

THE ROLE OF EDUCATION IN AGRICULTURAL PROJECTS FOR FOOD SECURITY AND POVERTY REDUCTION IN KENYA

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Abstract – Agricultural development projects have been promoted in many places as a feature of poverty-reduction strategies. Such projects have often been implemented without a strong in-built education component, and hence have had little success. Agricultural projects seek to improve food security by diversifying a household's resource base and facilitating the social and economic empowerment of women. The present study presents a survey designed to assess the relationship between education level and ability to benefit from dairy-development projects in Kenya. Results reveal higher occupation and employment levels among beneficiary than non-beneficiary households. On the other hand, beneficiaries of poverty-reduction schemes require specialized training. Apart from project-specific training, the level of general education alone cannot predict the attainment of project objectives.

Zusammenfassung – DIE BEDEUTUNG DER BILDUNG IN LANDWIRTSCHAFTLICHEN PROJEKTEN FÜR DIE NAHRUNGSSICHERUNG UND VERMINDERUNG DER ARMUT IN KENIA – Projekte zur landwirtschaftlichen Entwicklung sind an vielen Orten als Werkzeug armutsreduzierender Strategien vorangetrieben worden. Solche Projekte sind oft eingesetzt worden, ohne dass sie mit einer besonderen Bildungskomponente versehen worden sind, und hatten daher nur geringen Erfolg. Landwirtschaftliche Projekte versuchen, die Nahrungssicherung zu verbessern, indem sie die Grundlagen der Ressourcen der Haushalte variiert und die soziale sowie wirtschaftliche Förderung von Frauen betreibt. Die vorliegende Untersuchung präsentiert einen Überblick, der dazu dienen soll, die Beziehung zwischen dem Niveau der Bildungs und der Fähigkeit, von Projekten zur Entwicklung der Milchwirtschaft in Kenia zu profitieren. Die Ergebnisse zeigen ein höheres Beschäftigungs- und Anstellungsniveau in nutznießenden als in nicht nutznießenden Haushalten. Andererseits bedarf es einer spezialisierten Ausbildung, um von Plänen zur Verminderung der Armut profitieren zu können. Von der projektspezifischen Ausbildung lässt sich aus dem Niveau der allgemeinen Bildung keine Vorhersage über das Erreichen der Projektziele treffen.

Résumé – LE RÔLE DE L'ÉDUCATION DANS LES PROJETS AGRICOLES POUR LA SÉCURITÉ ALIMENTAIRE ET LA RÉDUCTION DE LA PAUVRETÉ AU KENYA – Des projets de développement agricoles ont été soutenus en divers lieux comme un dispositif de stratégies de réduction de la pauvreté. De tels projets ont souvent été mis en application, mais sans une composante forte incorporant l'éducation, et n'ont eu par là que peu de succès. Les projets agricoles cherchent à améliorer la sécurité alimentaire en diversifiant la base des ressources d'un ménage et en facilitant le renforcement social et économique des femmes. L'étude présente propose une estimation conçue pour évaluer la relation entre le niveau d'éducation et la faculté de bénéficier

des projets de développement de laiteries au Kenya. Les résultats révèlent des niveaux de métiers et d'emplois plus élevés parmi les ménages bénéficiaires que parmi ceux non bénéficiaires. D'un autre côté, les bénéficiaires de plans de réduction de la pauvreté ont besoin d'une formation spécifique. Sauf avec une formation spécifique au projet, le niveau d'éducation général seul ne peut présager de la réalisation des objectifs du projet.

Resumen – EL PAPEL DE LA EDUCACIÓN EN PROYECTOS DE AGRICULTURA PARA LA SEGURIDAD DE LOS ALIMENTOS Y LA REDUCCIÓN DE LA POBREZA EN KENIA – Los proyectos de agricultura han sido promovidos en muchos sitios como uno de los elementos estratégicos de reducción de la pobreza. Estos proyectos muchas veces se han implementado sin la incorporación de un sólido componente de educación, y en consecuencia han tenido poco éxito. Los proyectos de agricultura se realizan para mejorar la seguridad de los alimentos, diversificando la base de los recursos de los hogares y facilitando la adquisición de poder social y económico de la mujer. Este trabajo presenta una investigación que se ha delineado para evaluar la relación que existe entre el nivel de educación y la capacidad de beneficiarse de proyectos de desarrollo de la industria láctea en Kenia. Los resultados muestran mayores niveles de ocupación y empleo entre los hogares beneficiados frente a aquellos no beneficiados. Por otra parte, los beneficiados de los programas de reducción de la pobreza deben recibir una capacitación especial. Aparte de la capacitación específica relacionada con el proyecto, el nivel de educación general por sí solo no puede tomarse como indicio de la futura consecución de los objetivos del proyecto.

Резюме – РОЛЬ ОБРАЗОВАНИЯ В СЕЛЬСКОХОЗЯЙСТВЕННЫХ ПРОЕКТАХ ЗА БЕЗОПАСНОСТЬ ПРОДОВОЛЬСТВИЯ И СНИЖЕНИЕ УРОВНЯ БЕДНОСТИ В КЕНИИ – Проекты сельскохозяйственного развития распространяются во многих местах как часть стратегии, направленной на снижение уровня бедности. Такие проекты часто реализуются с небольшим включением образовательного компонента и, следовательно, имеют небольшой успех. Сельскохозяйственные проекты стремятся улучшить безопасность продовольствия путем введения разнообразия ресурсной базы домашнего хозяйства и содействия социальному и экономическому участию женщин. В данном исследовании предлагается обзор, направленный на оценку взаимоотношения между уровнем образования и способностью извлекать пользу из проектов, касающихся развития молочного хозяйства в Кении. Результаты свидетельствуют о более высоком профессиональном уровне и уровне занятости среди прибыльных хозяйств в отличие от неприбыльных. С другой стороны, бенефициарии схем снижения бедности нуждаются в специальной подготовке. Только один уровень общего образования, кроме специальной подготовки к проектам, не может определить достижение целей проекта.

Poverty is a multifaceted problem that includes factors such as finances, food supply, health, housing, sanitation, politics, infrastructure, war, and education (UN 2003). These can contribute to food insecurity and malnutrition. Poverty and food insecurity are intensified by a lack of access to and control over assets, as well as a lack of access to institutions that provide opportunities and safeguard against shocks and crises. On the other hand, food insecurity leads to malnutrition and an increase in morbidity and

mortality, and reduces the attainment of education and livelihood skills and options. Low national levels of education are detrimental to development under any circumstances; but in the fast developing, technologically globalized world the need for adult education and lifelong learning strategies for all populations is particularly urgent. Without such education, each household's ability to resist societal challenges and shocks is compromised, and human capital decreases. The recognition of the need to improve household food security and women's economic empowerment follows upon the realization of the great role they play as gatekeepers to national development and nutrition. This situation has led to the implementation of agricultural projects that target women smallholder farmers, projects that constitute one of the major strategies to expand agricultural output in rural areas.

Women account for 70–80% of household food production in sub-Saharan Africa, 65% in Asia, and 45% in Latin America and the Caribbean (UN 2003). They are responsible for generating food security for their families and also play a vital role in national agricultural production, producing both food and cash crops. Women farmers have shown that they can be expert in their own domain. Scientists at a Rwandan Agricultural Research Institute (ISAR) and the International Center for Tropical Agriculture (CIAT) in Colombia have collaborated with local women farmers in an effort to breed improved bean varieties. Formerly the breeders' success at predicting 2–3 bean varieties that displayed the greatest potential under actual growing conditions resulted in mildly successful increases in bean productivity. However, the selection of bean varieties by women farmers substantially outperformed the selection by bean breeders. Similar results were obtained in the Philippines and India, demonstrating that a vast reservoir of expert human capital remains largely untapped (Brown, Hilary, Lawrence, Christine and Agnes 2001). However, women are disadvantaged in many ways, not least due to their lack of access to extension education. Women's responsibility in agriculture is increasing with more and more children enrolling in free education, thereby reducing the source of cheap labor. Also, more and more men are seeking urban employment, creating an even larger labor deficit in the agricultural sector. With the increase in male migration and the feminization of rural poverty, there is an even greater need to improve women's income levels and household food security. Yet to increase productivity, women need education, including knowledge of and skills in agricultural production, local genetic resources, seasons in relation to types of crop, and food processing and preservation.

Development projects that seek to improve food security in Kenya have included livestock projects. Livestock generates a larger share of income for rural households, improves food security, and possibly enhances women's participation in civic activities. Gender equality is good for nutritional status improvement (Oniang'o and Mukudi 2002) and for national development. Under unequal conditions, women and girls have poorer nutrition outcomes throughout their lifecycles, high rates of mortality, less access to health care,

and greater household food insecurity (Haddad, Hoddinott and Alderman 1997; Kurtz and Johnson-Welch 1997; Osmani and Sen 2003; Shiffman 2000). Livestock projects that target women smallholder farmers can achieve greater success if there is careful planning, targeting, and implementation. Merely distributing livestock to women may not necessarily benefit them in the household because it increases their workload and drudgery. Women also need education and training regarding various project components and resource management if they are to realize any perceived benefits from agricultural and other developmental projects. Thus, the value of lifelong and adult learning for the success of development projects cannot be stressed enough. Likewise, the value of education for women and girls involved in all levels of development cannot be underestimated, as has been noted in the Millennium Development Goals.

However, project-specific educational components have not always been strongly integrated in agricultural projects. The assumption has been that general education alone enhances beneficiaries' ability to understand project objectives, but this has resulted in little success in poverty alleviation. The claim is that even people who have had a general education need training regarding aspects of project components so as to gain a clear understanding of objectives and outputs. The value of project-specific education (in addition to general literacy education) and the role of lifelong learning in poverty reduction strategies cannot be emphasized enough since agricultural projects, as a poverty-reduction strategy, could be more relevant and sustainable with strong built-in, project-specific educational components. Lack of education is both a handicap for millions of women around the globe and the basic cause for poor agricultural development and food insecurity in the developing countries. Women's lack of education limits their ability to earn money and get credit, to participate in decision-making in their households and communities, to delay having children, and to offer their children the best opportunities in life. Failure to educate women has many causes, including the need for girls' labor in the home, attitudes that devalue education for girls, fears about girls' security outside the home, and lack of resources to pay for education (Fritschel and Mohan 2001). Thus, the present study sought to establish the effect of the level of educational background on performance in dairy projects by comparing beneficiaries and non-beneficiaries of livestock development training.

Background information on the Livestock Development Project

The Livestock Development Project (LDP) started as an initiative of the Government of Kenya and the Government of Finland. It was designed to improve milk production and food security, as well as to empower women in decision-making at both household and community levels. The

LDP was a holistic service program that integrated training in primary production of livestock and livestock products, marketing, and other tertiary activities. The dairy program had both the livestock and the cooperation of the Ministry of Agriculture, Livestock Development, and Marketing (MOALDM) and the Ministry of Cooperative Development (MOCD). The LDP was initiated in Western Kenya, a region with negative developmental characteristics, such as high level of poverty, low level of education, small land holding size, high population density, high levels of malaria infection, and other diseases. Lacking income-generating activities, this region is marked by adverse poverty. It also has high population densities with small landholdings such that small-scale dairy farming can become a viable income-generating activity. Cattle herds in the region are dominated by zebu cattle, which are known for their low milk output, though they have adapted to the environment. The activities of livestock projects include upgrading cattle herds, supporting women's groups, fodder production, milk marketing, monitoring and evaluation, and improving the food security and nutrition status of women and children. The dairy program sought to empower women economically in view of the role they play in community development and household provisioning.

Dairy programs targeted women farmers, who are presumed to be doing the bulk of the farm and domestic work but are left out of decision-making regarding income expenditure and the control of income-generating activities. The program had to create conditions for motivating women to participate more productively in the ownership and caretaking of dairy animals through training and provision of workload-easing facilities on a cost-sharing basis. The program facilitated the participation of members of women's groups in the cow-from-cow rotation scheme (CFCRS), where in-calf heifers were "loaned" to selected women's groups and members that met specified educational criteria, including membership in a women's group, ownership of a developed Napier grass plot (*Pennisetum purpureum*), a developed zero-grazing unit, and ownership of basic facilities for disease control. Disease control requires basic education. Once a group had been identified, officials and targeted individuals were trained in dairy farming before receiving a dairy cow. A written contract was made with recipients to repay the loan by "passing on the gift." The heifers were then passed on to individual women members chosen through a lottery, or some other means determined to be fair. The decision to pass the cows on to individual women was based on impracticality of a women's group keeping a herd, which could be subjected to neglect due to ownership conflicts. This mode of targeting excluded the very poor, who were food insecure and in real need of intervention. Workload-easing appliances, such as roof catchments, cement tanks, chaff-cutters, wheelbarrows, energy-cookers, were also given to these women on a cost-sharing basis to motivate them to participate in the project.

Materials and methods

Study site

The study was conducted in Winam Division in Nyanza Province, and Emuhaya and Sabatia Divisions in the Western Province of Kenya. These areas were chosen for the study because smallholder dairy projects are concentrated there. Average land size in these divisions was also small, which allowed smallholder farming and dairying activities.

Study population

The dairy projects targeted female heads of households with literacy education. Women were targeted due to the great role they play in development at national, community, and household levels. It is believed that agricultural credit programs for small-scale farmers and action to empower women are measures that will improve household food security. Women heads of households were therefore, included in our study.

Study design and sample size

The study was conducted using a cross-sectional survey design. Information about existing dairy programs and a list of beneficiaries were obtained at the Divisional Livestock Extension Office in each division selected. The list of beneficiaries was used to randomly select participants in the study. The criterion for inclusion in the study was existing membership in a dairy program for not less than 3 years. From each division, beneficiaries and non-beneficiaries were matched for locality, socio-economic status, and age group range. A total of 100 participants – 50 beneficiaries and 50 non-beneficiaries of the projects – were selected from each division, with a total of 300 households forming the study sample.

Data collection and analysis

Using an interview schedule, data was collected on selected parameters, such as household size, dependency ratio, level of education of heads of households, household incomes, women's knowledge of dairy management and nutrition, occupation, and employment structure of female heads of households. A participatory approach was used to gather more information from the selected female and male smallholder farmers on perceived benefits of the LDP, strengths, weaknesses, and opportunities (SWOT) of the LDP. Participatory approaches included proportional piling, quantification of benefits and disadvantages of the project, and focus group discussions. A scoring system was used. Mean and standard deviations of

scores were calculated and *Z*-tests used to assess the differences between the groups.

The study sought to explore what benefits accrue from the agricultural projects and to analyze what additional support is needed to maximize the benefits of such projects. Questions concerned educational levels, differences in agricultural production between the two groups, employment opportunities, and other economic characteristics. The women were also questioned about gender distribution of activities, their general knowledge of dairy management, marketing, and the nutritional values of milk. The women's nutritional status was also assessed.

Results and discussion

In what follows here, the findings have been summarized in each case and the issues designated by each sub-heading are discussed. A concluding section will synthesize the overall findings and highlight recommendations for action.

Demographic characteristics

Demographic characteristics of households were classified into population composition, family size, and dependency ratio.

Population composition

Total population under 15 years of age in the sample households was 38 and 39.7 males in beneficiary and non-beneficiary households, respectively, and 36.6 and 43% females in beneficiary and non-beneficiary households, respectively. These levels represent a lower percentage than the national levels, where 53% males and 52% females are below 15 years of age. As this population reaches adulthood, the economy will need to generate income opportunities that accommodate their offspring.

Family size

Families were categorized as small (less than five members), medium (5–6 members), and large families (more than six members). While significantly ($p < 0.01$) more non-beneficiary households had small families, beneficiary households had more medium households ($p < 0.001$). There was no difference in the number of large families in both groups. Large household size is associated with labor availability during peak labor demand in agriculture. Average family size was 7.04 and 6.54 in beneficiary and non-beneficiary households, respectively. The project area was dominated generally by large family size. There are many views concerning the effect of large family size on food security. Although many people believe large family size provides more labor, and hence income sources for the household in terms of hired

services, a large size places greater demands on women's provision of household resources and overextends them.

Dependency ratio

Dependency ratios observed of 1:1.68 and 1:1.37 for beneficiary and non-beneficiary households, respectively, were higher than the national average of 1:1.3. This high-dependency ratio means increased demand for women's time and energy in food production procurement and provision. The younger population exerts pressure on household resources by demanding more, especially food, shelter, clothing, education, and health care. Given both the need to supplement farm incomes with off-farm earnings and the lack of social security systems, family size and dependency ratio may be determined by how many children as one can afford to educate and care for. Large households require more resources to meet demands of education, health, food, and clothing. This creates trade-offs between competing demands and overextends the households' economic resource base. Larger households are thought to be at greater risk of nutritional problems than small households.

Education level of female heads of households

Generally education levels were higher in beneficiary than in non-beneficiary households. The level of illiteracy was 10.7 and 18.5% for beneficiary and non-beneficiary households, respectively. Over half of the female heads of households were either illiterate or had received only primary education, with 42.7 and 23.1% from beneficiary and non-beneficiary households, respectively, having had a high school and college education. Increasing women's level of education is a key ingredient for women's empowerment. Basic education is the foundation for developing flexible skills needed to participate in knowledge-intensive economic activities for food and livelihood security and sustainable environment resource use for poverty alleviation. Even with the introduction of free primary education and affirmative action, there still exist gender gaps in education, where women at increased risk of falling behind men in their ability to participate in development. The challenge is in this regard is to continue to advocate increased enrollment of women and girls in education and to improve opportunities for lifelong learning.

Although we shall see that the beneficiary group was more productive in development than the non-beneficiary group, the low level of education (including illiterate and primary school level) among all women is disheartening. The level of achievement in all samples reflects this. If women are to be empowered, they must receive more education. Negative attitudes of parents, teachers, principals, and children towards the education of girls and women must be changed. Thus staff training, curricula review, lifelong learning, and civic education are necessary in order to ensure that gender stereotypes are not perpetuated in the classroom or in the community.

People with education shift their focus to non-farm activities to diversify their economic resource base for security in times of extreme risk. Education is crucial for improving livelihoods and the major factor for bringing about change in development. The Government of Kenya's educational policy places a great deal of emphasis on education, as a consequence of which it spends about 22% of the national budget on education. Because more males than females are literate, increased attention has been given to girls' education. The proportion of school-age females in secondary and high schools as compared with males is 55% females and 62% males – about twice the average for all sub-Saharan countries (ACC/SCN 1993).

Agricultural productivity

Demand for livestock products is increasing in developing countries, making it the fastest growing agricultural sector. Expansion of this sector has far-reaching implications for resource-poor women, especially combined with strong training programs in group developments and the production, processing, and marketing of animals and animal products. Livestock projects target rural women to improve food security and cash income, provide draft power, create manure, and gain added value through livestock reproduction. The conditions for participation are not favorable for poor women. These schemes allocate animals only to women due to the misguided assumption that women make decisions independently and will improve their bargaining position by bringing wealth into the household. However, the workload increases for women who are already overextended in view of other household chores. It is necessary to develop affordable technologies to ease workload. Such projects would be more successful if men were included in the discussion of benefits and workload distribution so as to remove antagonism between spouses and increase the value of livestock income to household needs.

Livestock produce food and marketable products, adding value to farming enterprises, increasing incomes, and enhancing biophysical economic viability in agriculture. Educating livestock farmers in rangeland management and crop-livestock integration would be of great value to natural resource management, besides increasing livestock productivity.

Our findings showed that, although there was a significant increase in milk production in beneficiary households, the marketing structure was not operated efficiently. Improvement in milk price to cater to dairy inputs would play an important role in further enhancing milk production. By adopting simple, affordable technologies for processing surplus milk and adding value to the product for increased utility, the livestock sector would be transformed. Nutrition education and machinery for variety product development must be provided if there is to be a marketed surplus of milk. The success of dairy development depends to a large extent on marketing and pricing arrangements. The challenge would be to provide reliable com-

munications systems and an all-weather road network. There is also a need for an information and communication technology center, which supports lifelong learning and adult education, where women can access agricultural, nutrition, and health information for household livelihood improvements.

Employment and labor markets for women

Employment opportunities for women are critical for empowerment and food security. More women from beneficiary households were in civil employment than those from non-beneficiary households. Monthly income and median income was thus higher in beneficiary households. Extensive empirical evidence has revealed that increasing the share of women's income in the household considerably improves family and social welfare (Walingo 1998). Increasing women's earnings and share of family income empowers women by strengthening their bargaining power in the household. Education is one of the most important factors accounting for increased female participation in the labor force. Unemployment and occupational segregation are greater for poor women. It is necessary to establish policies that promote women's participation in the labor force by actively targeting the poor and addressing gender discrimination. Land rights for women can permit planning and managing of land and income use. It is urgent that efforts be made to enlighten women about their land rights and how to claim them. This requires education for poor female and male smallholder farmers. Women also require financial markets and information extension to invest in property.

Economic characteristics of households

More women from beneficiary than from non-beneficiary households ($p < 0.01$) have formal employment. This is possibly due to their higher literacy levels as compared to those of non-beneficiary households. Educated women initiate welfare programs through their membership in women's groups, and have clear objectives and well-specified goals. Women's groups are agents of implementation of development programs, and employed women are able to meet the financial obligations required for the efficient functioning of the groups.

More women from beneficiary households were employed as primary school teachers ($p < 0.001$) and high-school teachers ($p < 0.05$) than those from non-beneficiary households. Significantly more women ($p < 0.001$) from the non-beneficiary households were unemployed than those from beneficiary households. Women from both groups were involved in business in the form of small trade, from which they earned an income for household improvement. Because employment is linked to the level of education, more women are now seeking education to move out of the domestic domain and actively participate in civic activities. A statistically significant difference was observed between beneficiary and non-beneficiary households regarding total

monthly income ($p < 0.05$) and mean household income ($p < 0.001$). The dairy projects have had a tremendous impact in enabling beneficiary households to improve their income significantly and thus both their socio-economic status and purchasing power. However, although the mean per capita income was higher in beneficiary than in non-beneficiary households, the difference was not statistically significant, possibly because of large family size and dependency ratio observed in beneficiary households coupled with increased demands of the dairy enterprise.

For poverty reduction, it is necessary to assess in detail the economic performance of the dairy enterprise. It may be that economic returns are quite minimal when all resources invested are outlined, costed, and compared to the returns. Poverty eradication requires a multifaceted approach, and efforts aimed at such eradication should involve everybody from the poorest to political decision-makers, as well as civil and religious authorities who are determined and committed. The active advocacy role of civil society has been a major factor in bringing questions of poverty and its linkages with the globalization process into sharp focus (UN 2000). The United Nations, together with UNCTAD, had for many years drawn the international community's attention to the need to address the plight of the poorest and the least developed countries. Now nations discuss Poverty Reduction Strategy Papers (PRSPs) that define strategies to be pursued. The PRSPs are prepared by national authorities with broad-based participation of civil society organizations, stakeholders in enterprise, and the poor in the respective community. Although PRSPs make reference to the poor, there is little effort to disaggregate 'the poor' (Grindle 2002).

Labor and time utilization in the dairy enterprise

In sub-Saharan Africa, mostly women and children engage in agricultural labor. When agriculture becomes a main economic enterprise, management shifts to men, which tends to deny women the much-needed economic resources for the welfare of households. Interestingly enough, no man from beneficiary households was actively engaged in dairy activities, while only 28.5% of men from non-beneficiary households were involved in dairy activities. Significantly more men from non-beneficiary households were engaged in dairying ($p < 0.001$). Significantly more beneficiary households employed hired labor ($p < 0.001$) in the dairy enterprise. Women from beneficiary households were occupied in non-farm activities for livelihoods. This gives rise to a question: To whom should agricultural extension education be directed? Generally speaking, adult education should be offered to all people. Hired laborers may not have the required knowledge in dairy farming and also may not receive extension education, training, or related seminars.

Over 70% of the labor done in the dairy enterprise in this area is by women. Although there is increased milk production, women do not always have ready access to profits emanating from dairy farming. Women

are responsible for cleaning the cattle shed, watering the animals, fetching fodder, stall feeding, and even milking the cows. Dairy training schemes therefore, overburden women beneficiaries by adding to their already heavy workload. There is a need to collect gender disaggregated data to understand role differences in agricultural production, livestock management, household, and family duties, and differences in managerial and financial control over production. This will improve extension work training at the village level insofar as it tailors extension information to users' needs.

Women from beneficiary households spend on average seven hours a day on dairy activities, in addition to other duties. In certain instances, hired labor was used to supplement female labor. The general patterns in distribution of gender responsibility in agriculture will be identified. Such differences are significant for policy formation; in pinpointing them, it will become possible to account for the distribution of roles and resources in order to target effectively the appropriate producer for particular programs in any locality. Women usually spent more time on low-productivity tasks that are essential for family survival and maintenance, time that is not accorded economic value.

Time- and labor-saving technologies must be developed together with *jua kali* (artisans) since most improved agricultural practices increase demand for women's labor. Efficient modes of transport must be developed to help to reduce time spent on routine household and family activities so as to free up their time and thereby enhance productivity. The other challenge is to strengthen women's access to water for domestic and income-generating activities. Such access will improve health and income and liberate women from drudgery. Although income-generation through various farming activities and other water-based enterprises constitutes the mainstay of rural livelihoods, women's opportunities for water-based income-generation are still too limited. New water sources need to be developed to increase women's access to income, especially when combined with access to land, credit, markets, and required skills. It is also necessary to develop and disseminate affordable small-scale land and water-management technologies to poor rural women and men. The development of a center for information and communication technology for the dissemination of agricultural information, a center where radios, telephones, and computers would be integrated with lifelong learning, could potentially enhance agricultural projects.

Knowledge levels of women related to dairy-projects components

Dairy cooperatives were introduced in the dairy-project area as a market outlet for milk. Women were tested for knowledge of existing cooperatives, and the results revealed significantly higher knowledge ($p < 0.05$) among beneficiaries than among non-beneficiaries. However, the level of knowledge was still low for beneficiaries, revealing a dismal performance of dairy coopera-

tive societies in the study area. Many beneficiaries were unable to state the functions of dairy cooperatives. Even so, more women from beneficiary than from non-beneficiary households were able to name ($p < 0.05$), locate ($p < 0.05$), and state the functions of a dairy cooperative ($p < 0.001$). Results revealed a lack of impact of dairy cooperatives on women's employment, and hence no effect on their time input and income. Similar findings have been reported elsewhere (Doornhas, Frank Van, Manoshi and Riet 1990). In other regions of the world, dairy cooperatives have been reported to increase family income (Rajendra, Jithendran and Jayachandra 1992; Hirevenkanagoudar, Hanumanthappa and Jalihal 1988). Few benefits from the dairy enterprise in the project area accrued to women. Dairy farming is not a scale-neutral activity; rather, the benefits of dairy development accrue to those segments of the population that are better off. The success of the program, its planning and implementation, depends on the active involvement of those for whom it is intended. Educating the target population about the objectives and benefits of the program and helping them to understand the functions of various aspect of dairy farming is necessary for the project to achieve the desired impact.

Knowledge among women about dairy management

The dairy development projects had a training component in aspects of dairy management for beneficiaries. Such training has a spill-over effect on non-beneficiary households, for non-beneficiaries acquire skills by observing from those who have been trained in dairy management, as well as by asking them about what they have learned. Knowledge of dairy management can be gained through either hands-on experience or training, seminars, and workshops. Analysis of the women's knowledge of dairy management indicated that significantly ($p < 0.001$) more women from beneficiary households received training in dairy management than those from non-beneficiary households. More women from non-beneficiary households were ignorant about dairy management ($p < 0.00001$). However, more women from beneficiary than from non-beneficiary households ($p < 0.001$) gained knowledge through experience. Those from beneficiary households who lacked training reported that non-attendance in training sessions and workshops was mostly due to failure to secure permission from their spouses to take part. The training component is necessary to improve performance of the dairy sector in raising household incomes and improving food security. A better approach would have been to educate both husbands and wives about program objectives and outcomes to counter any antagonism between spouses that might hinder development. Projects should have a built-in educational component that emphasizes to the beneficiaries the diverse benefits of the outcomes.

Knowledge among women about the nutritional value of milk

Women were tested about knowledge of the nutritional value of milk and symptoms associated with selected nutrient deficiencies. The nutritional score was calculated by allotting a tentative score according to the number (12) and type of responses. Summing up tentative scores for each question provided the total attainable score, which was equated with 100, and the conversion factor $100/S$ was used in awarding scores. The overall knowledge score was 64% for beneficiaries and 63.4% for non-beneficiaries. Participation in dairy projects had no impact on women's nutritional knowledge or awareness. Although women from beneficiary households had higher literacy levels than those from non-beneficiary households, there was no difference between the two groups regarding knowledge of the nutritional value of milk in households' diets and its role in the control of child malnutrition. The dairy projects did not have any significant impact on changing women's attitudes towards milk consumption under certain disease conditions. Similar results have been reported by Hoorweg and Nimeijer (1980a, 1980b) and Christian, Rita, Sunder and Tara (1988). Githagui (1980) found that nutritional knowledge after nutrition education did not change the practice of participants. Emphasis on the benefits of milk for household consumption may prove a strong selling point for adoption of dairy farming in the project area. Agricultural projects must be designed and implemented with the involvement of the beneficiaries at all stages. The educational component must be strongly built into all phases of such projects.

Nutritional condition of women

Malnutrition has to be considered in terms of under- and over-nutrition. The prevalence of obesity among women was between 6 and 4.5% in some beneficiary households. On the other hand, the prevalence of under-nutrition was 7.4 and 8.6% among women from beneficiary and non-beneficiary households, respectively. A lifecycle approach to nutrition problems and choice of interventions is necessary since a woman's nutritional status is cumulative over time. A woman's poor nutrition is likely to be passed on to a fetus and infant/child and continue through adolescence, with a far higher risk of the individual experiencing numerous development deficits and dying in infancy. Such an individual is more predisposed to later cardiovascular and endocrine diseases. The major consequences of malnutrition for women are poor productivity and health. However, insufficient attention has been given to the extent, causes, and consequences of women's malnutrition. Efforts must be directed to identification of causes specific to and consequences of malnutrition among poor women. Social, economic, and cultural factors – such as women's social status, fertility patterns, and discrimination, which influence morbidity – should be identified for targeted intervention. This can be

achieved with adult education and lifelong learning components in the project development systems.

It is necessary to conduct a clear assessment of access to quality and quantity of health and nutrition services. Nutrition intervention programs that aim at improving female nutritional status throughout their lives, thus alleviating lifecycle nutritional imbalances, and at maximizing impacts can achieve greater success with a strong built-in educational component. Nutritional education content should include macro- and micronutrients, energy intake, and action to strengthen the capacity for practice of caring for women and adolescent girls. Advocacy should include the enhancement of female nutrition, education, and mainstreaming the use of birth weights as an index of development. Food and nutritional issues can thus be used to mobilize legislatures, the judiciary, and the media to give voice and strengthen accountability. The community must be made aware of the problems facing them, especially food and environmental problems, through nutrition and health education, as well as adult literacy campaigns. Nutrition maps, in conjunction with educational, health, poverty, and environmental status maps, must be developed so as to highlight the problems in these areas. Collaborative work with ante- and postnatal clinics must be undertaken in the provision of nutrition and reproductive health education, as well as in creating opportunities to access contraception resources and the education sector.

Conclusion

Results revealed higher literacy rates and occupation and employment levels among beneficiary than among non-beneficiary households. Knowledge scores on aspects of nutrition and dairy farming were not significantly different between beneficiaries and non-beneficiaries. Although per capita income was higher in beneficiary households, there was no significant difference in total household income between the two groups. It is therefore necessary to focus project-specific education on beneficiaries in relation to all project components to improve the impact of a project on a community. The hope is that such an approach will cause beneficiaries to appreciate the project and improve its sustainability. A strong educational component has to integrate poverty reduction strategies to enable individuals to identify and diversify their resource base and to improve the household food-security situation. However, general education for all is necessary for improved livelihoods. Targeting the educated alone leaves out the very poor, who require poverty alleviation strategies, including education to improve their livelihoods. It is therefore necessary to raise the provision of adult education generally, and especially for those who have had no education at all, so that they can participate in development projects.

Agricultural projects have the potential to improve household socio-economic status if:

- targeting includes the neediest so that they can become beneficiaries of the programs;
- the targeted become involved in the design and implementation of the programs for sustainability;
- those targeted are trained to understand, accept, and effect the program's objectives;
- education is more strongly integrated in the program; and
- evaluation is built into the programs at all stages. Although projects may target individuals with general education, it is necessary to include further content-specific education in the training programs.

Implications for adult education theory and practice for poverty reduction include the following:

- Curricula for adult education have to be included in agricultural development projects at all stages. It is necessary to draft relevant adult education manuals for diverse projects.
- Inter-ministerial cooperation is necessary to mitigate the effects of illiteracy on development projects.
- Poverty eradication strategies must be integrated in adult education curricula.
- Adult education in Kenya has not been properly implemented, although the policy is good. We have witnessed elderly pupils over 60-years old join elementary classes with minors in order to acquire enough education "to be able to count and read the Bible."
- The Ministry of Education has to strengthen its staff's capacity and provide resources for monitoring and evaluating the delivery of and interventions in education.
- The impact of 'illiterate poverty' on the educational system is of paramount importance and must be addressed in the design of sustainable policies and programs. This requires the collection of impact data of differential effects of 'illiterate poverty' on learners, teachers, and the educational system in view of age, gender, and socio-economic status in order to gain insight into types and kinds of policies and programs that should be initiated or developed.

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