, we analyze the role and involvement of self-help groups in the minor millet marketing chain recently set up by the M.S. Swaminathan Research Foundation. We then compare the role of collective action in this new market with the cases of marketing chains for cassava and organic pineapples, two cash crops with expanding production in the same area. Our analysis shows the critical role of collective action as a necessary but not sufficient condition for the successful commercialization of underutilized plant species for the benefit of the poor and the conservation of agro-biodiversity.

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Introduction

Underutilized plant species can be characterized by the fact that they are locally abundant but globally rare, that scientific information and knowledge about them is scant, and that their current use is limited relative to their economic potential (Gruère et al., 2008). Most of these species could benefit from market development as a means of supporting their long-term use while generating sustainable income for the producers and market chain actors.

Minor millets in South India are examples of underutilized plant species. Finger millet (*Eleusine corocana*), foxtail millet (*Setaria italica*) and little millet (*Panicum milliaceum*) are considered 'minor' because of the lack of research investment they attract, and their limited commercial importance in terms of area, production and consumption (Nagarajan and Smale, 2007). In the Kolli Hills of Tamil Nadu, a genetically diverse pool of minor millet varieties has long been grown by the tribal farming communities for their own consumption without being formally traded. Despite a traditional consumption preference for minor millets by the local population, in recent years the area devoted to minor millets has declined considerably to the advantage of substitute crops such as cassava, rice, pineapple and coffee, which are grown exclusively for sale. In response to this development, the M.S. Swaminathan Research Foundation (MSSRF), a leading non-governmental organization based in Chennai, India, has led 'conservation-cum-com-

mercialization' intervention programmes over the last 10 years in Kolli Hills. These programmes aim to raise the market potential of minor millets through value addition and help the farming communities maintain their agro-biodiversity by providing economic incentives for its conservation (MSSRF, 2002).

In this paper we analyze the market development initiative for minor millets in Kolli Hills with a specific focus on the role of collective action and group initiatives organized by MSSRF. Based on a series of focus group discussions with stakeholders held during the summer of 2006 and 2007, we analyze the key collective activities that take place in the minor millet value chain and compare it to the cases of two competing cash crops in the same region: cassava and organic pineapples.

In our analysis, we define collective action as the set of actions and initiatives undertaken voluntarily in cooperation by a group of individuals in pursuit of a shared interest (Meinzen-Dick et al., 2004). By focusing on market chain development, we are specifically interested in the structure of incentives among market actors and the role of these groups in making the supply chain effective. In this setting, collective action can play different roles: within the supply chain, it provides a means to realize scale economies, pool resources, ideas and effort; secondly, it can increase internal demand; and lastly, it may also affect agents external to the chain, such as outside consumers or policymakers. Small producers often face higher transaction costs especially when they specialize in products for niche markets (Poulton et al., 2005). Through collective efforts, small producer groups can take advantage of niche market opportunities (Bebbington, 1996). This case study

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evaluates which roles collective action can have in the marketing of underutilized species.

In what follows, we first describe the agricultural and institutional context of the case study. Second, we analyze the collective action initiatives undertaken in the minor millet market chain in Kolli Hills. We then compare them with the ones taking place in the marketing chains for cassava and pineapples, and draw some conclusions.

Agricultural and institutional context

Kolli Hills is a mountainous area with a temperate climate located on the eastern border of the Namakkal District in Tamil Nadu, India. Forests occupy 44% of the total area of 28,293 ha, while agricultural activities take place in 52% of the area, leaving 4% for other activities (Kumaran, 2004). More than 95% of the estimated 50,000 inhabitants of Kolli Hills are tribals from the Malayali community (MSSRF, 2002). Kolli Hills is linked to the rest of the district by a single paved road on the south west of the hills that passes through Semmedu, the administrative headquarters that hosts all the government departments. Many areas are still accessible only by foot and remain isolated.

Kumaran (2004) classified the land-use for agriculture in Kolli Hills into three types: (1) valley lands with springs, primarily under wetland crops such as paddy; (2) dry or rainfed lands, allocated for millets and cassava; and (3) land on the fringes of the valleys devoted to the cultivation of pineapple, coffee, pepper and other condiments. In recent years, the dry lands have rapidly been converted to cultivation of cassava, while millet cultivation has increasingly shifted towards the rocky terrain on the slopes of the hills (Fig. 1). Pradeep and Rajasekeran (2006) estimated that cassava land represents about 75% of the total dry lands. Irrigated land comprises less than 15% of the cultivable area (MSSRF, 2002).

Traditionally, the Kolli Hills region is known for its genetic diversity in minor millets: little millet, finger millet, Italian millet and foxtail millets. Each of these crop species is represented by diverse land races, displaying diverse morphological and agronomical characters and thereby contributing to preserving agrobiodiversity. Until recently, minor millets were extensively grown and widely consumed in Kolli Hills mostly as a subsistence crop. However, their cultivation has declined due to changing consumption and production preferences in favour of other crops such as cassava, rice and pineapple.

As shown in Table 1, minor millet production in Kolli Hills started declining in the mid-1980s and has been progressively replaced, since the early 1990s, by cassava. By 2001–2002 cassava represented 56% of total cultivated area while minor millets represented only 10.5%; pineapple covered 4.6%, and other crops 29% occupied of the total area.

MSSRF started its intervention in Kolli Hills in 1994 by conducting a 3 year appraisal of the problems faced by farmers of minor millets and other crops in the area. It identified several issues: the rapid decline in the production and consumption of minor millets, the transformation of land due to cassava cultivation, and the lack of a marketing system for minor millets.

These audits led to several programmes subsequently implemented by the foundation over the last decade. In particular, a programme was initiated to protect millet biodiversity through conservation and commercialization. The objectives of the foundation were: first, to link the primary producers to a marketing chain; second, to develop uses for minor millets and their by-products; and third, to promote minor millets as a competitive alternative to other crops.

Collective action and its role in the marketing chain

To provide market linkages for minor millet, MSSRF first promoted self-help groups (SHGs) among the millet growing commu-

Table 1

Trends in cultivation area under minor millets, cassava and pineapple (Ha) millets, cassava and pineapple (ha).

Year	Small millets	Finger millet	Cassava	Pineapple
1970–1971	1799	N/a	0	40
1995–1996	950	N/a	2020	740
1996–1997	967	N/a	5000	900 (est.)
1999–2000	465	841	6255	323
2000–2001	667	903	5460	295
2001–2002	651	764	7540	616
2002–2003	647	953	4454	602
2003–2004	766	545	5848	610

N/a, not available.

Sources: Statistical Handbook of Tamil Nadu (1997), MSSRF (2002), King (2005), Rengalakshmi et al. (2006).

Note: Due to non-availability of data for finger millet alone in the initial years, it is separated from other minor millets.

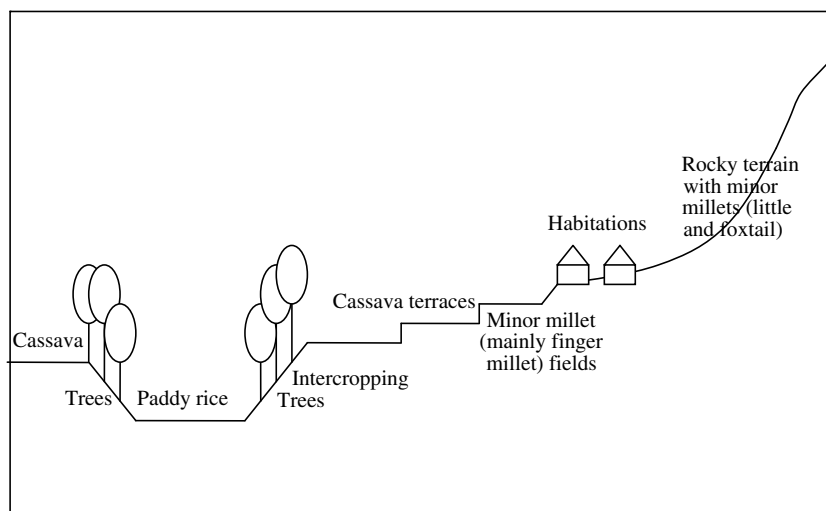


Fig. 1. Schematic representation of the agricultural systems in Padasolai settlement, Kolli Hills (August 2006).

nities. SHGs are common grassroots institution through which development activities are implemented in many regions of India. Participation is voluntary, and the schemes are based on internal lending incentives. With MSSRF's facilitation, 13 SHGs were created in Kolli Hills in 1996–1997. Subsequently, these have increased to about 40 SHGs. MSSRF acted as an initial catalyst for these groups, helping them to organize and providing training in financial accounting, enterprise and managerial skills.

As part of the market development for minor millets, a number of specific task-driven enterprise groups were also formed by local communities according to their willingness to participate and their ability to conduct specific tasks. Each enterprise comprises people belonging to one or more SHGs. The role of MSSRF was to create an enabling environment among local stakeholders by providing necessary skills and training. The basic infrastructure for each enterprise was either funded voluntarily by village participants, or supported via a loan from MSSRF, or linked to existing government schemes.

As a result, 12 types of enterprise groups were established based around specific activities that included agronomic input groups, credit, marketing and processing. Table 2 summarizes the characteristics of the enterprises involved in millet and pineapple activities in Kolli Hills.¹ Membership in an enterprise is decided by the community and individual farmers; the only condition for entry is that members should be farmers that grow one of the targeted crops. The enterprises have been brought under a single federated system linked to the Tribal Cooperative Marketing Development Federation of India Ltd. (TRIFED). Marketing mechanisms were negotiated between the enterprises and TRIFED, and resulted in a memorandum of understanding stating the rules and procedures to be followed, signed by a representative of each enterprise and TRIFED (MSSRF, 2002).

The market chain for minor millets

Gruère et al. (2008) define three necessary conditions for the successful marketing of underutilized plant species²: increased efficiency of supply, demand expansion and a supply control mechanism (product differentiation strategy). In this section, we analyze the role of groups to fulfil these conditions, and explain the organization and mode of action of selected groups in the market chain.

Developing an effective supply chain

Fig. 2 shows the minor millet supply chain. Three major groups are critical in the market chain: the first is in charge of procuring millets from farmers; the second is involved in the dehusking and processing; and the third group is responsible for value addition and packaging before sending the products to retailers. The other groups contribute to activities related to inputs and production of minor millets in the hills. At the end of the chain, minor millets are sold as packaged, 'ready to cook' grains, flour or malt to consumers.

Table 3 shows the distribution of marketing margins in the minor millet supply chain. Prices and margins reflect the cost of the transaction and were agreed upon with all stakeholders. They remain constant per unit. Primary producers retain between 14% and 30% of the total retail price, depending on the type of millet and final market destination, which is significant compared to other processed food products.

¹ As shown in Table 2, many activities in the minor millet commercialization are led by separate men's or women's groups. For more on gender issues in Kolli Hills, see Rengalakshmi et al. (2006).

² Success is defined as the sustained generation of income for local users and the preservation or improvement of local agro-biodiversity.

Table 2

Characteristics of enterprise groups in Kolli Hills.

Type	Total members	Men	Women	Enterprise
Men	12	12	0	Rice and millets dehusking mill and marketing
Women	12	0	12	Organic pineapple
Women	12	0	12	Millets marketing
Women	12	0	12	Millets marketing
Women	18	0	18	Organic pineapple
Women	13	0	13	Organic pineapple, ragi flour mill
Women	20	0	20	Organic pineapple
Women	19	0	19	Organic pineapple, ragi flour mill
Mixed	13	10	3	Millets marketing
Mixed	14	8	6	Organic pineapple
Mixed	12	5	7	Millets marketing
Men	13	13	0	Rice and millets dehusking mill

Source: MSSRF field staff, Kolli Hills (2006).

Each level in the supply chain involves an enterprise group designed to accomplish a specific task. Collective action allows individual group members to share costs, pool preferences, information and strategy, and increase their self-motivation, as demonstrated below in the case of three critical activities in the supply chain. Since these groups are made of pre-existing SHGs that have been functioning for some time, they also benefit from the collective trust of individuals within the community.

Participatory varietal selection

MSSRF employed two strategies for raising millet productivity: varietal selection of minor millet cultivars and in the improvement of crop management practices. Tests were conducted on 2000 pure-line and inbred line selections of minor millet cultivars including the Kolli Hills land races and improved cultivars from various research institutions. Farmers participated voluntarily in the varietal selection process. As a result, 36 lines of improved and local cultivars were chosen. Interestingly, men's and women's group did not share the same selection criteria; the men selected early maturing varieties whereas the women selected varieties with adequate taste and culinary preferences (MSSRF, 2002). Pooling preference by groups ensured that the selected varieties satisfied different individuals while complying with clear productivity criteria.

Two types of farmers' groups later undertook seed selection and multiplication of minor millets in these communities. The use of groups in the process helped to pool resources, such as land and labour, with the goal of obtaining the selected seeds for farmers entering the market.

Women's group on procurement of minor millets

Higher in the marketing chain, the women's SHG in Aripallapatty is primarily responsible for procuring minor millets in the growing regions and transporting them to the dehusking centre for processing. Members of the groups each produce an average of 300 kg per harvest. About half is usually kept for home consumption, and the remainder is sold to the processing mill. Group members also procure grains from a radius of 5–6 km and mostly carry them by head loads to a village assembly point. The assembled grains are then transported by a hired vehicle to the processing facility.

Under the current system, information about demand is provided by the processing group to the procurement group well before harvest. Procurement starts within the group, and if supply is insufficient, expands to other growers in the community. Be-

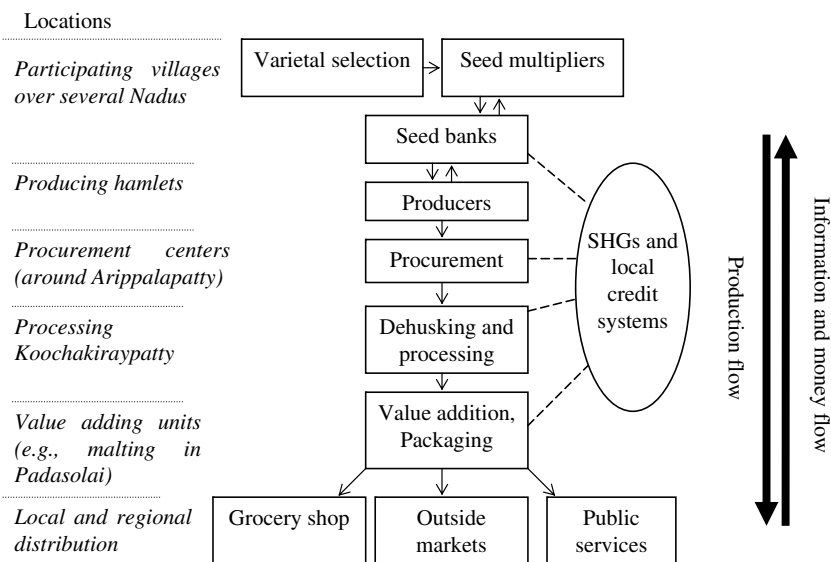


Fig. 2. Schematic representation of the market chain for minor millets.

Table 3

Marketing margins of value-added minor millet products in Kolli Hills (Rs./kg).

Particulars	Little and foxtail millet rice	Little and foxtail millet flour	Finger millet flour
Procurement cost at the farm gate	7.50	7.50	7.00
Transportation to dehusking mill ^a	1.25	1.25	1.25
Dehusking charges	1.25	1.25	1.00
Flour preparation cost	1.50	1.50	3.00
Packing material cost	1.50	1.50	1.50
Packaging, labeling and labour expenses	1.00	1.00	1.00
Transport charges for processed materials from Kolli Hills to Namakkal shopping centers	1.25	1.25	1.25
Commission to marketing agents ^b	1.00	1.00	1.00
Total expenses incurred/kg of millet	16.25	16.25	17.00
Selling price/kg	28.00	30.00	24.00
Profit margin/kg of millet product sold obtained from Namakkal markets ^c	11.75	13.75	7.00

Note: The marketing margin increases by 5–7% when supplied outside the Namakkal markets. The recovery percentage of flour from grain ranges between 50% and 60% for all millets and 90% for finger millet.

Source: Field team, Value-chain analysis report of MSSRF towards FAO-IFPRI project, Kolli Hills (2006–2007).

^a Dehusking mills are located 9–10 km from the procurement centers. The transportation charges to mills are calculated based on public transportation. If transported by trucks, the cost of transportation increased by Rs. 3.45/kg.

^b If the group directly supplied to retailers then this cost is incurred as labour charges.

^c The profit margin also increased by more than 10% of the selling price if sold in other value-added forms.

tween 2003 and 2007, millet procurement in this community increased from 1.1 tons to 2.5 tons. The total production capacity of this area remained uncertain, but group members believed they would be able to double their procurement capacity.

By joining efforts, the women's groups involved in procurement were able to obtain bank loans of Rs. 25,000–40,000, depending on the size of the group, to build a small storage facility and a drying yard within their community. Thus, the role of collective action in procurement activities went beyond a simple division of labour, to sharing experiences, sharing space for storage, sharing resources to rent a vehicle, and further expanding their business operations. The collective structure of the chain also helped and supported the horizontal and vertical transmission of information about the supply capacity within the group and to the processing group.

Men's dehusking and processing group

Further along the marketing chain, a men's group is responsible for the dehusking and processing facility in Koochakirayanpatty. This group specializes in processing rice and millets. The major

challenge for this group was to obtain the necessary infrastructure (machinery and a building) and to meet processing energy requirements. By pooling their efforts, they first obtained a small loan-grant from MSSRF in 2005 to purchase processing machinery. On fulfilling the state government's regulatory requirements, they obtained a special grant of Rs. 37,000 from the District Rural Development Authority to construct the building. Currently, the group takes care of all the mill maintenance and sustains its operations through profits generated, net of the repayment of its loans.³

Like other enterprises, this group works in consultation with other groups in the chain to set up production targets and establish procurement prices. It receives payments from the marketing and packaging groups for the dehusked or milled minor millet flour.

Overall, this group-driven intervention has proved successful on the supply side. An empirical study of the economic impact of minor millet programs in Kolli Hills comparing intervention and non-intervention areas (Nagarajan et al., 2008) has shown that the

³ In 2007, the group had already repaid 70% of the loan from MSSRF.

collective efforts of producer groups had a positive impact on minor millet conservation and commerce.⁴ Furthermore, farmers in the intervention areas increased their yields of minor millets by 5% by adopting improved crop management practices.

Demand expansion and product differentiation

Currently, external demand comes mostly from health conscious consumers and diabetics in metropolitan regions. To sustain demand, MSSRF developed a branding strategy promoting the product as locally grown and certified organic. All the product packages are sold with recipes in Tamil and English, using traditional culinary practices as well as new ones developed by expert chefs. The groups also compiled a recipe booklet on minor millets (MSSRF, 2004), sold as a part of the marketing effort. MSSRF staff used local events and the annual temple festivals within and outside Kolli Hills to sell products made from minor millets and inform visitors about the advantages of millet products and recipes. The producer groups of Kolli Hills in the last 2 years also have successfully conducted road shows and campaigns to create public awareness of value-added minor millet products. This strategy has improved sales for Kolli Hills branded minor millet products, which are now sold in 34 stores in the Salem and Namakkal districts alone. Sales have increased 300% to 2 tons in 2007 (King et al., 2008).

MSSRF has also used advocacy to influence policy at a higher level, by promoting the inclusion of minor millet ingredients in government sponsored meal programs for school children to further increase demand. Swaminathan (2006) urged the Government of India to include minor millet grains, sorghum and millet procurement and provision as part of the existing public distribution system to ensure nutritional security and sustainable production. The major challenge for minor millets emanates from the fact that their close substitutes such as rice are heavily subsidized both on the production and consumption sides, while millets are not targeted by any government programmes.

Although groups have not been used to foster outside policy advocacy, they have been critical in awareness creation and promotion for increased demand. Because of the novelty of their products, the willingness of individuals to promote minor millets in local festivals has been important. By participating in the chain and by learning new recipes, they also have increased their own consumption of minor millets.⁵

Collective action and marketing of pineapples and cassava in comparison to minor millets

Market improvement and organic certification of pineapples

Pineapples produced in Kolli Hills have a reputation for freshness and taste. During the consultation by MSSRF, five villages with a large area under pineapple cultivation were selected and mobilized into five SHGs. The consultation revealed that many pineapple producers had to walk long distances carrying heavy loads to access the regional market in Kolli Hills. As a response, organized procurement and transportation efforts were promoted by MSSRF among the groups.

MSSRF also helped to establish an association of pineapple producers and to link it to an exporter of organic pineapples, Ion Ex-

changes (India) Ltd. Since the pineapples produced in the Hills are chemical-free by default due to low external inputs, they were able to obtain organic certification without much difficulty. ECO-CERT International, a German organic certification company, was approached for certification. A group of multi-disciplinary experts inspected the site and certified an area of 94 ha as an organic production zone for pineapple cultivation.

The main issue faced by producers was the payment of the organic certification costs. MSSRF paid the certification costs in the first year; in the second year, the producers bore 50% of the cost, and in the subsequent years they paid the full cost of certification. These costs are significant, but the association of producers rapidly saw that the investment was profitable. The pineapples are sold locally for Rs. 1–3/kg and sold for Rs. 5–6/kg to exporters, an average increase in profit of about 40%. About 40 tons have been marketed to organic exporters, with an estimated potential of 400 tons (MSSRF, 2002). By pooling resources, pineapple producer groups were able to obtain a premium and market access to the prized European Union markets.

Contract farming for cassava

Cassava was introduced relatively recently to Kolli Hills and spread rapidly in the last 20 years. A number of factors make cassava more attractive than minor millets to farmers. First, cassava land management is advantageous. Minor millets have three–four month growing season, following which there are no good alternative crops. In contrast, cassava takes 10 months to grow and thus occupies the land space more fully. Second, minor millets provide a single annual harvest with partial cash payments, whereas farmers can obtain revenue from cassava periodically during the year due to the individual contractual arrangements with the purchasing company. Net returns from cassava per unit of land are around Rs. 5000 per 9–10 month season, whereas returns from millet cultivation average Rs. 2500 per 3–4 month season, if the product is sold in the market. Finger millet benefits from a higher farm gate price (Rs. 9/kg) compared to other minor millets, but its cultivation is intensive and requires irrigation.

Cassava is exploited mainly for extraction of starch and glucose, used in textile and pharmaceutical industries, and for production of pellets used in various food products. The cassava industry was encouraged to extend production to Kolli Hills because of the region's agronomic advantages and low labour costs. These savings seemingly compensated for the additional transport cost associated with the use of the only windy road connecting the hills to the plains.

In terms of collective action, cassava producers within each community help each other during sowing and harvesting periods, sharing labour resources. Sowing is carried out by all women of the community in each individual field. Village-wide collection of cassava tubers was also observed, where all the men and women of the village helped collect and transport the tubers by head load to the shared truck hired for the occasion.

Comparison: The role of collective action in marketing of the three crops

We use a simple conceptual framework to structure our comparison. Where there is an enabling political and institutional environment that allows actors to make their own decisions, successful implementation of a development activity at the local level depends on three necessary conditions: (1) the will, motivation or incentive to conduct this action; (2) the capacity to do so; and (3) a strategy or plan of action.

Table 4 summarizes the differences between these three markets in terms of will, capacity and strategy; the supply- or

⁴ Increased conservation efforts were measured using participation rate in community seed banking, participatory varietal selection and the continued cultivation of minor millets. Impact on commerce was measured by increased profit levels of producer groups and its effect on household income (Nagarajan et al., 2008).

⁵ Nagarajan et al. (2008) have shown a marginal increase (1.5–2%) in annual consumption of minor millets among the Kolli Hills communities since 2004.

Table 4

Comparison of the role of collective action in three agricultural markets in Kolli Hills.

	Minor millets	Pineapples	Cassava
Type of crop	Underutilized plant species	High value product and niche market	High value industrial crop
Capacity	<i>Collective action</i> : internal lending	<i>Collective action</i> : association of producers, organic certification fee and procurement groups	<i>Mostly individual, collective action at harvest and sowing time</i>
Will	<i>Collective action</i> : multiple enterprises and coordinated SHGs, lower economic incentive in the short run	<i>Individual and collective action</i> for organic producers: association to obtain organic certification (medium run economic incentive)	External funding motivation, <i>individual payments</i> (short run economic incentive)
Strategy	<i>Collective action</i> : MSSRF audit and participatory selection, agronomic improvement, marketing enterprises	Association with MSSRF on initial strategy but long-term <i>individual production strategies</i>	<i>Individual contracts</i>
Market development	Supply-driven	Supply- and demand-driven	Demand-driven
Chain of order	Bottom-up	Top-down for conventional and mixed for organic	Top-down

demand-driven nature of the market development initiative; and the direction of the chain of order.⁶ Collective action occurs in all three markets at the production level by sharing labour and capital. But the nature of the incentives and the strategies adopted within each market differ widely, from purely individual in the case of cassava to purely collective in the case of minor millets. Finally, both the chain of order and nature of the market development initiative vary greatly among the three crops.

In the case of minor millets, the market chain was successfully developed through collective action covering the three necessary conditions. First, the decision and motivation to develop markets for millets was based on group decisions with support from MSSRF. Second, the capacity to set up a functioning market chain was built on the collective action of the community members. Finally, the strategy agreed upon was the result of a grassroots discussion within SHGs, enterprises and communities.

Moreover, we saw that collective activities, as organized by MSSRF, not only contributed to the functioning of the market chain, but also helped increase the internal and external demand for the new millet products. By mixing members of several SHGs, enterprises benefited from combined financial resources when needed, particularly during the initial phase of market development. Furthermore, the shared capacity and common strategies of the enterprises reinforced the will of the community to conduct this effort. There are also multiplier effects along the chain, as the development of the market may encourage others to join; common decisions ensure everyone is motivated, and common motivation enhances capacity.

The degree of collective action in the organic pineapple marketing chain is intermediate between minor millets and cassava. Different groups gathered the produce at a common collection centre. Pineapple producers not only shared labour-intensive tasks, but also pooled financial resources to meet organic certification requirements. As in the case of minor millets, the chain involves groups that are essential for the product, information and money flows. But unlike minor millets, there is no effort by producer groups to market the crop beyond the market links initiated by MSSRF. There is no further product development, demand expansion or promotion; no packaging and no consistent effort by all producers to maintain production levels. Collective action was based on a common motivation to strengthen capacity and to set up a common strategy during the intervention. In other words, the intervention to improve the market chain linked supply-driven and demand-driven factors. Actions taken by individual producers may be motivated by individual factors, although they are driven by a common strategy and semi-pooled capacity. Unlike the other

two marketing channels, this chain involves both top-down and bottom-up chains of order.

For cassava, collective action is involved in labour-intensive tasks. Unlike the case of minor millets, each household can contract individually with the company, so there is no need for a common strategy or common will. If one farmer stops growing cassava, others will still be able to grow and sell it individually. In other words, contract farming tends to dissolve the need for collective action to achieve results. The chain for cassava is driven by the cassava industry demand, and the chain of order is top-down. In contrast, the minor millet chain is supply-driven; both the producers and the market chain actors are trying to develop a market and link their products to potential demand. The chain of order for minor millet is based on collective “grassroots” decisions and, as such, can be considered essentially bottom-up.

Conclusions

The example of market development for minor millets in the Kolli Hills of Tamil Nadu shows that collective action initiatives play an essential role in market development for underutilized crops. The outcome of the initiative can be considered successful in many aspects: it provided a new incentive for the production and consumption of minor millets, thereby conserving them in the rural landscape, while generating an extra source of income for local users. Because this initiative heavily relies on groups, collective action is shown to be necessary for the success of market development and will most likely be needed for a sustained, effective marketing strategy.

Underutilized species like minor millets in Kolli Hills have the particularity of facing weak demand, mostly due to ignorance of the product's attributes and poor public and scientific knowledge. Unlike pineapples, minor millets are not locally, regionally and internationally known by consumers. Unlike cassava, minor millets are not driven by robust industrial demand. As a result, developing a market for an underutilized crop is a question of expanding demand and creating wider consumer acceptability. Expanding demand is difficult and has to be done concurrently with the development of the market chain.

Since these underutilized crops are initially only used locally in rural communities, mostly by smallholder farmers, market development has to start from this production base. Because the initial limited demand for these crops makes them uncompetitive compared to existing cash crops with well established demand, the individual economic incentives to market them are rather weak, if not totally absent. For all these reasons, collective action initiatives are absolutely necessary for the development of a robust marketing channel. Pooling resources, realizing scale economies, sharing information, and developing a community-based incentive structure are essential contributions of collective action. Market

⁶ Here, the chain of order is defined as the order of actions linking different actors in the market chain.

development without driving demand will require capacity, strategy and a will that can only be achieved by acting jointly.

Still, even with strong and robust support from groups of local users, the example of minor millets in Kolli Hills shows that market development may face significant challenges in the long run. On the production side, cassava has maintained a competitive edge, being more profitable, and might therefore dominate the area, despite its many associated external costs. Though profitable in the short term—cassava income is used to purchase most household food supplies, especially rice (Finnis, 2006)—cassava cultivation is expected to reduce soil fertility, resulting in progressively declining yields and reduced income. The diversification towards cassava in Kolli Hills might also be affecting the food security and dietary diversity of the local communities in the long run (Bohle, 1992; Finnis, 2007).

On the consumption side, minor millets also face a number of constraints, because rice is heavily subsidized, undermining demand for millets. Even without the price difference, traditional cooking knowledge about minor millets has been lost over time. Providing recipes, cooking demonstrations and recipe books will help but might not be sufficient for consumers to gain a strong interest in the products. Furthermore, tastes have changed, and local inhabitants have become accustomed to eating rice and other grains, so that replacing rice with minor millets could be challenging.

The establishment of a long run market for minor millets will require sustained effort and will likely need to target a specific, stable segment of consumers. Indirect public support, such as the use of minor millets in school meal programmes, hospital meals and military rations, could help provide a robust demand and a continued incentive to produce. Public policies designed to redress production externalities could also facilitate the change in the incentive structure in Kolli Hills to the benefits of minor millets. Collective action by local users could contribute to reaching policy support for minor millets, via information campaigns, collective purchases or consumption subsidies that would enhance their appeal and increase their consumer base.

Therefore, collective action has a significant role to play in establishing a successful promotional strategy for demand expansion to ensure that the production of underutilized crops, like minor millets, is solidly anchored and potentially sustained in the long run. But it remains a *necessary* but not *sufficient* condition for successful commercialization. Group coordination and concerted efforts will not establish a market niche if the market potential is insufficient, if the demand basis is too limited, or if the competition remains distorted by biased government subsidies for competing alternatives.

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References

- Bebbington, A., 1996. Organizations and intensifications: Campesino federations, rural livelihoods and agricultural technology in the Andes and Amazonia. *World Development* 24 (7), 1161–1177.
- Bohle, H., 1992. Disintegration of traditional food systems as a challenge to food security: a case study of Kollimalai Hills in South India. In: Raza, M. (Ed.), *Development and Ecology*. Rawat Publications, Jaipur, pp. 139–146.
- Finnis, E., 2006. Why grow cash crops? Subsistence farming and crop commercialization in the Kolli Hills, South India. *American Anthropologist* 108 (2), 363–369.
- Finnis, E., 2007. The political ecology of dietary transitions: changing production and consumption patterns in the Kolli Hills, India. *Agriculture and Human Values* 24, 343–353.
- Gruère, G.P., Giuliani, A., Smale, M., 2008 (in press). Marketing underutilized plant species for the benefit of the poor: a conceptual framework. In: Kontoleon, A., Pasquai, U., Smale, M. (Eds.), *Agrobiodiversity Conservation and Economic Development*. Routledge, Abington, Oxon, UK.
- King, E.D.I.O., 2005. Sacred Forests of Kolli Hills, Tamil Nadu, India: A Study on Botany, Ecology and Community Interactions. Ph.D. Thesis, M.S. Swaminathan Research Foundation, Chennai, India.
- King, E.D.I.O., Nambi, A., Nagarajan, L., 2008. Integrated approaches in small millets conservation – a case from Kolli Hills, India. Selected Paper Presented at the International Symposium “Underutilized Plant Species for Food, Nutrition, Income and Sustainable Development”, Arusha, Tanzania, March 5–7, 2008.
- Kumaran, M., 2004. Assessment of development interventions of M.S. Swaminathan Research Foundation in Kolli Hills Using Geographical Information Systems. Unpublished: MS Thesis in Geoinformatics, Gandhigram Rural Institute-Deemed University, Gandhigram, Tamil Nadu, India.
- Meinen-Dick, Gregorio, M., McCarthy, N., 2004. Methods for studying collective action in rural development. *Agricultural Systems* 82 (3), 197–214.
- MSSRF, 2002. Rural and Tribal Women in Agro-Biodiversity Conservation. Food and Agriculture Organization (FAO) RAP Publication 2002/08. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand.
- MSSRF, 2004. Mouth-Watering Gourmets from Traditional Foods of Kolli Hills. Published Booklet from the Field station (MSSRF), Kolli Hills and Namakkal.
- Nagarajan, L., Smale, M., 2007. Village seed systems and the biological diversity of millet crops in marginal environments of India. *Euphytica* 155, 167–182.
- Nagarajan, L., King, E.D.I.O., Jones, H., Vedamoorthy, A., Kumar, N., 2008. Economic impact of development interventions towards farmer welfare: a case on minor millets in Kolli Hills, Tamil Nadu. Working Paper, Workshop on “Using Markets to Promote the Sustainable Utilization of Crop Genetic Resources” at the UN FAO, Rome, Italy, 5–7 May, 2008.
- Poulton, C., Dorward, A., Kydd, J., 2005. The future of small farms: new directions for services, institutions and intermediation. Paper presented at “The Future of Small Farms” Workshop, 26–29 June, 2005. Imperial College, Wye, United Kingdom.
- Pradeep, V., Rajasekaran, J., 2006. Classification and Characterization of Self Help Groups (SHG's) Enterprises in Kolli Hills Developed by MSSRF. Unpublished: MA Report in Social Works, American College, Madurai, India.
- Rengalakshmi, R., Mishra, S., Chaudhury, S.S., King, E.D.I.O., Ray, T., 2006. When is Knowledge Power? Gendered Knowledge and Women's Changing Status in two Agro-biodiversity-rich Locations (Kolli Hills and Jeyapore). Working Paper, M.S. Swaminathan Research Foundation, Chennai.
- Statistical Handbook of Tamil Nadu, 1997. Department of Statistics, Tamil Nadu, India.
- Swaminathan, M.S., 2006. Key Note Lecture for Avabai B Wadia Memorial Oration, Mumbai, The Tribune, July 16, 2006.